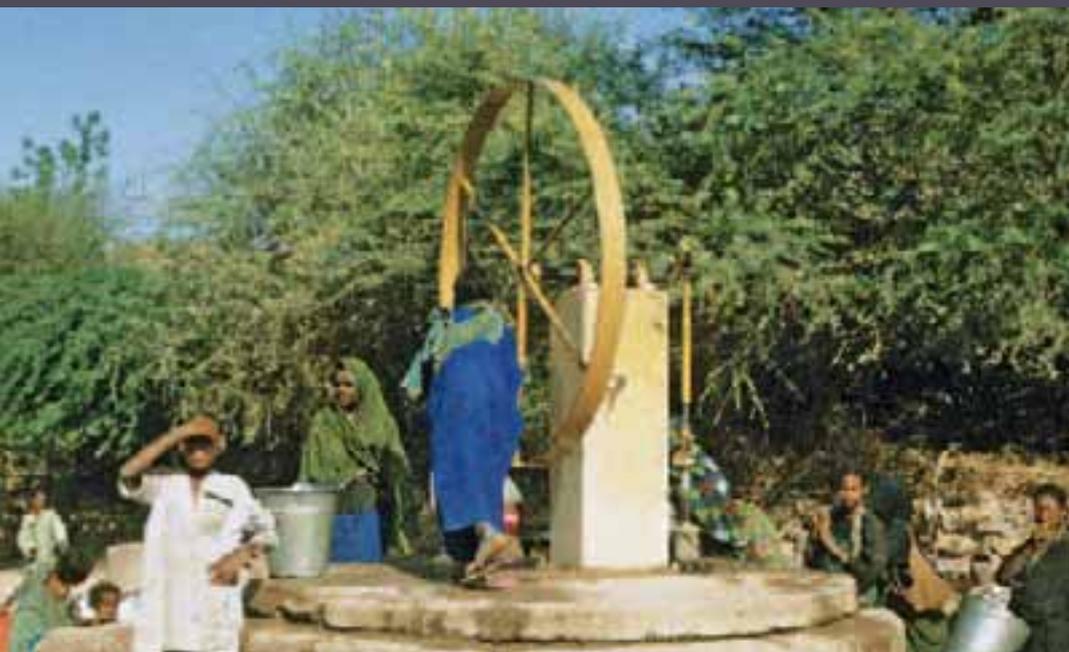


NORTH-SOUTH CENTRE

Research for Development

Annual Report 2008



ETH

Eidgenössische Technische Hochschule Zürich
Swiss Federal Institute of Technology Zurich



North-South Centre
Research for Development

Vision

The ETH Zurich is a leading institution on North-South matters in its field. It has a long-term commitment to research and education in support of globally accessible knowledge for sustainable development.

Mission

The ETH Zurich promotes research and education in the field of international development and cooperation. It facilitates collaboration with relevant institutions in developing countries, countries in transition and Switzerland in the technical, natural, human and social sciences. These activities are visible nationally and internationally.

Goals

- The North-South Centre promotes long-term research collaboration with partners in developing countries placing emphasis on both interdisciplinary research projects and the link to capacity development.
- The North-South Centre supports students from developing countries and countries in transition at the Master of Science and doctoral levels as well as ETH students interested in topics relevant to development.
- The North-South Centre establishes and maintains contacts among its members, within the ETH Zurich and in national and international networks and fora. In Switzerland and beyond, the North-South Centre aims to be recognised as the focal point of the ETH Zurich in all affairs that involve developing countries and countries in transition.

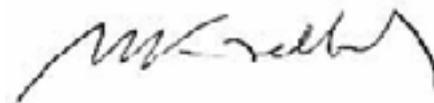
Editorial

2008 has been a rewarding and encouraging year for the North-South Centre of the ETH Zurich. Let me point out two highlights. First, the Sawiris Foundation for Social Development donated ten doctoral scholarships. This is a great help in fulfilling the mission of the North-South Centre and in getting the ETH Zurich even more involved in research for developing countries. Already before being publicised worldwide, the scholarship triggered quite a number of applications, and in 2009, we will select the first fellows. Second, we organised the food security conference together with the Syngenta Foundation for Sustainable Agriculture. More than 250 participants attended the conference and debated on this very important subject.

With the “Focus” section of our annual report, we want to take up current issues for in-depth discussion. This year, we chose integrated water resources management (IWRM). Water is crucial for all living things on earth and a vital resource for humankind. Water resources are under pressure due to population growth, economic growth and improved standards of living. This results in intensified competition for water. At our annual conference 2008, we addressed integrated water resources management as an essential element of sustainable development.

Working as a professor in the field of water resources, integrated water resources management is part of my work. My research group is involved in two projects which are portrayed in the “Focus” section. One is the ADAPT project – an integrated water resources management study in the Zambezi Basin. The other one addresses sustainable water and land management in the Okavango Delta in Botswana. My student, Lesego Kgotlhang, who was one of the first pre-doc grantees of NIDECO (one of the predecessor institutions of the North-South Centre) and who obtained his doctoral degree in 2008, presents the transfer of research results into policy and practice.

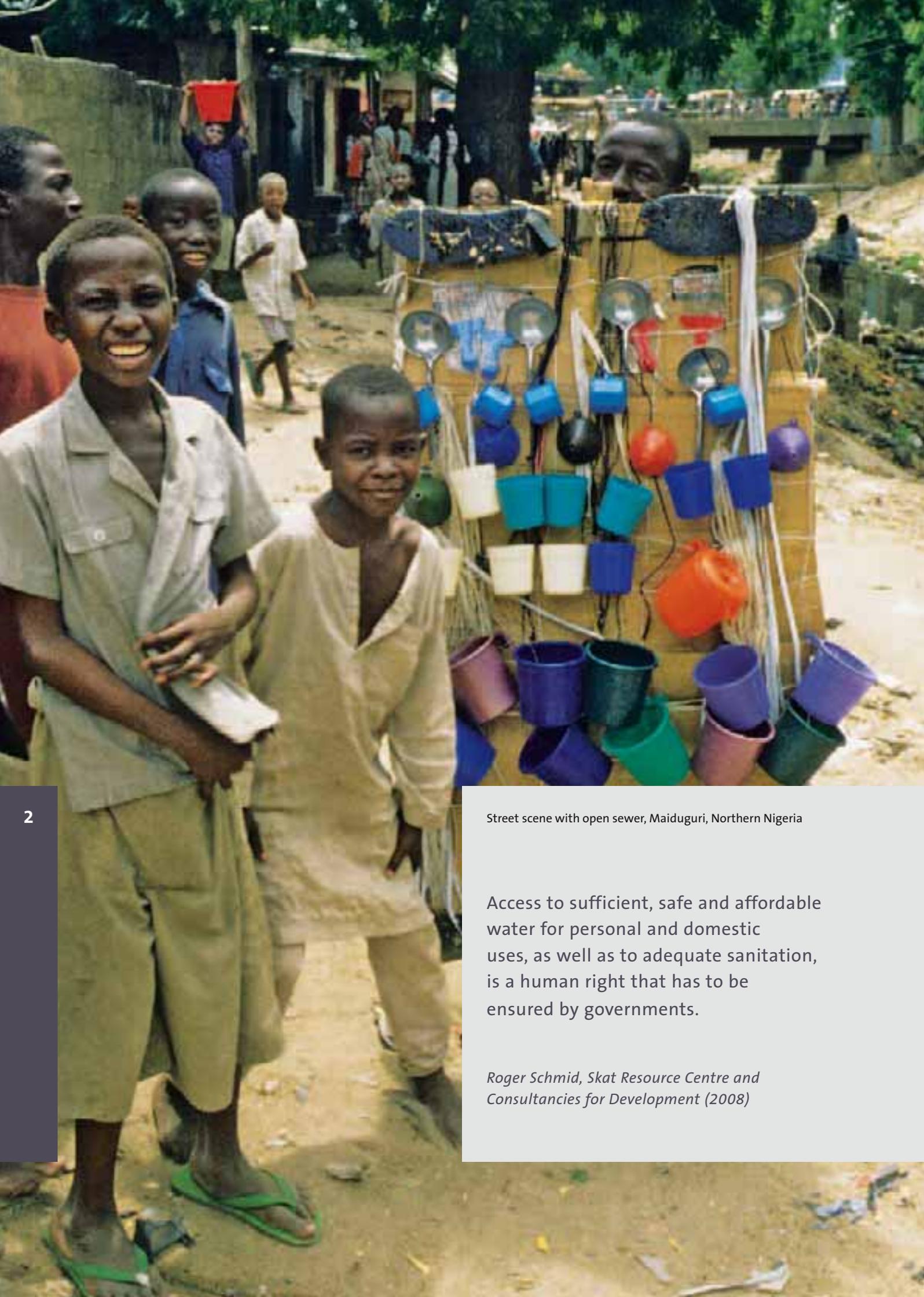
All the members of the North-South Centre are working on subjects related to the developing world. As every year, our Annual Report presents their broad range of research activities, which cover interdisciplinary work, basic and applied sciences, as well as education. The long list of projects shows that research for development is a non-negligible part of our school’s output – a fact of which we can truly be proud.



Wolfgang Kinzelbach, President



Wolfgang Kinzelbach,
President of the North-South Centre



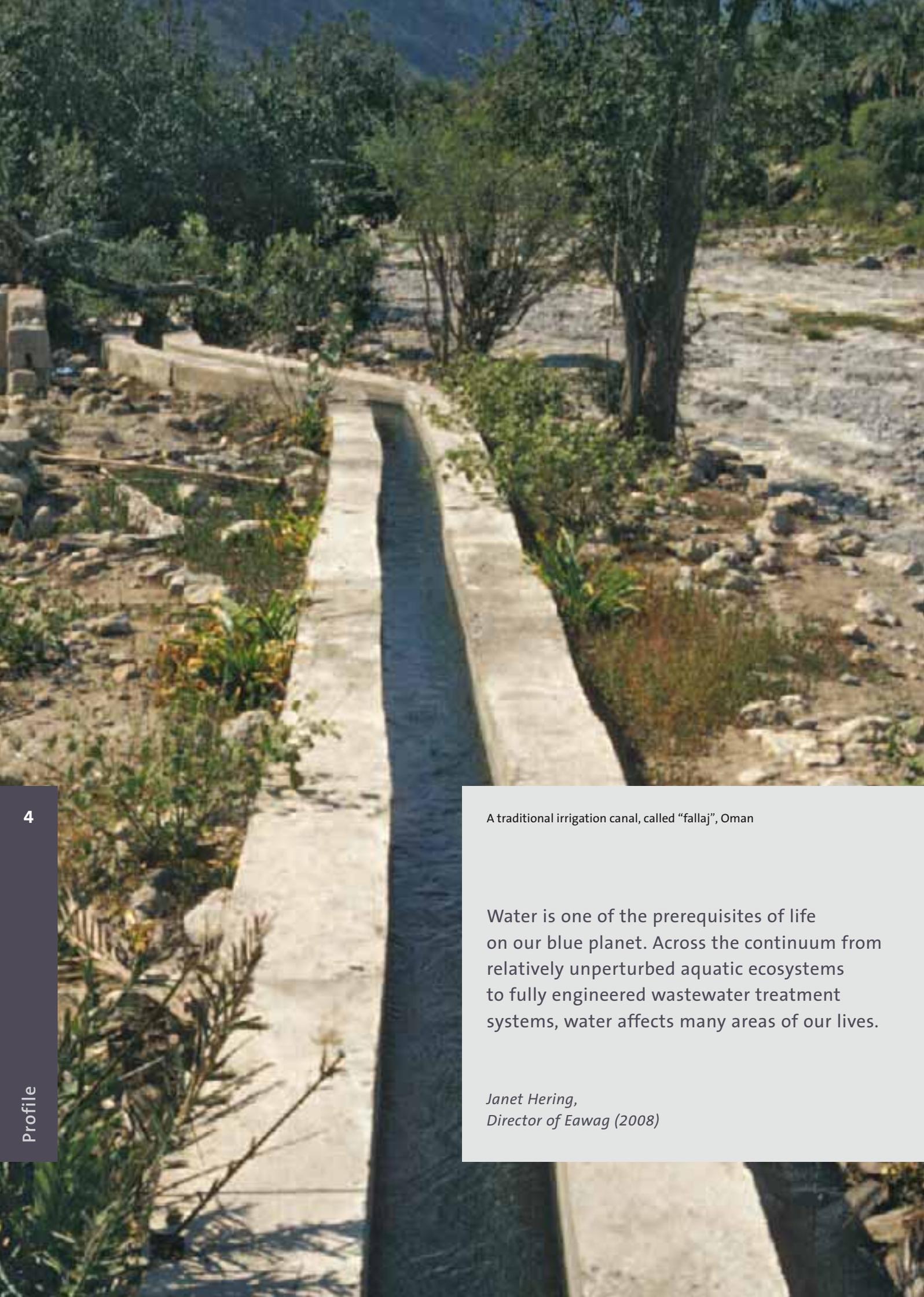
Street scene with open sewer, Maiduguri, Northern Nigeria

Access to sufficient, safe and affordable water for personal and domestic uses, as well as to adequate sanitation, is a human right that has to be ensured by governments.

Roger Schmid, Skat Resource Centre and Consultancies for Development (2008)

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A traditional irrigation canal, called “fallaj”, Oman

Water is one of the prerequisites of life on our blue planet. Across the continuum from relatively unperturbed aquatic ecosystems to fully engineered wastewater treatment systems, water affects many areas of our lives.

*Janet Hering,
Director of Eawag (2008)*

Consolidation and new frontiers

2008 was the first fully operational year of the North-South Centre, which was officially recognised as a competence centre of the ETH Zurich by the School Board as of January 1. The most gratifying experience of this legal act was the boost in internal and external visibility and recognition as an important strategic entity of the ETH Zurich.

When the new School Board entered into office in September 2007, it inherited the task of legally confirming the recognition of the North-South Centre as competence centre of the ETH Zurich. In its December 2007 meeting, the Board made this confirmation and communicated it to the North-South Centre to be effective from January 1, 2008. Since then, the ETH President, Ralph Eichler, the Vice-President for Research, Peter Chen, and the Rector, Heidi Wunderli, have interacted with us on various occasions. Their commitment to the cause of the North-South Centre became visible in several welcome addresses at events of the North-South Centre, where they expressed their appreciation of research related to developing countries and to North-South partnerships. Furthermore, Peter Chen, Wolfgang Kinzelbach and I travelled to Berne for a courtesy visit to the new Director of the Swiss Agency for Development and Cooperation (SDC), Martin Dahinden.

International relations have become a recognised strategic priority of the ETH Zurich. The majority of international ETH partnerships is still with European or US universities and research institutions, mainly due to its history and its tradition of promoting advanced research. However, North-South relationships are an integral part of the international strategy of the ETH Zurich, which was approved in December 2008. The new delegate for International Institutional Affairs, Gerhard Schmitt, and his team have established close linkages with us. In 2009, these links and the strategic integration will be continued and intensified.

Boost in visibility

In addition to the internal recognition, the increased and more professional communication efforts of the North-South Centre contributed to the boost in visibility. The recruitment of our communication manager Ursula Gugger Suter permitted us to visually align and intensify internal and external communication measures. Our communication tools include the website, a three-page flyer, the first annual report, a number of event-related materials, and regular e-mail newsletters to the members of the North-South Centre. The entire management team – with contributions of several members – organised an exhibition, five public conferences or workshops and a couple of individual presentations. All these activities repeatedly brought the North-South Centre to the attention of the ETH audience, our Swiss partners, stakeholders, and beyond. Several articles in the online magazine of the ETH Zurich and in various Swiss media further enhanced our visibility. The high visibility within the ETH Zurich resulted in attracting 20 new members in the course of 2008, raising the total membership from 71 in 2007 to 88 at the end of 2008 (three members left the ETH Zurich during the year).

Structural consolidation

Our statutes have permitted a smooth transition from the two predecessor institutions, ZIL and NIDECO, to the new



Barbara Becker, Managing Director
of the North-South Centre

North-South Centre. All governance mechanisms have become fully operational in 2008. The steering committee met three times – each time providing an opportunity to meet one of our partners: colleagues from cooperation@epfl, from the NCCR North-South and the Director General of IITA, Hartmann, respectively. Between these meetings, the executive committee provided advice to the Managing Director mainly through ad hoc bilateral interaction. Part of the governance function is executed through sub-committees of the steering committee, which also met regularly or interacted via e-mail consultations: The sub-committees “International agricultural research”, “Grants”, and “UNEP steering committee”, as well as the “RFPP selection committee”.

The General Assembly was well-attended. The new members and the programme for 2008 were approved, the financial statement 2007 was accepted, and the budget

2008–2011 was acknowledged. The General Assembly further agreed to the steering committee’s proposal to appoint the former ETH President Olaf Kübler as the North-South Centre’s delegate for strategy development.

The administration of the North-South Centre was still demanding with regard to the transition of the funds and financial procedures of the two predecessor units into one coherent system of accounts and a consolidated budget for the period 2008–2011. In January 2008, Isabelle Gómez joined the management team as programme manager for capacity development. In July, she increased her assignment by taking over the RFPP management from Marc Zoss, who left the team to start his doctoral project in agricultural economics. From September 2008, Dorota Niedzwiecka reduced her assignment. We could recruit Roger Merz to complete the administration capacity in the fields of finance management and membership matters.



Samih Sawiris, Heidi Wunderli and Wolfgang Kinzelbach at the signing ceremony for the Sawiris Scholarships

Expansion of activities and scope – The highlights

The following pages of this annual report demonstrate how the North-South Centre has expanded its programme portfolio and its activities as compared to those of its predecessor institutions ZIL and NIDECO. Notably the large number of events indicates this expansion. Thematically these events covered the topics of potato research for development (International Year of the Potato 2008), ecosystem services (the topic of the UNEP flagship proposal), water management including the aspect of sanitation (International Year of Sanitation 2008), and the world food situation. Smaller events were dedicated to capacity development, the Millennium Development Goals, as well as the research-for-development paradigm.

Two developments deserve special mention: The renewed attention to the world food situation, and the granting of ten doctoral fellowships by the Egyptian entrepreneur Samih Sawiris.

The focus of the Swiss Centre for International Agriculture (ZIL) has always been on research for improving the world food situation. This focus has remained one of the programmatic pillars of the North-South Centre. With the acute price crisis of staple foods in spring 2008, the topic caught media attention resulting in an increased demand for the expertise of the North-South Centre. Apart from several newspaper articles and radio broadcasts in which we could give input, the ETH magazine *ETHGlobe* made the world food crisis its topic for the September issue. *ETHGlobe* is widely distributed with some 35,000 copies. The majority of articles in this issue were from members and staff or about activities of the North-South Centre, thus contributing greatly to the renewed recognition of this long-standing research focus.

Independently, the Syngenta Foundation for Sustainable Agriculture (SFSA) approached us to jointly organise a conference on the world food situation. By combining the efforts and net-

works of the SFSA and the North-South Centre, we could attract a remarkable group of internationally recognised speakers. More than 250 participants from Switzerland and neighbouring countries attended the conference in December.

Through brokering of the ETH Alumni Association, Samih Sawiris was brought in contact with the North-South Centre. His interest in investing in technology development for improving the livelihoods of poor people in developing countries could be operationalised in a scholarship programme for doctoral candidates. The candidates will research product development or methodologies with direct relevance for poverty alleviation. The donation will cover ten fellowships over a period of five years, from which the first two candidates will be selected in 2009. The signing ceremony of the contract was combined with a small media event to make the North-South Centre and its activities even further known.



