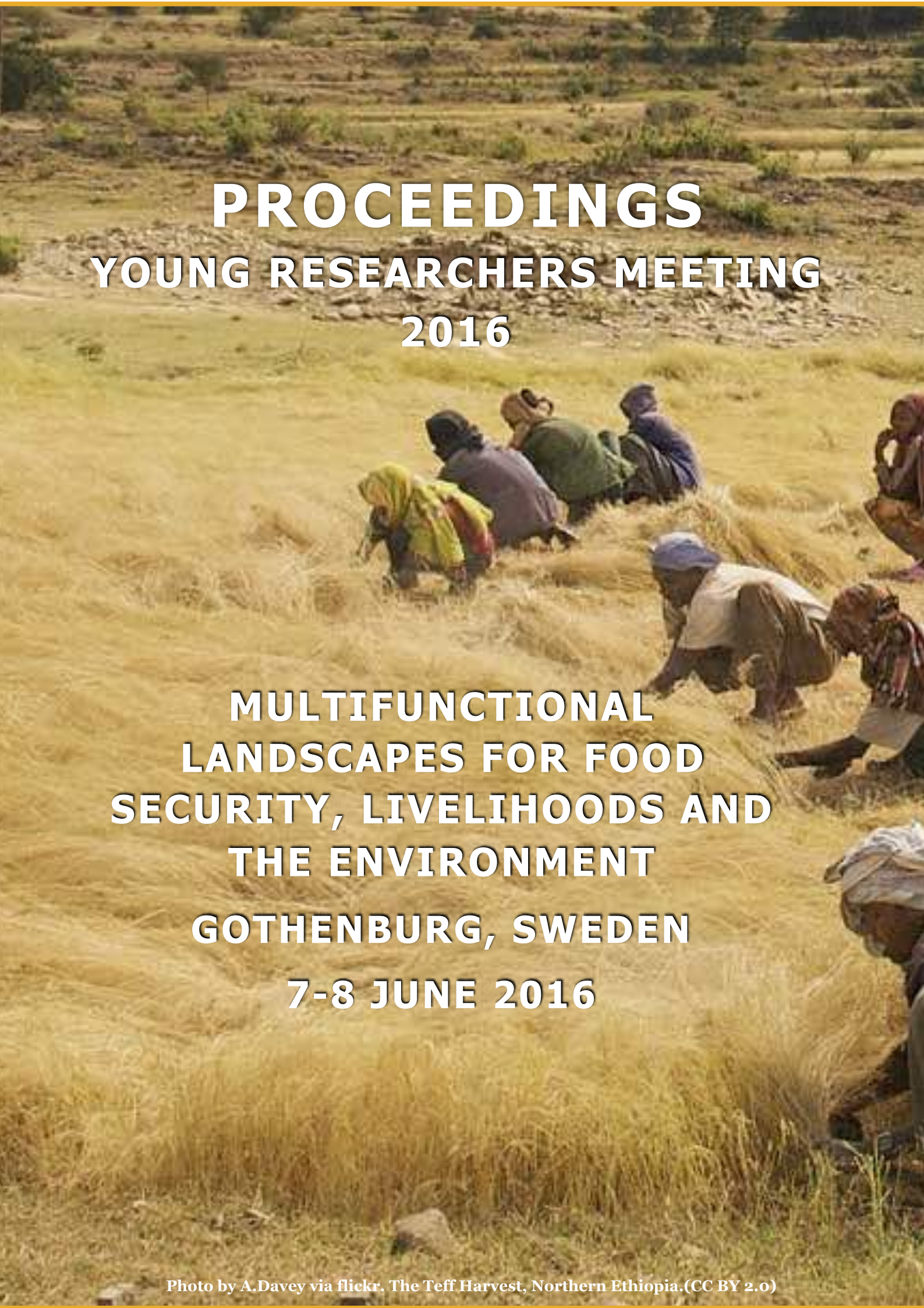
PROCEEDINGS

YOUNG RESEARCHERS MEETING 2016



MULTIFUNCTIONAL LANDSCAPES FOR FOOD SECURITY, LIVELIHOODS AND THE ENVIRONMENT

GOTHENBURG, SWEDEN

7-8 JUNE 2016

Photo by A.Davey via flickr. The Teff Harvest, Northern Ethiopia.(CC BY 2.0)

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ABOUT

SIANI (Swedish International Agricultural Network Initiative) is a member-based network that supports and promotes Swedish expertise on sustainable food security and nutrition, in line with the Swedish Government's policy on global development. SIANI's mission is to "Promote dialogue and collaboration on sustainable food security, with a focus on low-income countries". SIANI has extensive experience in creating productive dialogue through seminars, expert groups and other strategic initiatives.

In line with SIANI's vision and mission ***The SIANI theme Sustainable Agricultural Production and Food Security*** serves as the entry point for an enriched synergy with SLU Global. The theme provides an opportunity for SLU to strengthen capacities for dialogue between research disciplines/institutes, the community of practice and policymakers.

The mission of the ***Swedish University of Agricultural Sciences (SLU)*** is "to develop the understanding, management and sustainable use of biological natural resources", which adheres to several of the Sustainable Development Goals in the United Nations' "Agenda 2030". The unit ***SLU Global*** was established in 2012 in order to implement SLU's strategy for global development. SLU Global supports the development of higher education and research in collaboration with partners in low-income countries and with relevant multilateral organisations.

Together, SIANI and SLU Global host a large biannual national conference Agri4D. This conference also has an inter-twining biannual smaller ***meeting for young researchers*** since 2014. For 2016 it was proposed to carry out the smaller conference with the thematic field of "multi-functional landscapes". A desired outcome of the meeting is to contribute to networks and multidisciplinary exposure for young researchers in relevant fields. This conference also gives an opportunity to expose interesting and relevant new research within the Swedish resource base to media and interested stakeholders.

Focali (Forest, Climate, and Livelihood research network) is a Swedish research network focusing on forest / bio-energy, climate change and poverty issues. Several Swedish universities and institutions are represented in the network. The purpose is to contribute to the provision of relevant knowledge to Sida and other Swedish authorities for the effective use of forest operations to achieve climate-poverty targets. Focali also aims to increase the flow of relevant information between scientists, industry, government and civil society.

Author: Johannes Ernstberger, SLU
Layout: Margarita Cuadra, SLU
Uppsala, 2016

Program

First day - June 7th

13.00 Welcome and round table presentations of participants. Per Knutsson, GU

13.45 Project presentations of young researchers (including 15 min coffee break).

Format of the presentation: Max 10 min presentation of your research project and how it relates to your sub-theme, followed by 5 min questions or comments.

