Sveriges lantbruksuniversitet
Swedish University of Agricultural Sciences

Agricultural Research Towards Sustainable Development Goals

25-26 September 2013

CONFERENCE PROCEEDINGS

SLU-Global Report 2013:3

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Proceedings of the 2013 Agricultural Research for Development Conference

Agricultural Research Towards Sustainable Development Goals

25-26 September 2013, SLU Uppsala, Sweden

The Swedish Research Network: Sustainable Agriculture and Forestry for Development

Proceedings of the 2013 Agricultural Research for Development Conference

Agricultural Research Towards Sustainable Development Goals

Editors:	Heather Mackay and Gert Nyberg
Organisers:	Agri4D in collaboration with SIANI, Focali, Future Agriculture, Future Forests, SLU and SLU Global.
Series:	SLU-Global Report 2013:3
Cover photo:	Kaway (Bolivia)
ISBN:	978-91-576-9185-9 (print), 978-91-576-9186-6 (electronic)
Keywords:	Sustainable development goals; agricultural research; international development; sustainable intensification; climate change
Print:	Swedish University of Agricultural Sciences (SLU), Uppsala 2013
Electronic publishing:	http://epsilon.slu.se

This publication can be downloaded at www.agri4d.se and www.slu.se/slu-global

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Conference Programme: Agricultural Research Towards Sustainable Development Goals

25-26th of September 2013

Venue: SLU - Swedish University of Agricultural Sciences in Uppsala, Sweden
Updates: News about the conference will be published on www.agri4D.se
Twitter: See and use #Agri4D2013 for tweets about the conference

The Millennium Development Goals (MDG's) were formulated as a tool for focusing development work during the first fifteen years of this millennium. Although they have not been reached some important headway has been achieved for all of them (to varying degrees). They have also served to align and focus research in the development area. Most importantly, from an agricultural research perspective, the MDG's have helped bringing agriculture and agricultural research back on the development agenda.

Since 2015 is the target date for the achievement of the MDG's and the logical date to begin a second phase that will build on their achievements, member states of the General Assembly of the United Nations agreed at Rio+20 to develop a set of Sustainable Development Goals (SDG's), that are coherent with and integrated into the development agenda beyond 2015. After Rio+20 a consultative process was initiated and a High Level panel presented a report on the Post 2015 development agenda to the UN General Secretary. This is a part of the process to formulate the SDG's and to create a shared global development agenda beyond 2015 with sustainable development at its core.

Conference theme:

Agricultural production and agricultural research are fundamental and instrumental in the tremendous challenge to reach Sustainable Development.

Achieving the SDG's could be the driver and motivator in Agricultural Research for Development. Hence the theme for the 2013 Agricultural Research for Development will be: *Agricultural Research Towards Sustainable Development Goals.* In addition the conference sessions are related to four sub-themes, relevant to the main theme and also continuously relevant to agricultural research for development, to the research society and to sustainable development.

The sub-themes are:

- Capacity Development,
- Sustainable Intensification,
- Climate Change
- Multi-disciplinarily

More information about the conference:

At the conference there will be opportunities for individual scientists and PhD students to present research projects, ideas and results in posters, open speakers corner sessions, parallel sessions and/or in discussion fora. Read more about these possibilities and take part of updates about the, conference program, parallel sessions, logistics etc. on: www.Agri4D.se Titles of presentations will be announced in a later version of the program.

Questions about the conference?

Contact Gert Nyberg: Gert.Nyberg@slu.se

Conference Program: Agricultural Research for Development 2013

Day 1 am: Wednesday, 25 September		
08.15-08.45	**Registration & Coffee**	
08.45-09.00	**Welcome and opening: Prof. Magnus Jirström** Lund University and Chair Agri4D	
09.00-09.45	**Professor Molly Jahn** - *Sustainable Development: Innovation in Agricultural Systems - Implications for our Future.* Center for Sustainability and the Global Environment, University of Wisconsin-Madison	
09.45-10.15	**Dr. David Nielson** The World Bank	
10.15-10.45	**Coffee**	**Speakers Corner**
10.45-11.15	**Prof. Hannah Akuffo** - *Research Capacity Strengthening efforts toward Sustainable Development Goals – A perspective from Sida.* Sida (Swedish International Development Cooperation Agency)	
11.15-11.45	**Prof. Hamidou Boly** TEAM Africa (Tertiary Education for Agriculture Mechanism)	
11.45-12.15	**Dr. Peter Holmgren** Director General CIFOR (Center for International Forestry Research)	
12.15-13.15	**Lunch**	**Speakers Corner**

Conference organizers:

Agri4D

SIANI
Swedish International Agricultural Network Initiative

Future Agriculture
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Future Forests

SLU

SLU Global

Day 1 pm: Wednesday, 25 September				
13.15-14.00	**Prof. Johan Rockström** Director Stockholm Resilience Centre (SRC)			
14.00-14.45	**Panel discussion with keynote speakers from day 1** Moderator: Johan Kuylenstierna, Executive Director Stockholm Environment Institute (SEI)			
14.45-15.15	**Coffee**			**Speakers Corner**
15.15-17.15	**Sessions: 1:1**	**1:2**	**1:3**	**1:4**
	Securing Land Rights in Sub-Saharan Africa - In the context of increased competition for land **Room: Aulan** Organized by: Lasse Krantz & Maria Ölund LARRI (Land Rights Research Initiative), Linda Engström & Michael Ståhl The Nordic Africa Institute (NAI)	**Capacity Development** - For Higher Education and Research **Room: B** Organized by: Ulf Magnusson SLU/SLU Global	**Multifunctional Landscapes part 1:** - How to enhance productivity and restore ecosystem services for improved livelihoods? **Room: C** Organized by: Anders Malmer SLU/ SLU Global & Madelene Ostwald GMV (Centre for Environment and Sustainability)/Chalmers/ Linköping University/Focali	**Pre/Post Harvest Losses** - Including postharvest handling and storage **Room: D** Organized By: Matthew Fielding SIANI (Swedish International Agricultural Network Initiative)/SEI
17.15-19.00	**Reception** (17.15-17.30: Launch of the second phase of the SIANI network)			

Day 2: Thursday, 26 September

08.30-09.00	**Coffee**			
09.00-11.00	**Sessions: 2:1**	**2:2**	**2:3**	**2:4**
	Restoration and use of grass-land **Room: B** Organized by: Ewa Wredle SLU	**Water resources and sustainable intensification** – trade-offs and opportunities across scales and agricultural systems **Room: Aulan** Organized by: Mats Lannerstad SEI & ILRI	**Multifunctional landscapes, part 2:** - How to enhance productivity and restore ecosystem services for improved livelihoods? **Room: L** Organized by: Ingrid Öborn ICRAF (World Agroforestry Centre)	**Transforming Gender Roles in Agriculture:** **-** Ways Forward **Room: C** Organized by: Melinda Fones Sundell SEI/SIANI
11.00-11.15	**Break**			
11.15-11.45	**Dr. Tony Simons** Director General ICRAF (World Agroforestry Centre)			
11.45-12.45	**Lunch**			**Speakers Corner**
12.45-13.15	**Prof. Deliang Chen** - *Evolution of climate science: moving towards transdisciplinarity?* University of Gothenburg			
13.15-13.45	**Dr. Jimmy Smith** - *Improving environmental sustainability of livestock systems in the developing world* Director General ILRI (The International Livestock Research Institute)			
13.45-14.15	**Coffee**			**Speakers Corner**
14.15-14.45	**Prof. Arild Angelsen** - *Will agricultural intensification save tropical forests?* UMB (Norwegian University of Life Sciences)			
14.45-15.30	**Prof. Bina Agarwal** - ***Gender and Agricultural Features: Challenges for Policy and Research*** The University of Manchester			
15.30-16.00	**Panel discussion with keynote speakers from day 2** Moderator: Annika Åhnberg, former Swedish Minister of Agriculture			

SUMMARY OF KEYNOTE PRESENTATIONS AND PANEL DISCUSSIONS

Welcome and Opening

Professor Magnus Jirström, Lund University and Chair of Agri4D

Photo: Magnus Jirstöm

A warm welcome, and introduction to the theme of the fourth agricultural research conference, was given by Magnus Jirström, Professor of Human Geography at Lund University and chairman of the Agri4D network. He described the growing recognition among researchers, policymakers and young students of the vitality of working with agricultural research for any sustainable development. He emphasised that as researchers and practitioners we need to be better able to reach out to broader audiences, to influence agendas and to demonstrate solutions to the serious problems facing the world, in order to have an impact. In this it is necessary to advocate for the crucial import of agriculture. This period in the international calendar for the setting of new goals for sustainable development to follow the millennium development goals is particularly important. Such goal setting allows benchmarking and the measurement of change. To be involved, and to ensure agriculture is not lost in these processes, the international agricultural and forestry research and development community must be able to demonstrate what research can do, its value for impact and how such investigation can make a practical and real difference to issues of food, of fuel, of climate, of livelihoods. This conference represents a step along this vital path.

Report: Heather Mackay, Agri4D

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Sustainable Development: Innovation in Agricultural Systems–Implications for our Future

Professor Molly Jahn, Dpt of Agronomy, Center for Sustainability and Global Environment, University of Wisconsin-Madison

Professor Molly Jahn began her presentation by expressing the importance of working in the nexus of land, water, and energy. She emphasised that decisions in our food systems have implications for the nexus at different scales. To achieve this we need to better define what is meant by a safe or safer space when it comes to agriculture and food systems.

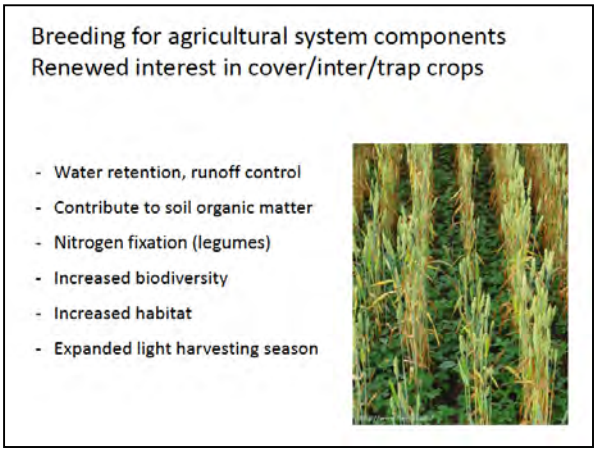
Photo: Molly Jahn

Looking back 50 years

When considering historical agricultural production, there has been a lot of evolution in a period where the population has increased by 117 percent. Looking back over 50 years, it is easy to see that substantial changes have occurred concerning productivity, biodiversity, nutrition, yield, as well as shifts in land and resource use. The developed world has been widely successful in increasing yields, as well as, productivity and efficiency. Professor Jahn emphasized that even though the world is in a state of caloric global efficiency per capita, this occurs as a result of heavy fossil inputs without

consideration for negative consequences, such as critical resource degradation.

This system has caused an imbalance where environmental impact is substantial; consequences such as greenhouse gas emissions, biodiversity loss, water pollution and unsustainable water withdrawals are increasing. Professor Jahn stated that, "Maximizing productivity does not equate to food security". According to the World Vegetable Centre (AVRDC), international food production is sufficient for global per capita requirements, yet approximately 0.83 billion are underweight, 2-3.5 billion and malnourished, and 1.1 billion are overweight.



Slide: M.Jahn

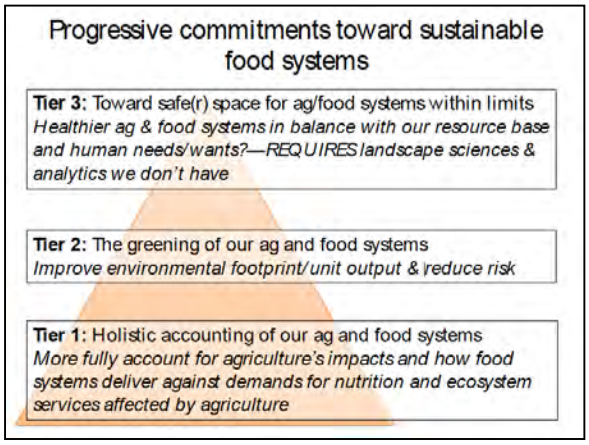
Jahn is concerned that yield gains in major cereals is starting to decrease in key locations, while many global stocks are low. Specifically, she illustrated the strong correlation between instances of civil instability and the food price index. This is a serious threat that impacts directly security and safety. Professor Jahn challenges us to be aware of these kinds of interactions as prices are high and grain stocks are at a global low, especially as the world continues to warm and become more vulnerable to extreme weather.

Most importantly, Jahn stressed the fact that agriculture is a lifeline that is not only essential for food, materials and energy, but also as a dominant form of planetary care. As global populations reach 9 billion on one planet, using 20th century extractive modes of agricultural production to achieve massive gains in productivity is the worst idea in Jahn's opinion.

Plant Breeding for Risk Mitigation

Plant breeding no longer has a sole focus on yield, but instead is used for risk mitigation. Looking to resilient agricultural systems as a means of ensuring nutritional security will be key to enduring volatile weather. This means breeding crops for shorter rotations, crop cycles and early maturity. Professor Jahn offered the example of Kangkong (ipomea aquatic), which is a semi-aquatic plant that grows in tropical and subtropical regions that offers a good source of protein, vitamin A, iron and calcium. These plants are ready for harvest within 30 days of planting and, thereafter, can be harvested in weekly intervals.

Currently, plant breeding for cropping systems, as opposed to just for crops, is becoming important. Lots of different plants are crucial for stable agricultural systems. Breeding for more complex systems, such as agroforestry or mixed crop/livestock, is also taking place. Similarly, breeding for nutritional content and outcomes is becoming important. Jahn emphasised that improving vegetable and legume performance leads to improved nutritional outcomes in diets and human nutrition. There is also a great opportunity for increasing the use of edible plant species to stabilize our food system.



Slide: M.Jahn

Visions for the Future

Committing to move towards sustainable food systems is essential looking forward. Jahn believes that operating in safe(r) spaces, where agriculture and food systems operate within the limits of our resource base, is required to achieve successful change (Tier 3 of the sustainable food systems pyramid). This requires landscape sciences and analytics. The Commission on Sustainable Agriculture and Climate Change came out with seven recommendations to move towards risk mitigation and resilience in food systems. Professor Jahn focused on the final recommendation from the commission that states: "Create comprehensive, shared, integrated information systems that encompass human and ecological dimensions". This is very important, as there exists much disagreement and uncertainty in our information/knowledge systems, such as land use and land crop map disagreements.

For Professor Jahn the future involves "working together to create trusted information sharing environments in a pre-competitive space, across sectors, for collective benefit". This involves examining different layers and scales of information connected to models to explore interactions. This will involve linking scientific communities together in public spaces to navigate through these resources.

Professor Jahn finished by offering some of the intellectual trends from sustainability science that are relevant for agricultural development. Firstly, she stressed the need for landscape views to manage outcomes. Moreover, Jahn believes that we are moving into a post-disciplinary era that requires new vocabulary, taxonomies and ontologies that describe features of systems that have been historically disaggregated. In addition, new scientific frontiers such as the ability to navigate across scales, managing uncertainty and risk and linking outcomes to our choices are significant trends for agricultural development. Finally, radical partnerships are coming together to create vertically integrated and multi-sector coalitions for research. Jahn neared the end of her presentation with a proposal for a new goal for 21st Century agriculture: "We need to learn to live well within our means" as expressed by Chad Waukechon of the Menominee Nation:

Report: Kristin Follis, Uppsala University

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Agricultural Research, Extension and Education in Africa. Stocktaking and Future Challenges from an Institutional Perspective

Dr David Nielson, Senior Agricultural Services Specialist, The World Bank

Photo: David Nielson

Dr. David Nielson's presentation reported on what has been going on in agricultural research, extension and education in Africa. Specifically, he offered an institutional perspective into agricultural development over the years, in addition to outlining future challenges.

Looking to the Past

According to Dr. Nielson 2003 was a very important time for African agriculture; there was a need to improve in areas such as planning and productivity. This was to be led by Africans who could set the agenda through the Comprehensive Africa Agriculture Development Programme (CAADP). It was at this time that

the Forum for Agricultural Research in Africa (FARA) was created. Agricultural extension, such as the Training and Visit programs, were prevalent. However, there were also many challenges. During this time agricultural universities were struggling and most institutions with a regional perspective were in their infancy. Support from external, global actors and their projects were very fragmented.

The challenges that existed in 2003 continued through to 2008. Agricultural universities were struggling as the number of students increased while external support and budgets were decreasing; consequently, this led to problems with regards to quality of education. Additionally, Training and Visit programs were in decline with nothing to replace them and international projects and support was still very fragmented. The CGIAR was a very strong but independent actor. On the other hand, the CAADP process was successfully developing with country level processes launched, with a strengthening of FARA and Sub-Regional Offices (SROs). Under this process The Framework for African Agricultural Productivity (FAAP) was also developed.

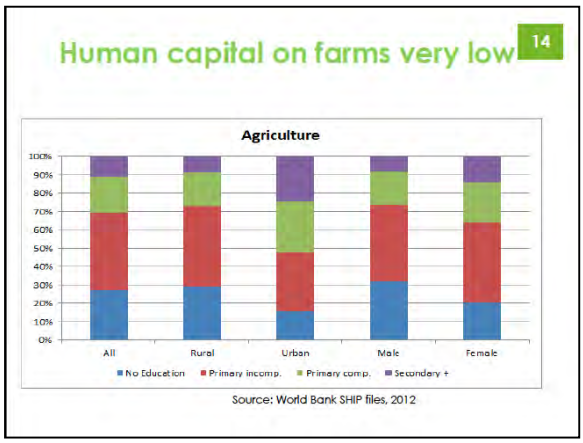
Foundations for Transformation

FAAP was important to agricultural development as it created more partnerships and linkages for African agricultural programmes at different scales. FAAP advocated the need for leadership at a regional level, better planning with CGIAR, a human capital approach, and integration of university programmes, all to be led by African institutions. Centrally, FAAP recommended how to do better in African research and education. Some of the most important accomplishments of FAAP included a scaling up of programmes, coherence in strategic plans, a core budget that was not earmarked, administrative capacity where procedures were established, and the creation of leadership roles.

Dr. Nielson suggested that in 2013 foundations for transformation are in place. Conceptual directions are widely agreed upon at each level and sub-region, including research priorities. Moreover, supra-national institutions are in place to lead, support reform and coordinate investment on research, extension and education where they were not before. The relationship with CGIAR is strengthening and the CAADP processes are at all levels. There is also a harmonization of support at the continental and regional levels. Additionally, there has been an increase of external support at the supra-national levels.

Lack of Transformative Progress

Yet while these foundations for progress have been put in place there has not yet been transformative progress. Transformation in agriculture is just getting started. Overall, most of the growth in agriculture has increased as a result of inputs, more land and more labour, not through productivity gains. There is also little improvement in human capital, purchased variable inputs and physical capital. For example, the majority of African farmers lack a primary education.



Slide: D. Nielson

Challenges & Moving Forward

Dr. Nielson believes that FAAP approaches can help through: reformed extension, such as raising human capital at a farm level and technology transfer; reformed research, such as specialization, stronger links to universities and more effective partnerships; and lastly, reformed education and training, such as raising human

capital at professional levels and stronger links to research systems. However the FAAP agenda has yet to achieve a scaling up and reform at a national level. There lacks a regional approach to education, as well as, integration of research, extension and education. Lastly, there needs to be further reduction in fragmentation of the effort.