Ralph Eichler, President of the ETH Zurich, welcoming the participants of the food security conference

The North-South Centre at a glance

Programme and organisation

The North-South Centre, a competence centre of the ETH Zurich, was founded in 2007. Its vision is to enhance the long-term commitment of the ETH Zurich to make scientific knowledge globally accessible for sustainable development. The North-South Centre promotes research and education in the field of international development and cooperation. It facilitates collaboration with institutions from the South in the technical, natural, human and social sciences.

Developing countries and countries in transition are facing ecological, economic and social challenges. The North-South Centre fosters sustainable development by pooling a broad range of research expertise for interdisciplinary projects

dealing with these challenges. Thus, the research activities of all members represent the core of the North-South Centre. Resulting partnerships with research institutions, governmental organisations, development agencies, and others in the North and in the South are another important pillar of the North-South Centre.

The activities of the North-South Centre cover three main areas: “Research collaboration”, “Capacity development”, and “Networking and communication”. Thereby, the North-South Centre promotes the ETH Zurich as a leading institution on North-South matters in its field – research and education.

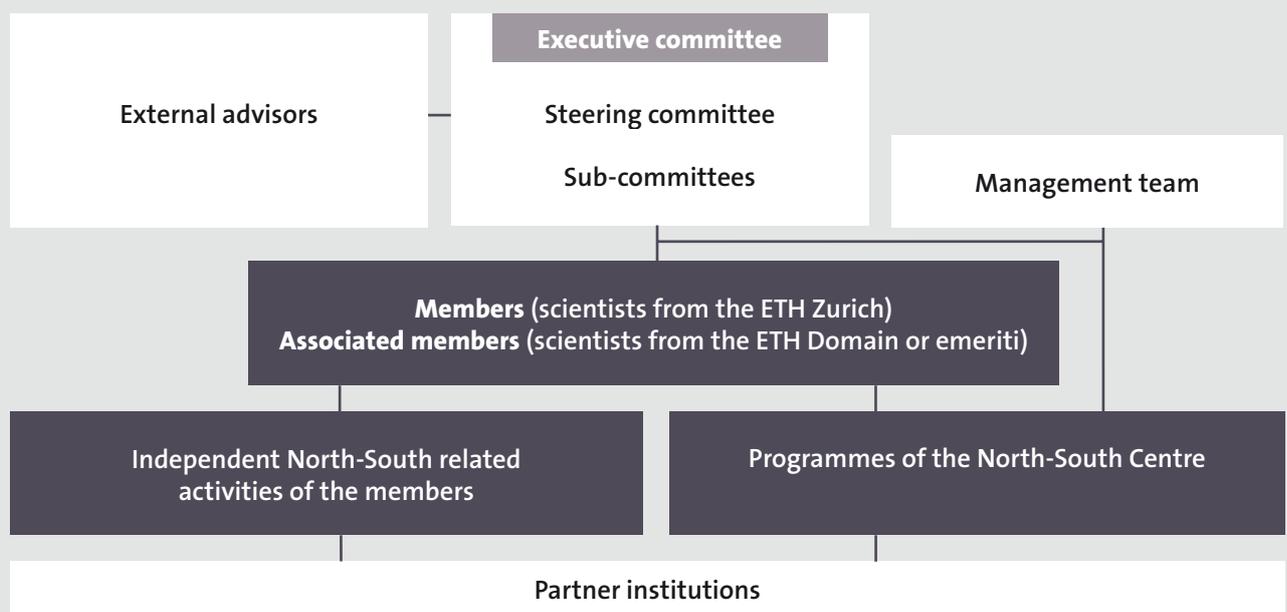


Programme structure of the North-South Centre

The core of the North-South Centre activities is based on the research partnerships of its members and associated members who currently belong to ten out of 16 departments of the ETH Zurich and to the Eawag. The members either conduct research projects related to the different programmes of the North-South Centre or independent North-South related activities. All these activities are embedded in long-term partnerships with institutions from the South and from the North.

As defined in the statutes of the North-South Centre, the governing bodies are the executive committee and the steering committee. In addition, four sub-committees of the steering committee oversee specific programmes. External advisors are forseen for the support of the centre in its strategic development.

The management team performs the day-to-day business. In 2008, it consisted of the Managing Director, seven part-time staff members for programme management, administration and communication as well as one temporary consultant.



Organisational structure of the North-South Centre

Executive committee

Wolfgang Kinzelbach, D-BAUG (President)
Michael Kreuzer, D-AGRL (Vice-President)
Renate Schubert, D-GESS (Vice-President)

Steering committee

Wolfgang Kinzelbach, D-BAUG
Michael Kreuzer, D-AGRL
Renate Schubert, D-GESS
Silvia Dorn, D-AGRL
Ines Egli, D-AGRL
Stefanie Engel, D-UWIS
Emmanuel Frossard, D-AGRL
Jaboury Ghazoul, D-UWIS
Rolf Kappel, D-GESS
Rainer Schulin, D-UWIS
Hans Thierstein, D-ERDW
Barbara Becker, Managing Director (*ex officio*)

Sub-committees

Grants

Wolfgang Kinzelbach, D-BAUG (Chair)
Jaboury Ghazoul, D-UWIS
Rolf Kappel, D-GESS
Rainer Schulin, D-UWIS
Michael Siegrist, D-AGRL

International agricultural research

Michael Kreuzer, INW, D-AGRL (Chair)
Silvia Dorn, IPW, D-AGRL
Ines Egli, ILW, D-AGRL
Emmanuel Frossard, IPW, D-AGRL
Bernard Lehmann, IED, D-AGRL

UNEP steering committee

Renate Schubert, D-GESS (Chair)
Nina Buchmann, D-AGRL
Jaboury Ghazoul, D-UWIS
Wolfgang Kinzelbach, D-BAUG

RFPP selection committee

Barbara Becker, North-South Centre (Chair)
Willi Graf, Swiss Agency for Development and Cooperation
Urs Scheidegger, Swiss College of Agriculture,
Berne University of Applied Sciences
Jean-Pierre Sorg, D-UWIS
Annet Witteveen, Intercooperation

External advisor

Delegate for strategy development
Olaf Kübler, former President of the ETH Zurich

Management team

Barbara Becker, Managing Director
Mathias Egloff, Programme Officer
Isabelle Gómez, Programme Officer
Ursula Gugger Suter, Communication Manager
Sabine Hahn-Fornet, temporary consultant
(*until February 2008*)
Manfred Kaufmann, Programme Officer
Roger Merz, Administration (*from October 2008*)
Dorota Niedzwiecka, Administration
Marc Zoss, Programme Officer (*until June 2008*)



The North-South Centre management team in 2008
(clockwise from upper left): Barbara Becker,
Ursula Gugger Suter, Manfred Kaufmann, Mathias Egloff,
Roger Merz, Dorota Niedzwiecka, Isabelle Gómez

The North-South Centre at a glance

Members

Department of Agricultural and Food Sciences (D-AGRL)

Souheila Abbeddou,
Institute of Animal Science

Dr. Philipp Aerni,
Institute for Environmental Decisions

Prof. Dr. Nina Buchmann,
Institute of Plant Science

Dr. Else Katrin Bünemann,
Institute of Plant Science

Prof. Dr. Silvia Dorn,
Institute of Plant Science

Dr. Michel Dumondel,
Institute for Environmental Decisions

Dr. Ines Egli,
Institute of Food Science and Nutrition

Prof. Dr. Emmanuel Frossard,
Institute of Plant Science

Dr. Michael Goe,
Institute of Animal Sciences

Prof. Dr. Richard F. Hurrell,
Institute of Food Science and Nutrition

Dr. Jan Jansa,
Institute of Plant Science

Prof. Dr. Michael Kreuzer,
Institute of Animal Sciences

Prof. Dr. Christophe Lacroix,
Institute of Food Science and Nutrition

Prof. Dr. Bernard Lehmann,
Institute for Environmental Decisions

Svenja Marquardt,
Institute of Animal Science

Prof. Dr. Bruce McDonald,
Institute of Integrative Biology

Prof. Dr. Leo Meile,
Institute of Food Science and Nutrition

Dr. Astrid Oberson,
Institute of Plant Science

Prof. Dr. Michael Siegrist,
Institute for Environmental Decisions

Prof. Dr. Peter Stamp,
Institute of Plant Science

Dr. Rita Wegmüller Coulin,
Institute of Food Science and Nutrition

Prof. Dr. Caspar Wenk,
Institute of Animal Science

Stephan Markus Wullschleger,
Institute of Food Science and Nutrition

Marc Zoss,
Institute for Environmental Decisions

Department of Architecture (D-ARCH)

Dr. Margrit Hugentobler,
Centre for Cultural Studies in Architecture

Department of Biology (D-BIOL)

Prof. Dr. Wilhelm Gruitsem,
Institute of Plant Science

Charles Orek,
Institute of Plant Science

Judith Owiti,
Institute of Plant Science

Dr. Hervé Vanderschuren,
Institute of Plant Science

Dr. Peng Zhang,
Institute of Plant Science

Department of Civil, Environmental and Geomatic Engineering (D-BAUG)

Dr. Emmanuel Baltsavias,
Institute of Geodesy and Photogrammetry

Prof. Dr. Armin Grün,
Institute of Geodesy and Photogrammetry

Prof. Dr. Hans Jürgen Herrmann,
Institute for Building Materials

Prof. Dr. Wolfgang Kinzelbach,
Institute of Environmental Engineering

Sabrina Krank,
Institute for Construction Engineering and Management

Prof. Dr. Holger Wallbaum,
Institute for Construction Engineering and Management

Department of Computer Science (D-INFK)

Prof. Dr. Hans Hinterberger,
Institute of Computational Science

Department of Earth Sciences (D-ERDW)

Dr. Werner Balderer,
Geological Institute

Prof. Dr. Jean-Pierre Burg,
Geological Institute

Prof. Dr. Domenico Giardini,
Institute of Geophysics

Prof. Dr. Gerald Haug,
Geological Institute

Dr. Andrew Kos,
Geological Institute

Prof. Dr. Hans R. Thierstein,
Geological Institute and Prorector International Relations

Department of Environmental Sciences (D-UWIS)

Virginie Elsa Boreux,
Institute of Terrestrial Ecosystems

Julia Emmanuela Born,
Institute of Terrestrial Ecosystems

Carina Cavalcanti,
Institute for Environmental Decisions

Prof. Dr. Huw Davies,
Institute for Atmospheric and Climate Science

Clémence Dirac Ramohavelo,
Institute of Terrestrial Ecosystems

Prof. Dr. Peter Edwards,
Institute of Integrative Biology

Prof. Dr. Stefanie Engel,
Institute for Environmental Decisions

Prof. Dr. Andreas Fischlin,
Institute of Integrative Biology

Prof. Dr. Jaboury Ghazoul,
Institute of Terrestrial Ecosystems

Prof. Dr. Janet Hering (Director, Eawag),
Institute of Biogeochemistry and Pollutant Dynamics

Prof. Dr. Gertrude Hirsch Hadorn,
Institute for Environmental Decisions

Dr. Chris Kettle,
Institute of Terrestrial Ecosystems

Dr. Thomas Köllner,
Institute for Environmental Decisions

Smitha Krishnan,
Institute of Terrestrial Ecosystems

Dr. Harry Olde Venterink,
Institute of Integrative Biology

Dr. Charles Palmer,
Institute for Environmental Decisions

Dr. Lucy Rist,
Institute of Terrestrial Ecosystems

Devesh Rustagi,
Institute for Environmental Decisions

Prof. Dr. Roland W. Scholz,
Institute for Environmental Decisions

Prof. Dr. Rainer Schulin,
Institute of Terrestrial Ecosystems

Prof. Dr. Klaus Theo Seeland,
Institute for Environmental Decisions

Dr. Jean-Pierre Sorg,
Institute of Terrestrial Ecosystems

Dr. Marcella Veronesi,
Institute for Environmental Decisions

Prof. Dr. Bernhard Wehrli (Eawag),
Institute of Biogeochemistry and Pollutant Dynamics

Prof. Dr. Alexander Widmer,
Institute of Integrative Biology

Prof. Dr. Alfred Wüest (Eawag),
Institute of Biogeochemistry and Pollutant Dynamics

Astrid Mirjam Zabel,
Institute for Environmental Decisions

Department of Humanities, Social and Political Sciences (D-GESS)

Prof. Dr. Thomas Bernauer,
Institute for Environmental Decisions

Julia Elisabeth Blasch,
Institute for Environmental Decisions

Justin Caron,
Institute for Environmental Decisions

Prof. Dr. Rolf Kappel (NADEL),
Problems of Developing Countries

Prof. Dr. Renate Schubert,
Institute for Environmental Decisions

Department of Information Technology and Electrical Engineering (D-ITET)

Prof. Dr. Gerhard Tröster,
Electronics Laboratory

Dr. Oliver Zenklusen,
Lecturer

Department of Management, Technology and Economics (D-MTEC)

Mozhgan Alaeifar,
Centre for Energy Policy and Economics

Dr. Mehdi Farsi,
Centre for Energy Policy and Economics

Prof. Dr. Massimo Filippini,
Centre for Energy Policy and Economics

Reporting date: 31 December 2008

The North-South Centre at a glance

Associated members

ETH Domain

Dr. Doulaye Kone (Eawag),
Department of Water and Sanitation in Developing Countries

Roland Schertenleib (Eawag, retired),
Department of Water and Sanitation in Developing Countries

Dr. Hong Yang (Eawag),
Department of System Analysis,
Integrated Assessment and Modelling

Dr. Chris Zurbrugg (Eawag),
Department of Water and Sanitation in Developing Countries

Emeriti

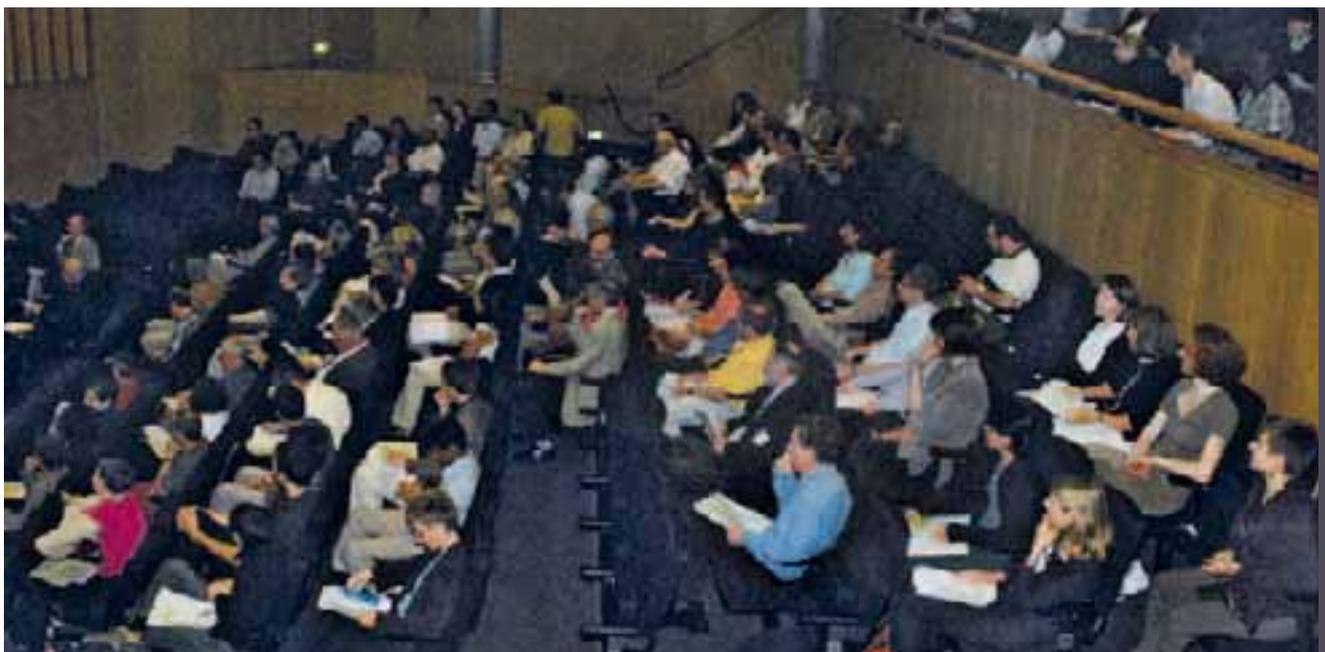
Prof. Dr. em. Rudolf Baumgartner,
NADEL (D-GESS)

Prof. Dr. em. Felix Escher,
Institute of Food Science and Nutrition (D-AGRL)

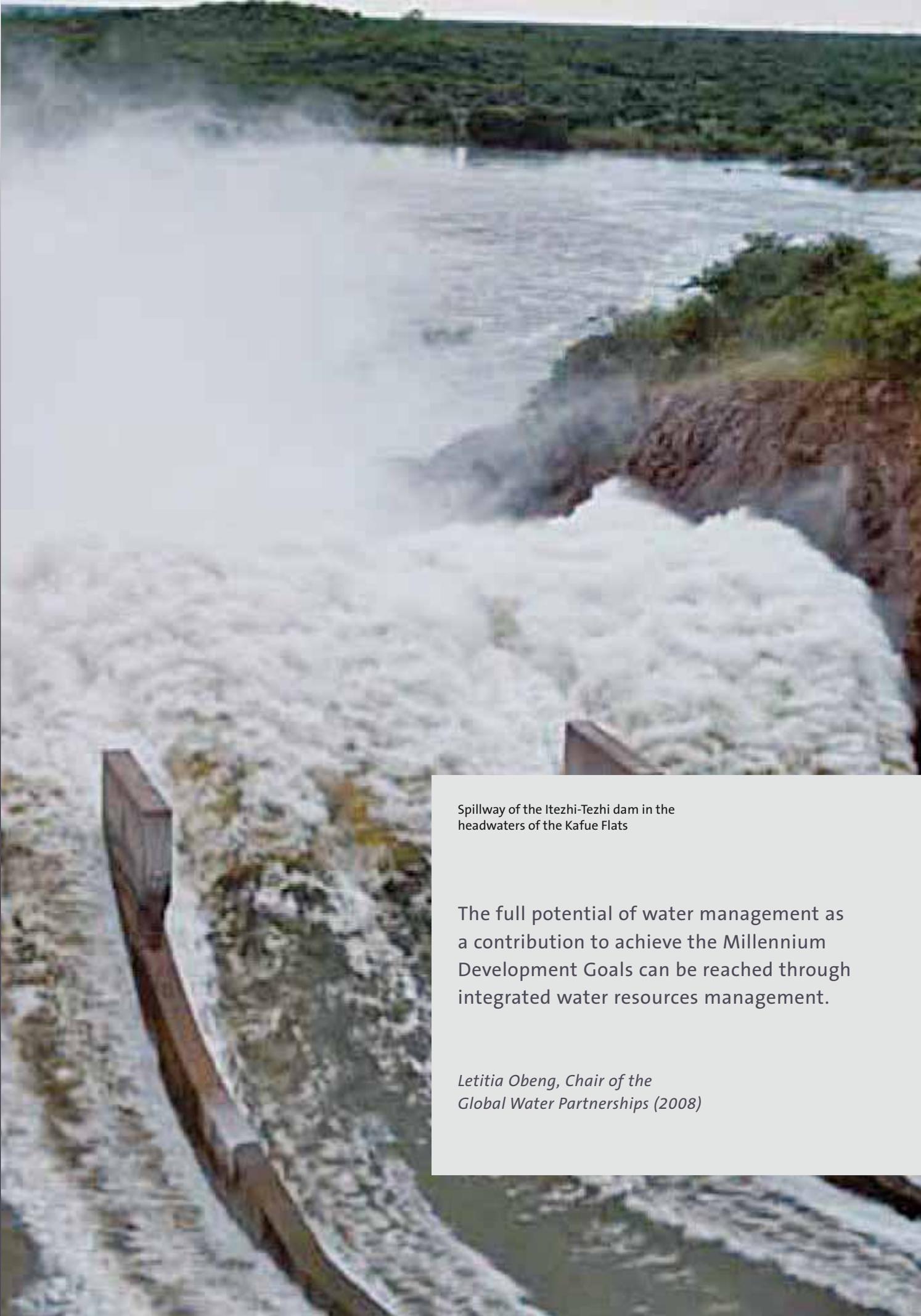
Prof. Dr. em. Franz Schmithüsen,
Institute for Environmental Decisions (D-UWIS)

Prof. Dr. em. Daniel Theodor Spreng,
Centre for Energy Policy and Economics (D-MTEC)

Reporting date: 31 December 2008



The North-South Centre conferences provide a platform for our members to meet and discuss research for development.