19.00 Shared dinner

Second day - June 8th

Keynote presentations

9.00 Anders Malmer, SLU:

9.45 *Governing landscapes towards multifunctionality: contradictions, tensions and windows of opportunities.* Per Knutsson, GU

10.30 Coffee break

11.00 *Tikopia: A climate smart, sustainable and multifunctional island.* Thilde Bech Bruun, KU

11.45 Lunch

12.45 Theme discussions in groups bringing out joint questions/ problems/challenges for discussion in relation to the sub-theme, based on the abstracts and the presentations on the first day. Here you can also raise issues that you want to discuss.

Coffee break

15.30-16.00 Plenary and wrap up. Per Knutsson, Thilde Bech Bruun, Anders Malmer

FIRST DAY

Welcome and round table presentations of participants. Moderated by Per Knutsson, GU

Rapporteur: Johannes Ernstberger, SLU

The Young Researchers meeting on multifunctional landscapes was officially opened by Margarita Cuadra who shortly presented SLU Global, the Swedish International Agricultural Network Initiative (SIANI), and the Forest, Climate, and Livelihood research network (Focali), all of which had been key contributors to organising the meeting.

Per Knutsson welcomed everybody to the Linné campus of Gothenburg University and gave a short introduction to the School of Global Studies whose venues the meeting was taking place in.

To introduce the idea of the young researchers meeting, he handed the word over to Madeleine Fogde from SIANI. Madeleine welcomed the participants, introduced herself and her background, and explained the role of SIANI and today's meeting: Founded in 2008 with the goal to find ways of feeding a potentially doubling population in a sustainable way, thus taking into account our planetary boundaries, SIANI aims at transferring knowledge and creating outreach. SIANI acknowledges that there is a large knowledge resource base across different sectors and disciplines, and works with creating connections across global scales and within Sweden. As one of their activities, they arrange a large conference on agricultural development, Agri4D every other year. In the years between, a smaller interdisciplinary meeting specifically for younger researchers is organised, the Young Researchers Meeting, which this year had the theme of multifunctional landscapes.

Per Knutsson shortly presented the schedule of the one-and-a-half day-long meeting, and explained that the following day would include a division into three different sub-themes hosted by three senior researchers. He then introduced himself and his role as a senior lecturer and coordinator of the PhD programme. He mentioned his social science background and his core areas of interest being land use/change, governance of land. He told of his experience from West Africa, especially Burkina Faso, but explained that he also had worked with semi-arid pastoralists in Kenya, and coastal conflicts in India. He mentioned that he would be leading the sub-theme focused on planning in multifunctional landscapes.

Welcome and round table presentations of participants. Photo M.Cuadra

PRESENTATIONS BY YOUNG RESEARCHERS

Abstracts

Land-use transitions and agroforestry in upland Myanmar

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After five decades of military rule, Myanmar experiences a phase of rapid and largely unforeseen socio-political change. The 2015 election victory of former opposition leader Aung San Suu Kyi and subsequent appointment of civilian president Htin Kyaw, mark just the latest shift of political power in this process.

However, Myanmar's transition is not solely political in nature. Reforms and the country's progressive opening have spurred an influx of investments and diverse international actors; including corporate and private investors, non-governmental organisations, as well as bi- and multilateral donor funds. In 2011/12 the government passed a series of highly controversial investment and land-sector policies that appear to be motivated by a development agenda designed to foster agri-business investments, rather than to capitalise upon traditional family farming practices, currently constituting the backbone of crop-production in Myanmar.

Experiences from neighbouring countries suggest that rural livelihood and land-use changes in Myanmar are now likely to happen fast and be of a long lasting nature; as a far-reaching transition from subsistence-oriented agriculture, to intensified export-oriented farming is not readily reversible. Yet, contemporary land-use changes in the context of the Union's current transition remain under researched; and there is a striking absence of work explicitly evaluating social and environmental trade-offs associated with an intensification process from subsistence oriented swidden farming to more permanent commercial crop production. This knowledge gap is problematic, as insights about these trade-offs and aspirations of various land-sector stakeholders are a pre-requisite for informed decision making about desirable development trajectories for Myanmar's upland landscapes.

I will share work-in-progress on a literature review on drivers, pathways and impacts of agricultural land-use and tree-cover change in Myanmar; and present initial plans for empirical research seeking to advance current knowledge about potential development and intensification pathways for the Union's upland landscapes, with an explicit focus on agroforestry.

Laura Moch during her presentation. Photo M.Cuadra

Do European agroforestry systems enhance biodiversity and ecosystem services? A meta-analysis

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Agroforestry has been proposed as a sustainable agricultural system over conventional agriculture and forestry, conserving biodiversity and enhancing ecosystem service provision while not compromising productivity. However, the available evidence for the societal benefits of agroforestry is fragmented and does often not integrate diverse ecosystem services into the assessment. To upscale existing case-study insights to the European level, we conducted a meta-analysis on the effects of agroforestry on ecosystem service provision and on biodiversity levels. From 53 publications we extracted a total of 365 comparisons that were selected for the meta-analysis.

Results revealed an overall positive effect of agroforestry (effect size=0.454, $p<0.01$) over conventional agriculture and forestry. However, results were heterogeneous, with differences among the types of agroforestry practice and among the ecosystem service assessed. Erosion control, biodiversity, and soil fertility are enhanced by agroforestry while there is no clear effect on provisioning services. The effect of agroforestry on biomass production is negative. Comparisons between agroforestry types and reference land-uses showed that both silvopastoral and silvoarable systems increase ecosystem service provision and biodiversity, especially when compared with forestry land. Mediterranean tree plantation systems should be especially targeted as soil erosion could be highly reduced while soil fertility increased. Landscape scale seems to be necessary to capture the complexity of agricultural landscapes in ecosystem service assessments. We conclude that agroforestry can enhance biodiversity and ecosystem service provision relative to conventional agriculture and forestry in Europe and could be a strategically beneficial land use in rural planning if its inherent complexity is considered in policy measures.