There are many challenges still to be met. Funding depends heavily on external support. There is a strong focus on short-term impact, however long-term capacity building is important to consider.

Most importantly it is important to state that Africa is now in a good position to move forward. Africa has now put in place the structures to help itself in agriculture in a manner that was not in existence before. With 2014 deemed the 'Year of Agriculture' by the African Union the previous and the upcoming decade in agriculture will be showcased. It is an exciting time to work on African agriculture.

Report: Kristin Follis, Uppsala University

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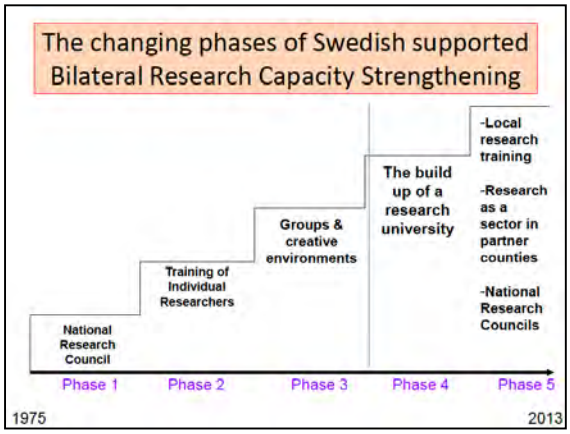
Research Capacity Strengthening Efforts towards Sustainable Development Goals–A Sida Perspective

Professor Hannah Akuffo, Deputy Head, Dept. for Global Cooperation, Swedish International Development Cooperation Agency (Sida)

Photo: H. Akuffo

Professor Akuffo began the presentation by explaining Sweden's history with supporting research capacity and how it has evolved over time. From the early 1960s there has been a lot of Swedish engagement with developing countries; there was a two-way communication where young Swedish scholars traveled as expatriate teachers and researchers, while young scholars from developing countries were invited to study and train in Sweden. In 1975 the Swedish Government invested in research cooperation and established the Swedish Agency for Research Cooperation with Developing Countries (SAREC) in 1978. Specifically, the mandate stated SAREC was to assist developing countries in their research efforts, support their research findings, and support Swedish development research. The overall goal was to support research in and by low-income countries for development.



Slide: H. Afuffo

Strengthening Research Capacity

Professor Akuffo emphasised that the central objective of Sweden's research support is, "to strengthen and develop scientific research of relevance to the fight against poverty in developing countries". This is achieved through three focus areas, of which two are important to this presentation: area one, research capacity building in developing countries and regions, and, area two, research of relevance to developing countries.

According to Akuffo, the aim is to create national research capacity where there is a

national commitment to research, research expertise, and national demand for such research. Similarly, this entails supporting university research capacity where there exists university's commitment to research, research expertise, research management expertise and continuously improving learning. There must exist an environment that enables research.

This means improving the ability of partner countries to formulate research strategies by boosting the capacity of research councils, research training, and research management. Akuffo believes that development of sustainable structures for performing research of global importance locally is central. This requires built capacity for sustainable continuation.

The example of Makerere University in Uganda was presented. In March 1999 the university was dealing with problems such as weak research culture, lack of scientific literature, lack of ICT, weak administration etc. To combat this Sida provided funding to devise a master ICT plan and install optical fiber throughout the campus to open up access to online journals. They worked to support faculty-based programmes, support PhDs to become better supervisors, create PhD research courses, provide funding for projects etc. According to Akuffo, the result today is on-going research training with 102 PhDs, 20 Post-Docs and a hub for PhD training of lecturer's from other universities.

Slide: H. Akuffo

Key Issues

One of the key issues offered by professor Akuffo is the weak administration and management of institutions. This has sometimes required major university-wide administrative reforms. In addition, access to libraries and full access journals has not been available in many countries. Investment in ICT is a key sustainability issue. National libraries need to be nurtured and strengthened to be able remain available when Sida withdraws support. Similarly, there is often a lack of career path for researchers. There is a need for positions to allow the development of skilled researchers after PhD degrees. According to Akuffo, this should be the responsibility of the university.

Research Partnerships

Currently Sida supports the strengthening of research capacity at universities through a program called "Research Training Partnership Programme as an integral part of Institutional Research Capacity Strengthening". The objective is to assure quality research training programmes within prioritised areas of national importance. These are long-term based postgraduate research training partnerships between universities of Sida's target countries and Swedish universities. The program has a central goal to create partnerships that contribute to development of human resources and research capacities of higher education institutions.

Professor Akuffo finished by examining a similar partnership called "Enhancing Support for Strengthening the Effectiveness of National Capacity Efforts" (ESSENCE), which is a collaborative framework between funding agencies to align efforts for research capacity. The goal is to create dialogue between funders, create harmonisation, and learn lessons from capacity development.

Report: Kristin Follis, Uppsala University

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Strategies for Transforming Tertiary Agriculture Education in Africa

Professor Hamidou Boly, Coordinator, Tertiary Education for Agriculture Mechanism (TEAM) Africa

Photo: Hamidou Boly

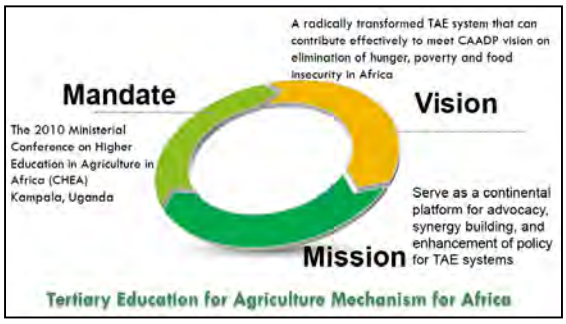
TEAM-Africa (Tertiary Education for Agriculture Mechanism in Africa) is an initiative aspiring to transform the tertiary agricultural education sector in African countries. Professor Hamidou Boly, working as a coordinator for TEAM-Africa, presented five main challenges identified as contributing to the weak performance of tertiary agricultural education in the region.

Challenges for African Tertiary Agriculture

The first challenge is the low enrolment rate at African universities meaning that there will be an insufficient number of agricultural technicians assisting farmers in the future as well as a risk of low contribution to research within the field. The second challenge is the gender gap of students at universities. The number of men is four times higher than the number of women. The third challenge is the weak quality of training as a consequence of a focus on theoretical knowledge rather than on practical training. Another challenge is the weak governance structure of the tertiary agricultural education. This was, for instance, exemplified by political involvement in education and a weak interrelationship between central actors such as ministries of agriculture, farmers and the private sector. The final main challenge is the financial management and the low and declining support from the public sector. There is, however, much support from development partners.

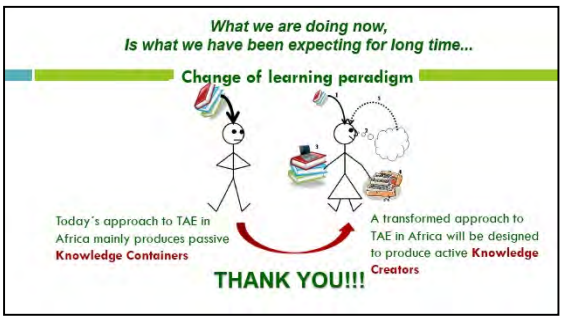
Agricultural Development Programme

Boly saw that CAADP (the Comprehensive Africa Agriculture Development Program) has potential to enhance the tertiary agricultural education on the continent. CAADP encourages governments to assign 10 % of national funds to the agricultural sector in order to attain the objective of a 6 % agricultural growth. The four topics that CAADP addresses are 1) Land and water management, 2) Market access, 3) Food security and 4) Agricultural research, technology, dissemination and adaptation. Within the latter topic, a framework called FAAP has been developed including guidelines for organising interactions between actors and organisational reforms aiming to increase the productivity within the agricultural system.



Slide: H. Boly

Professor Boly also argued for the importance of focusing on tertiary education. He presented figures of agricultural productivity and the level of education. These figures indicate that a higher level of agricultural education leads to higher agricultural productivity. An example of a country with successful agricultural development is Rwanda which was the first country to sign CAADP in 2007. This success can be seen in the increase in graduates within the agricultural discipline from 2088 in 2001-2005 to 9637 in 2006-2011. Moreover, the production of wheat, maize, cassava and Irish potato in Rwanda has increased more than twofold since 2007.



Slide: H. Boly,

TEAM Objectives

The final part of the presentation was devoted to the objectives and activities of TEAM-Africa. The main objectives are 1) to create awareness for enhancing the support and efficiency of agricultural education, 2) to mainstream tertiary agricultural education, which implies working for improved relations between education, research and extension, 3) to reform tertiary agricultural education with the help of FAAP principles including self-assessment, strategic planning and better coherence and coordination between concerned actors as well as 4) to improve training through facilitating the use of new learning tools. Some activities performed by TEAM-Africa aim to identify and analyse trends in the agricultural food sector and how these affect the tertiary agricultural education. The objectives of other activities are to support changes in the field of education and to establish an educational centre in the Sahel region.

Report: Angelica Karlsson

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Landscapes: Solutions for Sustainable Development

Dr Peter Holmgren, Director-General, Center for International Forestry Research (CIFOR)

Dr Peter Holmgren is the Director-General of the Center for International Forestry Research (CIFOR). His presentation emphasised the importance of having a landscape-perspective for sustainable development, and the necessity of integrating different sectors, such as agriculture and forestry.

Stability of Food Insecurity

From 1960 to 2010, the food production and the number of people experiencing food security tripled. However, despite a tripled GDP on a global level and a considerable decline in food prices during the same time period, the number of food insecure people continued being around 1 billion. This stability must be taken into consideration when discussing improvements in food security. There are many possible reasons for this relatively stable figure in food insecurity, among these are problems related to equity, democracy and human rights.

Photo: Peter Holmgren

In the forthcoming decades the world will be different from now: an increasing population of around about 9.6 billion people by 2050, different consumptions patterns, a changing climate, changing migration flows and new technologies. Such future scenarios must be considered in agriculture and forestry today which, Holmgren said, is not done to a satisfactory extent.

A Landscape Approach is Multi-sectoral

He discussed the problematic aspects of a system based on different sectors. Such division of problems and solutions, like agriculture and cities, leads only to fragmented efforts Holgren purported. A landscape approach, on the other hand, offers solutions that integrate different

sectors. Sustainable landscapes are, he said, a key to developing the future we wish for and also a key to managing climate change as, for instance, landscapes stand for more than a third of the greenhouse gas emissions. This is apparent in Sumatra where forests are burnt down to make land available for palm oil plantations. These fires do not only concern the forestry sector but also the agricultural sector, which is why the problem cannot be solved by any of these sectors alone.

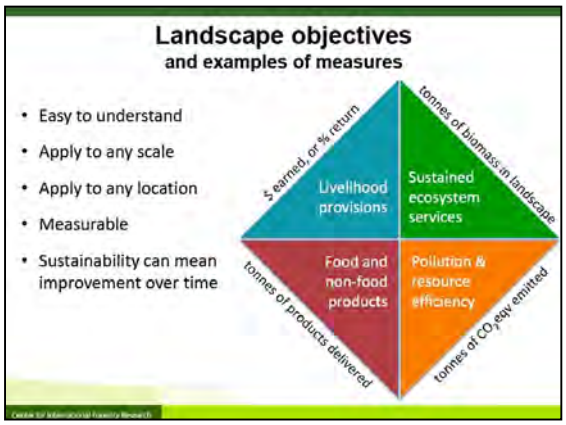
Slide: P. Holmgren

Sustainable Development Goals

Regarding the Sustainable Development Goals of the United Nations Holmgren proposed that the current goals should be based on the five transformational shifts identified in the report "A new global partnership: eradicate poverty and transform economies through sustainable development", published by the United Nations. These were 1) leave no one behind, 2) put sustainable development at the core, 3) transform economies for jobs and inclusive growth, 4) build peace and effective, open and accessible institutions for all, and 5) forge a new global partnership. To these, he wished to add Sustainable landscapes as a goal.

Landscape Objectives

Holmgren continued his presentation by underlining the need of identifying landscape objectives that are easily understood, measurable and that could be applied at different scales and locations. There is, furthermore, a need to recognize local stakeholders and their potential to solve problems instead of focusing too much on a global perspective. In this context, he advocated for institutions at a landscape scale where the function could be to enhance dialogue between concerned actors as well as define objectives and priorities.



Slide: P. Holmgren

Role of the Public Sector

The role of the public sector was also brought up. Holmgren provided suggestions of how this sector may assist including context specific ways of securing rights to resources and land tenure, improving labour conditions, facilitating access to financial capital for smallholders as well as developing policies, subsidies and taxes contributing to objectives related to both livelihoods and the environment. His presentation concluded with the recognition that sustainable development goals, and a landscape approach, call for new partnerships and alliances.

Slide: P. Holmgren

Report: Angelica Karlsson

Sustainable Intensification of Agricultural Development: Scientific Support for a New Paradigm

Professor Johan Rockström, Executive Director, Stockholm Resilience Centre

Photo: Johan Rockström

In his presentation Johan Rockström emphasised how agricultural science will face new challenges in the future and that sustainable intensification is central for coping with these challenges. As we are about to pass the ecological capacity of the planet, achieving equity–in terms of sharing finite natural resources such as phosphorus–and additional research seeking to develop sustainable agricultural systems are essential. One significant aspect in this context is that the present epoch, by some called the Anthropocene, is characterised by interdependence between different locations and scales across the world implying that actions in one place have effects in other places.

Agricultural Challenges

Rockström highlighted several problems related to agriculture. Agriculture contributes to a high degree of the biodiversity loss at the same time as this activity loses much from said biodiversity loss. The extensive use of fresh water is a further important concern in agriculture, not least as 3.5 billion people (half of the world's population) experienced water shortage in 2005. Another aspect is the expansion of urban areas, which will result in 4-8 % of current agricultural land being lost.

Agriculture contributes considerably to the emissions of carbon dioxide and hence to human induced climate change. Such emissions are however only the starting point for localised heat disturbances: it is rather how the biosphere responds to these local emission-induced climate changes that really takes us into global levels of change, argued Rockström. Agriculture, Rockström went on to argue, is the single greatest human activity that changes the biosphere and its response mechanisms. Thus what we do within agriculture is a serious determinant of how the climate will change in the future. He believes this serious implication of agriculture is a 'missing link' in discussions on climate.

Rockström also gave attention to the effects that climate change will have on the water supply. A compilation of climate and hydrological models reveal that in a two-degree warmer world rainfall is likely to decrease by 25% in northern Africa and southern Europe. In other places, however, precipitation will probably increase, which is not necessarily better for agriculture since rainfall events are likely to be more intense.

Slide: J. Rockström

Agriculture Must Offer Ecosystem Services

Current agricultural systems are functional under stable conditions but they are making us vulnerable in situations when we face diseases or

other shocks. Rockström connected this to ecosystem services. Unlike natural ecosystems that provide several kinds of ecosystem services, intensive agriculture is poor in offering ecosystem services other than provisioning services (crops, meat, fish fuel and fibre). One challenge is to develop multifunctional agricultural systems offering further ecosystem services in order to get landscapes with enhanced buffer capacity. Developing such systems demands collaboration among scientists across different disciplines.

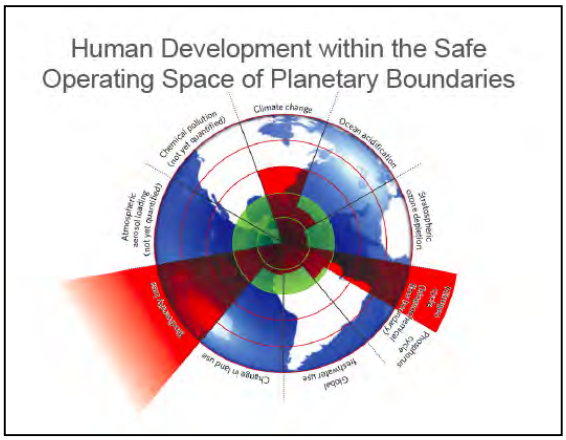
Slide: J. Rockström

Relations and Feedbacks across Scales

Rockström returned to the issue of interdependence between different locations and scales. This can be illustrated in many ways. In Borneo, for instance, 75% of the rainforest has been converted into palm oil plantations. This is an agricultural activity that not only has negative consequences for local people and local biodiversity, but also affects the South-Asian monsoon and causes an increased number of forest fires in Asia. Ultimately this has impact upon global food prices. Researchers have found that the Amazon rainforest may perhaps be an instable ecosystem implying that the forest could turn into a savannah as a result of self-reinforcing feedback-processes thus risking greater impacts on the global climate.

A Planetary Boundary Framework

Actors within the United Nations are agitating for an integrated framework for development. One framework that could be useful in this respect is the Planetary Boundary framework. It identifies processes required for sustaining a stable planet and encompasses quantified boundaries for each process. If these boundaries are passed, the stability of the planet is threatened.



Slide: J. Rockström

Economy no Longer a First Priority

This implies that the economy can no longer be a first priority of development as in the present paradigm. The economy can instead serve the society, which in turn has to operate within the ecological limitations. Agriculture has to adapt to the Planetary Boundaries concerning climate change, land use, fresh water use, nitrogen and phosphorus use, among other things. Rockström, along with colleagues, has specified some of the Planetary Boundaries for agriculture. For instance, the quantity of carbon dioxide in the atmosphere cannot exceed 350 parts per million.

Move Agriculture from Source to Sink

In closing his presentation Rockström discussed approaches to meeting different kinds of challenges. The results from research he has been involved in reveal that it will be possible to sustainably secure the food supply for the expected 9 billion people in 2050, using only the existing agricultural technologies and management systems.

There is also a potential to transform agriculture from being a large carbon source to become a carbon sink by, for example, avoiding ploughing and turning agricultural systems into conservational agriculture systems. Small-scale water harvesting is one example of how to improve the productivity at the same time as the quantity of fresh water increases by reduced evaporation.

Slide: J. Rocksröm

Report: Angelica Karlsson

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Panel Discussion, Day 1

Panel:
Moly Jahn, University of Wisconsin-Madison
David Nielson, The World Bank
Hannah Akuffo, Sida
Hamidou Boly, TEAM Africa
Peter Holmgren, CIFOR

Moderator: Johan Kuylenstierna, Executive Director, SEI

African Tertiary Educational System

A panel discussion session followed the final keynote presentation of the day. There was considerable interest in the topic of the tertiary education sector in Africa. A number of participants wondered how prevalent it was that leaders in African countries have been reluctant to support tertiary education because they viewed intellectuals as being a source of political opposition that will challenge their governance. Professor Boly said that this has been relatively common in the past but there are signs of change. The civil society in the universities can be more active in protesting against poor governance. Leaders have been afraid of this and have thus interfered in the tertiary education system and reduced its funding. However this rather serves to foster politics within universities and distracts from a focus on the teaching and research. Professor Boly emphasised the need to reduce the impacts of politics and the public influence. Instances where board members or university leaders are too close to the structure of government must be reduced in order to improve the efficiency of our universities.