A wide-angle photograph of a dam spillway. The water is turbulent and white with foam as it flows over a series of concrete steps. The spillway is flanked by reddish-brown earth and sparse green vegetation. In the background, a dense forest of tall trees stretches across the horizon under a clear sky.

Spillway of the Itezhi-Tezhi dam in the headwaters of the Kafue Flats

The full potential of water management as a contribution to achieve the Millennium Development Goals can be reached through integrated water resources management.

*Letitia Obeng, Chair of the
Global Water Partnerships (2008)*

FOCUS:

Integrated water resources management

Water for people, water for food, water for nature, and water for industry – these different uses of water demand coordinated action. Integrated water resources management (IWRM) is an approach which involves coordination and fosters efficient, equitable and sustainable solutions to water and development challenges. ETH Zurich and Eawag both have a long-standing commitment to water research for development and expertise in IWRM.

The United Nations have declared the year 2008 the International Year of Sanitation. Today, about 2.5 billion people do not have access to basic sanitation. The International Year of Sanitation has helped to raise awareness of this crisis. Hopefully, it will have accelerated progress towards cutting the number of people without access to basic sanitation in half by the year 2015. However, access to sanitation is only one water-related challenge that developing countries currently face. Increasingly, water resources are under pressure from population growth, economic activity and improved standards of living, resulting in an intensified competition for water – for the different human needs and for the environment. Meeting the needs of the various water users in a sustainable and equitable way is an allocation problem that requires decision-making based on knowledge about the trade-offs involved. Integrated water resources management (see box at right) is an internationally accepted and widely promoted approach to address this challenge. In 2008, the North-South Centre acknowledged the importance of IWRM by making this the topic of its annual conference, jointly organised with Eawag.

This Annual Report features integrated water resources management as its “Focus” theme. The ETH Zurich, together with Eawag, has a long-standing commitment to and expertise in water research for development and IWRM. On the following pages, we provide insight into different IWRM-related water research projects of members of the North-South Centre. The first article addresses the African dams project (ADAPT) in the Zambezi catchment area. Main contributors of this interdisciplinary CCES project discuss the research set-up of ADAPT from an IWRM perspective, particularly emphasising the interdisciplinary character of the project as well as the role of their local research partners and other stakeholders. In the next article, Lesego Kgothlang presents his research findings on sustainable water and land management in the Okavango Delta. Prior to his doctoral project at the ETH Zurich, he worked as a senior hydrogeologist in the Department of Water Affairs in Botswana.

Consequently, he is in a position to assess the relevance of his research results for designing appropriate water policies in Botswana. Finally, Chris Zurbrügg gives us an overview of the Department of Water and Sanitation in Developing Countries (Sandec) of Eawag. He focuses on the role that research has to play in addressing and mitigating the above-mentioned sanitation crisis and puts sanitation in the wider context of IWRM.



Kafue Flats

Integrated water resources management (IWRM)

The Global Water Partnership defines IWRM as a process which promotes the coordinated development and management of water, land and related resources in order to maximise the resulting economic and social welfare in an equitable manner and without compromising the sustainability of vital ecosystems. Water's different uses – for people, for food, for nature, and for industry and energy – demand coordinated action. Operationally, IWRM approaches involve applying knowledge from various disciplines as well as insights from diverse stakeholders in order to devise and implement efficient, equitable and sustainable solutions to water and development problems. An IWRM approach is an open, flexible process bringing decision-makers (across all sectors that affect water resources) and stakeholders together in order to set policy and make sound, balanced decisions in response to specific water challenges.

ADAPT, the African dams project – An integrated water resource management study

The interdisciplinary ADAPT project will enhance the scientific basis of integrated water resource management (IWRM) by developing new models that can be used to improve the operation of existing large hydraulic structures and in designing future schemes. The approach will be used to investigate the large reservoirs and wetlands in the Zambezi Basin, but will be readily adaptable to other complex river basin systems. Together with African partner institutions, the ADAPT project will also engage in a capacity-building effort.

Participants: Bernhard Wehrli and David Senn (Eawag and D-UWIS), Rolf Kappel (D-GESS), Wolfgang Kinzelbach (D-BAUG)

Interviewers: Manfred Kaufmann and Ursula Gugger Suter (North-South Centre)

What are the main objectives and the scope of ADAPT?

Bernhard Wehrli: First, the practical and societal use of the ADAPT project should be to optimise large existing dams in their operation schemes, and to design new schemes for new dams. Food supply problems, irrigation water needs and electricity requirements increase the demand for dams. The second objective is to contribute to the mitigation of the problem of an underdeveloped research infrastructure. One is to make use of new techniques, new data sources like remote sensing, large-scale modelling, or tracer hydrology. In addition to making this infrastructure available, it is very important to train local partners on how to use it. On a third level, of course, we have a lot of scientific curiosity. Aquatic systems in Switzerland and in Europe have been researched for 150 years. However, there are very exciting aquatic systems in other places with unknown processes and unknown behaviours. Such a project offers the opportunity to conduct great research and to attract good students.

David Senn: Integrated water resource management includes several disciplines, which all can increase their respective body of knowledge by conducting such a comprehensive research programme.

Rolf Kappel: I would like to add some more detail: the construction of dams and the use of the water for hydropower is one very important aspect of the conflicting use of the limited water resources in the whole basin. However, it is not only hydropower; it is also the use of water for agriculture. And, it is the use of water for industry, for households, and for ecosystems. There will be an increasing demand for water that will have trade-offs. There will be conflicts between different types of possible users.

Why did you choose the Zambezi Basin?

Bernhard Wehrli: This project had an extended pilot phase with desk research on African river basins and large dams, including case studies issued by the World Commission on Dams. Moreover, it matched our defined criteria. We wanted to have a river basin that is international so that it is also interesting from a political science perspective. The basin should have at least one large dam and a research history. In addition, we wanted our results to be part of the planning process for dams in the future. Thus, plans to build new dams should already exist in the respective region. Finally, there is an issue of political stability. Based on all that, we have chosen the Zambezi Basin. This area has two large dams, which have been built in colonial times, and eight neighbouring countries. At least Zambia and Mozambique offer decent conditions to do research and there are many plans to build more dams.

David Senn: On a more specific basis, one fact is particularly interesting for the biogeochemistry projects. Downstream of one of the major dams of a tributary stream there is a very valuable wetland, the Kafue Flats. That wetland has an important aquatic life and is a valuable floodplain ecosystem that supports higher mammals. However, it is directly downstream from this dam and that changes the flood regime in the floodplain, which changes the plant life affecting the larger mammals. Therefore, this wetland gives us the opportunity to study the effects of a dam on a very sensitive and valuable downstream ecosystem. In addition, there is another non-impacted floodplain not too far away where we can study a relatively pristine system for a control study on a control site.

We have seen in the project documentation that you have a range of local partners in the river basin. How did you choose your partners when you started to write the proposal for the ADAPT project?

Bernhard Wehrli: Well, there are the obvious partners – the companies or institutions that run the dams have to be on

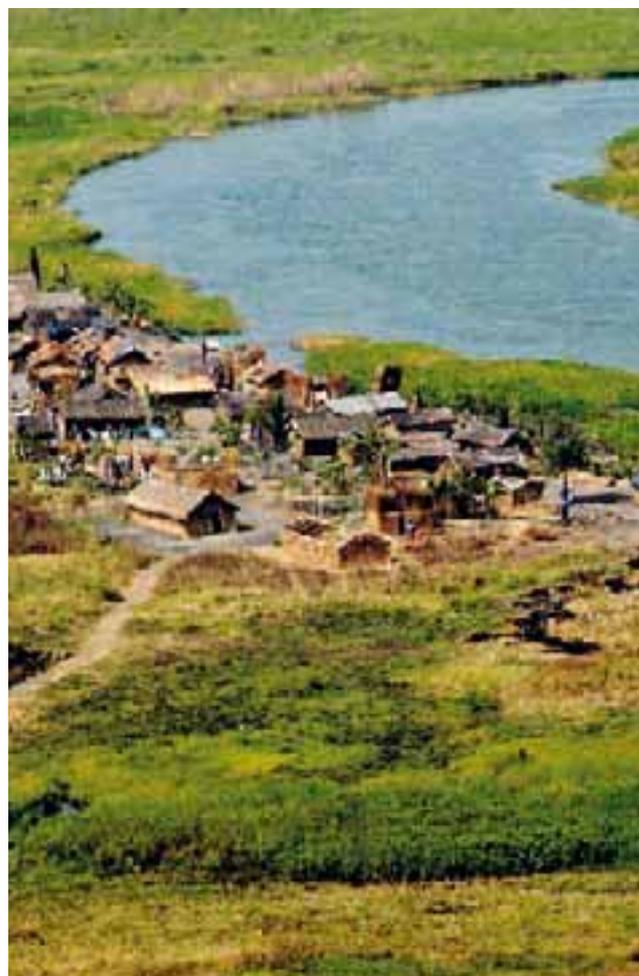
Kafue Flats fishing communities

board. Otherwise, getting access would be very difficult. These partners have been contacted early on and they are very helpful and cooperative. They support us with the logistics and grant access while we supply them with data and results. Through WWF and other NGOs we found partners at the universities. We were very fortunate. Professor Imasiku Nyambe from the University of Zambia participated at the first meeting and from then on, he was our key person who “opened the doors”.

We would now like to talk in more detail about the scientific output of the ADAPT project. What are your respective research groups doing?

Rolf Kappel: In resource and environment economics, there is a long tradition that focuses on the costs and benefits of alternative uses of natural resources. This is, so to speak, the expertise and type of research that we can bring into the project. We may look at a specific region in the basin or at the overall basin and try to evaluate costs and benefits for different types of use of water – be it for hydropower, agriculture, industry, households, or the environment. When we include the trade-offs between the different types of users, we can try to calculate an optimal use under given assumptions or under given restrictions. Of course, there is more than one optimal way to use such a huge water resource. Then, we use these results and present them to the different stakeholders with different interests in order to find out the common denominators for optimal solutions. In the end, it is a process of political negotiation. In that sense, we cannot expect that science can provide an optimal solution. However, it can provide solutions with the best cost-benefit-ratios under certain assumptions.

David Senn: I work both within Bernhard Wehrli’s biogeochemistry group as well as within Alfred Wüest’s physical limnology group studying the reservoirs. From the ecosystem standpoint, when you introduce reservoirs you turn a river into a series of interconnected lakes. In so doing you change the rate in which the water moves downstream,



ADAPT – Preserving the ecological integrity of wetlands

*Peter Edwards and Harry Olde Venterink,
Chair of Plant Ecology (D-UWIS)*

Building a dam can have major effects upon downstream ecosystems. On a global scale, the vast wetlands along the Zambezi and its tributaries are important for their wildlife. Furthermore, they provide a livelihood for local people practicing traditional forms of grazing agriculture. The challenge for the future will be to find ways of using more of the river water for irrigation and power generation while preserving the quality of riparian ecosystems.

The ecological studies are designed to understand how changes in the hydrological regime will affect the functioning of wetlands. Our work is concentrated on a vast wetland in Zambia, the Kafue Flats, that is already showing undesirable ecological changes after the building of two dams. In particular, an exotic shrub from South America, *Mimosa pigra*, is spreading aggressively, thus reducing the area available for both livestock and wildlife. We hope that our work will help in finding ways to prevent such negative developments.



Shire River near the
Zambezi confluence (154 000 km²)

ADAPT – Designing effective international governance systems

*Thomas Bernauer and Lucas Beck,
Chair for International Relations (D-GESS)*

We are interested in designing effective international governance systems for the Zambezi water resources. The international regulatory regime for the entire Zambezi Basin that is currently in place is called the “ZAMCOM agreement”, and contains general guidelines but no specific allocation rules concerning the costs and benefits related to water use.

We are using a combination of computational simulations and stakeholder surveys in order to develop scenarios of water use in the Zambezi Basin over the next 40 years. The scenarios cover the key sectors agriculture, hydropower, industry, households, and environment. Our aim is to identify where and when allocation conflicts are most likely to occur. While the scope and intensity of such conflicts are currently modest, our scenarios suggest that they are likely to heat up in the near future. From that perspective, the absence of allocation rules in the ZAMCOM agreement is a major shortcoming. Building on this insight, we seek to identify the implications of different allocation rules for key stakeholders. We hope that our research will contribute to a more systematic reflection on how to integrate allocation rules into the ZAMCOM agreement.

and in doing that you potentially change the chemistry of the water as it moves downstream. One of the most dramatic things that can happen is that all of the particles that are moving downstream settle down into the bottom of the reservoir because the water velocity slows down. Consequently, you are losing these particles and the nutrients associated with them. In addition to that, one of the large impacts that dams can have is that the bottom waters in these reservoirs become low in oxygen. The same bottom waters are then used to spin the turbines, which results in low-oxygen water in the downstream river. There is a potential to disrupt the downstream ecosystem. Furthermore, there are feedback effects. For example, in a place where you have distinct wet and dry seasons, these rivers tend to have natural flooding cycles and these flooding cycles influence the plant life. Changing the flooding regime triggers changes in the chemistry and changes in the plant life, hence affecting the animals that are grazing on these plants. Therefore, the goals of our groups are to try to understand how these systems are behaving under the current conditions and, by studying unimpacted systems and combining the observations, to find out how changing the operation rules at the dams might improve the health of the impacted ecosystem.

Wolfgang Kinzelbach: As you have heard, there are potential conflicts between hydropower and ecology and our goal is to see if compromises are possible – for instance, by sacrificing some hydropower one could improve the ecological situation. As David has said, quality and nutrients are an issue. However, another issue is the seasonality and the shape of the flooding curve over a year. If you have information on upcoming floods, then maybe you could adapt your storage strategy. For example, one could supply some areas with water, which due to the production of electricity have not been supplied before. Having this information in real-time with satellite images is the concrete task of our group. The method used is modelling. We want to image this system in a mathematical model. Then we have to feed this model with data. In structurally weak areas such as those in

developing countries, we do not have many stations on the ground. However, we can look down on the area through the satellites and get data from which we can draw our conclusions and from which we can construct the parameters that we need for our model.

Bernhard Wehrli: This is an area where cooperation is very fascinating. Wolfgang's student is making a model to predict how much water will be in the floodplain. Our students are measuring the water quality that is critically affected by the rewetting and drying of the floodplain. Hence, we depend on the data of the floodplain analysis to understand what is going on in the river.

You pointed out some interdisciplinary aspects of the ADAPT project. We would like to know more about how interdisciplinary research actually works in practice.

Bernhard Wehrli: The project started with an interdisciplinary group of professors – all of which are experienced in interdisciplinary research. It is crucial that one thinks about integration and interaction right from the start. In the course of the project, David has been instrumental in bringing together the doctoral students and helping them see the others' work in a very early phase. This allows all students to know about the other research projects and to know whom to contact when collaboration is needed.

Is integration already set up in the project proposal when the research questions are being defined?

Wolfgang Kinzelbach: When we presented the project proposal to CCES, integrated research was one of the basic requirements. In practice, there is a certain danger in integrating several doctoral studies. If a doctoral student depends on data from another doctoral student and the delivery of this data is somehow impeded, the doctoral research may be put at risk. To mitigate that risk, we ensure that every doctoral research project has a stand-alone part and a so-called service part for the larger whole.

Rolf Kappel: For example, problems also arise in practice be-

cause the hydrology model is too detailed to be integrated into a coupled hydrology-economy model. Therefore, we need to adjust the hydrology model to get a simplified tailor-made solution for the integration with the economic model.

Wolfgang Kinzelbach: However, the high resolution of the model is necessary for the doctoral students working on the biogeochemistry side of the project in order to define water quality. Interdisciplinary research poses challenges when put into practice.

Talking about your research partnerships: What is the role of the local research partners?

Bernhard Wehrli: Our African partners participated at the first workshop because we wanted to learn about the different local conflict lines from them. We wanted to have a project with resonance in the region. Later, our partners were very helpful with logistics. We could not work in the Zambezi Basin without local partners. In addition, African Master students do their Masters in collaboration with our doctoral students.

Wolfgang Kinzelbach: The challenge of unequal partners – as far as scientific capacity is concerned – always remains. The University of Zambia is a very poor and little developed university. Consequently, this kind of research partnership always involves capacity-building efforts.

Do you pursue capacity-building more on the individual level, or do you address the institution as a whole as well?

Wolfgang Kinzelbach: At the moment, it is individual capacity-building. However, we always had the idea of maintaining a station for the ETH Zurich in Africa. Should we invest, for example, in the University of Zambia in order to have a place for fieldwork, for teaching and for exchange? The idea was delayed because of funding.

David Senn: One of the interesting things is that the two students that we have recruited for our project so far are from Zambian environmental agencies: the Zambian Wildlife Authority and the Department of Water Affairs. Both of

them are granted leave by their institution to come and work for two years on a Master project. In that sense, the capacity-building is hopefully going to build some capacity within the government agencies as well.

That brings us directly to the next question on stakeholders' involvement. Which types of stakeholders who are not researchers – like the Zambezi River Authority – are involved?

Wolfgang Kinzelbach: We are closely working together with ZESKO, which is one of the power companies, and they rely on predictions and modelling but have a model with which they are not satisfied. We are helping them to improve their model – which is a direct benefit for that company.

What about the local people? We know that involving them is difficult when conducting research on a basin scale, but are they somehow involved?

Bernhard Wehrli: Well, it's not a wide-scale involvement. One of Thomas Bernauer's students is doing interviews. To understand the demand side, he interacts in a structured way with as many people as he can. Alternatively, there are NGOs involved, and in some ways they are representatives of the local people.

Let us now talk about the expected outputs of the ADAPT project. What will they be and how will you communicate and disseminate them?

Bernhard Wehrli: It has to be an interactive process. We develop models and analysis tools and then, at some point during the project, we will meet with different actors in the river basin to discuss the preliminary results and define preferences, scenarios and trade-offs between these, like Rolf has been saying. All this has to be discussed and taken into account for the subsequent work. Finally, we would like to have people trained to work with our tools.