Mario Torralba during his presentation. Photo M.Cuadra

Understanding multifunctional landscapes and their change to inform intensification efforts

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Sustainable agricultural intensification requires knowledge of the multiple functions landscapes have for local people, to avoid trade-offs from interventions. I have studied six villages in northern Burkina Faso where smallholder farming is the dominant livelihood strategy, rainfall and yields are highly variable, and poverty widespread. In these village landscapes, units such as fields with trees, fields around homesteads, depressions, shrublands and fallow all contribute with multiple benefits to livelihoods, but in different configurations. Benefits include food from crops and wild sources, energy, material, income and insurance. Fields with trees contributes substantially to all benefit categories, not only crop production. Interpretation of aerial photographs and satellite images show that cropland have expanded in the villages since the 1950's, from initial levels ranging from 30 to 70 % of village area, to covering 50 to 80 % around 2010. Over this period, the population density has doubled. Today, crop production is more dependent on the input (manure, mineral fertiliser, labour) you can afford than on the surface land you have access to. Further, in some villages, the area of shrubland has become too small for ranging livestock, and to maintain the diversity of woody species needed for the generation of benefits. This research has integrated the local use perspective in assessment of landscape functions in a way that has allowed for up-scaling to provincial scale. This increases the potential to inform interventions with knowledge of the current benefits to livelihoods from local landscapes. Changes in these benefits need to be considered in evaluations of interventions. The results indicate possibilities for intensification by making input accessible to farmers, and that intensification can make land available for shrubland. An emerging question is what type of agriculture will both be a desired livelihood strategy for new generations of farmers, and sustainable from an environmental perspective.

Hanna Sinare during her presentation. Photo M.Cuadra

Mapping tenure security across urban slums and informal settlements in Addis Ababa, Ethiopia

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This research project examines the notion of tenure security within the context of urban slums and informal settlements in Addis Ababa, Ethiopia.

Having embarked on a mission to eradicate poverty from its surface, the Ethiopian capital finds itself in the midst of an extensive urban transformation process with the hope of alleviating the poor from the uncertainties of life under the informal.

This project will be focused around three steering objectives: firstly, mapping the types of irregular settlements in the city based on a set of characteristics outlining physical, social, legal (and possibly other) features; then, analysing and comparing how the residents express and experience their tenure security within their (in)formal standing; and lastly, identifying how resettled slum dwellers and informal settlers are experiencing and expressing their tenure security following formalisation.

By focusing on these separate aims, the study will compare at least three types of tenure as manifested by the surveyed population: the informal settler; the formalised slum dweller; and the resettled squatter. By doing so, this project hopes to cross-analyse unique forms of habitat in relation to livelihood security and geographical location, while simultaneously establishing a means of measuring tenure security outside of the standard formalisation box.

Elisabeth Dessie during her presentation. Photo M.Cuadra

Contributions of forest foods to meeting recommendations for dietary intakes: A multi-country case study analysis

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The role of forests and trees within food producing landscapes is gaining increasing attention. To date, most evidence of the importance of forests and trees for food security and nutrition comes from broad correlative studies of tree cover and nutrition, or from case studies of single communities. Forests and trees may contribute to food security through three different pathways: first forests provide ecosystem services such as water regulation, soil protection and pollination services that contribute to conventional agriculture; secondly, types of agriculture in forested areas such as agro-forestry and shifting cultivation are typically diverse and resilient and thus increase production diversity and stability of food systems; finally, forests may contribute directly to food security and nutrition through the provision of wild forests foods including fruits, vegetables, bushmeat and fish. This study examines the nutritional contributions of wild forest foods using standardised survey data across smallholder dominated forested landscapes in 24 tropical countries. We use data from the Poverty and Environment Network (PEN) , a collaborative research project led by the Centre for International Forestry Research (CIFOR).

Here we test the hypothesis that the consumption of forest foods can make important contributions to dietary quality. Drawing on data collected using a standardised methodology in 58 forest-adjacent communities in 25 countries across the tropics, we estimate the contributions that micronutrient-rich forest-source foods make to meeting individual dietary recommendations, compare quantities of forest plant foods and animal source foods with national averages and compare the relative contributions of forest foods to smallholder agriculture.

Over half the households in our sample consumed one or more forest food in the past year but we find a high degree of heterogeneity in patterns of forest food consumption. Average forest fruit and vegetable consumers consumed low quantities that make negligible differences to dietary intake. Average forest meat and fish consumers obtained less than one fifth of their dietary needs from forest sources alone. For high level forest food consumers however, contributions to dietary needs is high. Due to the high level of heterogeneity, we identify four site level typologies of forest food use: forest food dependent, limited forest food use, forest food supplementation and specialist forest food consumers. For forest food dependent and specialist forest food sites, those engaged in the consumption of high quantities of forest foods obtain a large proportion of recommended fruits and vegetables and animal source foods from forests. For both limited forest food use and forest food supplementation sites however, the quantities being consumed likely make little contribution to nutrition, though, in the context of diets otherwise lacking in sources of micronutrients could be of importance.

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We find some forest food consumers enjoy nutritional superior diets to their national counterparts, but this applies only to those households heavily engaged in the extraction and consumption of forest foods. For the average forest food user, the quantities micronutrient rich food groups consumed from forests are relatively low compared to national average consumption quantities of these food groups, but may be significant if supplemented by other sources.

If indeed forests substantially contribute to dietary quality in some areas, forest loss and land use change (including that driven by agricultural expansion) may result in unforeseen, adverse consequences on nutrition for local people.

Dominic Rowland during his presentation. Photo M.Cuadra

A rose by any other name? Assessing the effectiveness of landscape approaches in the tropics

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We assessed the effectiveness of so-called landscape approaches in 52 tropical countries. Our findings indicate that landscape approaches can be successful in improving dimensions of conservation and development within the landscape such as: social capital, enhancing community income and employment opportunities as well as reducing land degradation and conserving natural resources. Despite these encouraging findings, comprehensive data on the social and environmental effects of these benefits are still lacking. The quality and consistency of implementing, monitoring, and reporting of landscape approaches in the tropics often lack the necessary precision to adequately assess effectiveness in practice. However, we are able to identify some key contributing factors towards effective implementation, and progress, of landscape approaches and suggest that multi-level governance structures correlate well with success. We conclude that landscape approaches are a welcome departure from previous unsuccessful attempts to reconcile conservation and development in the tropics but remain nascent in both their conceptualisation and implementation.