Continuing with the focus on tertiary education a participant question whether the World Bank and international development sector could be criticised for putting too great a focus on primary education at the expense of higher levels of education. Hannah Akuffo of Sida and David Nielson of the World Bank were asked what the international donor sector is going to do to contribute to tertiary education in Africa. Hannah responded by describing how Sida was discouraged from supporting education at the university level during the 1970s, simply by the fact that the levels of primary education at that time were so low. She said this has now changed and there is recognition from Sida, the World Bank and others that building research capacity and tertiary education capacity and training is an important development strategy. Boly added that Africa has seen new policies emphasising higher education in the last five to ten years, good examples being Rwanda and Ethiopia.

Photo: Johan Kuylenstierna

Discussion then turned to the role of researchers and the systemic failure to fund the best researchers, who, according to one participant, are often resident within the universities yet the

funding for research goes to the national research institutes. David Nielson acknowledged this problem and emphasised that the World Bank has recognised the need for this to change. However change implies getting a lot of people to agree. It is a process that the World Bank is supporting but it will not happen overnight.

Measuring Success in Agriculture?

With a question from Melinda Sundell of the Stockholm Environmental Institute discussion turned to the issue of how to measure success in agriculture and whether this new 'landscape approach' has any relation to the old 'farming systems' approach. Peter Holmgren responded to the question of measuring success by stating the keyword as being 'business' Most agriculture, in his view, is a business, not simply survival. It is increasingly an enterprise. So we need to think about how we support this business and how we measure success in business. He thus questioned why we do not have functional financial markets to support investments in these businesses? Maybe there simply is no real interest in solving land use issues. If that is so, why do we put so much trust into international, top-down processes? Maybe we are focusing too little on local possibilities and local solutions. Any indicators of success need to be simple, and they need to be standardised. Yet we need to bear in mind who is doing the measuring and how are they measuring. He emphasised the importance of measuring locally rather than at a global scale.

Vocabulary Not Yet Existing

Molly Jahn then suggested that vocabulary is incredibly important for benchmarking success. What we name, we see. What we overlook, we often get hurt by but we fail learning how to manage. We need indicators of success that integrate social and biosphere variables. She did not think that we have the word yet, the categories, that would be most efficient. A lot of what we are talking about is risk and financial services. We are exposed to risks but there is no systematic way to describe them. She agreed with Peter Holmgren that scale is important and that the local must not be overlooked but she stressed that we as researchers and decision-makers need to learn to link the scales. Professor Holmgren however cautioned against the 'tyranny of the averages' and emphasised the need to move away from global maps of status or changes which obscure the local.

David Nielson of the World Bank agreed that measuring success is of central importance and said the World Bank have been working on this in Africa through the initiatives he outlined in his presentation. However getting agreement on a results framework is extraordinarily difficult. He did not think he had ever seen any comprehensively agreed on a result framework. It is tough to get the right balance between long-term goals and short-terms goal. Another participant suggested that we need to encourage researchers and decision-makers to start thinking in the really long-term.

Food Security ≠ Agriculture

Peter Holmgren suggested that it is time for us to disconnect 'food security' from 'agriculture' and questioned why we think that low food prices are the key to the future as they clearly are not. This leads to underinvestment and unsustainable food systems. Who defines meaningful research? If the way we have organised our institutions is a part of the problem, should we really trust them to define what is meaningful research?

Nielson then disagreed somewhat with Holmgren's suggestion that food security be disconnected from agriculture noting that nutritional deficiencies, stunting and lack of energy have a huge impact on agricultural productivity. He described how 200 years of productivity improvements in agriculture in the

UK after the industrial revolution was simply down to the nutritional improvements gained during that time.

Holmgren replied that as long as we limit our focus to a hard-wire direct link between agriculture and food security, without taking into account wider economic, social, productive and equality issues, we will not solve food security.

Debates in Natural Sciences

Magnus Jirström of Lund University was prompted by Johan Rockström's presentation to question the level of certainty in natural science research saying that some aspects are still hotly debated. As an example he gave that of conservation agriculture, or genetically modified organisms. When one reads natural science journals it is apparent that some say, for example, that conservation agriculture this will only work in some parts of the world and not in Africa. This lack of certainly in the natural science evidence makes it difficult for a non-natural scientist to decide where to focus. Molly Jahn suggested that we to stop separating the social sciences from the natural sciences. She also felt that there is transparency and certainty in a number of very sophisticated scientific models of biophysical or climatic change that helps with the need to link scales.

Report: Heather Mackay, Agri4D

Slide: Examples of Landscapes, P. Holmgren

Slide: M. Jahn

Towards Sustainable Agriculture

Dr Tony Simons, Director-General, World Agroforestry Centre (ICRAF)

Photo: Tony Simons

Development Challenges

The focus of Tony Simons' presentation was how to work towards a sustainable agriculture. His talk outlined some development challenges, sustainability issues, and some opportunities and considerations for reaching this goal. He started off by approaching the development challenges with a question: are issues such as the commuter problems in Los Angeles, the population in Cairo, or the rural poverty and hunger in many countries, differentiated problems or are they interlinked global challenges which should be addressed collectively? Simons went on to suggest that the problems we are faced with can be sorted into one of three categories: **Collective problems** which as challenges faced by all (such as climate change or disease), **Common problems** where we face similar challenges in different places, and **Differentiated problems** which are those that are locally specific and highly contextualised. Within the field of sustainability Simons suggested that we have confused these problems without separating them into these different categories. He claimed that we need to distinguish a problem better and look for the rules and principles required to build an understanding and decision-making ability.

Food Security and Land Degradation

Two major development challenges brought up in the presentation were those of food security and land degradation. In the next 40 years Simons pointed out that the world needs to produce as much food as we have done in the last 8000 years–a scary thought. Food security is about the four pillars of availability, access, utilisation and stability as well as trying to build sustainable food production systems. Yet when you compare the food required for a week by an average displaced family in Chad with the average family in Germany Simons suggested that we need to consider whether it is sustainable production that is needed, or rather a paradigm shift towards sustainable consumption that we really should be looking at.

Slides: Tony Simons

Much of the world's food is often produced in the tropics on land that is degrading. The latest World Bank report shows that if we don't find more sustainable pathways we will be spending US$20 billion dollars a year to halt land degradation in

Africa alone, by 2030. Yet such land degradation does not just have an economic price, but also a very real price in human suffering said Simons as he showed maps revealing the close relationship between land degradation and child mortality across western Africa. The more degraded your land is–the bigger your risk of losing your child.

Slide: Tony Simons

Issues for Sustainability

Another issue Simons raised was that of the externalities of business. The latest TEEB for Business Coalition study on the top 100 externalities of business demonstrate the total world GDP measures up to US$72 trillion dollars p.a and agriculture represents GDP US$4.2 trillion p.a. However, when the externalities and economic costs of greenhouse gas emissions, loss of natural resources, loss of nature-based services and climate change were added to the equation they amounted to US$4.7 trillion. The logical, albeit ludicrous, conclusion is that agriculture is **too risky** a business; we thus need to **stop farming**.

The problem with this sort of accounting, according to Simons, is that we record the revenue but we tend to ignore natural capital lost. This is an important example demonstrating the problematic aspect of how we approach development planning today. A problem is that we tend to get confused by the cost, the price and the value leading to a catastrophic failure to allocate resources correctly. Simply put, Simons said that we do not value food enough and we do not price the whole cost of the production. We need to change the accounting around to reflect the realities in order to build real sustainability.

A Landscape Approach

How do we make it work in all the different ecologies of the world and all the different social landscapes that we face? Simons asked. Taking a landscape approach and implementing climate smart agriculture could be a way forward. When we look at the transition in landscapes from forested areas through to defrosted areas it is necessary to also investigate where the opportunities and constraint in a landscape arise.

Simons demonstrated his point with an example where the government of Norway are trying to help Indonesia manage their hundred million hectares of remaining forest through the UN-REDD Programme. Yet this fails to deal with the 41% of emissions coming from convertible or "non forest" agricultural areas. Nearly half of the problem exists within the agricultural part of the landscape and that is where REDD has failed–it is only partial accounting. It is as if you have a rash all over your body and say "I'm only going deal with the rash on the right hand side of my body", Simons illustrated. Such an approach will not make you healthier.

This demonstrates the failings of a sectorial approach. On the one hand we have the foresters' view of the world, made of trees in forests. On the other hand there are trees on farms, trees outside forests with very different spatial distributions. The point was illustrated with maps showing a forester's view of the global distribution of forests, a view of those trees outside official forests. Simons strongly advocated for the need to integrate these two views to manage landscapes sustainably.

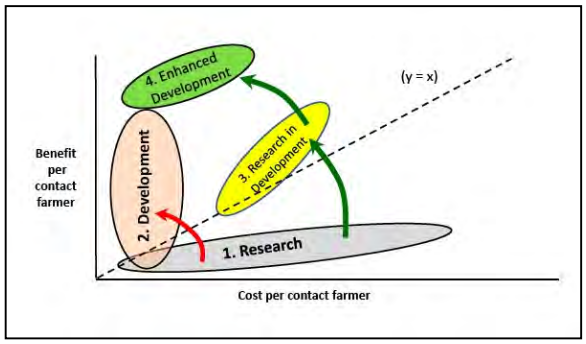
Concluding, Simons emphasised the need to look at the whole landscape and to concentrate on how to measure progress. Measures such as productivity, carbon stocks, and the strength of farmer's institutions are not all the same. In addition, the needs of the actors are different

although the goals might be similar. It, according to Simons, is necessary to investigate these reconciliations, understandings and trade-offs much more if landscape approaches are to work.

Opportunities

Moving onto a focus on the opportunities available within sustainability Simons mentioned the importance of gender equity. Achieving social equity in the rural landscapes, he claimed, was an effective method of ensuring they are better managed and more productive. However, there are risks of disenfranchising men if too much focus is put only on the role of women. It is necessary, rather, to look at the gender dimension both through gender differences and gender synergies.

Another opportunity for changing our development paradigm emphasised was through research and how that research is carried out. We tend to think of research as researchers generating and validating knowledge, while we think of development as the programmes and projects coming out of that. We are rarely researching the development process itself, and rarely researching how to make better decisions. This is another area where significant opportunity lies. According to Simons, it is vital to move from proof of concept to proof of application within research.



Slide: Tony Simons

Scholars ask so many questions about why, what, where and when but when it comes to the 'how' researchers only approach this by asking for the best practice. It is important to tease out how to make research findings actually happen in practice. This offers the opportunity of achieving much higher returns in development projects (see slide above). Simons concluded his presentation by underlining the need to change some of the paradigms surrounding sustainability and development, and emphasised the importance of being able to measure sustainability and to demonstrate the value and impact of our research in order to reach towards a sustainable agriculture, and indeed a sustainable development.

Report: Frida Andersson, Maria Ölund, Focali

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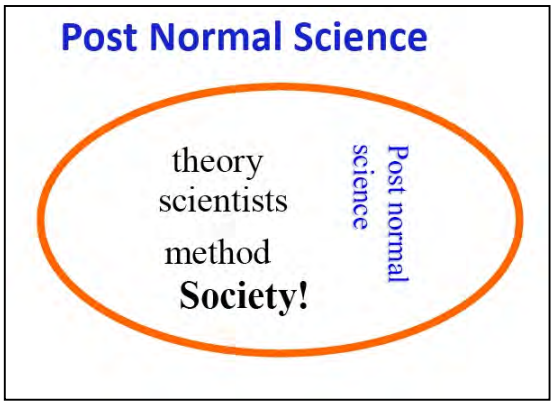
Evolution of Climate Science: Towards Transdisciplinarity

Professor Deliang Chen, University of Gothenburg, Sweden

Photo: Deliang Chen

Professor Deliang Chen of Gothenburg University offered a climate perspective on sustainable development with his presentation by focusing on the science of sustainability, the history of climate science and by outlining some of the challenges and opportunities. By walking through some milestones within the history of climate science Chen described how the science has developed over the past four decades, stating that it is not simply a science anymore. There is now a need for scientists to inject their findings into the consciousness of society and to meet the needs of policy making. Such a role goes under the term 'post normal science'. Within normal science reside theories, scientists and methods. Post normal science

means moving beyond that, to include the society, Chen explained.

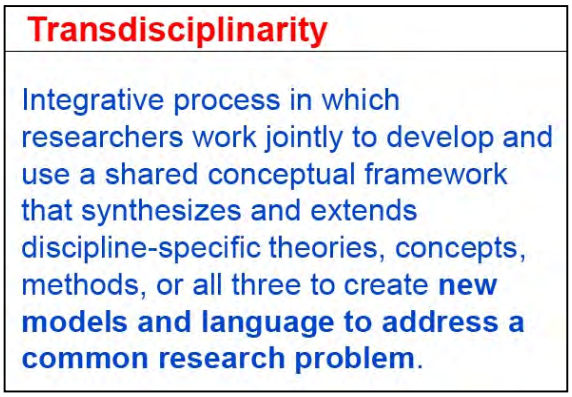


Slide: D. Chen

Science and Society

He continued by outlining some of the main characteristics of 'post normal' science. Within normal science you are very much disciplinary based, trying to solve problems with existing knowledge and methods within existing disciplines. Post-normal science, on the other hand, has to at times face uncertain factors, for example factors of climate change. Unlike in normal science values are quite often disputed in 'post-normal' science as the society dimension is added to the equation. Another important aspect of 'post-normal' science is that when an extended stakeholder is involved there is a need for dialogue on scientific input to decision-making, whereas in normal science researchers have generally been conducting science for science's sake within a fairly enclosed academic community. In addition the stakes are high and the decisions are often urgent as the policy makers often need the scientific information within the near future.

An international network has been established and international organisations are making efforts to coordinate the observations and look at the research needs within this multi-disciplinary field of climate science. The UN system is doing a great job, in Chen's view, of coordinating global efforts and increasing our understanding of the climatic system. Thanks to the general circulation climate model (GCM) developed by GFDL in the late 1960s, it is possible to test and consider possible future scenarios. Chen also emphasised the importance of the three influential World Climate Conferences, which have served to demonstrate the need and power of having coordination. Their importance for climate research, and for a change of mindset in how the research is conducted, have been substantial.



Slide: D. Chen

Transdiciplinarity

Chen then moved on to talk about climate science moving towards a 'transdisciplinary' science. This entails working across the disciplines in order to achieve a converged view where a new level, in terms of the concept, methods, theory and language, can be reached to solve a common issue. He continued by summarising the characteristics of transdisciplinarity. The problems sustainability addresses are so complex and descend from so many domains that it is necessary to be aware of the limits of the disciplines. A transdisciplinary approach can be an effective tool for tackling the complexity in climate science and the challenges of fragmented knowledge. It is also important to acknowledge the local context and the uncertainty surrounding this, for example when considering the impacts of and implications for agricultural science.

Communicate Solutions

Another point Chen emphasised is that scientists need to look more at communicating their work across disciplines, and across stakeholders. He stress that now is the time to address the 'how' question and for science to take on solution-

oriented and action-oriented research. "We have to be serious about the question of how to solve problems", urged Chen.

The transdisciplinary approach is not only realistic but also necessary, according to Chen. Changes in societies and ecosystems are happening at a faster pace. Within research advances in complex system theory has taken place and some of this can be used to deal with the complex behaviour and actions among different systems. He identified globalisation as a central issue, as well as the rapid increase in the use of new communication technology, as these have helped speed the changes.

The climate community has traditionally been very keen on playing with data and models, but not as keen on applications, until recently. Within the new framework, the Global Framework of Climate Services (GFCS), the users' needs are seriously taken into account and efforts are being made to create a user-interface platform. You can't just create information and say "ok, it's there, you can use it" without looking at the interface, Chen insisted.

Five Challenges for Sustainability

A few years back a global effort was launched by the International Council for Science (ICSU) to look at a few fundamental challenges faced by humanity. This resulted in five challenges for sustainability: forecasting, observing, confining, responding and innovating. According to Chen, the latter came rather as a surprise but has resulted in the insight that we need to be innovative, not just in terms of science, but in terms of looking at the social systems and the behaviour of human beings. This is a pre-condition for being solution-oriented.

However the scientific climate research community is responding to this call for action quickly and are now looking at one of the big challenges–prediction. Trying to predict complex systems offers great challenges. When land use changes, the water will be affected and when the water cycle changes it has climatic impacts. The earth is a complex nonlinear interactive system that requires collaboration across disciplines. Chen also acknowledged the triple challenge for climate science of being able to carry out good quality science, to make an impact, and be useful to society. The community is taking on this challenge by designing models that will be more useful, and offering information on how to shift from a global to a local level. An example of valuable information on down-scaling is available at the GCM website, which Chen emphasised could be very useful for the agriculture and forestry sectors.

Slide: D. Chen

Chen concluded with a summary of what needs to be done within climate science. The main message was to find new ways to conduct science, to be more innovative as well as more integrative, and to offer solutions.

Report: Frida Andersson and Maria Ölund, Focali

Improving Environmental Sustainability of Livestock Systems in the Developing World

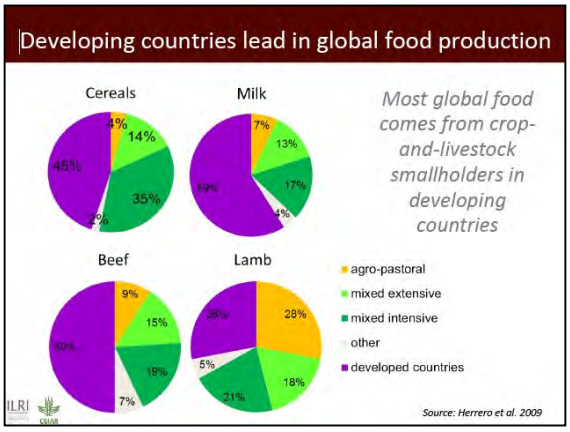
Dr Jimmy Smith, Director-General, International Livestock Research Institute (ILRI)

Photo: Jimmy Smith

Dr Jimmy Smith, Director-General of the International Livestock Research took the floor to speak to the topic of how the world will be feeding itself in 2050. His presentation focused on the livestock sector and its role in future food security, particularly smallholder livestock farming systems in developing countries. This sectoral focus did not, he stressed, contradict or negate anything that was said by previous speakers about the need for a landscape approach to solving problems and the need for multi-sectoral and transdisciplinary solution finding. He began by addressing those who say that in order to save the planet we must get rid of livestock farming, and those who say that in order to protect our health and that of the world we should stop eat meat, milk and livestock products. Smith argued that such beliefs are disingenuous and that in fact smallholder livestock systems have a crucial role to play in global food security, sustainable environmental management and poverty reduction.

Growing Demand for Livestock Products

Smith pointed out that four of the five highest value global commodities are derived from livestock: cow's milk, indigenous cattle, pig and chicken meat. He highlighted the growing demand for meat and milk (by almost 100%) in developing countries as incomes rise and diets diversify. This is a demand-driven livestock revolution from developing countries, not a supply-led revolution from the developed world such as the Green Revolution was, claimed Smith. To those who suggest eliminating livestock this represents quite a challenge.



Slide: J. Smith

Smith showed statistics revealing that most global food comes from these small-scale integrated farming systems in developing countries (see slide above). This is why a multi-sectoral landscape approach is so necessary. He also noted that only 10% of livestock products are traded internationally: 90% are kept nationally and most are produced and consumed locally or sold within informal markets.

Sustainable Development Goals

With these facts in mind Smith advocated for the livestock sector having an intrinsic role for many of the millennium development goals and he highlighted those goals related to poverty reduction, gender equality, health, food security and nutrition, water and sanitation, sustainable energy, and natural resource management. He saw this importance having continuing validity for any future sustainable development goals. Smith went on to give some brief examples.