Do you plan to support the process of analysing the scenarios and of decision-making, or do you plan to train local people who will then do the follow-up?

Wolfgang Kinzelbach: We are not there to make the decisions for them. We always have to work on two levels. Number one, we have to do science, we have to publish scientific papers. Number two, we have to do useful things for the society there. To do so, we have to communicate the results of the analyses to allow for better choices.

You mentioned the scientific papers as one channel for communication and dissemination. Are there other channels as well?

Wolfgang Kinzelbach: Workshops – and all the software that we develop will be available for the stakeholders in the basin. Thanks to our capacity-building efforts, we have people who are trained to use the software. In addition, there are students who improve their skills by taking part in the research programme. All these activities are the basis for an implementation that is not dependent on us.

Do you plan to write a synthesis report? Something that goes beyond the individual research papers?

Bernhard Wehrli: We promised to have an accessible website with the products of our research – an archive of what we have been doing.

David Senn: Most likely, dams are going to be built within the next decade. The culmination of our work will be well-timed to be in people's minds as these dams are being built. How much they take it into consideration and how much they actually use the tools – this is beyond our control. However, the tools will hopefully be available and usable.

Did you plan any evaluation and impact analysis?

Bernhard Wehrli: Yes and no. ADAPT is research in the area of sustainability and the review panel of CCES will evaluate that. However, at the moment we don't have a clear plan on how to evaluate the outcome.

We are also asking from a donor perspective. For example, many projects in developing countries receive funding from

the Swiss Agency for Development and Cooperation (SDC). Due to political pressure, SDC must demonstrate that research has an impact on the ground.

Bernhard Wehrli: Many of the existing evaluation questionnaires focus on activities. Personally, I would rather like to learn how to increase the quality of our activities instead of having an enormous database of information that often just lands in archives. In order to accomplish this, one needs to interact with the local partners.

One possibility to evaluate this project would be to check if the new tools are being used in the planning process for new dams. Do you agree?

Bernhard Wehrli: One could set out such criteria to evaluate success and failure in terms of practical impacts. However, that is again something else than what I, personally, would be most interested in. I would like to know from the government agencies, from the power companies, and from the students there: Have we been useful or what else had been expected of us? What could we do better next time?

Rolf Kappel: The impact of research and science is so complex, that it is not predictable right from the start. The question is, whether you try to measure the impact of a research programme after you have finished it, one year after, five years after, or ten years after. Many research activities have had their impact after long delays in an extremely complicated way no one could foresee. In that sense, I am very sceptical about measuring the impact. Another key question in that respect is the role of researchers. There is a very delicate borderline. For example, when we do optimisation calculus and provide several optimal solutions, we invite all the relevant stakeholders in order to conduct a guided and participatory multi-criteria analysis. The question remains whether this is something that should be done by scientists, or rather by people from local administrations, development agencies, or other state organisations.



What can ADAPT achieve during the next four years?

Bernhard Wehrli: I would be very happy if some of our achievements would actually be implemented. The reason why I am optimistic is, that we have a great team together – a team that includes Africans. I believe in people. If the people will get a push to act within their society, the achievements can be implemented.

Do you see a potential that your results will have a beneficiary impact?

Bernhard Wehrli: Definitely. As I said, there are technical advances and there are scientific advances. In addition, communication is facilitated. For example, people have e-mail and they get warnings if there is flooding in the upstream areas. Intensified communication will support the implementation of our research results.

David Senn: The research questions that we ask are not research questions that we came up with on our own. Local people and the NGO community are asking these questions on what types of water floods are needed to sustain the environment and the ecosystem. Therefore, I hope that the timing is right for the results and models that we come up with and that they are introduced into a process that started before us and will continue after us.

Applying airborne geophysics in large-scale hydrological mapping of the Okavango Delta, Botswana

The waters that feed the Okavango Delta originate from the highlands of southern Angola and pass through the northern part of Namibia before entering the delta in the north-western part of Botswana. Therefore, the main challenge that faces the delta is competition for the scarce commodity of water. Angola exploits this natural resource in its endeavour to rebuild the economy after a long civil war. Namibia has the ambition of using the Okavango waters not only for human, but also for industrial consumption such as hydroelectric power generation. Downstream in Botswana, the pristine Okavango Delta is a major tourist attraction and tourism comes second after diamonds in contributing to the country's economy. In addition, the Okavango waters are the major source of freshwater in northwestern Botswana. Finally, the Okavango Delta hosts a tremendous biodiversity, which is of value not only to local communities but also to humankind. It is therefore an important site for global bio-diversity preservation. Thus, competition for water is an issue that requires delicate handling.

In view of these challenges, the three riparian states established a permanent Okavango River Basin Commission (OKACOM) in order to collaborate and to coordinate the sustainable management of the basin's resources. In addition, the Okavango Delta was declared a Ramsar and World Heritage Site in 1997. Consequently, the government of Botswana – in collaboration with the Ramsar Bureau – has formed the organ Okavango Delta Management Plan (ODMP). ODMP has the task of formulating an integrated management plan for the delta that would feed into the OKACOM process.

An integrated distributed hydrological model is one aspect that will facilitate the decision-making processes. The aim of the model is to numerically simulate the impact of climate change and of diverse water management scenarios on different spatial scales. The results will provide a scientific basis for the discussions on trade-offs and the finding of solutions between the international stakeholders of the system.

The model itself needs specific types of data sets, e.g., aquifer geometry and hydraulic parameters. To obtain subsurface information in a terrain where the geology is largely concealed below a thick blanket of sands is a challenging task. Earth observation satellites and aerial photography can only provide information on the ground or a few millimetres below ground. A conventional technique such as drilling is not only expensive, but also the least attractive if we are to preserve the pristine nature of the delta. Consequently, there is a need to use other remote sensing techniques that can give information from within the subsurface. My thesis focused on the integrated use of remotely sensed airborne magnetic, electromagnetic and ground-based gravity data sets for the hydrological mapping of the pristine Okavango wetlands.

Wildlife in the Okavango Delta, Botswana



Key results

We are using a hydrological model to simulate the impacts of water management scenarios and the consequences of natural influences such as climate. For the modelling, we seek to determine the geometry of the aquifer system underlying the overland flow system. Because the two systems are coupled, we cannot model flow dynamics of one system without considering the influence of the other. The results from our analysis of airborne magnetics and ground-based gravity data show that the aquifer thickness is structurally controlled and has an average thickness of 180 metres. It is thicker within the Okavango Graben and thinner on the flanking horst structures. When inserting this distributed aquifer thickness into our coupled surface-groundwater hydrological model, the results correlate much better with observed flooding events than if we use a constant aquifer thickness as was done in the previous model.

Previous research estimated that approximately 300 000 tons of salts have been deposited in the delta system. Being a terminal evaporative system that has fresh surface waters entails that a portion of these salts has to be fed into the deep aquifer in order to account for the salt balance. We are investigating the mechanism that is responsible for this disposal of salt. Ground resistivity, derived from airborne electromagnetic data, shows that the numerous islands in the delta provide a platform whereupon evapo-concentration of salts leads to salt removal below the islands due to density-driven flow. This finding underscores the importance of preserving the coastline of the delta provided by the interface of the islands with surface water. The interface allows the respective mechanisms to operate, thus removing salt from the delta waters and leaving the waters fresh.

Interaction with stakeholders

The Institute of Environmental Engineering at the ETH Zurich started a two-phase research project in a joint venture with the Ministry of Minerals, Energy and Water Resources (MMEWR) in Botswana. The goal of the project was to develop the abovementioned hydrological model. In the first phase, the Department of Water Affairs (DWA) represented MMEWR. The main role of the DWA was to provide transport and personnel during field trips. In addition, the Department of Geological Surveys (which is also a part of the MMEWR) played a crucial role by providing the required geophysical data in the second phase of the project.

During and upon completion of these project phases, the ETH team participated in international conferences held within and outside of Botswana. The team shared knowledge with both the local and international communities on the hydrological, geological and geophysical aspects of the delta. In order to disseminate information, we published several articles in journals. Further articles are still in preparation pending the completion of the second phase of this project. Finally, we conducted training workshops for DWA staff as a way of sharing knowledge.

The first phase of the project resulted in two doctoral theses provided to DWA and other stakeholders such as the Okavango Research Centre (a research arm of the University of Botswana dedicated to the Okavango Delta). The second phase was also completed with two doctoral theses (including this thesis) which are currently being communicated to various stakeholders. It is our sincere hope that DWA, as the main government stakeholder, will use our research results to contribute to the ODMP and subsequently OKACOM as envisaged when the partnership between the ETH Zurich and MMEWR began.

Lesego Pius Kgotlhang

Water for people – Direct impact on quality of human life

Around the world, 1.1 billion people do not have access to safe drinking water and 2.5 billion are without adequate sanitation facilities. Every day, nearly 6000 people die from water-related illnesses – the vast majority are children. The goal of cutting the number of people without access to clean drinking water and basic sanitation in half by 2015 was formulated at the UN Millennium Summit in New York (2000) and the World Summit on Sustainable Development in Johannesburg (2002). A holistic approach based on an integrated water resources management (IWRM) concept is considered to be a promising way to achieve these goals.

“Water for people” is one of the cornerstones of IWRM. In this context, ecological goals are closely linked to economic and social goals. Avoiding water pollution and damage to vital ecosystems relates directly to excreta and wastewater management. The effectiveness of excreta and wastewater management determines subsequent risks in water quality or required steps in water treatment for ensuring safe drinking water. Furthermore, excreta and wastewater management connects directly to issues of “water for food”. Here it is not only the resource water, which is decisive for production, but also its continuous depletion of nutrients and organic matter from soils. Although abundant in human and animal waste, nutrients and organic matter are often not easily accessible, or their untreated and unrestricted reuse influences health risk of farmers and/or crop consumers.

Optimising the synergies between these dimensions in the water sector and aligning the differing demands, needs and cause-effect relationships are not only major challenges but also important opportunities of an IWRM approach.

Forty years of Eawag commitment

At Eawag, the focus on the developing world started in 1968 with the “International Reference Centre for Wastes Disposal (IRCWD)”, based on a suggestion by the World Health Organisation (WHO). IRCWD – later renamed as Sandec

(Department of Water and Sanitation in Developing Countries) – originally acted as a documentation centre only. Through close interaction with a large network of contacts, Sandec identified major research gaps in this thematic field. In the early 1980s, when Roland Schertenleib was appointed head of the department, Sandec started to strengthen its research activities as a supplement to the dissemination activities. Today the department consists of 16 scientific and two administrative staff members based in Switzerland and many more partners in the South. In addition, doctoral and Master students as well as interns and civil servants are affiliated with Sandec.

Sandec has continued to establish its international reputation through applied research and continuous active participation in policy fora and international expert working groups. Today Sandec’s research activities focus (i) on the mitigation of acute problems of existing technological and organisational systems in the different subsectors, and (ii) on the conceptual development, strategic planning, piloting and advocacy of integrated approaches. Sandec is engaged in the following research themes:

- Development of integrated concepts and approaches for planning of environmental sanitation improvements (strategic environmental sanitation planning);
- Household water treatment technologies for rural and urban areas;
- Excreta and wastewater management for urban and peri-urban areas;
- Solid waste management for urban and peri-urban areas;
- Water and waste reuse issues with links to urban agriculture and health risks.

Sandec always conducts research in collaborative projects involving local partners from the South. This allows Sandec to fulfil the mandate of local capacity-building in research and ensures the continuous close contact with local universities,

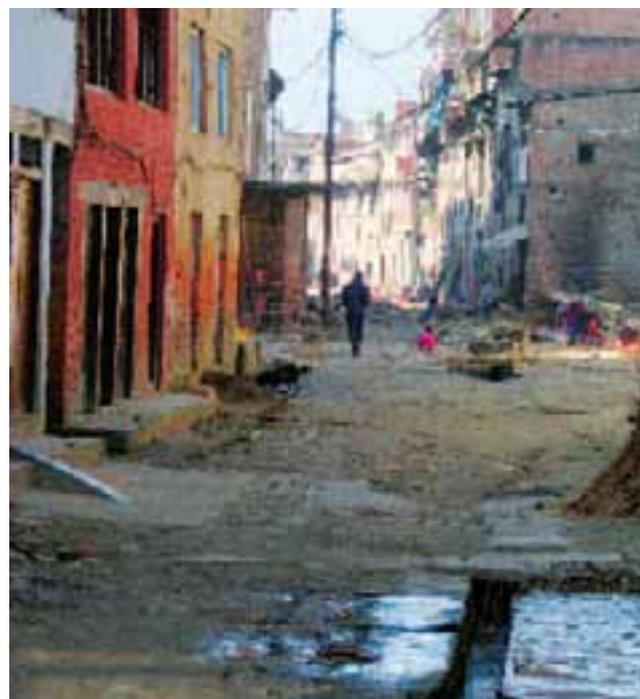
research NGOs and development agencies, as well as with local authorities in the specific country. Sandec's strength lies in its practice- and problem-solving-oriented research focus strongly appreciated by engineers and development agencies facing specific problems in their implementation projects.

Sandec selects research subjects based on the concept of narrowing down thematically (one or two specific subjects in a wider thematic domain) while maintaining – on this subject – a wide geographical spread over as many countries and regions of the developing world as possible.

Integrated concepts and approaches for planning of environmental sanitation

The majority of the world's population now lives in urban areas. Most of the new city dwellers live in unplanned settlements – favelas, bidonvilles or slums. Planners and policy-makers focus almost exclusively on trying to set up sewerage networks and centralised systems, although this is hardly ever a feasible solution. In collaboration with the Water Supply & Sanitation Collaborative Council, Sandec has developed the Household-Centred Environmental Sanitation (HCES) approach. This approach places the household and neighbourhood at the core of the planning and implementation process and fosters the process of finding a sustainable sanitation solution for the community.

Sandec began testing the HCES planning approach in pilot projects at six sites in Costa Rica, Burkina Faso, Kenya, Tanzania, Laos and Nepal. In each case, cooperation was initiated with local partners. All HCES planning processes showed that those responsible for improving environmental services require detailed information on the wide range of alternatives in sanitation systems and technologies. To enhance informed decision-making, Sandec therefore developed a "Compendium of Sanitation Systems and Technologies". This compendium facilitates a key step in the HCES process – the identification of different potential sanitation options.



Neighbourhood in Siddhipur, Nepal. The planning of urban sustainable sanitation is a complex interdisciplinary task.

Small-scale water retailers in Nouakchott, Mauretania



Integrated participatory planning processes such as the HCES process for sanitation are essential tools for an IWRM process where multi-stakeholder approaches and concertation for a mutual agreement are the foundations of its success.

Christian Zurbrügg



Scientists measuring radiation properties of vegetation for the calibration of satellite images, Xinjiang, China

A key role for a research institute is to provide research-backed, policy-relevant recommendations that will help guide decision-makers through very difficult decisions.

David Molden, Deputy Director General of the International Water Management Institute IWMI (2008)

Research collaboration

Research collaboration comprises diverse partnerships of members of the North-South Centre in international development and cooperation. As a North-South Centre core activity, it embraces the programme on livestock systems research, the partnership between UNEP and ETH Zurich, and seed money grants.

By “research collaboration” we mean facilitating, maintaining and strengthening research partnerships with developing countries. This definition highlights the strong links to the other core activity areas of the North-South Centre, capacity development and networking. The first link can be seen as capacity development *through* research collaboration and the latter as networking *for* research collaboration. Consequently, research collaboration is a key element of the mission of the North-South Centre.

Despite its crosscutting relevance, research collaboration also forms one of the individual programme pillars of the North-South Centre – for good reasons. The programme on livestock systems research is characterised by its thematic coherence. Its strengths are looking at livestock systems through the lenses of different disciplines, deriving integrated research findings, and proposing practical solutions. The partnership between UNEP and the ETH Zurich also

goes beyond individual research partnerships. The flagship project on ecosystem services bundles research activities of different institutes of the ETH Zurich and of several UNEP divisions to work jointly in an integrated project. In addition, it differs from other activities in its strategic dimension: working with an international key actor in environment and development offers opportunities for effective dissemination and use of research results, as well as for the international visibility of the ETH Zurich. To complement the research collaboration programmes of the North-South Centre, seed money grants often stand at the beginning of new activities, opening doors to new research collaborations.

In addition to the programmes and instruments managed by the North-South Centre, its members are involved in numerous research collaborations with partners in developing countries. The list at the end of the section provides an overview of the breadth of North-South related activities.



Geographic distribution of all research projects supported by programmes of the North-South Centre or conducted directly through its members

- funded via the North-South Centre
- not funded via the North-South Centre

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Livestock systems research in support of poor people

In developing countries, the demand for meat and milk will more than double over the next two decades. Soon, the global livestock sub-sector will contribute half of the total agricultural products in value terms. The livestock sector employs 1.3 billion people (20% of the world population) and creates livelihoods for one billion of the world's poor (25% of the world's poor). The major factors driving this livestock revolution are increased urbanisation, population growth and higher incomes in developing countries. However, the livestock sector has a large impact on the environment, causing or aggravating problems such as:

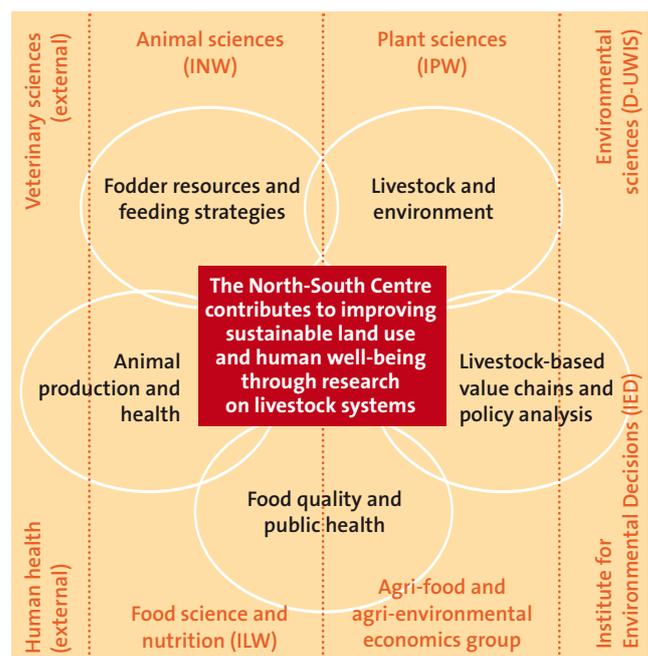
- land degradation by overgrazing and deforestation due to extensive systems;
- climate change through the release of greenhouse gases (in the magnitude of about 14% CO₂ equivalents);
- water pollution and eutrophication, as well as extensive water demand;
- loss in biodiversity due to habitat and resource competition with wildlife.

The central research challenge posed by the livestock revolution is to enable resource-poor farmers to benefit from livestock-keeping while reducing its negative impacts. The main objective is to determine the key elements of sustainable livestock systems.

With these ambitious goals in mind, the SDC co-funded programme "Livestock systems research in support of poor people" started in 2002. This programme focuses on poverty alleviation and on the sustainable management of natural resources.

The programme is structured along the thematic clusters depicted below. Although the current projects do not cover all areas, this structure allows us to conduct relevant research that is justified by (i) the demand as derived from the challenges identified in each discipline, and (ii) the impact that can be achieved. On the following pages, each of the projects is presented with its own report. The list at the bottom of each page shows to which cluster the project belongs.