James Reed during his presentation. Photo M.Cuadra

An ecological–economic analysis of climate mitigation through rewetting previously drained hemiboreal peatlands

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The Swedish National Inventory Reporting (NIR) to the UN climate convention (UNFCCC) shows drained organic soils (DOS) to have emissions about 11 Tg CO_2 eq yr^{-1}, almost as high as the road traffic, 18 Tg CO_2 eq yr^{-1}. DOS are hot spots for GHG emissions, which could be mitigated by rewetting and land use change. We performed an ecological–economic analysis of rewetting drained fertile peatlands in a hemi-boreal climate by different land use strategies over 80 years. Vegetation, soil processes and total GHG emissions were modelled using the CoupModel for four scenarios: 1) business as usual – Norway spruce with a groundwater level of -40 cm; 2) willow with groundwater at -20 cm; 3) reed canary grass with groundwater at -10 cm; and 4) a fully rewetted wetland. The above estimates were the basis for a cost–benefit analysis using social costs of carbon as a proxy for the value of GHG emissions, beside profits made from sold products. Avoided CO_2 was included due to both replacement of cement and steel in buildings as well as fossil fuels for heating and electricity production. Valuation of biodiversity was included for the fully rewetted scenario only. Scenario 1 resulted in a total soil emission of 24 Mg CO_2 eq ha^{-1} yr^{-1}, and compared with this the scenarios 2, 3 and 4 reduced emissions by 33%, 72% and 89%, respectively. While the emissions differed between scenarios, the first three scenarios produced similar amounts of biomass. Net annuity values for the four scenarios were; -136, -1131, 516 and 746 SEK ha^{-1} yr^{-1}, respectively. For scenario 1, overall costs were due to high emissions. Scenario 2 was the worst due to both high emissions and a low value for the sold willow. Scenarios 3 and 4 were the best, due to smaller emissions. We conclude that raising the water table for fertile drained peat soils could significantly reduce GHG emissions as well as social costs. This needs to be considered for land use planning and policy-making.

The study was funded by BECC (Biodiversity and Ecosystem services in a Changing Climate, http://www.becc.lu.se/, and the Swedish Energy Agency (project number 32652-1). We would like to thank Johan Rova, County Administrative Board Jönköping, who shared expertise on the cost of wetland restoration in Store Mosse National Park and Komosse nature reserve in Sweden. We also acknowledge the data provision from the Skogaryd research station, part of SITES (Swedish Infrastructure for Ecosystem Science).

Hongxing He during his presentation. Photo M.Cuadra

Can a protein production index optimize land use?

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Protein supply is a critical factor for human nutrition and has been acknowledged as one of the major challenges for humanity. Production and consumption of both vegetable and animal protein is associated with significant environmental impacts and resource use. The societal debate often focuses on vegetable protein as the sole solution to sustain the global population with least possible environmental impact which can seem logical as vegetable protein production often requires less land area and fewer inputs than animal protein production. However, resource inputs for different types of protein production differ significantly. The different inputs create different environmental impacts both in order of magnitude and type of impact. An especially complex matter is the capability of ruminants to digest roughage feed. The feed can be produced on permanent pastures which are unsuitable for production of crops for human consumption and can be produced on arable land in a crop rotation which is beneficial for the rotation, reduces nitrogen leakage and increases biodiversity. The large variety of production systems for ruminants also means that simplified estimations of environmental impacts can result in poor decisions that in the long perspective can create negative consequences for ecology and biodiversity. Relatively few research attempts have been made in this area and it is therefore important to investigate how land resources can be used efficiently in the future. The unit m^2/kg food which is often reported as an indicator of resource use does not capture the difference in land quality used in different food production systems, nor the quality of the protein produced. The aim in this project was to develop a measure describing how efficiently a food production system utilises the land to produce protein for human consumption incorporating both the productivity of land and quality of proteins harvested- a protein production index, PPI.

Anna Woodhouse during her presentation. Photo M.Cuadra

Can conservation agriculture save tropical forests? The case of minimum tillage in Zambia

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Minimum tillage is a key component in the promotion of conservation agriculture and the broader climate smart agriculture in sub-Saharan Africa. Climate smart agriculture is one of the main policy options for agricultural development and poverty reduction in the region and is promoted as a viable means to achieve the triple dividends of increasing agricultural productivity, improving adaptation to and mitigation of climate change. However, the multiple development and climate objectives associated with climate smart agricultural practices such minimum tillage have led to questions and debates on their effectiveness. Focusing only on the mitigation potential and on the main principle of conservation agriculture, this paper asks does minimum tillage reduce cropland expansion (deforestation). Previous studies linking conservation agriculture principles to mitigation approach this question by only focusing on the soil carbon sequestration potential. We argue that there is another potential linkage through the effects of minimum tillage (defined as ripping, planting basins and, or zero tillage) on crop yield and cropland expansion.

We apply instrumental variable and simultaneous equation methods to assess the effects of minimum tillage on cropland expansion (deforestation) using household survey data from 368 smallholders in Zambia. Our preliminary results suggest that about 19% of the farmers in our sample expanded cropland into forests, clearing an average of 0.14 ha over one year and that minimum tillage has limited potential to reduce cropland expansion due to its low adoption intensity. Higher crop yield, farm size and output prices stimulate expansion while secure land tenure and access to improved inputs reduce it. This implies that minimum tillage alone may be a risky option to reduce deforestation unless combined with other conservation measures such as direct control of expansion into forests.

Hambulo Ngoma during his presentation. Photo M.Cuadra

Agrophotovoltaics – A combined production system for food and energy to reduce land use conflicts between the agriculture and energy sector

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Within the last decades, renewable energy policies (e.g. the Renewable Energy Act (EEG) in Germany) have intensified area competition over agricultural land between energy crops, food crops, but also large scale Photovoltaic (PV)-plants. With the expected price competitiveness of PV systems, agricultural areas will be exposed to external pressure. Positive effects for the environment from solar power production (instead of fossil fuels) face (negative) local effects from PV plants, such as using food productive areas for PV-installations. Agriculture and energy production systems work independently and both require large areas. A workaround for this problem is Agrophotovoltaics (APV), a combined system for using photosynthesis and PV at the same time, with plants (e.g. vegetables) growing below mounted PV-cells in around five meters above the ground. Through this combined use of arable land, production systems for biomass and power could be combined on one site and the production efficiency is expected to increase as shading might have positive effects on cultivation conditions and water supply (e.g. reduced evaporation and reduced heat stress) leading to higher plant yields. Within the framework of the APV-RESOLA (contribution to a resource-efficient land use) project, a pilot plant will be built to analyse the APV-technology in Southern Germany. The project consortium includes partners from research, industry, planning, and regional farmers. Stakeholders and citizens will be involved in the technology development process for a sustainable market introduction of the APV-technology. Recommendations for politics, agriculture, technology developers and researchers will be provided through an innovation concept. Further applications of this technology aim at transferring this technology for hail protection, water management in semi-arid regions, and self-sufficient farming systems. An overview of the project structure, the goals and scope as well as some preliminary results will be given in this presentation.