Livestock Improving the Environment

Some claim livestock to be a cause of environmental problems (overgrazing, soil erosion, greenhouse gas emissions) but they are

also a victim (drought, famine, disease changes). Dr Smith advocated livestock as being a necessary part of environmental solutions. He presented a map of the world's greenhouse gas emissions per kilogram of animal protein produced. This showed that large livestock production inefficiencies in much of Africa and South America present an opportunity for efficiency, productivity and environmental gains.

Slide: J. Smith

Livestock Agenda and Opportunities

Smith then described the differing trajectories available to various livestock farming systems including those with strong growth potential where efficiency improvements should be made, those areas of fragile growth where environmental services must be restored, and those areas with high growth potential but a number of externalities to the production, such as waste in intensive systems. This has been developed, in conjunction with FAO, into a **'Global Agenda of Action'** in support of sustainable livestock sector development (see slide below). Smith went on to give examples of strategies for how to close the efficiency gaps in smallholder livestock systems, how to restore grasslands and manage other environmental services, and how to turn waste into valued products. He saw tremendous opportunity for research and for achieving impact here, claiming this to be a largely untapped potential.

No Moral Equivalent between North and South

Dr Smith concluded his presentation by reiterating the necessity of livestock, but also the vitality of efficiency and environmental improvements that need to be made within integrated smallholder systems. He also echoed Tony Simons earlier point about the richer countries of the world needing to switch mindset towards a more sustainable consumption. Finally, he emphasised the stark moral difference between those who have too much and make poor food choices, and those who have no choice of food.

Slide: J. Smith

Slide: J. Smith

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Will Agricultural Intensification Save Tropical Forests?

Professor Arild Angelsen, School of Economics and Business, Norwegian University of Life Sciences (UMB)

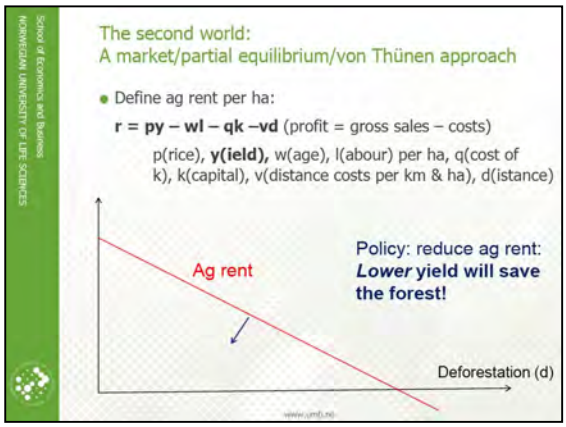
Photo: Arild Angelsen

Arild Angelsen looked at the question of whether agricultural intensification could be a way of saving tropical forests through an economist's eyes. He considered whether technological progress in agriculture (to increase yields) could lead to forest conservation or forest destruction. Angelsen noted that intensification can be achieved in two ways: one, by technological progress which allows a greater output from the same level of inputs; the other is through 'factor substitution' where more non-land inputs are required per hectare, for example fertliser, in order to achieve yield increase. This he noted has stimulated much debate on land consuming versus land sparing trajectories.

Opposing Views

Professor Angelsen then described two opposing worldviews within economics and questioned how we reconcile the two views. The first, the full belly model, assumes a self-sufficient, isolated community and amounts to a simple theory of deforestations where agricultural intensification (higher yields) will reduce the need for new land, that is, it will mean less encroachment into pristine forest land.

The next hypothesis within this worldview is known as the Borlaug hypothesis which describes the race between food production and population, and between yield increase and land expansion. Here the conclusion was that the Green Revolution saved forests, by allowing intensification.



Slide: A. Angelsen

Next Angelsen outlined the second view within economics beginning with a market or Von Thunen approach. This describes a rent gradient for land and concludes, in complete opposition to the previous view, that if you want to save forests you must reduce the yield being produced (see slide above).

Reconciliation?

So how can these opposing views be reconciled? To attempt to answer this Angelsen then reviewed a number of empirical studies and used their findings to extract the win-win scenarios for yield change (agricultural intensification) and forest area (forest preservation).

Slide: A. Arildsen

The win-win scenarios arise in cases where labour-intensive technologies are employed in forest-poor areas, where intensive agriculture is

promoted in areas where farmers also engage in low-yielding extensive farming practices, where technological improvements raise the supply of products in a situation of inelastic demand, and where technological innovation allows agricultural systems to provide the environmental services similar to those of natural forests.

Some Win-Win Least Likely

However Angelsen pointed out that some of these win-win scenarios are those that are least likely to be adopted by farmers due to anticipated price drops, or because they would require intensive use of the most scarce resources. Some trends that are influencing the outcome were then described with Angelson noting that trends of globalisation, market integration and commercial forestry are those least likely to be land and forest saving. The separation of forest and agricultural land, he emphasised, also means that the impetus for agricultural intensification becomes less important.

A Partial Solution

Angelsen cautioned against assuming that technological change and agricultural intensification will save forests, yet he also claimed that it is a mistake to be against intensification because of a view that such a strategy puts pressure on forests. He went on to conclude that agricultural intensification is a necessary and desirable strategy for a number of reasons but that forest conservation does not score highly in that list of reasons. However he claimed intensification of agriculture to be an important part of the solution as intensifying food production can enable and facilitate other forest conservation measures. He closed by stating that there is no guarantee that economic development (such as intensified agricultural production) can end inappropriate deforestation and he put the onus onto "informed and proactive policies" to ensure such an outcome.

Report: Heather Mackay, Agri4D

Gender and Agricultural Futures: Challenges for Policy and Research

Professor Bina Agarwal, Professor of Development Economics and Environment, University of Manchester

Photo: Bina Agearwal,

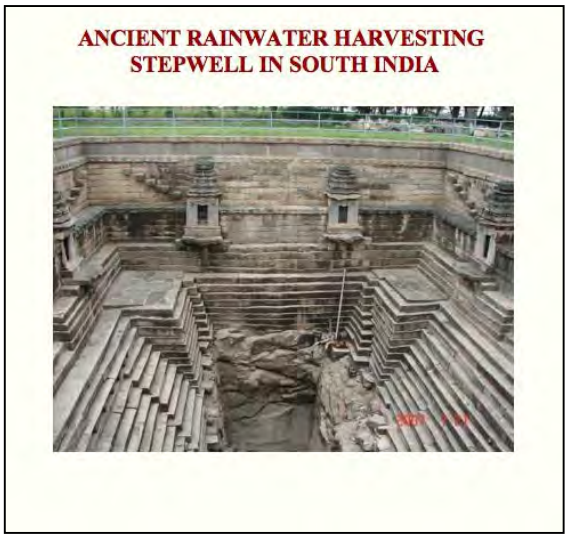
Prof. Agarwal outlined a trend of the feminisation of agriculture at the smallholder scale and called for a focus on women farmers being central to future agricultural growth and food security. Small farmers (<2ha, many of whom are women) can be a driver of regional growth. Yet gendered inequalities in access to inputs, principally land but also credit, fertilisers, labour, equipment, training, mobility and marketing, greatly constrain female farmers' productivity.

Slide: B. Agarwal

Land is the primary constraint faced by female farmers around the world, both a lack of title and access to it, and the small size of what land they do have. Overcoming the land constraint, Agarwal stated, would be a necessary precondition for easing the other obstacles facing female farmers. She went on to outline actions that could be taken to ease the land constraints women face, and institutional innovations (such as group farming) that can greatly improve female farmer productivity.

Easing Land Constraints

Agarwal described five potential policy mechanisms for easing the land constraints facing female farmers. These include land transfers by government, facilitation of land purchase agreements, or facilitation of land leasing mechanisms. Policies that protect smallholder farmers from indiscriminate land acquisition for non-agricultural use would be desirable, and improvements to the land registration procedure to allow security of access would feature highly.



Slide of Ancient Farm Water Innovation, B. Agarwal

Farm Innovations

Group farming was suggested by Agarwal as being an innovative alternative institutional model to aid female land access and success in farming. Group farming could take a number of forms such as shared marketing or technological investments, or joint acquisition or pooling of land. Such an approach offers economies of scale previously unavailable to female farmers and provides better access to land, information, credit, inputs, or training to name a few. Agarwal outlined examples of the Deccan Development Society (DDS) and the Kudumbshree Group Farm, both in India, and asked whether gender homogeneity was a factor in these groups' success. Her suggestions was that women are well-suited by nature, societal norms and experience to make a success of group farming.

Slide: B. Agarwal

Future Research

Principles of importance for successful group farming were outlined. These amounted to six recommended areas: voluntariness, small-size, socio-economic homogeneity, participatory decision-making style, checks to limit free-riders, and a fair and transparent distribution of production benefits. Important areas for future research with a gendered focus that Agarwal highlighted were research into suitable crops for female farmers, field trials geared to female farms and female needs, research into tool and equipment adaptation for women, and pilot testing of resource centres, extension and training services for female smallholders. She also noted areas where social scientists can contribute, namely in analysing gender gaps and productivity differences between male and female farmers, and assessing the impact of gender composition in collective efforts, among other topics.

In discussion with participants after the presentation Prof. Agarwal emphasised the value in performing a gendered landscape mapping of what women and men grow in a particular area

as a basis for determining research questions. She said that there is evidence that group farming initiatives for women are being scaled up from local initiatives to national alliances. Overall Professor Agarwal felt optimistic about the future for female-headed farm households.

Slide: B. Agarwal

Report: Heather Mackay, Agri4D

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Panel Discussion, Day 2

Panel:

Dr Tony Simons, Director General ICRAF

Prof. Deliang Chen, University of Gothenburg

Dr Jimmy Smith, Director General ILRI

Prof. Arild Angelsen, Norwegian University of Life Sciences

Prof. Bina Agarwal, University of Manchester

Moderator: Annika Åhnberg, former Swedish Minister of Agriculture (pictured right)

Transdisciplinarity

One of the first questions put to the panel, with the concept of multi- or trans-disciplinarity in mind, was whether panel members understood each other. The question provoked much discussion and some wry smiles. Prof. Angelsen pointed out that as soon as specialists leave their field of training they become amateurs and it is important to recognise this point and try not to speak as someone from all disciplines but to place oneself and one's discipline in context. If we are unable to do this the quality of the science suffers. Prof. Chen agreed with this point but emphasised the importance of striving towards interdisciplinarity. This takes time and effort and requires different skills and a whole new process in order to be able to communicate effectively with policymakers and multiple disciplines. Panellists emphasised that whilst scientists cannot be specialists in all things they do require some broader level of knowledge that enables understanding of other disciplines' questions and approaches.

Prof. Agarwal also questioned the rigidity of a discipline highlighting the constant evolution ongoing within many disciplines. A participant questioned whether scientists are studying the 'process' of transdisciplinarity. Panellists responded in the affirmative but stated that a benefit of transdisciplinary work comes rather from framing the research questions together, working together, rather than studying a process.

Communicating with Non-Scientists

Discussion moved on then to being aware of, and challenging, some of the political narratives that attempt to dominate science. Prof. Chen cautioned against directing science to be policy prescriptive. The scientists' role is to provide scientific evidence. The policymakers must consider this evidence, but there are other things that the policymaker must also take into account. Thus the scientist must also be able to communicate their disciplinary findings to multiple disciplines and stakeholders.

Smallholder Farming in Transition

Conversation moved onto the topic of farm size with audience members questioning whether sustainable smallholder agriculture is an end

goal, whether small-scale farmers are doomed to remain small, and how such a scenario fits with trends of rural depopulation, urbanisation, lost labour and so forth.

Slide: T. Simons

Much discussion followed but a general consensus seemed to be that researchers should view smallholder farming as the start point not the end goal. They are not static in their situation, many will grow larger, others will leave agriculture, others will migrate–there will be future labour loss with the ageing of the rural population. Yet yield improvement technologies within a small-scale system should not be ignored or denied their potential benefit over time. Dr Smith agreed that smallholder farming is a system in transition. His message was that as scientists we perceive issues through the light from our own disciplines, but we need to see the entirety through the lens of all the disciplines' lights.

Prof. Agarwal emphasised that what is large or small as a farm depends very much on the conditions of the context (soil, nutrients, crops, population, land acreages etc). This presents difficulties in defining an optimum point. She also highlighted that there are other methods of achieving economies of scale within farming without focusing on land holdings, such as group cooperation. Her final point supported the views of the other panellists that smallholder farming will decline: she quoted research findings that 40% of Indian farmers report that they dislike farming and they do not want their children to farm. They invest in their children's' education. Many will move, or be forced, out of smallholder farming in the near future.

Report: Heather Mackay, Agri4D

Slide: T. Simons

PARALLEL SESSION REPORTS

Day 1: Wednesday 25 September

1:1) Securing Land Rights in Sub-Saharan Africa–in the Context of Increased Competition for Land

Organised by: *Lasse Krantz & Maria Ölund LARRI (Land Rights Research Initiative), maria.olund@gu.se and lassekrantz15@gmail.com and in collaboration with Linda Engström & Michael Ståhl The Nordic Africa Institute*

Increased demand for land in recent years emanates from multiple competing interests ranging from conservation, carbon sequestration, mining, and forestry to large-agriculture. This demand has also raised the need for securing the land rights of local populations. Nowhere is this more urgent than in Africa, which is a region that attracts all these interests while the overwhelming majority of locals lack formal ownership rights to the land. How to improve tenure security is a complex issue. This session presented empirical data on land right issues in the context of large-scale investments.

Maria Ölund, Project coordinator of LARRI and the session moderator, gave an overview of some drivers behind the increased interest in land such as the food price and financial crisis of 2007-2008, population growth, and environmental stresses serving to limit productive land. Sub-Saharan Africa is often perceived as having a lot of unused/underused land, as well as cheap natural resources and labour.

Photo: L. Engström

Linda Engström presented findings from Tanzania concerning a large-scale land request from the investor Eco Energy. According to the company website the investment is targeting an "abandoned state cattle farm". However, 500 farmers live on the land today and approximately 6000 people utilise the land. Engström's research revealed complex realities on the ground, where Eco Energy claims that efforts are made to compensate the local community and respect their rights. While among the locals there was uncertainty of who Eco Energy are, as most of their contact has been with the consultancy intermediary. Locals claim they have been encouraged by the consultants to stop producing food becuase they "soon" will be resettled. A company decision to set aside land for pastoralists has meant the number of pastoralists and cattle have risen to the extent that water sources have been depleted, with the consequence that they are now forced to buy water or fetch it from far. Engström concluded that reality is more complex than dominating win-win or win-lose policy narratives and that multiple understandings of a situation is common in such land deals.

Michael Ståhl turned the focus to East Africa as a whole and considered privatisation of land and customary land tenure. Privatisation of land ownership has been implemented in Kenya since the 1960's and aims to create a class of prosperous farmers. Yet it has had positive and negative implications. It is claimed that customary land tenure embodies the wisdom from traditional societies and contributes to solidarity and equity. However, such positive traits are eroding due to factors like population increase, land

Photo: M. Ståhl

scarcity and commercialisation of agricultural production. Furthermore customary decisions on land management mirror local power structures and are not free from favouritism and inequality. Results presented by Ståhl show that governments in East Africa pursue various policies aiming at outright privatisation, or regularisation of customary systems. Both policy options have similar outcomes, with increased security of holding for those receiving title deeds or certificates and increased insecurity for those who don't. In addition, private land ownership seems to have a limited impact on both agricultural productivity and poverty reduction, unless supported by other policies such as marketing and infrastructure. Ståhl concluded that a multiplicity of tenures prevail in East Africa, making status uncertain and causing confusion. There is now a growing realisation within farming communities that documented evidence of land holding is necessary in order not to lose it to land-grabbers.

This fascinating presentation was followed by **Lasse Krantz'** talk on the formalisation of community-based tenure in Mozambique. Securing community-based tenure means that land rights are formalised on a group level, irrespective of whether the land and other resources are used individually or collectively. Land allocation and dispute resolution is carried out according to customary norms and procedures. Companies are able to get access to land only if locals don't claim the land, but consultation with the latter is required. However, according to Krantz, these community-investor consultations seem to be more symbolic than real. This approach of community-based land formalisation is, nevertheless, now also being adopted by some other countries in the region e.g., Liberia and South Sudan.

Photo: L. Krantz

After the presentations discussion considered both broad and specific issues. One example concerned how Eco Energy could have handled things differently. Engström replied that good intentions from the company seem to be there, but it is very striking that such different views on what's actually happening exist. She emphasised the importance of the investors being informed about and observant of the contexts they move into. Miscommunication between the investor and the community seems to be a central challenge which need to be addressed.

Another discussion emphasised how Swedish development cooperation can help by working to ensure that the private sector investments become better adapted to the interests, needs and rights of local communities. In considering how development cooperation can support the strengthening of local land rights participants emphasised 'appropriateness'. For example, individual land titling might not be the most appropriate solution in areas where customary tenure systems are still strong. A community-based land formalisation approach might be both more cost-effective and socially appropriate. In addition, land rights formalisation processes need to be combined with support to strengthen the capacity of smallholder farmers to organise and exercise their rights.

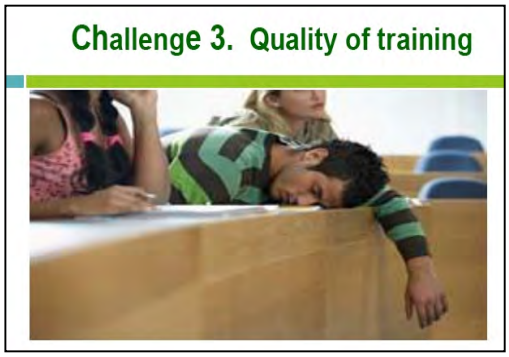
1:2) Capacity Development for Higher Education and Research

Chair: Dr. Ulf Magnusson, SLU Global and Future Agriculture, SLU: ulf.magnusson@slu.se

Report: Kristina Osbjer, DVM, Department of Clinical Sciences, SLU

In most societies it is acknowledged that higher education and research (HER) are vital and efficient drivers for development and wealth. Within the global development cooperation arena there is sometimes a discussion whether investment in HER is the best use of money for better livelihoods for poor people. There are also different views on the various formats of HER in development cooperation. This session included presentations on the role of HER for increased wealth and offered examples of best practices for HER-cooperation in the development context. The growing demand for capacity development in higher education and research in low-income countries was highlighted, with examples offered from past and present projects in Africa and Asia. It was recognised that a more holistic approach is desired in the support to higher education institutions in low-income countries. Capacity in research infrastructure, administration and ICT needs strengthening along with an increased number of qualified researchers. Quality and relevance of research was also elaborated upon since there sometimes is a bias in priorities (in both directions) regarding these two aspects. Well-articulated and clearly communicated research findings will drive policy and strategy development and facilitate evidence-based decision-making.

Arrangements for support and funding of PhD students from low-income countries were discussed looking at the commonly used sandwich model where PhD students carry out data collection in their home country based on home country needs but take courses and conduct data analysis in the funding country. The sandwich model is in contrast with a model where the full PhD is conducted in the funding country. This is considered to provide the student with greater opportunities to continue within the research field after graduation and to combine home needs with science thinking. The kind of model is also crucial if the student is to maintain a social and professional network within the home country.