The annual internal review of the programme, the Progress Forum 2008, explored the instruments that the project teams have employed in order to generate impact. As a result of these discussions, provisions for ensuring a lasting benefit from the acquired knowledge and/or improved technologies have been identified.



Programme structure with thematic clusters

An ecosystem service approach to agricultural security in a sacred landscape mosaic

The objective of this project conducted in Kodagu, South India, will (i) determine the pollination services provided by forest fragments to coffee crops, (ii) identify factors that affect the quality of ecosystem service provision, and (iii) quantify the economic values derived by coffee farmers from pollination services.

Wild bees are known to provide important pollinator services to agricultural landscapes such as coffee plantations. Forest fragments provide the much-required nesting sites and forage for these pollinators. Consequently, we expect higher coffee yields in plantations located closer to forest fragments. We are investigating the relationship between factors characterising the forest fragments and the quality of the pollination service. In addition, we are measuring the value of pollination services in terms of coffee productivity and economic returns to farmers. Finally, using GIS maps, we are evaluating the effect of landscape components on pollination services and subsequently on coffee productivity.

Coffee flowers eight days after the first summer showers, which usually occur end of February or early March. Lately, the rains have become less predictable and new technology such as sprinkling systems are more easily accessible. Thus, flowering of coffee is no longer dependent on the first summer showers commonly referred to as “blossom showers”.

In our study sites in Kodagu, fruit-set and pollinator diversity was high in places where irrigation initiated flowering. About 50% of the studied sites are irrigated. Flowering in these sites is often spread over a month, thus creating staggered flowering, which leads to higher pollinator visits. Whereas in sites that are not irrigated and where mass flowering occurs after the blossom showers, pollinator visits are quite seldom. Nevertheless, many planters (close to 50%) rely on rains due to low water availability and the costs involved in resorting to sprinkling systems. Furthermore – because of staggered flowering – the distance from the forest edge did not have a significant effect on pollinator visits and diversity of pollinators or pollinator visits does not have a significant influence on coffee fruit set.

Finally, Kodagu is a well-known district because its honey production succumbed to the Thai sac brood disease (TSBD) in early 1991. The *Apis cerana* colonies, which were affected by the TSBD, have started recovering in the past five years. However, *Apis dorsata* are bees that are migratory in nature. They migrate to Kodagu from the end of February until April. Hence, their availability for coffee pollination depends on their arrival. In the next project year, we will re-analyse the data with additional study sites evaluated in 2008 and with additional parameters that might influence the pollinator activity and, ultimately, coffee productivity.

Project leader
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Contact persons
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Collaborators
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Doug Sheil, CIFOR, Indonesia;
Uma Shaanker and CG Kushalappa,
UAS Bangalore, India;

Duration
October 2006 – September 2009

Thematic cluster
Livestock and environment



The bee species *Apis dorsata* pollinating coffee flowers, Kodagu, India

New policy mechanisms to mitigate wildlife-livestock conflicts

Farmers who live close to national parks with high wildlife densities often face substantial losses due to livestock predation by large carnivores and/or crop losses by wild herbivores. Such losses can be devastating – especially for households in developing countries which depend on small livestock herds and crops harvested on the family's fields. At the same time, overgrazing and ecosystem degradation induced by local farmers is often a major problem in the buffer-zone of parks. This is also the case for the Bandhavgarh National Park tiger reserve (BNP), our study site in Madhya Pradesh, India.

The aim of this project is to develop policy recommendations that would have the potential to alleviate such wildlife-livestock conflicts. In particular, we focus on assessing the conditions under which an incentive payment approach that makes use of performance payments is an advisable policy option. Performance payments are in-kind or monetary payments which reward the provision of defined environmental services.

While the research activities in 2007 were mainly devoted to the theoretical modelling of incentives under performance payment schemes, this year's core focus is fieldwork in India and Sweden. In India, we are assessing how a performance payment approach could optimally be designed

in order to provide incentives for livestock herders so that they would transform degraded pastures into silvo-pastoral land. This could supply more fodder for livestock, decrease pressure on the park, and eventually increase the wild herbivore population, which in return would benefit tiger conservation.

Within the scope of this project, the authors of a Master thesis on plant species selection by domestic ruminants around BNP found that herders have very little foresight concerning fodder security. Hands-on recommendations are provided for the development of fodder hedges and living fences, which are a source of food for livestock and, at the same time, prevent wildlife from entering crop fields due to their thorns and deep roots.

In Sweden, the only country to already have a large-scale performance payment scheme for carnivore conservation, we are analysing the determinants of conservation success. 50 village-level interviews were conducted and 1000 household surveys were sent to indigenous reindeer herders who are the participants of the scheme.



Participants of the policy workshop in Ahmedabad, India

Project leader
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Jeff Sayer, WWF International, Switzerland;
Thomas Sterner, HGU, Sweden

Duration
April 2007 – March 2010

Thematic cluster
Livestock and environment

Agroforestry for carbon sequestration to improve small farmers' livelihoods

This project has a two-fold objective, investigated in two subprojects. *Subproject 1* aims to assess the response of plant productivity to future climate change in different land use systems in Panama. In addition, it aims to quantify the carbon sequestration potentials in these systems, providing baseline information for adaptive management decisions and the very first data sets to policy-makers.

In 2008, we continued the ecosystem carbon dioxide and water flux measurements on pasture and improved afforestation. In addition, measurements of soil respiration fluxes were successfully conducted in both ecosystems. These measurements provide necessary information about carbon losses due to climatic or management impacts – particularly at nighttime when turbulent mixing is low. In 2008, Panama was strongly affected by “El Niño Southern Oscillation”, which resulted in a prolonged dry season of about four to six weeks. Consequently, dry season soil CO₂ efflux measurements were strongly limited due to very dry soils. In these climatic conditions, the measurements clearly indicated very small carbon losses, much in contrast to wet season measurements. Furthermore, CO₂ profile measurements were carried out in order to quantify carbon storage within the canopy in periods with low turbulent mixing. As of June 2008, we started to determine aboveground biomass production and grazing activity in the pasture ecosystem.

Subproject 2 aims to take novel natural-based approaches to increase plant health and reduce insect pests in afforestation and silvopastoral systems. This subproject shall support timber tree establishment on current pastures as a future source of income to the rural poor.

During the main growing season of the studied tree species, the effects of different experimental planting regimes on insect community composition, related damage to the trees as well as tree growth were investigated. We sorted the insect herbivores and identified the key herbivores that strongly contribute to the damage of trees. With feeding tests we assessed the affiliation to the focus timber trees and the diet breadth of key herbivores. We compared tree mortality and tree growth characteristics between mixed planting regimes, monocultures, and insecticide-protected plantings. Preliminary data analysis suggests that different planting regimes influence tree growth rather than tree mortality. Trees grew best when protected by insecticides. This indicates that insect herbivores could have a major influence on the growth of the studied timber trees. The effect of planting regimes on tree growth differed between different parts of the plantation, suggesting that small-scale variation in environmental conditions might weaken or strengthen the effects of a given planting regime.

Project leaders

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Contact persons

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Karsten Mody
Mirco Plath

Collaborators

Catherine Potvin, STRI, Panama and McGill University, Canada;
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Duration

July 2006 – December 2009

Thematic cluster

Livestock and environment



Set-up for soil CO₂ fluxes at the pasture site in Panama

Reversing soil degradation by tropical legume trees using GIS analysis

The main objective of this project is to establish a GIS based analysis system in order to evaluate the effects of the incorporation of the legume tree *Gliricidia sepium* on productivity and socioeconomic development of the agricultural systems in Meegahakivula region in Sri Lanka. The GIS model is used to find relations between the results of the three disciplines agronomy, photogrammetry and agricultural economics. It is the basis for a web GIS, which will be used to communicate the results from our analysis to a broader audience without the need of special software.

The agronomic project component established a second trial series using mungbean (*Vigna radiata*) and maize (*Zea mays*) as test crops. The two agronomic trials on fields and home gardens illustrate better yields of the crops in the home gardens because home gardens have a high biodiversity and better soil quality due to more intense management.

2008 was the main year of data collection for the socio-economic component of the project. The survey, which assesses the flows of cash and goods and the labour allocation of the different 116 households, continued. The knowledge gained enables the definition of an operational decision field to understand farmers' decisions, while taking

constraints from the economic, social, geographical and climatic environment into consideration. Assessing farmers' aims for future development serves to deduce a strategic decision field, that aids in the understanding of the households' long-term orientations, which are less constrained by economic pressures. Farmers' perception of soil degradation and the effects of *Gliricidia sepium* incorporation are assessed in a further interview held with all the households. A combined analysis of the different primary data sources, which considers economic, climatic, and topographic constraints, helps to understand the farmers' motivation to participate in a programme promoting *Gliricidia sepium* cultivation and application.

Two field visits showed the potential of interdisciplinary links within the project. The common database, basis of the GIS model, will be used for the analysis of the agronomic and socio-economic components in relation to topographic and landscape components delivered by photogrammetry. The three respective results will be used in a common analysis, using sustainability indicators in order to understand the long-term effects of the incorporation of *Gliricidia sepium* leaves into the production system of the farms. The GIS model facilitates common analyses and makes interdisciplinary interpretations of results possible.



A meeting with selected farmers provided the opportunity to discuss the project and to thank them for their collaboration

Project leaders

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Contact persons

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Duration

October 2006 – December 2009

Thematic clusters

Fodder resources and feeding strategies,
Livestock and environment,
Livestock-based value chains and
policy analysis

Benefits of cover crop legumes in smallholder systems in Central America

In smallholder farming systems of the Nicaraguan hillsides, intensification of land use has contributed to soil nutrient depletion and to a decrease in agricultural productivity. Nitrogen (N) is considered as the most limiting nutrient in the traditional maize-bean-livestock system. Furthermore, farmers lack adequate forage options to feed their livestock, particularly in the dry season. We are testing the hypothesis that an underutilised and drought-tolerant cover legume, canavalia (*Canavalia brasiliensis*), could be introduced into the traditional system to overcome soil fertility decline.

On-farm trials were set up at four locations in the Nicaraguan hillsides. For the first year of cropping (2007–2008), we assessed the soil surface N budget of traditional maize-bean rotation and compared it with the budget of maize-canavalia rotation. Different cutting intensities of above-ground biomass of canavalia were applied to simulate grazing. Nitrogen input variables were (i) mineral fertiliser N, (ii) N input with seeds, and (iii) symbiotic N₂-fixation that was estimated using the natural abundance method. The estimation of N output was based on N removed with harvested parts of maize, bean and canavalia.

Canavalia fixed between 15 to 38 kg N ha⁻¹, while common bean fixed 10 kg N ha⁻¹ on average during a crop season. Fixation by common bean was low due to its low biomass production. Farmers applied between 38 and 60 kg N ha⁻¹ in

the form of mineral fertilisers, while N contained in seeds represented only between 1 and 4 kg N ha⁻¹. The highest N removal occurred during the maize harvest, with an average of 43 kg N ha⁻¹. Due to low yields, the nitrogen output from the beans remained under 10 kg ha⁻¹.

The removal of different amounts of canavalia biomass had a considerable impact on the N balance: On the average, when 0% of canavalia was removed from the field, N surplus was 31 kg N ha⁻¹. In contrast, complete removal of canavalia biomass led to an average N deficit of 10 kg ha⁻¹. Under maize-bean rotation, the N remained more or less balanced with an average N surplus of 10 kg N ha⁻¹. Consequently, canavalia shows potential to fix a significant amount of N. However, when completely removed for utilisation as forage, it bears the risk of soil N depletion unless N would be recycled to the plot by animal manure.

An in-depth on-station study is in process. Its goal is to assess the effects of canavalia on soil N processes and on the yields of the subsequent maize crop using direct and indirect ¹⁵N-labelling techniques.

Farmer participation and interest in project activities have remained remarkably high. The farmers recognise the benefits of canavalia on milk production. Interviews and workshops carried out with farmers are currently under evaluation.

Project leaders

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Astrid Oberson

Contact person

Sabine Douxchamps

Collaborators

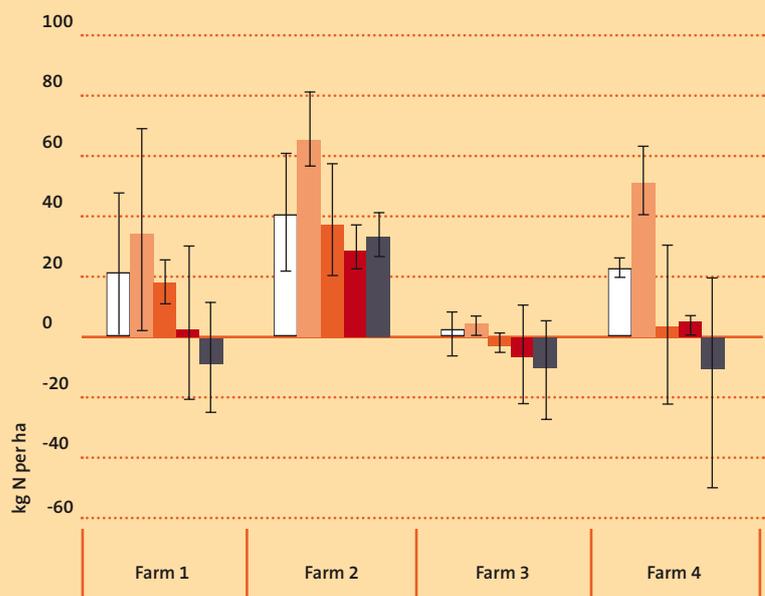
Michael Kreuzer, ETH Zurich, Switzerland;
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Axel Schmidt and Rein van der Hoek, CIAT, Nicaragua;
Martin Mena and Alexander Benavidez, INTA, Nicaragua;
Claudia Binder, University of Zurich, Switzerland

Duration

January 2007 – December 2009

Thematic cluster

Fodder resources and feeding strategies



N balance for each crop rotation in the farmers' fields.

- Maize/bean
 - Maize/canavalia with no removal
 - Maize/canavalia with 50% removal
 - Maize/canavalia with 75% removal
 - Maize/canavalia with 100% removal
- } of biomass during the dry season

Improving small ruminant productivity in dry areas

In countries such as Syria where precipitation is scarce, feed quality and availability are the major factors limiting the productivity of small ruminants. However, several locally available feed resources are still underutilised, including agro-industrial byproducts as well as crop residues. Although the use of these feeds has been tested in other studies, comparative evaluation with respect to digestibility and quality of milk and dairy products is still lacking. The objective of this project is to develop market-oriented approaches towards a more efficient use of available feed resources and an increase of productivity and profitability of Awassi dairy sheep production systems in Syria. The project includes studying the potential side effects of the use of these feeds on soil fertility and plant nitrogen use.

In 2008, the doctoral student Souheila Abbeddou completed all analyses related to two digestibility experiments initiated in 2007 at the International Centre for Agricultural Research in the Dry Areas (ICARDA, Syria). She determined intake, digestibility, body nitrogen, and mineral balance. *In sacco* digestibility analyses were done with different feeds in order to determine the individual ruminal degradation parameters. The evaluation of the feeding value continued with a 50-day on-station experiment on lactating ewes fed with the most promising diets. Milk yield was recorded on a weekly basis and protein, lactose and fat content determined. At ICARDA, various other nutritional parameters will soon be analysed.

In addition to the experiments with sheep, a three-month incubation experiment was carried out in order to assess the effect of three soil additives – fresh manure, composted manure and olive cake – on soil microbial activity and on nitrogen mineralisation. Parallel to this, a pot experiment using the difference method was established in order to determine the fertiliser value and nitrogen use efficiency in barley.

Based upon the results from the on-station experiment on lactating ewes, project staff and farmers planned an on-farm trial involving local farmers. This will be the last experiment within this project. Finally, extension and training brochures will be prepared and concluding workshops with stakeholders organised in order to disseminate the results.



Workshop with farmers at ICARDA, Aleppo, Syria

Project leader
Michael Kreuzer

Contact person
Souheila Abbeddou

Collaborators
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Astrid Oberson, Christophe Lacroix and Bernard Lehmann, ETH Zurich, Switzerland;
Hans Dieter Hess, Agroscope Liebefeld-Posieux (ALP), Switzerland

Duration
October 2006 – September 2009

Thematic clusters
Fodder resources and feeding strategies,
Food quality and public health

Camel milk products of high hygienic quality and safety

Camel milk is consumed in East Africa as untreated fresh milk or fermented milk known as “suusac”. The microorganisms (MO) that are present in the final product are not well-known. It can be assumed that unhygienic processes and uncontrolled spontaneous fermentations could lead to pathogenic MO in suusac, which could pose health risks for consumers. The objective of this project is to improve existing camel milk products. Our approach is to investigate the microbiota of camel milk aiming at developing starter cultures for the production of improved fermented milk and reducing risk-MO, which might have a negative impact on human health.

In Kenya and Somalia, we collected more than 1500 bacterial and fungal isolates from 126 milk samples. The milk sources originate from camel udder, herd milk, market samples, canister samples, fermented samples (suusac) and fermentation trials. First, we focused our search on lactic acid bacteria (LAB), which might be responsible for acidification, proteolysis and aroma-forming during spontaneous milk fermentation. A high diversity of LAB comprising many species (*Streptococcus thermophilus*, *Lactococcus lactis* subsp. *lactis*, *Lactobacillus* spp., *Weissella* spp., *Leuconostoc* spp.) was indeed characterised using molecular biological tools. These isolates represent species of common industrial dairy

starter cultures and are therefore promising adapted candidates to develop starter cultures for a targeted production of suusac-type sour milk.

Secondly, we detected pathogens belonging to *Enterobacteriaceae*, *Staphylococcus*, *Enterococcus* and, surprisingly, *Streptococcus agalactiae* and *Streptococcus bovis/equinus* at high titers. Isolates were partially antibiotic-resistant. We detected yeasts in most of the suusac samples. Their role is unclear and we therefore have to elucidate whether they are involved as food spoilage MO or, more importantly, whether they contribute to desired product characteristics.

The majority of milk sold at the consumer market in Nairobi did not fulfill the Kenyan hygienic criteria regarding high bacterial counts. Paired with our extended microbial analysis, these findings demonstrate that health risks through pathogenic or antibiotic-resistant bacteria exist. Taking our extended diversity analysis of pathogens into account as well, the need for improved hygiene practices at all levels in the production and marketing chain is obvious.

Project leaders

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Zakaria Farah

Contact persons

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Collaborators

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Duration

June 2007 – June 2010

Thematic cluster

Food quality and public health



Fresh camel milk is prepared for transportation by donkey to the nearest collection point approximately three hours outside Isiolo, Kenya.

Zinc fluxes from the soil into the food chain in arid agro-ecosystems – A case study in Iran

Zinc (Zn) deficiency is considered a major global problem in human nutrition, particularly in arid regions where populations depend on cereals as staple foods. In this project, which is being carried out in three provinces of central Iran, we are performing a case study on Zn fluxes from the soils into the crop plants and from agricultural food products into human nutrition. The goal is (i) to analyse the effects of agricultural practices on grain Zn and phytate concentrations in cereals, (ii) to assess the impacts of these cereals on human nutrition, and (iii) to evaluate agricultural options to reduce dietary Zn deficiency in human nutrition.