Daniel Ketzer during his presentation. Photo M.Cuadra

Enhancing the resilience of fishing communities to climate Change through co-management in the Hilsa fishery – A case study of Bangladesh

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Bangladesh is one of the most vulnerable continental nations in the world to climate change due to poverty, high population density, food insecurity, and exposure to flooding. Fishing villages are especially vulnerable because of isolation, lack of livelihood diversity, dependence on the aquatic ecosystem, and natural hazards associated with flooding and erosion. Hilsa (*Tenualosa ilisha*) is the national fish of Bangladesh and an important source of livelihood and seafood in Southern Asia. However, the stocks are subjected to serious depletion due to a number of threats and stressors including climate change. The PhD studies will analyse the dimensions of vulnerability of fishing communities and underlying causes, and assess how fisheries co-management can increase the resilience of fishing communities. The project employs participatory research methods that will enable fishers to work alongside researchers to identify problems and use their skills and local resources to find solutions. The present studies will contribute to the literature on fisheries co-management and fishing community resilience, advance understanding of power dynamics in fisheries and suggestions for strengthening the resilience of fishing villages to climate change and other stressors. Eventually, will contribute to improving the welfare and empowerment of the Hilsa fishing communities. Furthermore, from this case study, there will be relevant information and experience from the co-management arrangement which could be transferred to Hilsa fisheries management in India, Myanmar, Pakistan and Persian Gulf states.

Mohammad Mozumder during his presentation. Photo M.Cuadra

Household perceptions of the multifunctionality of agroforestry trees in smallholder farming systems of Tigray, Northern Ethiopia

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This case study's aim was to investigate the multiple functions and associated personal values of agroforestry trees in Tigray, Northern Ethiopia, from the perspective of farming households. 55 household heads in two locations, Abreha we Atsebah and Mayberazio, were interviewed during March 2016. For interviews, an adapted version of soft laddering interviews in combination with a means-end chain framework was used. Interviews consisted of two parts, first a structured checklist to gain an understanding of the individual household's farming system and to identify the main agroforestry tree species present in the household. Then, the main functions of these tree species were elicited and discussed in terms of attributes, consequences and associated personal values. The most common trees were *Faidherbia albida*, *Eucalyptus spp*., and *Acacia ethbaica* in Abreha we Atsebah, and *Acacia lahay, Eucalyptus spp*., and *Cordia africana* in Mayberazio. The main functions elicited were fodder (*F. albida; C. africana; A. ethbaica*), fertilizer (*F. albida; C. africana*), firewood (*Eucalyptus spp.; A. lahay; A. ethbaica*), construction (*Eucalyptus spp.; A. lahay; C. africana; A. ethbaica*) and sale (*Eucalyptus spp.; C. africana*). Functions could be divided into two categories: basic provisioning (firewood, fertilizer, construction) and business related (sale, fodder). Whereas both categories were highly valued by participants, trees that only relate to basic provisioning functions provided fairly little incentive for expansion. Trees that also related to a business were found to be cognitively linked to a better life and appear as most interesting for agroforestry expansion, unless they have a direct negative effect on the farming lifestyle, like e.g. *Eucalyptus spp*.

Johannes Ernstberger during his presentation. Photo M.Cuadra

Challenges and success factors to enhancing rural community resilience to drought – Case study Bugesera in Rwanda

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By 2025, 1.8 billion people will be living in regions with absolute water scarcity and a two-third of population could be living under water stress. At the global scale, agriculture is by far the most important water user and, the need for new approaches to managing those resources is becoming more pressing.

In Sub-Saharan Africa, small-scale rain-fed farming is the main livelihood source. To increase drought resilience, there are some commendable efforts in promoting community-based soil and water conservation by governments and development organizations.

Droughts normally make their entrance quite slowly and signs should be possible to see earlier – e.g. from signs in nature, seasonal forecasts or from just comparing monitored soil moisture or other factors against the typical development during a year. But if we have early warnings and water conservations systems like that – how can that information and knowledge be used on local, regional and national level? What is missing to engage rural communities to become drought resilient by developing long-term planning based on future scenarios?

Many successful cases of rainwater harvesting documented in Ethiopia, Kenya, Tanzania and Burkina Faso describe the technical management of water conservation, but little is mentioned on their failures.

In Bugesera district, water ponds were introduced to improve living conditions by insuring food security.

This case study is analysing the knowledge gaps in addressing the challenges related to building resilience to drought with focus on water management and other capitals. The challenges to overcome in order to increase resilience to drought with consideration to multi-level actions are highlighted.

Lazare Nzeyimana during his presentation. Photo M.Cuadra

The potential of edible forest gardens in urban areas

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In Sweden, as in many high income countries, the interest in urban agriculture is increasing. Many new forms of gardening in urban areas are emerging. One of them is edible forest gardening, which is one form of agroforestry, however not common in Sweden. There are about 25 small edible forest gardens in Sweden and 4 of them are located in public parks in the capital Stockholm. Since Stockholm is growing, the demand on housing is increasing. There is a conflict on the need of new housing versus conservation of the green areas.

Urban ecosystems generate several ecosystem services among them food, recreational values and climate adaptation. In dense cities green areas such as parks are becoming more important for human health and wellbeing. “Green infrastructure” as climate adaptation is considered a cheaper strategy than technical solutions.

The multifunctional benefits from urban agriculture in general are often underlined, but many studies lack the details of environmental consequences of different gardening methods. However, research on green areas in cities and research on edible forest gardens are separate, but indicates that there are more potential synergies, if explored together. Therefore, the focus in this study is on the potential synergies from edible forest gardens in urban areas in the temperate zone.

This first attempt aims to study the 4 existing edible forest gardens in Stockholm by investigate how have these edible forest garden been used so far? And what are the benefits and constrains with these edible forests gardens?

Several methods are used like study visits, participatory observations in planting and community events and interviews with initiators behind the gardens and managers. The result is discussed and compared with goals in planning documents from the municipality of Stockholm on climate adaptation, social sustainability and food security.