Slide: Hamidou Boly, TEAM Africa

If a long-term approach in supporting PhD students is established it is however advisable to strive for shorter time in the funding country to build up sustainable self-supporting PhD education in the home country. However, it was also argued that it is essential for the students' development and training to be exposed to, and work in, the research/university environment in the funding country.

Higher education has in the past taken up limited room in the global development agenda. Some actors have questioning whether higher education should be a target for funding when people are suffering from poverty. However, for a long-term perspective it is obvious that low-income countries must have their own trained professionals in order to move out of aid dependency. Hence there is a strong element of development sustainability in international cooperation for higher education and research.

1:3) Multifunctional Landscapes Part 1: Enhancing Productivity and Restoring Ecosystem Services for Improved Livelihoods

Organised by: *Anders Malmer SLU/ SLU Global & Madelene Ostwald GMV (Centre for Environment and Sustainability)/Chalmers/ Linköping University/Focali: anders.malmer@slu.se and madelene.ostwald@chalmers.se*

Slide: A. Malmer and M. Östwald

Under increasing pressure to improve food security and livelihoods from land-use, declining trends in soil fertility and tree cover need to be reversed. At the same time the resilience of the farming systems to maintain and increase delivery of primary products and other ecosystem services under climate variability and other stress factors needs to improve. One important component for restoring ecosystem services on farms and in agricultural landscapes is integration of trees. Tress can have multiple functions at field (e.g. micro-climate, N-fixation), farm (e.g. food, feed, fuel, income) and landscape (e.g. water cycle, erosion control, carbon sequestration, biological pest control, genetic diversity) scales. These multiple functions and the relation between them (benefits and trade-offs) depend on a multitude of factors both related to land-use practices and environmental factors. This session presented findings from current research.

Lina Hammarstrand and Andreas Särnberger (Chalmers University) presented their Masters thesis work where they compared two forest management systems in Miombo forest in Tanzania. Striking was that the unprotected forest had higher carbon content than the protected forest and also more species, while the protected had more distinguished Miombo species in its composition. The three most desired ecosystem services were defined during discussion with locals as being for charcoal, timber and the production of building poles.At the discussion afterwards it was pinpointed that Miombo forest under use usually has a higher diversity compared to protected systems. This may reflect natural disturbances and succession in Miombo as long as the forest canopy and soil productivity is not completely devoid. Through the interviews conducted in the study it was clear that the protected forest was well perceived because the locals were very involved, particularly via labour opportunity. Hence they had a great amount of information concerning the forest and the protection measures and motivation to support conservation.

Slide: Deborah Goffner

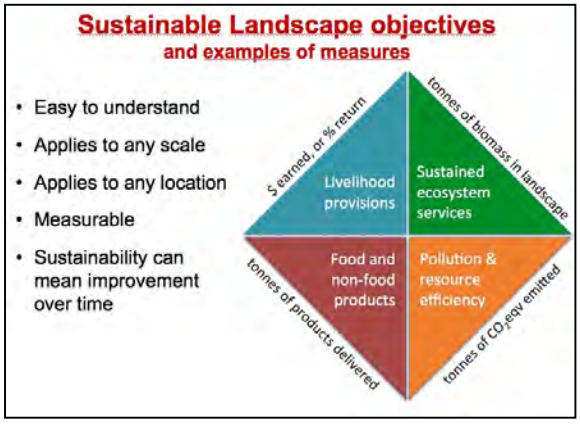
Hanna Sinare (Stockholm Resilience Centre) presented results from her study on ecosystem services and their benefits to livelihoods from seven different landscape types in six villages in northern Burkina Faso. Agricultural fields, depressions and homesteads were the ones giving the most services and benefits, while livestock, which contributes to a large part of benefits in times of trouble (drought, failed crops), require resources even from several more peripheral landscape types. She also presented a review in preparation on ecosystems services from trees and shrubs in West Africa, where preliminary results showed that nutritional value was the most scrutinized service found in the literature. Hanna

received questions on the effect of trees on regulatory ecosystem services such as water and temperature, as well as the microbial activities in association with trees in this area. There was also discussion on the "insurance value" of livestock particularly in relation to times of land-use change.

Deborah Goffner (CNRS, France and Stockholm Resilience Centre) introduced the large Pan-African programme "the Great Green Wall of Africa", a regional large-scale political process of African initiative. Her role has been on ecosystem restoration in Senegal where a number of soil and vegetation restoration projects and associated training activities are underway. One of the aims is to diversify the amount of indigenous species used in the afforestation program. Discussion after her presentation covered the different short and long-term goals of the programme, and the way of determining success in terms of survival rates when planting trees in sensitive environments.

Peter Holmgren (CIFOR) focused on the need for capital to generate positive development in the landscape and he took leverage from the discussion around REDD+ and the carbon market. His opinion was that public funding is not sufficient and private investment must be enhanced. There is a lot of private capital ready for good investment, he said, but ideas have to be presented clearly and convincingly. The procedure also has to secure long-term, affordable and reliable capital. Keep it simple, it has to be profitable and public funds have to be used effectively. A participant raised concern with Holmgren's proposals. In India, he said, public money is abundant but as soon as private investment comes in the focus becomes only on making money.

Discussion following the presentations covered several interesting topics but focused around forest use efficiency and the need for simple indicators in contrast to rigid REDD+ induced carbon accounting. There was considerable discussion around the concept of protected forests and whether such protection works or not. A final debate focused on what the "landscape perspective" really is and whether it includes livelihoods, governance and tenure or was it just a new name for watersheds.



Slide: Peter Holmgren

1:4) Pre/Post Harvest Losses-Including Post-harvest Handling and Storage

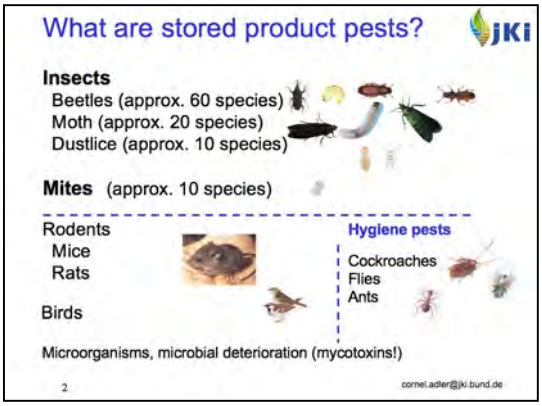
Organized By: *Matthew Fielding SIANI/SEI: matthew.fielding@sei-international.org*

Avoiding food losses and waste is an international priority. With food systems under increasing pressure to produce more with less such losses and inefficiencies are unacceptable. Reducing such losses, caused by pest destruction, inefficient storage, and crop contamination, in the agricultural value chain either *pre* or *post* harvest would directly contribute to global and regional food security. In this session four speakers offered insights into the subject of pre- and post- harvest losses and provided specific examples from their own research.

Adam John, PhD candidate, University Putra Malaysia, Kuala Lumpur, presented on "Rodent outbreaks in Southeast Asian rice cropping systems: using ecologically based rodent management to reduce pre-harvest

losses". According to his research, rodents cause 10-15% of pre-harvest losses of rice crops in South East Asia. These losses are equivalent to 15% of a farmer's income. Ecologically based rodent management (EBRM) uses ecological knowledge and traditional forms of management to reduce the use of rodenticides. For example, trap barrier systems involve the planting of an early rice crop to attract rodents. Traps are then placed at all paddy entrances to catch rodents before the primary crop is planted. John's findings state that the use of EBRM has reduced yield losses by up to half, and also reduced the use of rodenticides.

The next presentation, by Dr. Cornel Adler from the Julius Kühn-Institut, Berlin, was devoted to post-harvest losses and stored product protection research. Dr Adler specifically advocates for an Integrated Stored Product Protection system where methods of pest prevention, early pest detection and pest control are used in combination to achieve secure storage. For example, phytochemicals are used as aromatic or pheromone attractants to lure and trap pests. Preventative pest control is essential for the protection of the stored product.



Slide: C. Adler

Johanna Lindahl, researcher at ILRI, Nairobi, presented her research on aflatoxins. Her work examines the susceptibility of products, during all stages of agricultural production, to contamination with mycotoxin-producing fungi. It is an invisible, odourless and heat-stable toxin that results in loss of safe products. Most importantly, it is a great threat to human health as it is one of the most potent carcinogens known. Chronic exposure to aflatoxins can cause carcinogenic-hepatocellular carcinoma, stunting, and decreased immune defense. According to the US CDC an estimated 4.5 billion people are chronically exposed and an outbreak can potentially cause hundreds of fatalities. Lindahl's findings reveal that genetically modified maize, and products such as Aflasafe, can be possible solutions to reducing aflatoxins. The biocompetitive product Aflasafe is atoxigenic strains developed by microbiologists. These strains cannot produce aflatoxins and cannot become toxigenic.


DAILY NATION

Kenya alert over 2.3m bags of bad maize

Slide: J. Lindahl

Professor Bina Agarwal, University of Manchester, reiterated the points made by the preceding presenters and offered some conclusions from the session. There was a clear consensus among the speakers that pre- and post-harvest losses as a result of rodents, pests, fungi etc. are a serious threat to food production in both developed and developing countries. Ineffective forms of management, bad infrastructure, and poor storage systems lead to crop and quality losses as well as massive amounts of waste. Specifically, she emphasised the importance of cooperation between stakeholders as a way forward.

The central theme of the discussion that ensued was the separation of the debate regarding food versus fuel. Much of the harvest losses that exist can, in fact, be valuable to the agricultural supply chain. Waste from crop losses can be employed for a multitude of uses, including value-added products, food-crop residues etc. It was suggested that the ongoing antagonism between food and fuel should be brought together to create a more holistic discussion.

Climatic volatility was also pin-pointed as a potential exacerbated of pest problems. Weather volatility and increased temperature will increase the threat of pests and, therefore, are central to any discussion on harvest losses. Furthermore, it was emphasised that successful adaptation and management strategies need to be focused on local systems and incorporate community-based action. Bina Agarwal highlighted the success of local "master farmers" in India that work to link research with practice. Similarly, solutions must link new innovations and technologies with local farmers. It was suggested that genetically modified products should be examined as a possibility to reduce susceptibility to pests. However, even though these products have proven to be useful, they are rarely affordable. Technologies need to be made more available to farmers.

Finally, the weak communication between research and farmers was discussed. It was suggested that extension systems/services are needed to assist in creating linkages between farmers and regional organisations. Another recommendation was that better cross-sector cooperation is necessary to use the existing technologies at full capacity.

Report: Kristin Follis

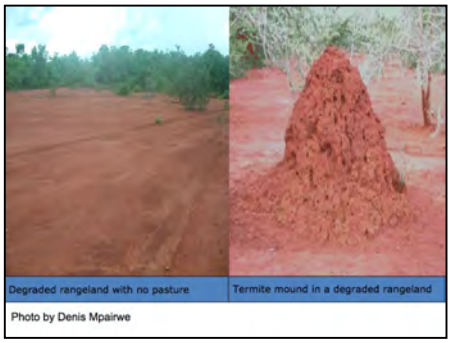
Day 2: Thursday 26 September (09.00-11.00)

2:1) Restoration and Use of Grass-Land

Organized by: *Dr. Ewa Wredle, Dept. of Animal Nutrition and Management, SLU: ewa.wredle@slu.se*

Pasture areas with no or little management has led to frequent overgrazing and a need for land rehabilitation for a more productive land use. Shrub encroachment and/or soil erosion of grasslands have a major impact on the quality and quantity of the pasture and thus the productivity of the livestock. This session discussed issues related to all possible strategies and technologies to improve pasture: grazing and herd management, livestock, land tenure changes etc.

Cattle grazing in Bale Mountains, Ethiopia. Photo: Maria Johansson



This session considered the use of lands for livestock, i.e. pastoralism, ways of managing the pasture areas and how to deal with degraded lands (see also the abstracts in appendix 1). Termites were the starting point for the discussion! They are widely blamed for reduction of vegetation and in the degraded land in Nakasongola in Uganda (in the cattle corridor) there are many termite mounds. According to the presenter, Dr Denis Mpairwe, there is a possibility to reduce the termites by adding manure (+ fencing and reseeding). If they only fenced and reseeded the termites were still there but by adding manure the degraded rangeland began to be colonised by grass again.

This was followed by considerable discussion about the use of fire as a management tool in the sub-alpine heathlands in Bale Mountains in Ethiopia as presented by Maria Johansson, SLU. The participants were informed that this was a tool that holds back bush encroachments but it is a debated method that will possibly be forbidden in the future. It is agreed that if fire is banned the quality of the pasture area be reduced in less than 10 years.

The use of fire in Bale Mountains, Ethiopia. Photo: Maria Johansson

Finally it was emphasised that the use of grasslands is very complex and in order to have a sustainable use of the different types of grasslands it is absolutely necessary that researchers collaborate more multidisciplinarily, and that policymakers develop joint plans with the different users of the grasslands.

2:2) Water Resources and Sustainable Intensification–Trade-offs and Opportunities Across Scales and Agricultural Systems

Organized by: *Mats Lannerstad SEI & ILRI: mats.lannerstad@sei-international.org*

Forecasts for 2050 project an additional 2.3 billion humans on Earth, with 3 billion more urban dwellers and continued economic growth. This population will demand both more food and more water-intensive foods. The pressure on already stressed water resources will escalate. Consequently a large part of the future food demand must be met through "sustainable intensification" of agriculture. Well-chosen management of precious resources will be crucial. This session highlighted linkages, modelling approaches, new perspectives, options and trade-offs for how to best orchestrate agricultural water management across scales to achieve sustainable intensification of food production.

The first presentation "Water, forests and footprints–finding the right scale for sustainability" was given by Kevin Bishop, Professor at both Earth Sciences at Uppsala University, and Aquatic Sciences and Assessment at the SLU. Bishop explained how forests impact water partitioning at different scales. At a local catchment scale forest removal usually increases the total water flow, always increases peak flows, and can increase as well as decrease the base flow. Although some ambiguity exists all scientific studies confirm that forests have larger evapotranspiration (ET) than most other land uses. However, when forest ET is viewed at larger spatial scales and more narrow seasonal temporal scales, it is possible to shift the perspective from a local "demands" towards a regional "supply" viewpoint. Bishop concluded that forest cover plays an important role for the hydrologic cycle. At the regional scale an increased forest cover can increase the overall precipitation and runoff. Consequently, local decision-making about forests will have trans-boundary impacts.

Photo: K. Bishop

The second presentation "Computational approaches to address water resource challenges and agricultural development" was given by Dr. Jafet Anderson from the Meteorological and Hydrological Institute

(SMHI). Through regional examples Anderson showed how computer models can assist in providing quantitative information about how different crop yield interventions influence water at different scales. The studies show that the most important limiting factor for crop yields is the lack of nutrients, and not limited water availability. Anderson noted that although modelling can give many answers participation by local stakeholders is necessary for sustainable management and adaptation. Dr Anderson concluded by emphasising the value of computational approaches to assess dynamic interactions between water and agriculture. However, models alone are not enough. Successful modelling is dependent on people, data, policy, institutions etc.

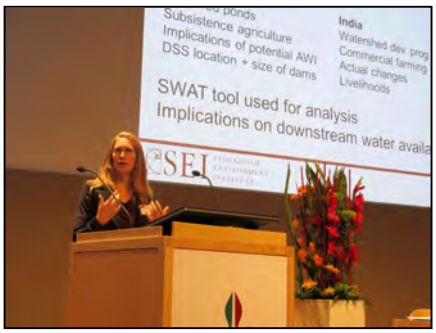


Photo: J. Anderson

The third presentation "Agricultural water interventions for sustainable intensification–upstream downstream trade-offs and opportunities" was a joint presentation by Dr. Louise Karlberg and PhD student Yihun Dile of Stockholm University. This talk presented two sister projects in Ethiopia and India. In both cases models were used to analyse how upstream water harvesting and nutrient application interventions impact downstream water availability. The case study in Ethiopia showed that crop yields significantly increase with water harvesting and nutrient applications and implied improved water availability in the dry season. The Indian project also measured differences in farm income before and after implementation of water harvesting. As a result of the project, farmers had moved from subsistence farming to a much more commercial agriculture, with improved farm incomes. In conclusion it was noted that both studies showed that runoff decreased significantly due to water harvesting. Further, peak flows were reduced and low flows increased, thus reducing the risk of flooding and erosion. Sediment losses were also reduced after water harvesting implementation. In upstream areas crop yields and biomass production have increased. In downstream areas water availability for drinking water supply may be reduced, as was shown in the study in India.

Photo: P. Keys

The final presentation "Precipitationsheds and the resilience of green water systems" was given by Ph.D. student Patrick Keys from the Stockholm Resilience Centre. He introduced precipitationsheds as the place where precipitation originates, and highlighted the importance, yet difficulty, in setting their boundaries. Precipitationsheds are dynamic in their nature with variability in both time and space. Keys presented a literature review of the effects of anthropogenic land use changes on downwind areas. Results show several examples where patterns of upwind-downwind connections were found, for example, irrigation upwind causing increased precipitation downwind. He presented possible management strategies, and their limitations. Keys pointed out, for example, that the area for a precipitationshed is huge and thus very difficult, though not futile, to manage. It may be important to monitor land use changes in certain upwind areas since these may have large impacts on precipitation, and thus moisture availability in downwind areas. Thus research about precipitationsheds may identify places and patterns of particular importance and possible threats to such patterns.

The closing panel discussion brought questions focusing on how modelling approaches can be improved and how the results can be used locally. In particular, the importance of well-defined boundaries and concepts were discussed. The panellists highlighted the importance, but also the difficulty, in integrating

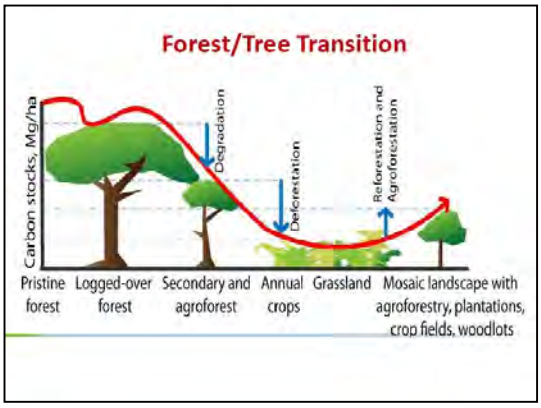
social aspects in their models. The complicated issue of water ownership was discussed. It was felt that access to information and knowledge sharing will assist sustainable usage of water resources. Last words regarding future water-related challenges focused on the need for cross-sectoral inclusion within modelling, the need to find a scale that can be realistically managed, and concerns regarding economic tipping points. Anderson stated that a fundamental challenge and key focus is to integrate many more processes into computer models. Where we can do that depends on what scale we are looking at. Patrick Keys acknowledged the key challenge of his work as being to bring it to a useful scale; to develop something that people can actually implement.