In the past year, we investigated the influence of various parameters characterising soil, climate, parent material, physiography and agricultural management on Zn concentrations in soil and in wheat and rice grains. Robust regression models that explained a significant proportion of the observed variance in the total and soluble soil Zn concentrations were established. However, the concentrations of Zn in wheat and rice grains depend not only on the concentration of Zn in the soil and other soil parameters. To a large degree, grain Zn concentrations are also influenced by climate, crop genotype and management factors, making predictions complicated – in particular for rice.

Furthermore, we performed two surveys on human Zn intake using three-day weighed food records – one in a suburban community and the other in a village. The Zn and phytate contents of the food samples are still under analysis. Nevertheless, preliminary results are as follows: Meat and dairy products were consumed regularly but in rather low amounts. The major difference was not between the rural and the suburban populations, but between the rich and the poor. Lower-income groups depend primarily on a cereal-based diet with little consumption of animal products. Bread is their main diet, while rice constitutes the main diet of higher-income groups. These results indicate that Zn deficiency is a major mineral malnutrition problem for lower-income groups, both in urban and rural areas.

Finally, the model PROTERRA-S, which was developed for the assessment of regional-scale heavy metal fluxes in Swiss agro-ecosystems, has been adapted to the needs of this project and to the available input data. Most input data have been compiled, and the input files are currently in preparation.



Bread made from white wheat flour – the principal diet of Iran's poor

Project leaders

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Contact persons

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Mahin Karami
Nazanin Roohani Sharaki

Collaborators

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Rita Wegmüller, ETH Zurich, Switzerland;
Claudia Binder, University of Zurich, Switzerland;
Armin Keller, Agroscope Reckenholz-Taenikon (ART), Switzerland

Duration

July 2007 – June 2010

Thematic cluster

Food quality and public health

The Memorandum of Understanding (MoU) between the United Nations Environment Programme (UNEP) and the ETH Zurich serves as a framework for collaboration that culminated in a flagship project of which the first module received funding in 2008.

The overall goal of this interdisciplinary project is to develop and apply scientifically sound and relevant methods for assessing and offsetting adverse effects on ecosystem biodiversity. The project will be conducted in a partnership with institutions from the South.

The partnership between UNEP and the ETH Zurich

In November 2005, the United Nations Environment Programme (UNEP) and the ETH Zurich signed a Memorandum of Understanding (MoU) to formally establish cooperation between the two institutions. The MoU serves as a framework for collaboration in the area of scientific assessment, monitoring and early warning of environmental change. It provides a framework for examining the interlinkages between environmental and social systems. On the side of the ETH Zurich, the North-South Centre was given the operative mandate for the implementation of the MoU.

For UNEP, the partnership with the ETH Zurich is an important element in the ongoing initiative of strengthening the science policy interface by bringing scientists and policy-makers together. The ETH Zurich will benefit from the network of UNEP in disseminating research results worldwide and enhancing the applications of the methods developed. UNEP and its national partners will contribute data and deliver support for case studies. The MoU expired in 2008, but both UNEP and the ETH Zurich have expressed their commitment to renew the MoU in 2009.

UNEP and the ETH Zurich decided to focus their collaboration in a so-called flagship project that should:

- address highly relevant research themes in the field of environmental monitoring and assessment and the sustainable use of natural resources;
- cover topics with relevance to the policy level and to developing country contexts;
- aim at developing new methodologies and decision support tools for current environmental challenges.

In a workshop in December 2007, UNEP and the ETH Zurich mutually agreed to launch a flagship project addressing ecosystem services (ES). More specifically, it is concerned with assessing and compensating the ecosystem impacts of biophysical products in the North-South context. Within this flagship project, three main research modules are planned. The first module analyses the ES impacts caused by agricultural production and trade carrying out comprehensive life cycle assessment studies. The second module, based on the insights gained in module 1, examines the possibilities of designing international payment schemes for ecosystem services (IPES) either by compensation payments for products or by tradable certificates for ES. Whereas module 2 focuses on the certification of individual products or individual ES, the third module will discuss certification of an entire landscape.

In 2008, for module 1, an interdisciplinary research group coordinated by Stefanie Hellweg submitted an ETH research grant application as a collaborative, highly interdisciplinary research proposal (CHIRP). The project has been successfully evaluated and will receive funding from the ETH Zurich. Research will start in 2009. An outline of the proposal is presented on the following pages. In addition, a CHIRP proposal for module 2 is in preparation and will be submitted in early 2009. Module 3 will continue to explore funding opportunities.

Assessing and compensating ecosystem impacts of agricultural products – “myEcosystem”

Many products consumed in industrialised countries originate from developing countries and countries with emerging economies. Multi-faceted ecosystem impacts are caused throughout these global value chains of products. With regard to agricultural products, such as food or biofuels, the lion’s share of impact often occurs in the producing countries. Particularly, land occupation and water withdrawal for agricultural activities lead to a significant loss in biodiversity and, thus, impact ecosystems on a worldwide scale.

An interdisciplinary group of researchers from three departments of the ETH Zurich is teaming up, contributing their expertise to jointly develop and apply scientifically sound and relevant methods for assessing and offsetting adverse effects on ecosystem biodiversity. The involved researchers work at the Institute of Environmental Engineering, the

Institute of Environmental Decisions and the Institute of Animal Science. They have backgrounds in environmental engineering, environmental sciences, agronomy, livestock science, biology, chemistry, and economics. These are the core disciplines necessary (i) to develop and apply methods for an assessment of loss in biodiversity due to water consumption and land occupation, and (ii) to accordingly design a financial offset scheme called “myEcosystem”. Three doctoral students and one post-doctoral scientist will work on this project – in the partner countries in the South as well as at the ETH Zurich. The partner institutions from the South will be identified in collaboration with UNEP. The project is financed by an internal ETH grant.

It is the goal of this project to develop methods to quantify the impacts to ecosystems in terms of biodiversity loss in the South caused by consumption of products in the North.

Project leader
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Additional supervisors
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Annette Köhler
Thomas Köllner

Doctoral students
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Michael Curran
Laura de Baan

Postdoctoral student
Karin Bartl

Collaborators
Marion Cheatle, UNEP
Guido Sonnemann, UNEP

Duration
July 2009 – June 2012



Cloud forest – A pristine ecosystem, Costa Rica

Furthermore, we will provide decision-support tools that indicate potential measures for reducing the impact. In some cases, this might occur by improving production efficiencies or by shifting production to alternative places. If this is not possible, a financial compensation scheme could allow for offsetting damages induced to biodiversity by the consumers. Such a compensation scheme would lead to a flow of money from the North to the South, fostering sustainable development in lower- and middle-income regions.

We will assess agricultural products purchased by consumers with respect to their environmental impact, covering the complete life cycles of products. Based on this assessment, possibilities and projects for compensating these impacts on biodiversity will be identified. We will design offsetting schemes that are ecologically and economically efficient so that they are directly applicable. For example,

companies in the retail sector will be able to use these schemes as incentive programmes for their customers. In this way, our work will allow for a reduction of the indirect, “virtual” impact on ecosystems caused by consumption in countries such as Switzerland.

In addition, the project will contribute to a better scientific understanding of cause-effect chains of loss in biodiversity. It will develop innovative approaches for the quantification of impacts due to water and land use in agricultural production. We are lacking such methods for consistent application on the global scale, which would enhance existing environmental assessment tools such as life cycle assessment (LCA). The new methods developed within the project will be applied to a number of case studies in order to illustrate their implementation and to provide environmental decision-support for these sample cases. The studies comprise cases for local decision-making, thus contributing to capacity-building in the partner countries. They also include internationally produced and traded agricultural goods.

The project will be conducted in collaboration with UNEP. With its international networks, UNEP will support the project in setting up case studies and in disseminating research results. The project stems from the collaboration rooted in the Memorandum of Understanding. The kick-off workshop of this flagship project will be held at the UNEP headquarters in Nairobi in July 2009.



Cultural landscape in the central Andes –
A man-made ecosystem, Peru

In addition to the research programme on livestock systems and the activities related to the MoU with UNEP, the North-South Centre provides small seed money grants. These grants serve to prepare new projects or to develop new institutional partnerships.

Furthermore, they strengthen impact generation by enabling the initiation of the implementation of given research results. The seed money projects are always carried out in a partnership between scientists from the ETH Zurich and scientists from developing countries.

Life cycle assessment of milk produced in the highlands and coastal areas of Peru

Seed money for the preparation of a new project (Michael Kreuzer)

Karin Bartl (Institute of Animal Science) collaborated with Carlos A. Gómez (Universidad Nacional Agraria La Molina, Peru) and Thomas Nemecek (ART, Switzerland). They carried out a life cycle assessment in order to compare the environmental impact of energy-corrected milk (ECM) in typical smallholder farms in the Peruvian highlands and in the coastal area.

All inputs for feeds and milk production were considered. Emissions of gases, nitrates, phosphates, heavy metals and pesticides to air, water and soil were estimated. The highest levels of estimated gaseous emissions (g/l ECM) on the coast were shown for carbon dioxide (6255), methane (32.1) and dinitrogen monoxide (33.1), while 234, 141 and 0.28 g/l ECM of these gases were emitted in the highlands, respectively.

Global warming potential (GWP) is defined as kg carbon dioxide equivalents per litre ECM. GWP was higher in the highlands (10.7) than on the coast (8.8). Milk production, including manure storage and enteric fermentation by cattle, was the main contributor to GWP in the highlands (83% of emissions). On the coast, feed production (35%), milk production (27%) and transport (38%) contributed evenly to GWP. The estimated potential acidification (g sulphur dioxide equivalents/l ECM) and eutrophication (g phosphate equivalents/l ECM) was higher on the coast (23.6 and 6.5 g, respectively) than in the highlands (10.8 and 4.8 g, respectively).

Application of an adapted safe starter culture for sour milk production in Mali

Seed money for impact generation (Christophe Lacroix)

Stephan Wullschleger (Institute of Food Science and Nutrition) worked in collaboration with the Laboratoire Central Vétérinaire Bamako (Mali) in order to initiate the implementation of the research findings resulting from his doctoral dissertation.

The Malian sour milk “fènè”, traditionally produced by spontaneous fermentation, is evolving from domestic to small-scale commercial production. The putative human pathogen *Streptococcus infantarius* subsp. *infantarius* has been identified as the main acidifier in traditional fènè fermentation processes and must be replaced.

We substituted *St. thermophilus* culture for the development of safe adapted starters. At 30°C and 35°C, a starter consisting of *St. thermophilus*, *Lb. fermentum*, *Lb. plantarum*, *Lactococcus lactis* subsp. *lactis* and *Weissella paramesenteroides* displayed high antimicrobial activity to *Listeria ivanovii* HPB28 and *Enterococcus faecalis* DSM 2048^T. Furthermore, it displayed high acidification and stability during five back-slopping cultures at 35°C and 40°C and acidified fastest in rural small-scale fermentations at ambient temperature (27–36°C), reaching pH 4.8±0.2 within nine hours. Recontamination was reduced but not eliminated (compared to traditional fermentation). Therefore, standardised protocols are proposed to improve safety and quality in fènè production.



Criollo cows in smallholder milk production systems in the Peruvian highlands



Malian sour milk samples prepared for organoleptic testing

The members of the North-South Centre are involved in numerous activities with partners in developing countries, of which the centre formally manages only a fraction. Notably, several projects of the Competence Center Environment and Sustainability (CCES) of the ETH Domain cover topics related to developing countries with about one third of our members being involved in these projects.

The list on the following pages provides a flavour of the breadth of North-South related activities conducted by the members of the North-South Centre.

Research projects related to developing countries

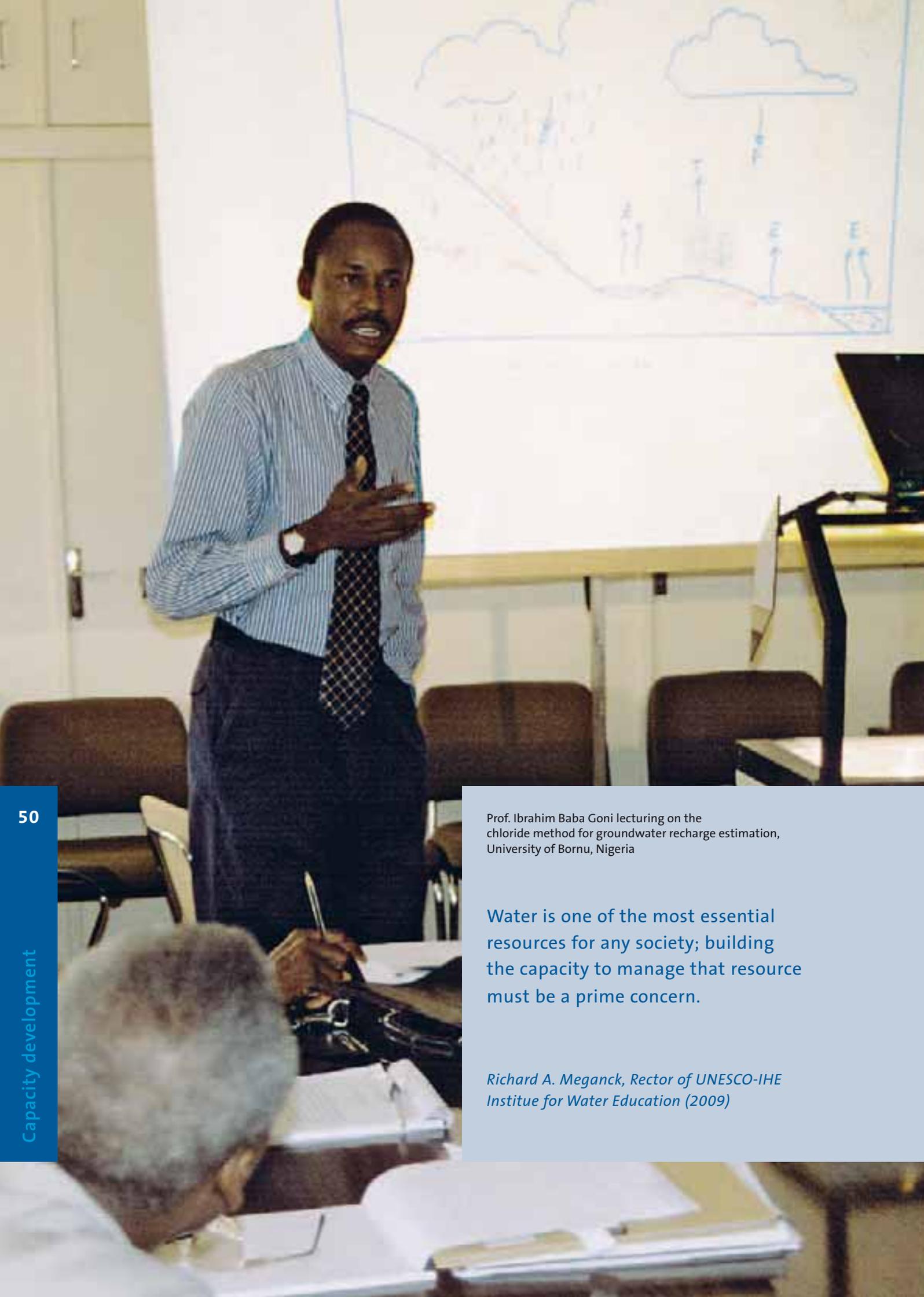
Project leader(s)	Project title	Project partner(s)	Country	Funding sources	Duration
Agricultural and Food Sciences (D-AGRL)					
Agri-food & Agri-environmental Economics					
Bernard Lehmann; Martijn Sonneveld; Bojan Scheurer	Analysis of the SADP (Sustainable Agricultural Development Program) and its influence on the sustainable development in the region of Meegahakivula regarding value-added chains	Peradeniya University, Sri Lanka	Sri Lanka	Internal funding	09/07 – 02/08
Bernard Lehmann; Michel Dumondel; Hermann Comoe	Analysis of socio-economic determinants of the sale of bovines in northern Côte d'Ivoire	Dao Daouda, Centre Suisse de Recherches Scientifiques (CSRS) en Côte d'Ivoire	Côte d'Ivoire	Scholarship ETH Zurich	09/08 – 06/09
Agronomy and Plant Breeding					
Peter Stamp	The dynamics of female flowering and grain set in sweet corn	S. Jampatong, Kasetsart University	Thailand	Internal funding	10/06 – 12/09
Peter Stamp	Protein quality improvement of waxy maize by incorporation of QPM in South East Asia	S. Jampatong, Kasetsart University, Ham Le Huy, Institute for Agricultural Biotechnology, Vietnam	Thailand, Vietnam	Internal funding	10/07 – 12/10
Animal Nutrition					
Svenja Marquardt; Michael Kreuzer	Characterisation of the value and utilization of forage plants on tropical wood pastures: the case of the Bolivian Chaco and Subandino	H. Alzérreca, S. Beck, C. Vacaflores, M. Mendoza, Universidad Católica de Bolivia; Herbario Nacional de Bolivia	Bolivia	VELUX Foundation	10/04 – 03/09
Michael Kreuzer	Development of a fertility-enhancing supplement for breeding bulls and cows based on the Andean plant species Maca (<i>Lepidium meyenii</i> Walp.)	C. Clément, ETH Zurich; I. Manrique, T. Bernet, International Potato Center (CIP), Lima, Peru; D.D. Ponce Aguirre, National University Daniel Alcides Carrion, Cerro de Pasco, Peru; I.A. Khan, B. Avula, University of Mississippi, USA; U. Witschi, Swissgenetics, Mülligen, Switzerland	Peru	Public institutions	12/07 – 11/10
Florian Leiber	Impact of increasing the complexity of forage composition in ruminant feed on ruminal biohydrogenation	A. Jayanegara, S. Marquardt, C.S. Soliva, ETH Zurich; E. Wina, Indonesian Research Institute for Animal Production, Bogor, Indonesia	Switzerland, Indonesia	DIKTI scholarships for Indonesian Lecturers of the Indonesian Government	12/08 – 11/11
Frigga Dohme; Michael Kreuzer	Renaissance of a neglected forage plant: Nutritional and anthelmintic potential of sainfoin	C.S. Soliva, ETH Zurich; B. Azuhwi, H.D. Hess, Agroscope Liebefeld-Posieux (ALP); Beat Boller, Agroscope Reckenholz-Tänikon (ART); M. Martens, Eric Schweizer AG; I. Mueller-Harvey, University of Reading, UK	Switzerland	Public institutions	06/08 – 05/11