Christina Schaffer during her presentation. Photo M.Cuadra

Design and Sustainability Assessment of Bioenergy Double Cropping System in Southern Sweden

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Due to short growing seasons harvesting two crops sequentially in one year is not common in Sweden. In this experiment a cropping system was designed where rye was grown as a first crop for energy production. Main ideas of the designed cropping system were to grow food crops after harvesting rye in the same year and to have soil cover all the year round to reduce nitrogen leaching. The field experiment was conducted in 2014-15 in Dybäck, southern part of Sweden. Rye was planted as first crop in September 2014 and harvested in green condition for energy production at the end of May 2015. Total biomass yield of rye was 13.3 t/ha. Blue lupin, soybean, black bean, lentil and buckwheat were selected as second crops and were grown from June to September 2015. There was no irrigation, fertilization and plant protection for growing second crops. Lentil grain yield was 1.7 t/ha which was highest grain yield among all the crops. Grain yield of buckwheat was also higher than other crops, 1.3 t/ha. Grain yield of black bean, soybean and blue lupin were 0.9 t/ha, 0.6 t/ha and 0.5 t/ha respectively. Total biomass yields in lentil and buckwheat were 4.5 t/ha and 3.8 t/ha respectively. Biomass yield of black bean, soybean and blue lupin were lower than the yield of lentil and buckwheat. Irrigation, nutrient management and plan protection might be helpful to improve overall production of the second crops. Availability of mineral nitrogen was investigated in three crops: soybean, lentil and buckwheat. No significant differences were found between the crops regarding the total amount of available nitrogen. Five semi-structured interviews were conducted to study possible motives and constrains that might affect farmers to adopt this system in southern Sweden. Results from the interviews indicated that absence of market, lack of suitable machineries to grow double crops and lack of knowledge of double cropping system may be the main barriers of potential adoption of bioenergy double cropping system by the farmers in southern Sweden.

Sbatie Lama during her presentation. Photo M.Cuadra

SECOND DAY - KEYNOTE SPEECHES

Rapporteur: Johannes Ernstberger, SLU

Anders Malmer: Sustainable intensification – solution for all global challenges? Yes, No or both?

Anders started his presentation by shortly introducing himself and his broad background in forest sciences, especially in the tropics.

He then established the outline of his keynote speech, stressing that it largely contained his reflections on the significance of landscapes. He emphasized the importance of understanding the larger role of landscape settings, not least to contribute in a broader perspective. This, he explained, could be relevant for the application of research results, for the public and in policy making.

Anders remarked that Sweden has recently seen a high level of policy discussion around development support, and brought up the question of refugees and resilient societies: How can one work proactively against conflicts or catastrophes related to climate events, and how to build resilient societies? He declared that there was a large number of challenges which could not be discussed in detail for now but concluded that sustainable intensification of agriculture is a way to work on resilience.

He then delved into how the idea of a landscape could be a possible frame for this. To do so, he first reflected upon the landscape as a scale: A landscape could be based on rural villages or communities, it might coincide with watersheds. It is an ecosystem on a larger scale and could thus be a base for research into biodiversity and land categories. Anders emphasised that it is the mosaics within landscapes that are most important for their biological diversity. At the same time, the landscape could be used as a unit for delivering product volumes for different value chains, such as milk, Non-timber forest products (NTFP), etc.

However, Anders explained, there are drawbacks. Referring to James' presentation, he acknowledged that the landscape approach does not serve as a win-win-win solution, and that there certainly are trade-offs. As one trade-off, Anders used the example of conservation and production, which he sees as different poles. This, he related to the choice between intensification and biodiversity. It depends, he elaborated, on the route that is taken: Intensification can mean rational production and monocultures, but also the enrichment of degraded areas, which could imply a higher biodiversity.

In a related thought, Anders brought up the issue of intensification versus organic farming. He advocated for allowing more complexity into this apparent contrast and clarified that in reality, there are intermediate ways. Anders mentioned findings of soil scientists that found a combination of mineral fertiliser and organic matter to lead to a better performance. Anecdotally, he told about the debate around GMO crops, which according to him, is driven in a scaring way. In return, he says that researchers have a responsibility to make these kinds of discussions milder and more complex. Anders concluded that intensification is not a question of modern versus traditional but that the way to go has to lie somewhere in between.

Continuing on intensification, Anders took up some thoughts on demographic changes related to agriculture. At some point, he argued, urbanisation leads to fewer farmers and larger units, which might be positive in terms of rationalisation. Yet on the other hand, it is the young people that are leaving, so agriculture faces a lack of innovators. As main reason for this, he took up that agriculture is associated with poverty.

Prof. Anders Malmer during his keynote presentation. Photo M.Cuadra

In terms of landscape research, Anders presented a review study of ecosystem services which highlighted that, although there is empirical research for ecosystem services, most work is done on a field scale and very little is done for landscapes.

To strengthen his reflections, Anders presented the case of trees and water. Based on the idea that trees can have synergies and trade-offs, the study in question looked at water management in relation to trees in Sub-Saharan Africa. The point of departure was that trees use more water than any other plant. However, he emphasised that the empirical basis for water usage of trees is not well-established and that measurements build largely on tree plantations which are likely to perform very differently from natural forests. On the other hand, trees do also provide hydrological improvements such as water infiltration. From this, Anders presented how the study conceptualized several factors related to water into an optimum tree density model. This density, he argued, should exist for every place in a semiarid environment, but would logically be different depending on the landscape. He explained that it could be used to model how an optimum tree landscape would look like: How much full forest would there be, where would it be, how much agroforestry is possible? Anders concluded that the approach is in an early stage and that there is much to do left, such as strengthening the empirical basis both within biophysical and socio-economic aspects. However, he sees in it a good example of combining synergies and trade-offs between landscape aspects.

Laura Kmoch took up the idea of an optimum tree density to discuss the arrangement of trees in an agroforestry system. Anders replied that the arrangement does play a major role and that the study saw a high variability. Yet, from just this one case it was difficult to build a theoretical model.

The question of microclimatic effects on such a model was taken up and Anders explained that the focus for the current study had been on macro-elements.

Furthermore, the definition of sustainable intensification was discussed and Anders remarked that he had emphasised looking at sustainable intensification beyond a specific definition and rather tried to give a broader structure.

Per Knutsson: Governing landscapes towards multifunctionality – Contradictions, Tensions & Windows of Opportunities

Per Knutsson opened up his presentation by outlining that he would initially reflect on the idea of multifunctionality and its relation to landscapes, and then elucidate the aspects of governance.

First, he presented his reflections on multifunctional landscapes based on a simple, non-structured literature review guided by the questions: What do we mean by multifunctional landscapes and what can it mean? On one hand, he found scholars viewing multifunctional landscapes as a physical unit that has several functions for society. Per remarked that in this way landscapes per se are multifunctional. On the other hand, he found studies, especially within literature on European Landscapes, that emphasize the idea of several spatial units that fulfil different functions within one landscape. He then referred to a definition proposed by, amongst others, the FAO that understands multifunctionality as a response to a demand on land, socially, economically, and environmentally. This, he concluded, relates inherently to sustainability and can be viewed as a greater aim itself: to increase multifunctionality in landscapes.