Report: Ylva Ran, Research Associate, SEI

2:3) Multifunctional Landscapes Part 2: Enhancing Productivity and Restoring Ecosystem Services for Improved Livelihoods

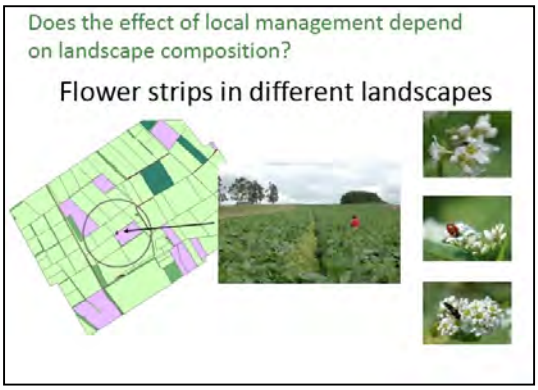
Organised by: *Ingrid Öborn ICRAF (World Agroforestry Centre):* *I.Oborn@cgiar.org*

This session discussed the scientific evidence that integration of trees on farms and in agricultural landscapes will contribute to enhancing agricultural productivity, resource utilisation and livelihoods for smallholder farmers. The benefits and trade-offs were considered. Resilience of farming systems to maintain and increase delivery of primary products and other ecosystem services under climate variability and other enhanced stress factors needs to improve. One important component for restoring ecosystem services on farms and in agricultural landscapes is the integration of trees., as described in part 1 of this theme (session 1.3).



Slide: T.Simons

The session heard first from Mattias Jonsson of Department of Ecology and the Centre for Biological Control, SLU on whether the landscape matters for on-farm productivity. His talk considered the effects of the wider landscapes in which farms are 'housed' upon pests, biological pest control and pollination. He gave examples of research both in temperate and tropical landscapes. Their findings suggested that biological pest control and pollination was more effective in more complex landscapes i.e. those landscapes that include a diversity of vegetation cover, as opposed to monocultures. However the findings for the number of pests found in a landscape were more difficult to determine. More complex landscapes tended to have a greater number and diversity of pests, but also a greater number and diversity of natural enemies to crop pests. Jonsson stated that it is not all that easy to design pest suppressive landscapes. He then considered the effect of management strategies and concluded that the efficacy of management for pests, biological control and pollination were often dependent on the landscape composition and the local-to-landscape interactions. He claimed that although managing the landscape in a smart way may not allow the elimination of pesticides, such a landscape approach can at least reduce the amount of pesticides required.



Slide: M. Jonsson

Jonsson's presentation was followed by two presentations from Vi Agroforestry's work with farmer groups and farmer organisations in Kenya. The first delivered by Carolyne Musee considered how to make agroforestry work for smallholder farmers in East Africa. Vi Agroforestry works with poor farming communities surrounding the Lake Victoria Basin in Uganda, Kenya, Rwanda and Tanzania with the aim to strengthen farmers and their organisations to fight poverty and environmental degradation and climate change by promoting agroforestry and sustainable agricultural land management practices (SALM). Methodologies include training on SALM, provision of starter tree seeds, demonstration sites, role model farms, field days, exchange visits, collaborations and farmer group capacity building.

Emanuel Wachiye gave the second talk from Vi Agroforestry focusing on the impact of SALM on farm productivity and local livelihoods. He provided examples of local SALM successes by 26,535 farmers in 1,555 farmer groups on 16,490 ha of land as of 2012. Practices encouraged for sustainable land use and improved carbon sequestration include cover crops, green manure, crop rotations, mulching, composting, water harvesting, woodlots, orchards, improved fodder to name a few. Results have been demonstrated in improved maize yields in participating farms, a rise in the number of months food sufficiency, and an increase in income gained from agricultural crops. In addition project farmers were able to increase their savings. Tree coverage on involved farms has also improved. Vi Agroforestry's findings suggest that the combination of simple SALM technologies with human capacity building for farmers in enterprise development and financial services can be a powerful strategy for environmental and livelihood improvement.

Picking up on Mattias Jonsson's consideration of the landscape level, and Vi Agroforestry's presentation of the farm level, Tony Simons, Director General of ICRAF, completed the session with a thought-provoking and engaging presentation on 'Climate Smart Landscapes'. He began by analysing the definition and implication of the term 'landscapes' and the inherent difficulties with such a concept. He cautioned religious zeal about landscapes while outlining the evolution of the concept. Meinig was quoted "landscapes are not only what lies before our eyes but what lies within our heads".

Slide: T.Simons

Simons then discussed the role of trees and forests and highlighted contradictions where large swaths of deforested land are still classified and quantified as forest because they are "expected to revert to forest" (FCCC, 2001), and at the opposite end of the spectrum, mosaic landscapes of agroforestry, crop fields, woodlots officially categorised as 'non-forest' often represent large areas of landscapes with trees (and carbon). Simons presented data and mapping from Indonesia to illustrate this point.

In discussing global land use and land areas, Simons advocated a more proportional view of the world where natural forests play a significant role. He posed the question of how best to optimise our goals: sectoral silos? economic measures? carbon sequestration/climate change mitigation? resilience/ adaptation? Simons suggested we lack the data and the monitoring to be able to understand and manage these trade-offs among ecosystem services, and to determine where the actual tipping points are. He then advocated for the crucial role of land tenure to land stewardship and the need for 'landscape' approaches to take this, and the aforementioned trade-offs and contradictions into account.

Discussion following these comprehensive presentations of issues considered the measurement of success and questioned how we do this effectively and across sectors. There was also concern about the sometimes all-too-apparent gap between farmers and researchers.

Report: Heather Mackay, Agri4D and Ingrid Öborn, ICRAF

2:4) Transforming Gender Roles in Agriculture: A Diversity of Approaches

Organized by: *Melinda Fones Sundell SEI/SIANI: melinda.sundell@sei-international.org*

Slide: M. Sundell

Looking at agricultural production and rural livelihoods through the gender lens has been done for decades in the academic world. There seems to be a general consensus that gender roles affect how agricultural production, marketing and income generation investments and interventions reach their goals. There has been a long history of moving from the Women in Development (WID) approach where women's special needs were addressed in often separate (and underfunded!) projects to mainstreaming the consideration of gender roles into larger investment programs and projects. The Agri4D conference reflects this mainstreaming where gender aspects are dealt with in the plenary and many of the parallel sessions. Why then, a special session on gender? The answer is because there is so much interesting new research and analysis to highlight! This session focused on two major areas: the first being how a gender perspective is improving agricultural research methodology, and the second highlighting projects where the implementation of a gender perspective has been a driver of success. Five presentations on transforming gender roles occupied the session. The topics were diverse and covered issues from adaptation to post-disaster in the Philippines, food security in Botswana, cattle farming in the Kalahari, gender neutral pro-poor growth in Malawi and Zambia, and the balancing of women's loyalty to the community while overcoming inequalities in Colombia.

Slide: M. Sundell

Ellen Hillbom (Associate Professor, Lund University) presented on the possibilities and challenges for gender neutral pro-poor agricultural growth in Malawi and Zambia. The study considers the local conditions for pro-poor agricultural growth in relation to women's and men's access to productive resources and markets, and has a special focus on smallholders and women. The aim of the project is to increase the empirical knowledge of what gender perspectives actually mean in the field, and to gather both panel household data and qualitative data from interviews. Can gender relations explain why certain villages show more successful growth? Does gender impact the production strategies and commercial integration of households? The project's twelve-year time-series data allows for analysis of long-term trends. The analysis will be complemented with qualitative data on how set structures impact on men's and women's opportunities. Interesting findings are anticipated.

Bernadette P. Resurrección (Senior Research Fellow, SEI) presented ongoing research on "Gender, floods, mobility and agricultural transformations in low elevation zones of Quezon Province, Philippines: A Post-disaster View". The setting is the disaster-prone areas that have undergone livelihood transformations after the flooding of 2004. The project looks at factors and dynamics that define peoples' attempts to secure farm livelihoods; how people adapt to flood risk; how gender and social vulnerabilities are produced or

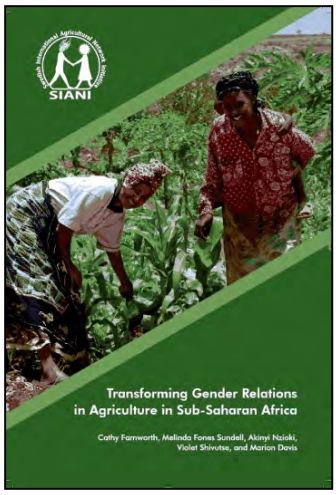
reproduced and how adaptation happens on the institutional level. Emerging findings from the qualitative research go beyond simple notions of gender specific impacts where women are portrayed disadvantaged. Additionally, being previously a blind spot, mobility is now highlighted as an emerging field of research in post-disaster contexts.

Andrea Petitt (PhD Student, SLU) presented her research on "Cattle in the Kalahari: Breeding Gendered Change". The project focuses on the role of women in cattle production, a business traditionally linked to masculinity and male interests. The study aims to understand why women are involved; how their involvement affects their economic security and independence; and how their involvement impacts gender relations and beef production. Preliminary findings include a more effective women's ownership in cattle production, which is understood to evolve as a "silent revolution". While women are increasingly involved, they are still perceived as if they are not, and often see themselves as exceptions to the norm. The introduction of new rules by the EU interestingly seems to be leveling the playing field between men and women as they are equally knowledgeable about new methods and techniques.

Onalenna Selolwane (PhD, Boidus Research and Design) gave a talk about the study titled "When rain clouds don't gather: Gender, agriculture and food security in Botswana". This study concerns how the agricultural strategies and food policies impact female farmers in the light of climatic changes and how differences in resources, technology and information access related to gender. The paper reviews different food and income strategies and how changes in rainfall affect men and women differently. The key finding suggests that the greater diversity of income that men hold allows easier adaptation to climatic variability, whereas women have to rely on lending to maintain outputs.

The session was closed by *Blanca Iris Sandoval* (MSc Student, SLU) who introduced her research on overcoming inequalities without challenging women's loyalty to the indigenous community–a case study in Nasa Kiwe, Colombia.. The project highlights unequal power relations that hinder women from participating in the social and political life of their communities. The aim is to understand how the women reconcile their loyalty to their community with their need to bring up inequalities they experience. The subtle forms of inequality and the mechanisms that reinforce them have been uncovered. Findings reveal that both men and women are committed to cultural and political struggles, but that the unequal distribution of land, access to credit, exclusive technical language and low political influence limits women's personal action.

This two-hour session gave glimpses of the width of the gender related research in agriculture in terms of subject matter, approaches and entry points. The discussion primarily circled around definitions, challenges of sampling, and suggestions of literature and theoretical approaches. The session was completed by the launch of the SIANI publication **"Transforming Gender Relations in Agriculture in Sub-Saharan Africa"** which was distributed to participants (abstract in appendix 1 or see http://www.sei-international.org/publications?pid=2380).



Slide: M. Sundell

Report: Nina Weitz

Speakers' Corner Presentations

There was the opportunity for others to speak for five minutes on a topic of their choice, after consultation with the conference organisers, during coffee and lunch breaks throughout the conversation. Nine people took up this opportunity. Two of these focused on collaborations and networking between industry and research: Marta Zdravkovic of SLU described a recent university-industry collaboration by focusing on the case of UniBRAIN Agribusiness Consortia (Universities, Businesses and Research in Agricultural Innovation). This initiative aims to improve the agricultural education system, foster innovations and boost the production and value chains of associated products. Mattias Goldmann, of the thinktank Global Utmaning, also described their initiative to act as a mediator between African projects and Nordic companies. Entitled ABBBA–African Bioenergy and Biofuels Business Assessment–they aim to bring about investments in the African forestry, biomass and bioenergy sector that meet high sustainability standards. He described their procedure and gave examples where they have supported investment in electric vehicles for safari ecotourism.

Slide: Marta Zdravkovic

Slide: Mats Sandewall

Continuing the link between business and research but shifting the focus to investigating the impact of plantation forestry Mats Sandewall, from the Forests Resources department at SLU Umea, asked what we see when we look at plantation forestry and agriculture intensification. He described trends of a loss of land for food production and a consequent need to intensify in Vietnam, China and Ethiopia over the past twenty years.

From a story of decline of available land for food production to a story of land improvement and rehabilitation: Gert Nyberg from the department of forest ecology and management at SLU Umea described a new research initiative investigating the success in land reclamation in dryland systems of Kenya known as the Triple L initiative where the 'Ls' stand for land, livestock and livelihoods. This project will analyse the land enclosure initiatives implemented in 1987 and assess the critical success factors integral to the associated vegetation increased and reversal of land degradation between then and now.

Slide: Gert Nyberg

In considering communication of research and practice results Olle Terenius from the department of ecology at SLU raised awareness of the value for project managers, and the potential for local beneficiaries, of using Wikipedia. Since spring 2013 SLU has been working with WikiMediaSverige to help researchers communicate their research findings, direct to end users, in their own local language through wikimedia. With agreements now in place between Wikipedia and mobile phone providers in a number of countries for free online access via mobile phone this initiative represents an enormous untapped potential for research communication, outreach and impact.

The remaining presentations communicated during the speakers' corner sessions were given by SLU Global's five theme leaders covering topics including: urban- and peri-urban farming (Ulf Magnusson), land use and climate change (Richard Hopkins), efficiency in farming systems (Håkan Marstorp), scale issues in relation to food security and poverty alleviation (Lennart Salomonsson), and restoration of degraded rural landscapes (Anders Malmer). SLU Global's mission is to coordinate, support and inform about the university's research, teaching and other activities with the aim of contributing to the development of agriculture in low-income countries.

Slide: Richard Hopkins

APPENDIX 1

ABSTRACTS FROM THE PARALLEL SESSIONS

1:2) Capacity Development for Higher Education and Research

ABSTRACTS

Capacity Development in Animal Breeding and Genetics – Insights and opportunities from a decade of regional "train the trainer" experiences

J.M.K. Ojango[1], B. Malmfors[2], J. Philipsson[2], I. Droor[1] and A.M.Okeyo[1]

[1]International Livestock Research Institute (ILRI), [2]Swedish University of Agricultural Sciences (SLU)

Livestock contribute to 40% of the global value of agricultural output and support the livelihoods and food security of almost a billion people (FAO, 2010). However, in order to meet the projected (double the current) demand for meat and milk within a few decades, livestock productivity in developing countries must increase, while minimizing environmental impact. To achieve this highly skilled people are required to lead and manage the development in the desired direction. Unfortunately, trained people are scarce in developing countries, not least in the area of animal breeding and genetics (ABG). In order to achieve sustained and desired change and ensure impact at scale within the livestock sector, one of the factors identified as critical to the success is to grow capacities to support appropriate livestock development in developing countries (ILRI strategy, 2013-2022).

From 1999 to 2011, ILRI in collaboration with SLU, and supported by Sida, coordinated a project aimed at strengthening professional skills and subject knowledge of researchers and university lecturers in ABG. The project was based on the philosophy of "training the trainers" to effectively multiply knowledge and concepts to new generations of university lecturers, researchers and policy makers. Through the program, **138** scientists across **46** developing countries in Sub-Saharan Africa and Asia were trained on ABG developments, implementation of breeding strategies, and on teaching and communication methods. In addition a web-based Animal Genetics Training Resource was developed available at: http://agtr.ilri.cgiar.org./ . At the country level, partners used their newly acquired knowledge and skills to influence national and international policies and dialogue. The project, through it participants also influenced how NARS and regional organizations conduct their own capacity building initiatives. A strong need for persons with ABG skills however still exists in developing countries. Concerted collaborative efforts need to be made to equip a critical mass of people with the skills to design, implement and maintain appropriate livestock research and development initiatives taking cognizance of the cross-cutting nature of capacity development across the livestock value chain. To benefit from the past experiences, a scaling out and further development of the capacity building model that is pivoted around previously trained scientists networking and collaborating at both national and regional levels in research and education should be pursued. This way, improved livelihoods, food and nutrition security in developing countries would be achieved while at the same time upholding environmental health.

Capacity Development in Environmental Chemistry in Low-Income Countries

Peter Sundin, *International Science Programme, Uppsala University, Sweden peter.sundin@isp.uu.se*

The International Science Programme (ISP) at Uppsala University, Sweden, is devoted to long-term support to institutional capacity building in research and higher education in developing countries, with focus on the basic sciences physics (since 1961), chemistry (since 1970), and mathematics (since 2002). Support is directed to institutionally based scientific research groups and networks of scientists. A

domestic population of skilled people, educated to the level of the contemporary research position in the sciences and mathematics is necessary to successfully address development challenges. Such knowledge is needed in a multitude of fields, for example in modern agriculture, health and medicine, engineering, and environmental management.

A pertinent challenge on the global level is an insufficient control of the use of chemicals, produced in increasing numbers and volumes, as demanded by technological development. Chemical technology has contributed significantly to increased material prosperity in all regions. However, unintentional distribution of chemicals to food and the environment can cause health and environmental problems. Environmental chemistry is an increasingly urgent field. This is especially pertinent for low-income countries where control may be weaker; to investigate and report the local situation, to contribute to global action, and to initiate preventive measures for example to facilitate exports of foodstuffs, avoiding income loss due to refusal of contaminated commodities.

The ISP chemistry program supports a number of research groups and scientific networks that work in the field of environmental chemistry. Their common aim is to reduce the risks of, in particular, agrochemicals. The research groups develop technical resources, train staff, cooperate with more advanced scientific partners, and disseminate results in scientific journals and at conferences. Networks arrange workshops, summer schools, symposia and conferences to train staff and provide platforms for scientific discussion and exchange–sometimes resulting in common research projects. The mode of operation is determined by each supported activity, depending on needs and feasibility, and which resources are accessible.

Capacity Development For Higher Education and Research–a university to university cooperation

Assoc. Prof. Dr. Suneerat Aiumlamai, *Dean of the Faculty of Veterinary Medicine, Khon Kaen University, Muang District, Khon Kaen 40002 Thailand.*

The Faculty of Veterinary Medicine (VM-KKU), Khon Kaen University, located in Northeast of Thailand was established in 1986 in response to the rapid expansion of the livestock industry. The mission of VM-KKU is to produce knowledgeable scholars, be a cooperative center for research and animal services, and be a center of continuing education and academic services for veterinarians, livestock producers and the public in Thailand and ASEAN communities. The goals are to drive and strengthen intensive research on one health concept, to produce ready to work veterinarian and scholars, to be the Mekong Sub-region animal health hub and to be a happy work place and enhance quality. The VM-KKU research strategic is to encourage the staff, particularly young colleagues to be outstanding researchers in national and international levels.

Joint research training between Sweden (SLU) and Thailand (KKU) has been carried on through the KKU staff who are SLU-PhD candidates. We encouraged younger staff to cooperate with SLU researchers and training in PhD program. The collaboration in short training courses for veterinarians in Thailand by Swedish lecturers and staff exchange on L-P program could strengthen the research at VM-KKU. Over 15 years of the collaboration, a number of VM-KKU teaching staffs had PhD training and then continuing research in Thailand. At the moment, VM-KKU young staffs are in PhD program at SLU, two PhD candidates in Surgery and one PhD in Theriogenology.

The policy of Thai Government on one ASEAN, encourage research projects and academic events across ASEAN. TICA has been working on many activities in ASEAN particularly provides scholarship to study in Thailand. A numbers of research agency in Thailand strengthen research and the

development in the country such as National Research Council of Thailand, Thai Research Fund, Biotech Fund, Research agency under Ministry of Public Health, Ministry of Agriculture, Ministry of Education, Ministry of Science and private sectors. The research funding is also provided by KKU (research cluster and research group) and VM-KKU to support the staff.

The strategic of research at VM-KKU is to have a better living and sustainable development of the country as well as to promote the academics career of teaching staff and complete the graduate program. We focus the research on one health concept (zoonosis, infectious diseases-animal health and food safety), animal productivity and herbal medicine. In the future, the research collaboration between SLU and KKU could approach on research project which be discussed and handed by graduated students and advisors from both SLU and KKU. The activity could include the short training courses for particular topics related to research issues for staff and students of KKU and SLU. The goals are to publish the international publications, transfer knowhow to the community, share the facility and research for development.