Project leader(s)	Project title	Project partner(s)	Country	Funding sources	Duration
Animal Nutrition, continued					
Florian Leiber	Assessment of natural pasture resources (essential nutrients) in endemic mountain regions with respect to nutritional balance and quality of sheep milk and dairy products (white brine cheese, yellow cheese, yogurt)	Ljubomir Angelov, Tsonka Nedelcheva, Venelin Kafedjiev, Institute of Cryobiology and Food Technology, National Centre for Agricultural Science, Sofia, Bulgaria	Bulgaria	SNF-SCOPES	01/06 – 03/09
Carla S. Soliva	Development and application of molecular techniques to enhance the utilisation of tanniferous forages by ruminants	T. Seresinhe, B. Piya-digama, R.A.U.J. Marapana, Department of Animal Science, University of Ruhuna, Sri Lanka	Sri Lanka	University of Ruhuna, Sri Lanka; ETH Zurich	02/08 – 12/09
Applied Entomology					
Silvia Dorn	Sustainable cactus moth management: Dispersal and SIT	K. Bloem, USDA-ARS, USA; North American Plant Protection Organization (NAPPO), Canada; IAEA, Austria; Mexican Government	Mexico, USA	USDA-ARS; NAPPO; IAEA	2006 – 2008
Consumer Behaviour					
Thomas Brunner	Perceived risks and benefits of different nanotechnology foods and packaging in Mexico	Esperanza Lopez, Universidad Autonoma del Estado de Morelos, Facultad de Psicologia, Mexico	Mexico	Internal funding	05/08 – 11/09
Food Biotechnology					
Leo Meile	Modelling of cassava mash fermentation for “attiéké” production based on a comparative study of the traditional spontaneously fermented inoculum and selected microbial starter strains	G. Amani, Université Abobo-Adjamé, Abidjan, Côte d’Ivoire	Côte d’Ivoire	KFPE Bern	02/08 – 06/08
Leo Meile; Christophe Lacroix	Diversity of microorganisms in sourmilk products of Mali and development of standardized starter cultures	Institut du Sahel, Bamako, Mali; B. Bonfoh, LCV Bamako, Mali; J. Zinsstag, Swiss Tropical Institute, Basel, Switzerland	Mali	ETH Zurich	10/05 – 03/09
Leo Meile; Christophe Lacroix	The cassava product “attiéké”: Microbiological diversity, impact on quality and safety and development of a controlled fermentation process	Centre Suisse de Recherches Scientifiques (CSRS) en Côte d’Ivoire; G. Amani, Université Abobo-Adjamé	Côte d’Ivoire	ETH Zurich	06/05 – 11/08
Grassland Science					
Michael Scherer-Lorenzen	BEF CHINA Forschergruppe (Biodiversity and Ecosystem Functioning)	Several German and Swiss partners, Chinese Academy of Sciences, various Chinese universities	China	DFG; CAS	2008 – 2010
Michael Scherer-Lorenzen; Jan Jansa	FUN_DIV: Functional significance of tree diversity for nutrient dynamics in a tropical plantation	B. Turner, STRI, Panama; C. Potvin, Mc Gill University, Canada	Panama	SNF	03/06 – 02/10

Project leader(s)	Project title	Project partner(s)	Country	Funding sources	Duration
Nutrition Biology					
Caspar Wenk	Lignin to reduce ammonia losses	K. Samarasinghe, University of Peradeniya, Sri Lanka; B. Bucher, ETH Zurich	Sri Lanka	ETH Zurich; Federal Office for Agriculture BLW	01/09 – 12/09
Plant Nutrition					
Else Katrin Bünemann; Emmanuel Frossard	Composition and dynamics of bacterial phosphorus in phosphorus-deficient soils	L. Bakken, University of Norway; A. Bationo, African Network for Tropical Soil Biology and Fertility (AfNet), Kenya	Norway, Kenya	SNF	10/07 – 04/10
Biology (D-BIOL)					
Plant Biotechnology					
Wilhelm Gruissem	Biocassavaplus	Shanghai Center for Cassava Biotechnology; University of Bath, UK; Donald Danforth Plant Sciences Center, St. Louis, USA; IITA, Nigeria; CIAT, Colombia	International	Bill & Melinda Gates Foundation	2005 – 2010
Civil, Environmental and Geomatic Engineering (D-BAUG)					
Groundwater and Hydromechanics					
Wolfgang Kinzelbach	Sustainable water and land management of the Okavango Delta, Botswana	Department of Water Affairs, Botswana; Harry Oppenheimer Research Centre of the Okavango Delta, Botswana; Technical University of Denmark, Lyngby	Botswana	SNF	10/04 – 03/09
Wolfgang Kinzelbach; Rolf Kappel	Management of soil salinisation in Sinkiang, China	Institute of Geo-Environmental Monitoring, Beijing, China; Agricultural University of Xinjiang, Urumqi, China; Flinders University, Adelaide, Australia	China	ETH Zurich (D-BAUG, FILEP)	01/03 – 12/09
Earth Sciences (D-ERDW)					
Structural Geology and Tectonics					
Jean-Pierre Burg	Structural and rheological evolution of an accretionary wedge: The Makran	Geological Survey of Iran	Iran	SNF	09/07 – 08/09
Jean-Pierre Burg	Double subduction: Numerical modelling of the tectonic interplay and magmatic productivity with application to the paired Karakoram and Kohistan Arcs	University of Lahore; Pakistan Museum of Natural History	Pakistan	ETH Zurich	10/07 – 09/10
Jean-Pierre Burg	Morphological stability of accretionary wedges: Record from the river system and morphotectonics of the Iranian Makran	Geological Survey of Iran; Teheran University, Iran	Iran	ETH Zurich	09/08 – 08/11
Jean-Pierre Burg	Digital geological and natural hazard maps of the Inner Tien-Shan (Kyrgyzstan)	Geological and Seismological Services of Kyrgyzstan	Kyrgyzstan	SNF	11/05 – 11/08

Project leader(s)	Project title	Project partner(s)	Country	Funding sources	Duration
Environmental Sciences (D-UWIS)					
Aquatic Chemistry					
Bernhard Wehrli; Thomas Bernauer; Peter Edwards; Rolf Kappel; Wolfgang Kinzelbach; Alfred Wüest	African Dams Project (ADAPT): Adapt planning and operation of large dams to social needs and environmental constraints – An integrated water resource management study in the Zambezi Basin	Anton Schleiss, Federal Institute of Technology Lausanne (EPFL); Imasiku Nyambe, University of Zambia; Zambezi River Authority; Zambia Electric Supply Company (ZESCO); Zambia Wildlife Authority (ZAWA); Ministry of Energy and Water, Zambia	Zambia	CCES; Eawag	09/06 – 12/11
Aquatic Physics, Eawag					
Alfred Wüest; Martin Schmid	Nutrient cycling and methane production in Lake Kivu	Pascal Isumbisho, Fabrice Muvundja, Institut Supérieur Pédagogique de Bukavu, DR Congo; Faculty of Science, National University of Butare, Rwanda	Rwanda, DR Congo	SNF; Deza	01/06 – 12/08
Alfred Wüest; Martin Schmid	Study on restratification of the reject water after methane extraction in Lake Kivu, Rwanda	Augusta Umutoni, Ministry of Infrastructure, Government of Rwanda	Rwanda	Belgium Technical Cooperation	01/08 – 07/09
Ecosystem Management					
Jaboury Ghazoul	Ecological and genetic processes underlying the conservation of rare endemic plants in the Seychelles	Ministry of Environment, Government of Seychelles; Seychelles Botanic Gardens	Seychelles	ETHIIRA, ETH Zurich	04/08 – 03/10
Jaboury Ghazoul	Mechanisms of species coexistence in tropical rain forests: Evaluating the regeneration niche	Sepilok Forest Research Centre, Malaysia; University of Aberdeen, UK	Malaysia	Natural Environment Research Council, UK	04/07 – 03/10
Jaboury Ghazoul	Evaluating mechanisms of species coexistence among tropical trees: The paradox of generalist species	Sepilok Forest Research Centre, Malaysia; University of Aberdeen, UK	Malaysia	TH Grant, ETH Zurich	10/06 – 12/09
Jaboury Ghazoul	Determining the role of mycorrhizal fungi in determining the outcome of niche differentiation in dipterocarps	Sepilok Forest Research Centre, Malaysia; Forest Research Centre, Malaysia	Malaysia	TH Grant, ETH Zurich	04/08 – 03/11
Jaboury Ghazoul	Integrating ecosystem services into coffee agroforestry management systems in India	French Institute, Pondicherry, India; College of Forestry, Ponnampet, India	India	Professorship of Ecosystem Management	04/06 – 12/09
Jaboury Ghazoul	Modelling impacts of oil palm expansion on biodiversity in Indonesia	National University of Singapore; PT Musim Mas, Indonesia	Indonesia	ETH Research Fellowship	04/08 – 03/11
Jean-Pierre Sorg; Bronislav Ivanovitch Venglovsky	ORECH-LES: Biodiversity and sustainable management of Kyrgyzstan's walnut-fruit forests. Development of new silvicultural approaches	Groupe de foresterie pour le développement, ETH Zurich; D. Sakbaev, D. M. Mamadjanov, Forest Research Institute Bishkek; KIRFOR, Intercooperation Bishkek	Kyrgyzstan	Various sources	08/99 – 12/10

Project leader(s)	Project title	Project partner(s)	Country	Funding sources	Duration
Ecosystem Management, continued					
Jean-Pierre Sorg; Gabrielle Rajoelison	Aménagement et gestion de grands espaces forestiers en zone sèche à Madagascar	Groupe de foresterie pour le développement, ETH Zurich; Ecole Supérieure des Sciences Agronomiques Antananarivo, Madagascar; Centre de Formation Professionnelle Forestière, Morondava, Madagascar	Madagascar	Various sources	2005 – 04/09
Environmental Philosophy					
Gertrude Hirsch Hadorn	Structuring the science-policy nexus in sustainability research	CDE, University of Berne; NCCR North-South; ZALF, Germany; INRA, France	India, Kenya, Tanzania, Ethi- opia, Nigeria, Madagascar	ETH Zurich internal grant; Internal funding	04/08 – 03/12
Environmental Policy and Economics					
Stefanie Engel; Charles Palmer	Climate change, land use and external changes	Environment for Develop- ment, CATIE Costa Rica	Costa Rica	CCES	08/08 – 07/11
Charles Palmer; Stefanie Engel	The effectiveness of Community Conservation Agreements in the periphery of Lore Lindu National Park in Sulawesi, Indonesia	S. Schwarze, Universität Göttingen, Germany; Alex Pfaff, Duke University, USA	Indonesia	PEPE; ETH Zurich	Continuous
Renate Schubert; Stefanie Engel	CLIMPOL, Subproject: Designing payments for environmental services under uncertainties	CATIE, Costa Rica	Costa Rica	CCES; ETH Zurich	01/08 – 12/11
Humanities, Social and Political Sciences (D-GESS)					
NADEL					
Isabel Guenther	Randomized impact evaluation of water interventions	Amsterdam Institute for International Development	Benin	KfW; IOB	12/08 – 12/10
Isabel Guenther	Sanitation and hygiene in developing countries	Harvard School of Public Health, Boston, USA	Sub-Saharan Africa	Internal funding	since 08/08
Isabel Guenther	Risks, uncertainty and wellbeing in developing countries	Goettingen University, Germany	Thailand, Vietnam	DFG	01/07 – 06/10
Isabel Guenther	Differential mortality in Sub-Saharan Africa	Goettingen University, Germany	Sub-Saharan Africa	Internal funding	since 06/08
Isabel Guenther	Social interactions, mortality and fertility	Harvard School of Public Health, Boston, USA	Various	Internal funding	since 12/07
Economic Research					
Renate Schubert	Institutional economics of the Clean Development Mechanism	Markus Ohndorf; Moritz Rohling	Switzerland	Internal funding	06/06 – 05/10
Renate Schubert	Bioenergy and sustainable land use	WBGU	Various	Internal funding	2/07 – 12/08
Mechanical and Process Engineering (D-MAVT)					
Energy Science Center					
Daniel Spreng	Workshop on clean cooking fuels	International Association of Energy Economics; W. Foell, University of Wisconsin, USA; H. Zerriffi, University of British Columbia, Canada	International workshop held in Turkey	BP International	07/07 – 07/08



Prof. Ibrahim Baba Goni lecturing on the chloride method for groundwater recharge estimation, University of Bornu, Nigeria

Water is one of the most essential resources for any society; building the capacity to manage that resource must be a prime concern.

Richard A. Meganck, Rector of UNESCO-IHE Institute for Water Education (2009)

Capacity development

Capacity development is one of the main activities of the North-South Centre. To cover the different needs of its target group, the Centre utilises a variety of instruments which embrace various levels of the academic career. Currently, the emphasis of the North-South Centre capacity development activities is on the doctoral level.

Capacity development is one of the main fields of the North-South Centre. In principle, it can target three different levels: individuals, institutions or the enabling environment. The North-South Centre's activities take place mainly at the individual level, supporting both scientists from developing countries who are collaborating with the ETH Zurich and researchers from the ETH Zurich dealing with development-related topics. To satisfy the different needs of scientists at different stages in their careers, a variety of instruments have been established. Thus, the North-South Centre's instruments embrace nearly an entire scientific career.

At the Master level, the activities have focused on exploring opportunities of new Master courses and funding instruments for candidates from developing countries. The North-South Centre has supported the preparation of the new Master of Advanced Studies in Sustainable Water Resources targeting students from the South, in particular from Latin America. Key stakeholders such as the Rectorate of the ETH Zurich, the ETH Foundation or private foundations have been contacted concerning scholarships for Master students from developing countries. Important strategic discussions have taken place and will be continued during 2009.

With two scholarship programmes and a colloquium for doctoral candidates, the emphasis of the North-South Centre's capacity development activities currently is on the doctoral level. These opportunities are open to both students from developing countries and from Switzerland. The "Research Fellow Partnership Programme" (RFPP) provides scholarships for young scientists dealing with development-related topics within agriculture, forestry and natural resource management. In 2008, 18 doctoral and post-doctoral fellows were supported by the RFPP. The "Sawiris Scholarships – Science & Technology for the South" programme has only recently been established and the first fellows will be selected in 2009. These scholarships support doctoral research projects dealing with a method or

product which is of direct use to the poor people in the South. The colloquium "Selected aspects of sustainable development", eventually, offers a platform for doctoral students to present their research to an interdisciplinary audience. It has been held annually for six years now and has been attracting a growing audience of scientists involved in development-related research.

For mid-career scientists, several especially tailored instruments are available: The North-South Centre allocates seed money for the launch of new projects and funds teaching stays at universities in the South. This opportunity is not only open to active professors from the ETH Zurich, but as well to its emeriti. To promote an exchange in both directions, scientists from the South are offered the opportunity to do research or teach at the ETH Zurich as visiting scientists.

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Research Fellow Partnership Programme for Agriculture, Forestry and Natural Resources

The Research Fellow Partnership Programme for Agriculture, Forestry and Natural Resources is funded by SDC and managed by the North-South Centre. In 2008, it enabled 18 young scientists to pursue their development-related research at the doctoral or post-doctoral level. Of the 16 ongoing projects, six were started in 2008: Sandra Contzen analyses the poverty reduction strategy implemented in Honduras since 2001 in view of small farmers' situations. Marc Zoss' project also deals with small farmers, though in Tanzania. He investigates how they can be successfully integrated into vegetable value chains. Two of the new projects are concerned with forest management: Devesh Rustagi aims at providing policy-makers with new insights on participatory forest management by conducting economic experiments in Ethiopia, whereas Zora Urech and Mihajamanana Fetra Rabenilalana explore the role of forest fragments for villagers and for biodiversity in Eastern Madagascar in order to develop new management models.

Carina Cavalcanti works with fishermen in a natural reserve in Brazil to investigate the role of cooperativeness in the adoption of sustainable common resource management. East Coast Fever is in the focus of Cassandra Olds' project, which explores ways to avoid the infection of cattle with *Theilaria parva* by means of a new vaccine.

Two fellows successfully accomplished their research projects in 2008: Changhu Wang completed his post-doc on the development of an *in vitro* protocol for the production of cassava doubled-haploids in collaboration with CIAT, the ETH Zurich und the South China Institute of Botany (SCIB). Currently, he is working for the South China Botanical Garden of the Chinese Academy of Sciences. Ricardo Oliva Perez obtained his doctoral degree realising a project on *Phytophthora infestans*. The research was carried out in collaboration with the ETH Zurich and CIP. He continues his research at the John Innes Centre in Colney, England.



RFPP research fellows (top row from left to right): Atti Tchabi, Markus Schneider, Sajad Bukobero, Lanto Herilala Andriambelo, Clémence Dirac Ramohavelo, Valéry Kouamé Hgaza Kouassi. (Middle row from left to right): Apollin Fotso Kuate, Peter Njoroge Njau, Christine Flury, Marco D'Alessandro, Martin Jemo, Cassandra Leah Olds. (Bottom row from left to right): Carina Cavalcanti, Sandra Contzen, Marc Zoss, Devesh Rustagi, Zora Lea Urech, Mihajamanana Fetra Rabenilalana

Mycorrhizal fungi for improved yam growth and reduced yam nematode infestation

The arbuscular mycorrhiza (AM) is the most widely occurring and important microbial symbiosis for agricultural crops. It is well known for its facilitation of plant mineral nutrient uptake, particularly under conditions of phosphorus-limitation, as is common in tropical soils due to leaching and/or severe immobilisation. Moreover, AM is believed to improve plant-water relations and resistance against pathogens. Yam (*Dioscorea* spp.) is the most important tuber crop in West Africa, particularly in Benin and Togo. Alarming, over the last years, the annual yam production per hectare has been decreasing considerably due to a loss of soil fertility and nematode damage. The present project aims at studying indigenous arbuscular mycorrhizal fungi (AMF) with respect to yam growth promotion and yam nematode damage.

Our studies illuminated the wide and diverse AMF species richness in yam. The use of *D. cayenensis* and *D. rotundata* as bait yielded 28 and 29 AMF species. They were identified through spore morpho-typing after 8 months of AMF trap culturing on the two yam species. The AMF actually colonising *D. rotundata* roots were also studied in the field using a novel field sampling procedure for molecular analyses. Multiple phylotaxa were detected that corresponded with the spore morphotypes observed. We therefore hypothesised that the legacy of indigenous AMF from the natural

savanna plays a crucial role for yam productivity, particularly in the traditional low-input farming systems prevailing in West Africa.

Therefore, the specific goal of the final year of the present project was to assess the interaction between yam and AMF in the presence or absence of nematodes. We used yam viroplants or minisets, which were inoculated with indigenous single spore derived isolates (total of 27) from nine AMF species. We found yam to be highly colonised by a multitude of AMF species. Upon inoculation of yam with a single spore AMF inoculum product, we generally observed an increased tuber dry weight (TDW) formation. In the presence of nematodes (*Scutellonema bradys*, *Meloidogyne incognita*), inoculation of AMF significantly increased yam growth and TDW formation while multiplication of *S. bradys*/*M. incognita* was suppressed. Application of AMF also resulted in improved quality of yam tubers when challenged with nematodes. This was not the case with nematode inoculation without AMF, indicating the positive effect of AMF on yam productivity. The results provide exciting prospects for African crop production.

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Research fellow

Atti Tchabi, University of Basel, Switzerland

Supervisors

Andres Wiemken and Fritz Oehl,
University of Basel, Switzerland;
Danny Coyne, IITA, Nigeria

Collaborators

Fabien Hountondji, IITA, Benin;
Paul Mäder, FiBL, Frick, Switzerland;
Robert Asiedu, IITA, Nigeria

Duration

September 2004 – September 2008



Atti Tchabi and Fabien Hountondji sampling yam roots for DANN extraction of the associated mycorrhizal fungi

Drinking water treatment using extracts from *Moringa oleifera*

Seeds from the pan-tropical tree *M. oleifera* contain a distinct group of water-soluble low molecular weight proteins (<10kDa), which are highly cationic (pI>11) in the pH range of water. This protein group interestingly commands the same water clarifying activity as Aluminium sulphate (Alum), which is a widely used coagulant in water treatment processes all over the world. Unfortunately, the provision of treated water in many developing countries heavily depends on imports of Alum. The Swiss Federal Institute of Technology in Lausanne (EPFL) has designed a robust extraction procedure to potentially produce an *M. oleifera* bio-coagulant. This bio-coagulant would be produced from the seed press-cake after the extraction of high quality edible oil. This dual exploitation of the seeds, producing the bio-coagulant and selling the seed oil, is believed to be economically competitive with Alum.