However, he continued, there are certain tensions within the idea of multifunctional landscapes. He exemplified this with a look to agroforestry, which is seen as something that has the de facto quality of being multifunctional. This, Per remarked, contrasts with the idea of multifunctional as a new paradigm, similar to the landscape approach. Another tension, he argued, arises from the issue of scale. Referring to Anders Malmer's earlier presentation, he agreed that landscape is about scaling up from the farm level. Furthermore, from the perspective of governance and decision making, landscape is a place where scales intersect. He went on to relate this to decision making in landscapes and found that a variety of actors are relevant for the landscape level, from farmers and land owner, to centralized governments and international conventions. These scales, he mentioned, are not necessarily spatial.

Per elaborated on this using land-use as a focus point. He argued that synergies and interrelations are oftentimes taken for granted, and multifunctional landscape approaches advocated as win-win solutions. On the contrary, he emphasised that there are conflicts or challenges as well. Per advocated to not only talk about stakeholders and actors but to even take into account conflicts of interests.

From his literature review, he highlighted three implications for research in multifunctional landscape research: Research should have the aim of mapping functions and demands; acknowledging conflicts; and understanding the decision making process.

Reflecting especially on the last point, Per introduced what he called the central question in relation to governance: What decision making processes are required? How can they be inclusive and involve different stakeholders? Furthermore, he emphasised a point that is less visible in the literature: It's not only about bringing people together, but there are political implications as well. Per remarked that something is happening when talking about landscapes rather than farms on a political level.

Continuing on this thought, Per introduced the issue of land in landscapes. At the core of land questions, he argued, is the kind of tenure system suitable for a landscape level. He posed the question of how landscapes affect or are affected by the land tenure system: Are there tenure systems which are more multifunctional than others? In relation to this question, Per introduced two theories: Firstly, Ostrom's polycentric governance that within multifunctional forest landscapes has been used to show that governance does take place on different scales if there are actors on different scales. Secondly, Cleaver & Koning's institutional bricolage which suggests that governance systems and institutions are at local levels already in place and that new land laws have to relate to the already existing governance systems. This, Per explained, results in complex systems where practically new and old rules, as well as private and public rules, intersect.

Assoc. Prof. Per Knutsson during his keynote presentation. Photo M.Cuadra

As a practical example of how this looks in a context, Per presented research from a Kenyan case. The research was part of the Triple L initiative, an interdisciplinary network of university and non-university departments researching the land-use change in West Pokot, Kenya, a landscape, where over the past 30 years land enclosure has taken place.

Findings of the study suggest that there is a rather complex land tenure system in place, that, according to Per, consists of different types of tenure at the same time: Some tenure types are according to the traditional system, whereas there is a new constitution and land rights system coming in. Per commented that the notion of private access and the practice of enclosures have been used in the case area for a long time, so they are not new ideas, even if their application is somehow changed nowadays. Currently, it is the community elders that facilitate a controlled transition to more privatized lands. They are, as Per remarked, supported by the government which offers land title deeds in exchange for an ordered transition. A similarly mixed system of new and old was found for land registration, which takes place both through formal and informal processes.

However, Per emphasised that there are challenges and conflicts, especially in relation to inequality or to the newly emerging land market. Per concluded his presentation with a reflection on whether the whole process is beneficial or not. He remarked that whereas it is a positive response to some trends such as population increase and marketization, there are also dangers, such as the finality of private title deeds.

In the following discussion, Hanna asked for similarities and differences to agroforestry systems in Burkina Faso. Per explained that he did not do any systematic comparison but that there seem to be some similarities, especially in relation to the rather strong institutions and overlapping processes of decentralization. On the other hand, he pointed out that, the Kenyan case showed a much more recent land use change. This was commented upon by Madelene that another similarity lies in their informal bottom up approaches. Per remarked that for both cases the formal institutions did not provide the rules of the game, but rather the game itself, the new context in form of a constitution.

Daniel raised the issue of governance on the African land market and the question of mistrust from the farmers towards the government, something which, according to Per, was not found in the study area.

Furthermore, issues of defining a landscape were taken up. Per remarked, that a physical delimitation is very difficult in contexts where pastoralists are involved.

Thilde Bech Bruun: Tikopia – A climate smart, sustainable and multifunctional island

Thilde Bech Bruun introduced the topic of her keynote presentation with a forewarning: Unlike what would be expected of a keynote, she would not present any overarching meta-approach but instead shine light onto a very small and specific case study and whether it had achieved a triple-win of climate-smart agriculture, sustainability, and profitability.

She presented the case of Tikopia, a small Solomon island that has become famous for surviving several of the worst tropical cyclones ever recorded without casualties, and has thus been highlighted by the IPCC as an example of local adaptation to climate change. Tikopia is, as Thilde remarked, a fairly unknown island and has been part of anthropological research three earlier times during the 20th century. Their own interdisciplinary research project, Thilde explained, looked at several Southwest Pacific islands, their subsistence livelihoods, resource use, and adaptation to harsh climates.

In the following, she gave a general introduction to the geographic characteristics of Tikopia and the Solomon Islands. Being located in the West Pacific, these 2000 islands face regular tropical cyclones that approach the island state from the East, where no land mass can be found. Furthest to the East and in the middle of the cyclone pathway lies Tikopia which consists of an extinct volcano, as Thilde pointed out. The latest cyclone, Zoë, (the 3rd most powerful ever recorded) hit Tikopia in 2002 and hovered over the island for three days, bringing massive amounts of rain. Thilde remarked that inhabitants were not warned but had read the weather and survived by hiding in caves, so that to the surprise of the global community no casualties occurred.

As one of the most characteristic features of Tikopia, Thilde brought up its remote and isolate location: Due to long distances to nearby islands there are no local boat connections, there is no possibility of air travel, and only 2 boats per year reach the island. Further strengthening the notion of remoteness, Thilde vividly told of the research team's own journey to the island which involved several changes of plans, and finally a bumpy six-day trip on an old iron boat.

Thilde continued her presentation by giving an overview of agricultural activities on the island, pointing out that 100% of the land area was cultivated, mainly in permanent agroforestry systems, partly in fallow mulching systems, and oven gardens. According to her, a variety of root and tree crops were produced. She mentioned that management practices did not involve any burning, external inputs or mechanization. An interesting point to Thilde was that there were no signs of soil degradation, neither did locals complain about soil degradation. As another important food source Thilde mentioned fish which is caught daily using a wide range of different techniques. The result, she concluded, is an island which is totally self-sufficient, has barely any external imports, and few income sources such as remittances.