Human resource development in SE Asia– the case of MEKARN

***Ewa Wredle**, Dept. of Animal Nutrition and Management, SLU, Uppsala. Ewa.wredle@slu.se*

The Mekong Agricultural Research Network program (MEKARN) a regional network on sustainable agriculture in South East Asia, financed by Sida, had as its core activities, research and research training, in the Lower Mekong Basin (Laos, Vietnam, Cambodia and Thailand). The program, managed by Nong Lam University in Vietnam, was initiated in 2001 and ended 2012. During this time period, five MSc programs were completed with a total of 65 students and 32 PhD students received their doctoral degree from SLU.

In many aspects the program has been successful as it has achieved and even exceeded the number of graduates compared with the set target. One important reason, besides the long lasting financial support, is the MSc component that MEKARN introduced at a very early stage. All courses included in the 2-year MSc and the thesis work was performed in the region even though the students were registered at SLU. Students were trained in modern research methods. The training included participatory techniques, laboratory techniques, research planning, statistics, as well as courses in animal science. Interestingly, the graduates are quite different from the norm in the region in that they think critically, can find information themselves and perhaps most important, are able to work without critical dependence on backup facilities such as well-equipped laboratories.

Another important factor for the good achievements was that the most talented graduates from the MSc programs were given a possibility to continue as PhD students in a "sandwich" mode. This means that they were registered at SLU where they spent approximate 3-4 month per year, taking courses, attending seminars, writing articles, but all research was performed in their home country. It can be discussed if the "sandwich" model is good or bad. It is however still today a big incentive for most of the students to have a doctoral degree from an European country despite the fact that they have to sacrifice quite a lot during their PhD time while in Sweden. Many of them had young children, some children only a few years old, and still the students (mothers and fathers) spent many months in Sweden every year. The highly motivated students as well as skilled supervisors from SLU are of course other reasons for the success of the MEKARN program!

African higher education and research systems in transition; the importance of international collaboration and research training

Dr Måns Fellesson, *Acting cluster leader for African Links at the NAI. E-mail: mans.fellesson@nai.uu.se Dr Paula Mählck, Researcher, Department of Education, Stockholm University. E-mail: paula.mahlck@edu.su.se*

Why should Swedish universities increase collaboration with African partners?

The development and economic growth in many African countries are literally crying out for skilled and qualified workers. The role of universities as educational producer has therefore increased markedly, which not only has created very high enrolments but also a worrying situation for the university's other main task – that as research producer.

In the competitive global knowledge economy, highly qualified human resources are increasingly recognized as being key to development. Among them, doctorate holders are not only the most qualified in terms of educational attainment, but also those who are specifically trained to be in the forefront of the innovation chain as they stand in a position to drive forward advances in science, technology and knowledge about society. In developing countries with relatively weak structures for research, the training of Ph.Ds. has hence been intimately linked to the reproduction of human capacity for research in national research systems. However, the combination of a number of factors (inadequate resources for research, massification of HE, increased competition and mobility within the international research community, escalating number of market driven private higher education institutions and increased demand from other sectors in the society for trained researchers) has increasingly come to challenge this connection.

The situation is indeed challenging, but that fact that it is caused by a growing importance of higher education and research as a tool for development is basically positive. The expanding development of African HE systems holds opportunities for different types of collaboration both in higher education and research. Hence, it is a golden opportunity for Swedish universities to invest in collaborations with African counterparts. Swedish internationalization could gain a lot from this.

Sweden has a comparative advantage in advancing collaboration with African counterparts. With support from government development aid, Swedish universities have been engaged in Ph.D. training in low-income countries in Africa for over three decades. This has generated a considerable number of Ph.D. graduates. These individuals are a central resource for the establishment of collaborations. However, despite of the fact that Ph.D. training has long been a core activity in Sida's support to research the knowledge on the long-term effects of this strategic capital-intensive investment in human capacity is limited. We know that the number of Ph.D. graduates in African universities is in general inadequate. We also know quite a lot about the current development in higher education and research in Africa. But we know very little about the mobility and careers development of this strategic resource. More knowledge is required on the situation of these individuals to be able to identify linking points for collaboration on different levels.

1:3) Multifunctional Landscapes Part 1: How to Enhance Productivity and Restore Ecosystem Services for Improved Livelihoods?

ABSTRACTS

Comparative evaluation of two forest systems under different management regimes in Miombo woodlands - A case study in Kitulangalo area, Tanzania

Lina Hammarstrand & Andreas Särnberger, *Department of Energy and Environment Division of Physical Resource Theory, Chalmers University*

The world forest is a key component in the environmental issue of global warming as it acts as one of the most important storage for carbon. This storage potential gives possibilities to mitigate carbon dioxide emissions and therefore reduce global warming. Tanzania is one country where a high deforestation rate is a major issue, especially in Miombo Woodlands. This study investigated the condition of two forest systems under different management regimes. One case focused on conserving the forest, named as protected forest, and one case focused on forest accessibility and usability, named as unprotected forest. Furthermore the thesis estimated how these two forests can contribute to the local livelihoods, and discusses the potential future for these forests.

The parameters measured to assess the forest condition were carbon stock in above-ground biomass, below-ground biomass and carbon content in soil and tree species biodiversity. The livelihood potential was assessed by a selection of system services most important for the local people identified through interviews. During the interviews, major threats and drivers for forest degeneration were determined and contextual parameter for these specific forest systems, such as population growth in the area and accessibility of the forests, were included to discuss the future potential of the forests in terms of carbon stock and system services.

The conclusion is that the two forest cases were quite similar for the parameters assessed in this thesis, which was a surprising result since historical studies showed that the protected forest was in a better condition. Furthermore, for some parameters, such as carbon stock and one of the system services, the unprotected forest even showed better results than the protected forest. When discussing the future potential it was concluded that there are two aspects of a forest, the global desire of preservation as well as the local need for usability and resource extraction. The ideal would be to satisfy both of these conflicting wills without further degrading the forest, meaning the extraction rate does not exceed the regrowth rate of the forest. But with the increasing pressures expected in the future it may prove difficult to meet all these demands in a sustainable way on such a small forest area. However, the study concludes that there are many factors that can be improved in the current forest utilisation to increase the forest usage efficiency.

Multifunctionality of Sudano-Sahelian village landscapes

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Understanding of complex and dynamic landscapes plays a key role to secure resilient flows of multiple ecosystem service benefits for rural livelihoods. Focusing on Sudano-Sahelian Burkina Faso, a region with widespread poverty and the majority of the population occupied in agriculture, this paper presents an approach to study multifunctionality of village landscapes by studying multiple ecosystem services from different units in the landscape. In a first step, multiple groups of provisioning ecosystem services and the

benefits to local livelihoods they generate was analysed. A range of participatory field methods were used to identify landscape types and groups of ecosystem services with relevance to local peoples' livelihoods. This data was combined with analysis of satellite images in GIS to gain a spatially explicit understanding of livelihood contributions from village landscapes. The identified landscape types were: Depression, Homesteads, Fields, Fallow, Shrubland, Forest and Bare soil, where trees and shrubs are present in higher or lower densities in all landscape types except Bare soil, and play an important role to define them. All landscape types except bare soil generate multiple ecosystem services leading to multiple benefits to livelihoods. No service or benefit is only generated in one landscape type. Trees and shrubs in the landscape stands for the generation of 5 out of 10 groups of ecosystem services.

To include the temporal dynamics in benefits to livelihoods from the local landscape, we also studied the role of different services in strategies to compensate for crop loss during drought years. The local landscape stands for 68 % of strategies to compensate for crop loss, but the landscape must be connected to a wider social system for the livelihood benefit to be realised, as over 80 % of this contribution is used to generate cash income. Livestock is the single most important resource when crops fail, standing for 33 % of compensation strategies, having the function of insurance. We identify potential trade-offs in case of intensification as resources to sustain livestock and crops are to a large part generated in the same landscape types. In conclusion, to understand the generation of multiple benefits to livelihoods from ecosystem services in smallholder-farmer dominated landscapes, it is necessary to analyse village landscapes in a holistic way to capture the range of benefits to livelihoods and their inter-annually changing importance. Further, landscapes must be put in a wider social context to understand what is needed for the realisation of livelihood benefits from ecosystem services generated in the local landscape.

Tree biology in the African Sahel: action research strategies in the Great Green Wall for the Sahara and Sahel Initiative context

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In response to increasing desertification in the Sahel, in 2007 eleven African nations in the Sahel region signed an unprecedented agreement: the Great Green Wall for the Sahara and the Sahel Initiative (GGWSSI). Far beyond a giant "wall of trees", the vision is more a series of cross-sectorial actions to address issues affecting the lives of people in the Sahelo-Saharan regions. Determining the impact of GGWSSI-triggered shifts on these social-ecological systems requires expertise in scientific disciplines ranging from biological and environmental sciences to social and health sciences. Toward this end, The French National Centre for Scientific Research (CNRS) created the GGWSSI Human-Environment Observatory, an interdisciplinary "research space" designed to facilitate exchange amongst GGWSSI researchers. The OHM funds several small-scale research projects annually that fall into four categories: biodiversity, water and soils, social systems, and health.

I will focus my presentation on a project that aims to improve tree biodiversity along the GGWSSI. As a first step, we revisited tree species availability and performed ethnobotanical surveys with local populations in the Ferlo region of northern Senegal where GGWSSI tree planting is currently underway. A "short list" of highly useful, low abundance indigenous tree species was established. In collaboration with the Senegalese GGWSSI National Agency, we are currently setting up field trials and testing parameters (seed provenance, improved water use efficiency) to determine whether these species can be realistically adapted to high throughput GGWSSI planting activities, and the potential ecological and human benefits associated with their reintroduction.

Can better access to capital be part of the solution?

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Whether in agriculture, forestry or other domains, finding a way to support sustainable land use is vital for human survival. Public funds are scarce and inadequate, yet private capital has not found a way to justify assuming the perceived risk of investing in small or medium –scale practices.

CIFOR, ICRAF, The Munden Project, Chatham House and the Ateneo School of Government are collaborating to meet this challenge. We have identified a way forward that we think will intelligently leverage limited public funds to satisfy investors' return requirements in a way that drives truly sustainable outcomes on farms and forests across the globe.

Sustainable forms of agriculture, forestry and other land uses are essential for sustainable growth and for confronting long-term food security and climate change. Many consider supporting such practices with proper finance to be a public-sector problem. We disagree with this view, for three reasons:

- Most of these practices are cash-generating, meaning that they have the potential to provide returns if aggregated properly. This suggests the potential for private funding.
- When judged relative to their risk and combined with intelligent public support, we believe the rates of return for these practices will offer a higher profit for investors (again, if aggregated properly).
- While vital in shielding investors from risk, public sources of finance would be completely inadequate for direct financing of these activities. They will inevitably fail to deliver the change at scale the world requires in order to meet the challenge of climate change.

At the same time, we know that private forms of finance have failed to deliver what sustainable practices need to be successful: flexible, patient investment. More simply put, the private sector has failed to seize the opportunity and we think it needs a push from the public side in order to do so.

Further, the verification of sustainable outcomes is often assumed to be technically difficult, expensive and subject to political bargaining. We are finding a way forward by combining a generic set of measureable outcomes with established monitoring approaches that have been established in strategic forestry planning for decades. The combination of long-term, fair and accessible capital and efficient verification tools can be a significant part of scaling up solutions for sustainable landscapes.

1:4) Pre/Post Harvest Losses-Including Post-harvest Handling and Storage

ABSTRACTS

Rodent outbreaks in Southeast Asian rice cropping systems Using ecologically-based rodent management to reduce pre-harvest losses

***Adam John**, PhD candidate, Agricultural and Food Policy Studies Institute at Universiti Putra Malaysia in Kuala Lumpur, Malaysia and is based in Stockholm, Sweden.*

Over a fifth of the world's rice is grown and consumed in Southeast Asia and it has been suggested that rice production has to double by 2050 in order to meet demand. This growth must come from increasing productivity therefore reducing harvest losses will play an important role in achieving this goal. Pests contribute to huge quantities of rice harvest losses every year and rodents are arguably the most damaging pest to rice harvests. However, considerations also need to be made as to how rodent control can be implemented in an ecological way and without having to rely on rodenticides. I will discuss the severity of rodent damage on Southeast Asian rice production as well as the links between rodent outbreaks and climate change. I will then focus on how ecologically-based rodent management (EBRM) is being used to reduce the impact rodents have on pre-harvest losses and how EBRM can contribute to food security.

Stored product protection research in Germany with a focus on tropical agriculture and cooperation

***Dr. Cornel Adler**, Biologist and Post-harvest Entomologist, Julius Kühn-Institut, Federal Research Centre for Cultivated Plants in Berlin, Germany.*

Stored product pests attack durable plant products in all regions of the world and can be distributed by trade. This is why international cooperation in stored product protection makes sense for all sides. Mostly insects are causing major losses in dry durable goods because they can multiply without an external source of water and are less easily kept out of storages than vertebrate pests. By respiration insects can increase the moisture content of durables and thus give rise to mite and mould development. In addition to quantitative losses and quality losses caused by infestation, the contamination and formation of mycotoxins is a major hazard associated with stored product pests. The consumption of infested products can lead to immune suppression, allergies, miscarriages, various diseases, and cancer in both man and livestock. The accurate determination of post harvest losses aimed at by the African Post-harvest Losses Information System (APhLIS) may also make sense for industrialized countries since there is hardly any data on the magnitude of losses. Insects usually orientate towards volatile cues in order to find suitable substrates for proliferation. These cues are a topic of our research at present (PhD A. Ndomo). In continuously warm climates losses tend to be higher than in moderate climates. But extreme losses occur at irregular intervals and may be linked to unusual weather conditions favoring pest development, poor storage structures, new types of stored goods (cultivars, species) or newly introduced pest species, different storage methods, to political instability, lack of information, or other reasons for negligence in storage. Integrated Stored Product Protection consists of methods to avoid, detect and control stored product pests. Pest prevention plays a more prominent role because it may help to keep product quality and help to avoid costs and other negative side effects of pest control measures. A hermetic enclosure achieved by the storage structure or

packaging is a challenge because it can prevent attack. Moreover, hermetic conditions may lead to an anoxic atmosphere that is insecticidal and fungistatic. Two current project proposals intend to elucidate risks and benefits of hermetic grain storage at temperate or warm climate conditions. High temperatures at >50°C can be used for arthropod pest control in empty structures, a method used in German flour mills but also applicable in tropical countries. Diatomaceous earth is studied as a non-toxic contact insecticide in temperate and warm climates (cooperation with Ngaoundere Univ.). Neem and other phytochemicals, traditionally used by farmers may be improved in their efficacy or reliability, but safety aspects and consumer preferences should be taken into account in these studies (PhD K. Tofel). It is necessary to find stored product protection solutions for each storage problem taking local stakeholders, structures and conditions into account. Post-harvest protection research has been neglected for some time but there is hope for a change to the better.

Aflatoxins, major contributions to harvest loss–what do we know and not know?

Johanna Lindahl, *Post doctoral Researcher, International Livestock Research Institute (ILRI), Nairobi.*

In high-income countries, contamination of crops pre or post-harvest with mycotoxin-producing fungi cause substantial financial losses, with mega-tons of crops every year exceeding the allowed limits and therefore being disregarded as human and animal food. It is estimated that applying the US and the EU regulatory limits to corn would cause losses of 40 to 124 million USD respectively, only in the three most important corn exporting countries. To this is added costs of destroying crop, which may amount to 50% of the corn harvest in some years. In low-income countries, limited food resources and lack of awareness, prevents many smallholders from discarding damaged, and infected food products. A climate that promotes fungal growth and suboptimal storage procedures contribute to the extensive aflatoxin contamination in these countries.

Aflatoxins are mycotoxins produced by *Aspergillus* fungi, mainly *Aspergillus flavus* and *Aspergillus parasiticus*. These toxins are capable of causing acute poisoning, which has been the case in Kenya, where outbreaks has caused hundreds of fatalities. However, the large outbreaks are not the biggest concern for aflatoxins. Aflatoxins are potent carcinogens and cause hepatocellular carcinoma, especially in association with hepatitis B virus infections. The annual number of fatal cases of liver cancer attributed to this reaches ten thousands of cases. In addition to this, scientists have found associations between chronic aflatoxin exposure and childhood stunting. Since aflatoxins are metabolized in the body after consumption of contaminated food, and excreted in milk as a metabolite, there is a fear that children fed on breast milk, and then weaned on cereal-based food and dairy products, are at a high risk of chronic early exposure. A risk mapping exercise was undertaken in Kenya to create a basis for finding high and low risk areas, and participatory rural appraisals were carried out in different villages, in order to comprehend the knowledge, attitudes and practices of farmers. The next step is to develop a framework for assessing the risks of aflatoxins and the economic costs, with special focus on the dairy production chain.

In the participatory rural appraisal almost all farmer groups reported maize spoiling, and 31 out of 54 groups sometimes gave this maize to the cows. All groups stated that eating mouldy feed is harmful to humans, but only 48 out of 54 believed it was harmful to animals. Results of the risk mapping exercise showed that much basic data on risk food consumption was lacking for risk maps to be reliable. Since outbreaks of acute aflatoxicosis are much more notable than chronic exposure, reports of clinical cases are mainly based on these, and adding historical outbreaks to a risk map may do little to predict chronic exposure. The conclusions are that much more basic data is needed in order to create a complete risk assessment and predictive maps, and to fully understand the impact.

2:1) Restoration and Use of Grass-Land

ABSTRACTS

Creating pastures in the Ethiopian highlands – traditional use of fire as a management tool

Dr Maria Johansson, SLU, Umeå

Fire is an efficient tool for managing ecosystems in order to increase food production. Pastoralists in Africa have for millennia used fire to improve and maintain pasture quality, but the last century fire use has often been a source of conflicts, and typically government authorities have issued general burn-bans. In Bale Mountains in Ethiopia, traditional fire management is still being practiced in the subalpine heathlands, due to their remoteness. But there is currently a fear that fire is threatening these unique ecosystems, and proposals to increase law enforcement are being made. In order to inform a dialogue on future management options, I examined this traditional fire management system from a perspective of fire behaviour and fire effects. I analyzed the rationale for fire use, its practical handling, and ecological effects by using interviews with pastoralists, analyses of stand age structure at the landscape level, quantification of fuel succession inside/outside grazing exclosures, and field observations and modelling of fire behaviour.

The informants stated three major reasons for burning: increasing grazing value, controlling a toxic caterpillar, and reducing cattle loss to predators. They were well aware of critical factors controlling fire behaviour, indicating an intimate knowledge of fire as a management tool. The heathland shrubs (Erica spp., "tree heathers") regenerate after each fire by vegetative re-sprouting from underground lignotubers. In young stages, the first three years, there is a large proportion of grasses and herbs, notably Trifolium spp., between the shrubs. The cattle consume both the grass/herb sward and young Erica shoots. Further, these young stands did not burn, due to lack of fine dead fuels, and a spatial separation of individual shrubs. Recent burns were thus used as firebreaks to control the size of subsequent burns, which resulted in a mosaic of vegetation of different age. Stand age structure at the landscape level indicated an average fire return interval of ~10 years. Modelling and field observations of fire behaviour verified very high fire intensity and rate of spread in stands older than 10 years.