Next, Thilde related this to the context of cyclones by first presenting a timeline of climatic events: Throughout the last 30 years, Tikopia was hit four times, buildings, boats, gardens, and trees were damaged, and the sea intruded into the crater lake. She mentioned that locals perceive an increase in the severity and frequency of cyclones, which is in line with IPCC predictions that estimate and increase of 20% in cyclones in the region. Tikopians mentioned it as one of their major problems.

However, Thilde explained, people do not only survive on Tikopia, they adapt; for example by having several (3-5) plots in different ecological zones with around 9 different crops. As other more short-term coping practices, she mentioned traditional food preservation techniques, fishing, and short rotation crops which are grown in 'oven gardens' right on the beach.

Thilde summed up that Tikopia has a multifunctional landscape, is climate smart with a not increasing, but stable production and sustainable. In terms of being profitable, Thilde reflected that whereas the island has no profit in economic terms, it is certainly beneficial, and depending on the chosen definition for profitability that would count.

As reply to a question on learning outcomes, Thilde advised for carefulness due to the very specific case, but still offered three thoughts for continuation: Firstly, the mulching system and its effectiveness. Secondly, the importance of local communities' food preservation techniques. Thirdly, questions of population control. Upon request, Thilde elaborated on the third point: The four powerful chiefs of the island have historically sent off people out into the open sea. More recently, population control is achieved through very strict roles on marriage.

Further questions circled around issues of national administrative control, which as Thilde replied is very limited, and land tenure, which according to her is based on a customary system.

Another discussion point was the relation of Tikopia to the outside world and related trends. Laura wondered whether globalization is purposely kept out of Tikopia. Thilde replied that indeed, there is a very strict formal process of being allowed to embark the island. Madeleine took this line of thought a little bit longer and asked whether Tikopia really has this romantic vibe or is it rather a prison for inhabitants. To answer this, Thilde explained that many Tikopians have left the island but live on other Solomon Islands. They are a strong community and share sense of belonging to this particular island and many of them claim that they will return someday. Interestingly, she remarked, many of these exile Tikopians are comparably high educated. Anna remarked on this from her/his experience from Papua New Guinea, arguing that the regional mind-set is very different from ours and does not involve the same focus on consumption.

As a final remark, Per compared the keynote presentations and reflected that even without being able to upscale this case, one can learn from its rare complexity.

Assoc. Prof. Thilde Bech Bruun during her keynote presentation. Photo M.Cuadra

PLENARY AND WRAP UP

Rapporteur: Johannes Ernstberger, SLU

Per Knutsson was first off to summarize the sub-theme session that had taken place just before. He explained that his session was structured in a round where everyone got a certain amount of time to raise challenges and ambitions in their current tasks. Depending on the person, this provided a number of different points. Per emphasised that it was interesting having people at such different stages of their academic work, from MSc to PhD students and to complete papers. In relation to all presentation, he saw that there were good discussions. As a more general point he took up that there were constructive discussions on theory and case selection despite the many different themes and interest areas. These discussions, he remarked, are helpful for looking at topics in new ways. As a challenge, Per pointed out the struggle of finding a suitable research approach to incorporate multidisciplinarity.

Plenary discussion session. Photo M.Cuadra

Thilde agreed and went on to present the structure that their sub-theme was based upon: An opponent system was used thus allocating opponents for each presentation. During the session, the group went through the comments and everybody was encouraged to fill in. Thilde remarked that this structure worked very well and led to engaged and constructive critique and fruitful discussions. More general thoughts that were discussed during the session were meta-studies, methodological considerations during field work, and literature reviews.

For Anders' session, it was Hanna Sinare who presented the outcomes. She mentioned that their small group had a similar academic level, but came from different disciplines. Similar to the others, one of the main tasks of the group session consisted of the discussion and feedback for the individual cases. As overarching outcomes, Hanna underlined the importance of multiple disciplines, be it within multi-, inter-, or transdisciplinary work, for solving and addressing current questions. As one related point, she took up the question of how to reach this? Should it be there from the start of a PhD or be integrated later, and in each case, how to train PhD students for that? As a general conclusion she cited Francis Wesley's concept of an epistemological agility, to understand why people from other disciplines have other ways and ask other questions. She gave the practical advice of valuing face-to-face contact for multidisciplinary work, to avoid miscommunications. Furthermore, Hanna argued for researchers to be confident in their policy recommendations while still showing understanding for policy makers that often take into account other factors. As a final point, she stretched the importance of both modelling and field work in research and stated that the creation of new hypothesis and data generation are linked.

As moderator of the discussion, Per expressed his thanks to all participants and opened up the floor for some general comments. Gert encouraged all attendants to really work within multidisciplinarity and to collaborate with others. Not only does it make good science, but it helps solving questions, and is a lot of fun.

Before the final thanks were uttered, Margarita conducted a short evaluation round. Some critical reflections of the round included extending the meeting by one day; increasing the number of themes; and clarifying the communication in terms of the formulated approaches. Positive feedback was given for the idea of an opponent system for the subthemes; coverage of travel and accommodation which was mentioned as very important for PhD students; the intimacy of the meeting that gave a good mix of feedback while still having a conference feeling.

Wrapping up the meeting, Per expressed his gratitude to Margarita from SIANI, and Maria from Focali. Both responded by encouraging the young researchers to keep in contact and get active within the respective networks.

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Participants in the Young Researchers Meeting 2016. Photo M.Cuadra

Short bios of senior scientists

Anders Malmer

Anders' research concerns tropical forests and landscapes, especially questions related to the role of trees in improving and restoring land productivity, livelihoods, ecosystem services and climate adaptation. He is currently sharing duties as Professor at the SLU Department of Forest Ecology and Management and as director for SLU Global. His research group currently includes activities in Malaysia, Burkina Faso, Kenya, Tanzania, Costa Rica and Honduras.

Per Knutsson

Per is Senior lecturer at the School of Global Studies, University of Gothenburg. His focus area is on inter- and transdisciplinary research on environment and development. Studies on rural livelihoods in Central America, Asia and Africa. Questions related to the implementation of sustainable development as theory and practice. Adaptation to climate change in semi-arid areas and in coastal urban areas. Sustainability analysis of local socio-ecological systems.

Thilde Bech Bruun

Thilde is Associate Professor at the Dept of Geosciences and Natural Resource Management at the University of Copenhagen. Her research has focused on the environmental effects of some of the dominant land use changes that are currently taking place in the tropics - for example the transitions from traditional land use systems to systems that are dominated by oil palm plantations in Malaysia and Indonesia or the change from shifting cultivation to intensive cultivation of maize in Thailand.


Swedish International Agricultural Network Initiative
SIANI


SLU Global


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