If the burn-ban was to be respected, the Erica shrubs would grow out of reach of cattle within ~10 years, creating a dense and continuous canopy. This would also create a risk of large-scale wildfires since the landscape is virtually devoid of natural fuel breaks. Under the present management regime, this heathland ecosystem should be quite resilient to degradation by fire, due to a relatively slow fuel build-up (limiting fire intervals) and an effective regrowth of Erica shoots. Nevertheless, if burning is done during severe drought, there may be a risk of deep smoldering fire killing the lignotubers. Given the intimate knowledge of fire behaviour and fire effects among the pastoralists, it should be possible to develop a joint fire management plan that can sustain both pasture quality and the unique ecosystem, and be sanctioned by both authorities and the local community.

Improving the utilisation of degraded rangelands using lablab hay as feed supplement

S. Katuromunda[1], E. Sabiiti[1], D. Mpairwe[1], C. Johansson[2], E. Spörndly[2], E. Wredle[2]

[1]Makerere university, Kampala, [2]Swedish University of Agricultural Sciences, Uppsala

In the rangelands of south western Uganda, pastoralism has been transformed into an agro-pastoral system. In an effort to increase livestock productivity, the agro-pastoralists have crossed their Ankole cattle with the Holstein Friesian to obtain Ankole x Friesian crosses with higher milk production potential. However, natural pastures which are the main feed resource do not meet the nutritional requirements of

these cross-bred cattle, especially during dry seasons when forage deteriorates. When forage quality is low, a deficiency in protein intake limits dry matter (DM) intake and utilization, which in turn affects the growth rate of calves. A study was conducted to evaluate the effect of variations in forage availability and quality, and protein supplementation on the growth performance of Ankole x Friesian crossbred calves grazed on natural pastures. A total of 30 weaned crossbred calves aged about six months from five farms were used in the study. Six calves on each farm were randomly divided into two groups, and then assigned two dietary treatments comprising a control diet where calves were grazed on the natural pasture only (T1), and supplementation with a mixture of 2 kg DM/calf/day of lablab hay and 0.3 kg DM/calf/day of maize bran (T2). The mean forage DM yield from all farms (2.8 ton/ha) was higher during the wet season and significantly dropped (1.6 ton/ha) during the dry season. The mean crude protein content in the pasture was 6.7% during the wet season and dropped ($p<0.05$) to 5.6 % during the dry season. The mean DM digestibility during the wet season did not differ ($p>0.05$) between treatments, but during the dry season the DM digestibility was higher ($p<0.05$) in the lablab hay supplemented diet as compared with the control. During the wet season, no significant differences in mean daily live weight gain were observed between calves that were supplemented with lablab hay and those on the control diet. However, during the dry season the mean daily live weight gain of calves maintained on the control diet dropped ($p<0.05$) as compared with that of calves supplemented with lablab hay.

Restoration of semi-arid range lands: Options to improve degraded rangelands in the Cattle Corridor of Uganda

***D. Mpairwe*[1], *D. Mutetikka*[1], *E.N. Sabiiti, S. Mugerwa*[1], *E. Zziwa*[1], *D. Peden*[2]**

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The 'cattle corridor' is a belt of rangelands that extends from southwest Uganda across toward the northern border. The region is generally too dry for crop production and suffers from land degradation caused by overgrazing and indiscrimate harvesting of trees for charcoal burning. Development investments have often neglected this region even though it occupies a significant area within the country. Drinking water is seasonally scarce forcing farmers to migrate with their animals in search of water and pastures. Makerere University has been conducting research within the cattle corridor aimed at identifying options for enhancing productivity of the rangelands, increase animal production, and restore degraded pasture lands. This paper is synthesis of the work and suggests option for improving productivity of degrade rangelands, livelihoods and environmental sustainability.

2:3) Multifunctional Landscapes Part 2: How to Enhance Productivity and Restore Ecosystem Services for Improved Livelihoods?

ABSTRACTS

Does the landscape matter for on-farm productivity? Effects on pests, biological pest control, pollination and other arthropod-mediated ecosystem services and disservices

***Mattias Jonsson**, Centre for Biological Control/Department of Ecology, Swedish University of Agricultural Sciences. Email: mattias.jonsson@slu.se*

Arthropods affect humans by providing a number of ecosystem services and disservices. Ecosystem services include biological pest control, pollination and dung burial, whereas disservices include pest damage and disease transmission. Most arthropods are mobile organisms where local delivery of an ecosystem service, e.g. to a crop field, not only depends on local management but also on the composition and structure of the surrounding landscape. The diversity and abundance of predators, parasitoids and pollinators have often been found to be lower in landscapes dominated by intensive agriculture and in fields with intensive management. However, the effects on pest populations are more variable.
In this talk I will discuss how landscape structure influence biological control, pollination and pest damage and how processes at different spatial scales may interact. I will give examples from both temperate and tropical agroecosystems.

Making it work for smallholder farmers in East Africa: Improved farm productivity, natural resource management and livelihood.

***Carolyne Musee,** Vi Agroforestry, Kisumu, Kenya. Email: Caro.Musee@viafp.org*

Vi Agroforestry is a non-profit, non-political and non-religious organisation registered in Sweden as a foundation under the name Vi Planterar Träd. In Africa, the organisation has project sites in Kenya, Uganda, Tanzania, and Rwanda registered under the name Vi Agroforestry. Vi Agroforestry envisions a sustainable environment that enables people in poverty to improve their lives through agroforestry and support to farmer organizations. Vi Agroforestry works with female and male small-scale farmers living in poverty within Lake Victoria's catchment in Kenya, Uganda, Rwanda and Tanzania, and their organizations.

Vi Agroforestry emphasizes that an environmentally sustainable development is important for poverty reduction, equality and a fair democratic world: "when we do not feed the environment, then it will not feed us". The importance of partnership for local ownership and sustainability of initiatives is fundamental for the work. For this reason, Vi Agroforestry's strategy is to reach farmers through their own groups and organisations which make the work more cost effective and sustainable. The focus is to mobilize farmers into development groups, which are registered. They become an avenue for different development agents to channel their efforts.

While supporting the local organizations financially Vi Agroforestry also provide advisory services and institutional development support to farmer groups and organisations at different levels. The agroforestry system and especially the multiple synergies in the concept of combining a more sustainable production with increased productivity and improved climate change adaptation is often the missing link for small-scale farmers. The inputs from Vi Agroforestry is essential to bridge this gap. In the long term, it is

anticipated that the work can reach further, be more effective and be increasingly locally established through the partners in the region.

Impact of sustainable agricultural land management (SALM) practices on farm productivity and livelihood in Western Kenya

***Emmanuel Wachiye**, Vi Agroforestry, Kitale, Kenya. Email: Emmanuel.Wachiye@viafp.org*

The Kenya Agriculture Carbon Project (KACP) is the first African agricultural soil organic and biomass carbon sequestration project. It is piloted in Western Kenya region, Nyanza and Western Provinces. The aim is to address climate change adaptation and mitigation in the agricultural sector, in particular among smallholder farmers, and to improve agricultural productivity. *From mid-2009 up to end 2012, the project has been undertaken by 26,535 farmers within 1,555 farmer groups*, and it targets to have *recruited 60,000 small-scale subsistence farmers (farmers having less than 2 ha of land) within 3,000 farmer groups by end 2014*. The project objectives are:

- Provide advisory/ extension services
- Restoring agricultural production so that there is increased farm productivity as well as diversified food sources
- Increasing farmer resilience to climate change
- Contribute to greenhouse gas emission reduction (CO_2)
- Selling emission reduction

The project provides advisory services on adoption of Sustainable Agricultural Land Management (SALM) practices such as reduced tillage, use of residues for mulching and composting, manure application, fertilizer use, water harvesting, terracing and tree planting to restore soil fertility and enhance soil-carbon sequestration. In the session the effects of implementing the SALM practices on farm productivity, e.g. maize yield, and livelihood will be presented.

2:4) Transforming Gender Roles in Agriculture: A Diversity of Approaches

ABSTRACTS (Focus 1)

The possibilities and challenges for gender neutral pro-poor agricultural growth in Malawi and Zambia.

Agnes Andersson-Djurfeldt and Ellen Hillbom, Lund University

The point of departure for this on-going project is the current interest in smallholder agriculture as a key aspect of African development. While growth in the smallholder sector is envisioned through the vague, but politically appealing, concept of "pro-poor agricultural growth", the role of women and gendered access to resources as part of this process needs to be further researched. The purpose of this project is to consider the local level conditions for pro-poor agricultural growth in relation to gendered access to productive resources and markets as well as the institutional challenges for achieving gender based inclusivity in this process.

To document the gendered aspects of growth we use a mixed-methods approach. Quantitatively we will add to existing household and village level panel data from sixteen villages and a sample of 880 smallholder households in Zambia and Malawi. For the qualitative study we have, based on existing panel data from 2002 and 2008, identified 160 individuals (80 men and 80 women) who have experienced rapid agricultural based growth. The research team has conducted interviews with women in male and femaleheaded households as well as male heads of households. Information has been collected on production patterns and access to productive resources within the household, marketing of produce, and access to income from farm sources as well as from non-farm sources. Further, interviews have been conducted with key informants and focus groups representing institutional structures regulating access to e.g. land and/or water rights, farm inputs, extension agents, farmers' organizations, etc. We are at the moment compiling and starting the analysis of the qualitative data.

Gender, floods and agricultural transformations in low elevation zones of Quezon Province, Philippines: A post-disaster view.

Bernadette P. Resurrección, Senior Research Fellow, SEI.

The adjacent municipalities of Real, General Nakar, and Infanta (acronym: REINA) in Quezon Province are located on the southern part of Luzon island in the Philippines. These municipalities have been on the Philippine watch-list of disaster-prone areas since a devastating flood and consequent mudslides inundated hundreds of villages in 2004. The 2004 flood, caused by the cyclone 'Winnie,' damaged homes and infrastructure, and significantly altered the river system and its agricultural landscapes. The big flood has been attributed to swift runoffs from years of unabated logging in the surrounding uplands. Consequently the river system has widened due to heavy siltation, while agricultural lands have been severely eroded by more frequent flooding and heavier precipitation.

As a result of these changes, residents have shifted from cultivating mono-varieties of rice and coconut farming and fishing to multiple crop cultivation, charcoal production, and diversified non-farm livelihood activities. Former massive mudslides and subsequent flood episodes have also significantly diminished the

fertility of croplands. Rice lands no longer yield sufficient rice, thus farmers today intermittently grow watermelon and vegetables. Despite government efforts to shave off thickened mud and rocky debris on farmlands, rice productivity has never been restored to its former levels. Farmers have instead resorted to planting short-term crops like peanuts, watermelon and sweet potato vines: one planting season is for watermelon, while the other planting season is for inter-cropping watermelon and sweet potato vines.

All these transformations have led farmers to move around more intensively and juggle agricultural and non-agricultural tasks that result in multiple livelihood portfolios, requiring more flexibility in divisions in mobility, time and skills. The establishment of resettlement sites for those whose homes had been damaged and washed out by floods also prompted residents to cultivate vegetable home garden plots for subsistence and petty trade. Meanwhile, recent developments in real estate construction in nearby provincial towns and in Manila have spurred rural men to take up jobs in this sector, while a number of farm women have taken up domestic work in near and far areas.

Left-behind farm women and men, for their part, have taken on more flexible roles in farming, where women do most of the farm work whereas men combine farm and non-farm wage labor in more well-endowed farms. The frequency of disasters, the boom in real estate in peri-urban areas and in the urban core of the Philippines, the lackadaisical response of the government complicate livelihood portfolios and have created new and old gender, class and age stratifications in this disaster-prone coastal area.

Cattle in the Kalahari: Breeding Gendered Change.

Andrea Petitt, *PhD Student, SLU.*

The field study for this research project is currently on-going and will be completed just in time for the conference. In very general terms it looks at the historical perception of cattle as a sector linked to men and male interests. This perception is still widespread and overlooks the different roles that women play in cattle production. The research has found a need to problematise the importance of men's and women's involvement in cattle production and answer two central questions:

- What does it mean that women are owners and controllers of cattle? For men, women, for the cattle?
- What can this research tell us about gender/animal intersectionality in a rooted network theory?

When Rain Clouds Don't Gather: Gender, Agriculture and Food Security in Botswana.

Onalenna Selolwane *(PhD), Director, Boidus Research and Design, Gaborone, Botswana.*

Botswana's physical environment is very harsh and has historically presented serious challenges to the country's longstanding commitment to social and economic development based on the principle of social justice. This vulnerability to environmental conditions has therefore always informed Botswana's development policies and strategies: forcing Batswana to consciously adopt sustainability as a fundamental guiding principle of their national development strategy. However global climate changes seem set to exacerbate Botswana's vulnerability and undermine whatever achievements the country has gained in social justice and people's welfare: particularly regarding those segments of the population that are still highly dependent on natural resources for their food, income and wealth. There is therefore a certain urgency to

seek new and more effective strategies for reducing the adverse effects of climatic changes and improve the security of vulnerable groups.

Women account for a disproportionate number of the population that is still both rural and dependent on rainfed agriculture and natural resource based livelihoods. They therefore form a significant core of those that are most vulnerable to changes in climatic conditions and the productivity of the agricultural sector. This paper reviews the impact of agricultural strategies and food policies on women farmers in light of decreasing rainfall and changing patterns of gendered inequalities in access to resources, information and technology. It focuses particularly on the arable sector and the extent to which policy reforms in the sustainable agricultural development agenda addresses women's vulnerability.

Overcoming inequalities without challenging women's loyalty to the indigenous community - Case study in the Indigenous Community Nasa Kiwe, Colombia.

Blanca Iris Sandoval, MSc Student, SLU.

An important amount of the indigenous populations' resources in Colombia are devoted to recover their political, cultural and territorial autonomy. There is no doubt about the commitment of indigenous men and women with such communal aims. However, the unequal power relations that women experience to freely participate in the social and political life of their communities lose attention in front of the discourses of these broader issues. Thus, this case study aimed at understanding how indigenous women reconcile the loyalty to their communities, while needing to bring up inequalities they experience.

The Indigenous Community Nasa Kiwe located in northern Cauca department, Colombia, was the setting of this research. The Nasa Kiwe belongs to the ethnic group Nasa or Páez, one of the 102 ethnic groups of the country, and at the same time, one of the more numerous in population. The Community has three land areas allocated for living and farming of community members. Their traditional economy is based on agriculture. The social and political life of the community is characterized by the dynamics between the general assemblies, the indigenous government and community work. These forms determine the system of decision-making, social control, application of justice and management of communal resources. Nasa Kiwe is also involved, beyond their own community, in regional plans and projects as members of the indigenous movement in the country.

Women in this context have gained space to participate in the social and political life of their communities during the last 40 years. However, these relationships still contain inequalities that limit women´s participation in the public sphere. This situation becomes problematic when, for instance, decision-making of male leaders about management of gold mining in their territories appeared as illegitimate and ambiguous for female leaders. Another example is women's access to manage communal resources, which is conditioned under men´s guidelines and networks.

The thesis uncovers subtle forms that inequalities take and the mechanisms that allow their perpetuation. The study explores the effects of dominant discourses on women´s agency in the struggle for gender equality. In addition, the paper contributes to research on forms of discursive colonization, and study of organizing principles of the public and the private spheres.

Focus Two: Book Presentation, "Transforming Gender Relations in Agriculture in Sub-Saharan Africa"

Edited by Cathy Farnworth, Melinda Fones-Sundell, Akinyi Ndozi, Violet Shivutse and Marion Davis

This book makes the bold claim that empowered women and men are better, more successful farmers who can make the most of opportunities. We argue that there is a causal relation between more equal gender relations in households and communities, and better agricultural outcomes. One underpins the other. This is a radical thing to say, because it means that the standard development interventions will not achieve their goals unless women and men are on equal footing, unhindered by gender norms. Empowering women as decision-makers in all areas of their lives is challenging and exciting, yet key to poverty reduction. Transforming gender relations will help to make smallholder agriculture and associated development efforts more effective and efficient, with knock-on effects for a variety of development outcomes.

Conclusions

This book grew out of a feeling that the role of gender is viewed too much as an obstacle or a constraint, when working with gender can actually free up resources and enable us to participate in more rewarding and more sustainable development. Based on this optimism we also felt that the problems created by gender inequality are by now fairly well understood in the academic debate, and what was needed was a source of inspiration for implementers. While we do work with a theoretical framework, outlined primarily in Chapter 2, we hope that what is most useful about this book is the highlighting of actual experience which has served to reinforce this theoretical model.

The many examples of successful gender transformation strategies used in this book do not fit into one neat category. We relied on the experience of those who contributed to the book and constructed our chapters after much discussion of what material was available. However, there are a number of general patterns that can be discerned in the case studies provided:

1. Gender roles affect how systems work at all levels: from the individual, to interactions within households and communities, to local, regional and national institutions, to the global socio-economic institutions and systems.
2. Agricultural production is an economic activity affected by the way men and women interact. Enabling them to interact in new ways frees up important resources for food production and poverty alleviation.
3. Solutions to the problems created by gender inequality need to be implemented as part of a greater package which will allow support and reinforcement to come from all levels.
4. In terms of the agricultural sector, "Think Globally, Act Locally" is a useful approach. Policies and enabling environment should be in place, but action is necessary at the local level.
5. Local action requires structures which facilitate the use of grassroots-level knowledge and participation.
6. While it is important to analyze the situation of the individual, very little can be done in terms of transformative change if individuals do not organize themselves in some way, both to press for change, and to make it feasible to reach them. This is why women's self-help groups and cooperatives have played such a crucial role in agricultural development in Africa.
7. It is important to build constructive settings or enabling environments in which greater equity can be achieved with a minimum of confrontation and conflict. People are the resource whose input into agricultural production and rural development needs to be strengthened: conflict saps strength.

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Agricultural Research for Development Conference, September 25-26, 2013

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Proceedings of the 2013 Agricultural Research for Development Conference

Agricultural Research Towards Sustainable Development Goals

Agricultural production and agricultural research are both fundamental and instrumental in the continuous challenge of attaining sustainable development. Outlining sustainable development goals (SDGs) intended as sequels to the UN millennium development goals, which will expire in 2015, could be a major driver and motivator for agricultural research for development. Hence the theme for the 2013 Agricultural Research for Development Conference at SLU, Uppsala was **Agricultural research towards sustainable development goals.**

The conference sessions were divided into four sub-themes relevant to the main theme and also continuously relevant to agricultural research for development, namely: **capacity development, sustainable intensification, climate change** and **multi-disciplinarity.**

Agri4D is a research network contributing to agricultural development and poverty alleviation in developing countries by stimulating the utilisation and growth of relevant Swedish research competence. Agri4D adds further value to existing Swedish research in sustainable international agriculture and forestry by:

* promoting multidisciplinary research within Sweden
* addressing broad thematic issues related to pro-poor development through incisive analysis and debate
* increasing communication and cooperation between Swedish expertise and international stakeholders

The network was founded in 2009 by the Swedish University of Agricultural Sciences (SLU), the Afrint Group at Lund University, the Environmental Economics Unit at the University of Gothenburg, and the Swedish Institute for Food and Agricultural Economics (now obsolete). We are now part of **SLU Global**, an SLU initiative which aims to coordinate the university's contribution to the implementation of the Swedish Government's Policy for Global Development.

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