The present project in Tanzania explores the applicability of a locally producible bio-coagulant for drinking water treatment to substitute imported commercial coagulants. In particular, the project focuses on the applicability in countries of the seasonally dry tropics, where the drought-tolerant Moringa tree can be easily cultivated in agro-forestry systems. Of major interest is (i) the impact of the local tree provenance source on the performance of the bio-coagulant, (ii) the effectiveness of the bio-coagulant according to

international (WHO) water quality standards, and (iii) a risk assessment for the use of the bio-coagulant in drinking water treatment processes.

The data obtained from laboratory assays during 2008 revealed a considerable larvicide activity when high dilutions of the bio-coagulant were added to water containing *Aedes aegypti*, *Anopheles gambiae s.s.*, and *Culex quinquefasciatus* larval stages. The observed larvicidal activity against disease-transmitting vector species, which are known to breed in artificial containers including domestic water storage containers, could be an additional argument supporting the development of a locally producible *M. oleifera* bio-coagulant.



Milcah Gitau, responsible for the mosquito insectary at ICIPE, Kenya

Research fellow

Markus Schneider, EPFL, Switzerland

Supervisors

Christof Holliger, EPFL, Switzerland;
Ian W. Marison, Dublin City University, Ireland;
Tolly S. A. Mbwette, Open University of Tanzania

Collaborators

Jamidu H.Y. Katima, Sixtus Kayombo and
Harishchandra B. Pratap, University of Dar es Salaam, Tanzania;
Ahmed Hassanali, ICIPE, Kenya;
Peter Lüthy, ETH Zurich, Switzerland

Duration

October 2005 – September 2009

Social practices and conservation – Livelihood strategies of forest-dependents

This research project aims at analysing how forest-related policies impact local practices and livelihoods of forest-dependents in Madagascar. Improving the livelihood of these forest-dependents who live in biodiversity-rich areas which are earmarked for conservation is a major challenge. Until the mid 1990s, conservation policies stripped away income and food from already impoverished rural people. As of 1996, a series of measures centred on participation and devolution* were set up, aiming at reconciling conservation and livelihood enhancement.

However, deforestation remains an important issue and livelihoods show no sign of enhancement. Instead, things tend to worsen mostly because of (i) using traditional institutions for political ends and (ii) dealing haphazardly with the dual objective of conservation and livelihood improvement while at the same time neglecting the issue of power. This resulted in a transfer of the symbolic capital and the creation of a new layer of local norms and rules, which have made devolution stand for the common denominator of diverse stakes in a social field wherein conflicts and cooperation appear simultaneously. The gap is still huge between official policy statements, international political commitment and reality at the local level.

Our quantitative survey on forest and farming systems showed a high complementary dependence of households

on all types of livelihood resources. In a given wealth class as well as when all classes are considered as a whole, with few exceptions the various sources of livelihood seem to be independent (i.e. the use of a given forest product is not correlated with the use of another one). However, the importance (LUVI**) of a given source of livelihood depends on the wealth class involved. This reveals a marked contrast between the stated purposes of equity and democracy and the outcomes achieved.

The lessons learned so far show that neither democracy nor equity at the local level can be generated by devolution of natural resources when these political and moral values are absent or exist in name only at the national level. This insight is scientifically and politically significant for the understanding of real or apparent non-compliance with rules that is often observed in areas where devolution processes are underway. It also provides a key to understand the mechanisms that lead to the current gap between objectives and outcomes of conservation policies.

* “Devolution” is defined here as the transfer of rights and responsibilities over natural resources from the state to user groups at the local level.

** The “local user’s value index” (LUVI) of a given product is the numerical translation of the importance in terms of both preference and relative magnitude.

Research fellow

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Supervisors

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Jean-Pierre Sorg, ETH Zurich, Switzerland

Collaborators

Bruce Campbell, CIFOR, Indonesia;
Bruno Ramamonjisoa, ESSA, Madagascar

Duration

May 2005 – January 2009



A common way of diversifying source of income and livelihood: Outsiders selling sweet potatoes in the village of Beronono, Madagascar

Enhancing the livelihood of the local population in a biodiversity hotspot

In the dry region of Central Menabe, along the west coast of Madagascar, clearing has drastically reduced the once large forests. If the deforestation continues at the present rate, the forest will disappear and no longer be capable of ensuring the different services and products it provides to the villagers. It is therefore urgent to intervene in this region with a view to ensuring the sustainability of all forest functions and to filling the needs of a range of stakeholders. In November 2005, we started our project with the main objective of setting up scientific bases for a multifunctional and sustainable management of a forest landscape. We applied research methodology from natural and social sciences.

In different forest plots, we inventoried natural resources used by rural populations. Interviews, scoring exercises, participant observation and surveys with local people allowed us to understand the local and commercial use of natural resources and the rules concerning its utilisation and exploitation. The results show how the rural population depends on the natural resources. In addition, we carried out interviews with other actors involved in central Menabe biodiversity conservation and rural development.

201 tree species have been inventoried, including some important species for the timber market such as *Dalbergia* spp, *Securinega seyrigii* or *Cedrelopsis grevei*. Especially for households that are located near forests, illegal logging could constitute important revenue. From the socio-economic standpoint, agriculture and chicken breeding represent the main activities that insure the rural households' food and financial security. From the ecological standpoint, agricultural clearings and large livestock pastures are the activities generating the most negative environmental impacts. In general, optimisation of agricultural techniques, development of chicken breeding, and improvement of the management of pastures have a high potential to optimise the rural livelihood while decreasing the pressure on biodiversity.

Forest management needs a total integration of the rural population into the planning process if it aspires to balance the need to protect a hotspot of biodiversity with the need to let people live off the forest products. Biodiversity conservation and rural development should be considered side-by-side, taking into account the alternatives specific to each goal.



An old forest area used as rice field in Ankorobato, Madagascar

Research fellows

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Duration

November 2005 – April 2009

Understanding yam (*Dioscorea* spp.) response to fertiliser application

Nitrogen (N) is often one of the limiting nutrients in yam (*Dioscorea* spp.) production. Crop growth response to N application can be predicted by foliar diagnostic techniques. We hypothesised that leaf N content in yam plants would depend on plant growth stage and its nutritional status. The objective of this study was to determine the leaf node to be considered for the best leaf N assessment.

To test these hypotheses, a field experiment was conducted in central Côte d'Ivoire. *D. alata* cv. TDa 95/00010 was grown with and without N fertiliser application in a randomised complete block design. Leaves from the main vines of two healthy plants exposed to sunlight were numbered from the apex (young leaves) to the base (old leaves). Their chlorophyll (C) content was measured with a SPAD (soil plant analytical development) instrument. Furthermore, their leaf conductance was measured. After these measurements, leaves were destructively sampled and their N and C contents determined. Analyses and sampling were done during vegetative growth stage at 75 days after planting (75 DAP), tuber initiation (100 DAP) and tuber bulking phase (130 and 160 DAP).

All parameters varied significantly depending on leaf node and growth stage. While leaf N content decreased rapidly from the youngest leaves (node 1) to leaves nodes 5 to 10 – depending on growth stage and fertilisation level – the

SPAD reading increased. For the old leaves at the base of the vine, both leaf N content and SPAD reading remained fairly constant. Under non-fertilised conditions at 160 DAP leaf N content decreased from the apex to the base of the vine suggesting that N was remobilised. Leaf conductance and leaf C content increased with each node until node 7 and then remained constant from node 8 to 14. Afterwards they declined until the base of the vine. This suggests that leaves from nodes 8 to 14 have higher capacity for photosynthesis and thus will be suitable for leaf N assessment. All parameters differed significantly between growth stages in non-fertilised treatments. Probably due to N application at 90 and 130 DAP, this was not the case in fertilised treatments.

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Research fellow

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Supervisor

Emmanuel Frossard, ETH Zurich, Switzerland

Collaborators

Aké Sévérin, Université de Cocody, Côte d'Ivoire;
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Andres Tschannen and Lucien Diby, CSRS, Côte d'Ivoire

Duration

December 2005 – December 2009



Soil plant analytical development (SPAD) reading

Control options for the African root and tuber scale on cassava

The African root and tuber scale *Stictococcus vayssierei* is a major pest in the forest zone of Central Africa where it infests at least ten cultivated crops with greatest occurrence on cassava. The ant *Anoplolepis tenella* is closely associated with the scale and is thought to be the key factor contributing to the scale's proliferation. One central question that must be addressed when developing scale control options is about the nature of the interactions between this pest and *A. tenella*, and the conditions that promote the abundance of the ant.

We have conducted faunistic studies in the three predominant vegetation types in southern Cameroon – crop fields, fallows, and forests. We found 254 ant morphospecies representing 9 subfamilies and 43 genera. The abundance and distribution of sap-sucking insects and plants with extrafloral nectaries are being investigated because they are possible factors (among others) affecting the structure of the ant assemblage. *A. tenella* was the second most abundant species after *Myrmicaria opaciventris*, and its abundance was positively related to *S. vayssierei* abundance. The highest densities occurred in mixed-crop fields infested with *S. vayssierei*. Moreover, *A. tenella* distribution and abundance appears to be affected by temperature and humidity which might affect its competitiveness in the lowland areas where it is either absent or rare and where *S. vayssierei* is also absent.

In a greenhouse under semi-field conditions, we determined that *A. tenella* actively moves the scale between plants to the extent that the scale crawlers' chances of finding a host plant is enhanced by one order of magnitude in the presence of *A. tenella*. To date, however, we have not found any evidence of phoresy on alate *A. tenella* queens dispersing during nuptial flights. We are presently investigating aerial dispersal of the scale.

We initiated studies with several known ant poisons to determine their effect on *A. tenella* in order to develop means to disrupt ant-scale interactions and thereby control scale populations. Results to date show that liquid boric acid at doses of 0.5% and 1% (water dilution) is effective in producing nearly complete mortality in *A. tenella* workers in less than six days. We are presently screening ant attractants to develop fairly specific baits targeting *A. tenella* and being least disruptive to other co-occurring ants.



Severe African root and tuber scale infestations on cassava

Research fellow

Apollin Fotso Kuate, IITA, Cameroon

Supervisors

Peter Nagel, University of Basel, Switzerland;
Rachid Hanna, IITA, Cameroon

Collaborators

Maurice Tindo, University of Douala, Cameroon;
Georg Goergen, IITA, Benin

Duration

November 2006 – October 2009

Analysis and initial exploitation of resistance to wheat stem rust race Ug99

This project aims at (i) identifying improved wheat germplasm resistant to Ug99 race of stem rust, and (ii) characterising “Avocet/Pavon 76” mapping population for stem rust. In search for wheat germplasm resistant to Ug99, 33 lines selected from the 1st Stem Rust Resistance Screening Nursery (1st SRRSN) and 2nd SRRSN grown during 2007 main and 2007–2008 off-seasons were planted in replicated multi-locational trials in four sites in wheat growing areas in Kenya. The 33 lines were selected from a set of 104 whose gene stipulation had been done using markers at the University of Sydney, Australia in early 2008. Most of the lines contained the genes *Sr2*, *Sr24*, and *Sr31* in addition to some unknown genes. The disease severity ranged between 5% and 40%. The yields ranged between 1 to 4.5 tons per hectare. The best line had a very low disease score (5R) across all sites and an average grain yield of three tons per hectare, which was 27% higher than the best check. Seven of the good lines have been forwarded to the National Performance Trial Committee for final testing before being released as varieties in Kenya. Furthermore, a new nursery, the 3rd SRRSN has been grown for 2008 main and 2008–2009

off-seasons. The initial results of the evaluation show some improvement in the section for adult plant resistance, but less than expected for a major gene type of resistance.

The Avocet/Pavon 76 mapping population, consisting of 298 recombinant inbred lines (RILs) were characterised for Ug99 response in replicated trials during 2007 main and 2007–2008 off-seasons. RILs containing *Sr26* (originating from Avocet), identified based on low reaction and by using the SSR (Simple Sequence Repeats) marker, were excluded from the analysis. The remaining 180 RILs were planted in the 2008 main and 2008–2009 off-seasons. During the two seasons, the disease severity has been too low for good phenotypic data. Thus, we will repeat the experiment in 2009 main season for more reliable data. Of the 180 RILs, 92 were sent for diversity array technology DArT analysis with 458 markers distributed across all the chromosomes. Chromosome 3B had the highest number of markers followed by 6B and 4A. The map development for the Avocet/Pavon population and the QTL (quantitative trait locus) analysis will be performed in 2009.

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Research fellow

Peter Njoroge Njau,
University of Zurich, Switzerland

Supervisors

Beat Keller,
University of Zurich, Switzerland;
Ravi P. Singh, CIMMYT, Mexico

Collaborator

Macharia Gethi, KARI, Kenya

Duration

January 2007 – March 2010



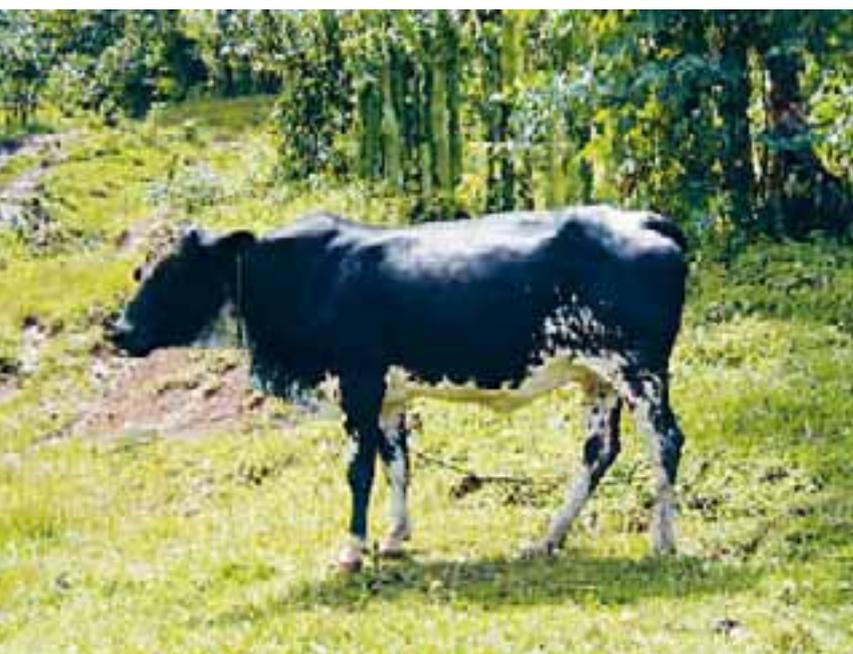
Kenyan farmers admiring some of our new wheat lines with resistance to Ug99

Estimating effective population size for the conservation of African cattle breeds

Demographic information is often lacking for livestock breeds in developing countries. Therefore, effective population size – a major criterion to assess the degree of breed endangerment – cannot be calculated. However, this information is crucial for priority-setting in livestock conservation, and consequently, for a sustainable management of local breeds. In this project a molecular method for the efficient estimation of effective population size is proposed. We are investigating the use of genome-wide single nucleotide polymorphisms to estimate the effective population size of two indigenous African cattle populations and one reference population. This new method was elaborated in a research partnership between the Swiss College for Agriculture SHL, the International Livestock Research Institute ILRI, and the University of Goettingen.

In June 2008, the lab delivered the genotyping results for the reference population (128 samples) and the two African populations – Sheko (51 samples) and N'Dama (38 samples). During a research stay at ILRI in Kenya, the fellow had the opportunity to conduct an initial analysis of the genotypes supported by Miika Tapio. Back in Switzerland, further analysis of the genotyping results was conducted and the simulation study was carried on. The genotyping results permitted the estimation of the effective population size and the derivation of its trend. The genotyping results for the seven chromosomes 2, 4, 7, 9, 12, 20, and 26 are similar for both N'Dama and Sheko breeds. Whereas both breeds show a decreasing effective population size the patterns differ. The effective population size for the N'Dama breed 25 generations ago is estimated to be 210 and 160 for Sheko, respectively.

To finalise the project, Miika Tapio has scheduled a visit in April 2009. This visit is expected to bring the project to a successful end and to lead to many interesting ideas for follow-up projects and collaborations.



Sheko-heifer in Ethiopia

Research fellow

Christine Flury, SHL Zollikofen, Switzerland

Supervisors

Stefan Rieder, SHL Zollikofen, Switzerland;
Olivier Hanotte, ILRI, Kenya;
Henner Simianer,
University of Goettingen, Germany

Collaborator

Miika Tapio, ILRI, Kenya

Duration

February 2007 – March 2009

Exploiting scents of distress: Making maize plants more attractive to beneficial insects

The fall armyworm *Spodoptera frugiperda* (Smith) (Lepidoptera: Noctuidae) is one of the most destructive insect pests of maize in the Americas, where it causes severe economic losses to farmers. In Mexico, this pest is commonly controlled with synthetic insecticides, which pose hazards to the environment and to humans. Thus, biological control of fall armyworm is considered a highly desirable alternative. The aim of our project is to improve biological control in maize against the fall armyworm by exploiting the plants' natural indirect defence mechanisms. When plants are attacked by insect herbivores they respond by emitting specific volatiles that are highly attractive to the natural enemies of the herbivores, such as predators and parasitic wasps. These volatiles also induce defence mechanisms in nearby plants.

During the first part of this project we mainly worked on the isolation of attractive volatile compounds to the parasitoid *Cotesia marginiventris* (Cresson) (Hymenoptera: Braconidae), one of the major parasitic wasp of *S. frugiperda* in Mexico. We tested whether a highly attractive fraction of the emitted volatile blend would attract more parasitic wasps in a maize field at the CIMMYT field station. While we made

significant progress towards a better understanding of the attractiveness of some compounds, we were not able to enhance parasitism rates by applying these compounds in the field.

As a consequence, we used two alternative approaches to enhance biological control. A first approach consisted in spraying plants with benzo-(1,2,3)-thiadiazole-7-carbothioic acid S-methyl ester (BTH), a salicylic acid mimic that interacts with the plant hormone signaling. In the field, we observed higher parasitism rates of *S. frugiperda* feeding on maize seedlings that were treated with BTH compared to larvae on control plants confirming laboratory study results. Thus, BTH might indeed help to improve biological control while simultaneously enhancing the resistance against pathogens. In a second approach we applied dispensers releasing so-called green leafy volatiles (GLVs) into a maize field. These compounds are known to “prime” plants so that they respond faster and stronger upon subsequent herbivore attack. Our data suggest that instead of enhancing biological control, GLVs rather increase the number of plants infested with *S. frugiperda*. Both approaches are currently being repeated in the second field season.

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Research fellow

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Supervisor

Ted Turlings, University of Neuchâtel, Switzerland

Collaborators

Georg von Mérey, University of Neuchâtel, Switzerland;
Kevin Pixley, George Mahuku and Silverio Garcia, CIMMYT, Mexico;
Jörg Degenhardt and Jonathan Gershenzon, Max Planck Institute for Chemical Ecology, Jena, Germany

Duration

May 2007 – September 2009



Maize plant infested with a larva of the fall armyworm

Community structure of mycorrhizal fungi in crops following forest clearance

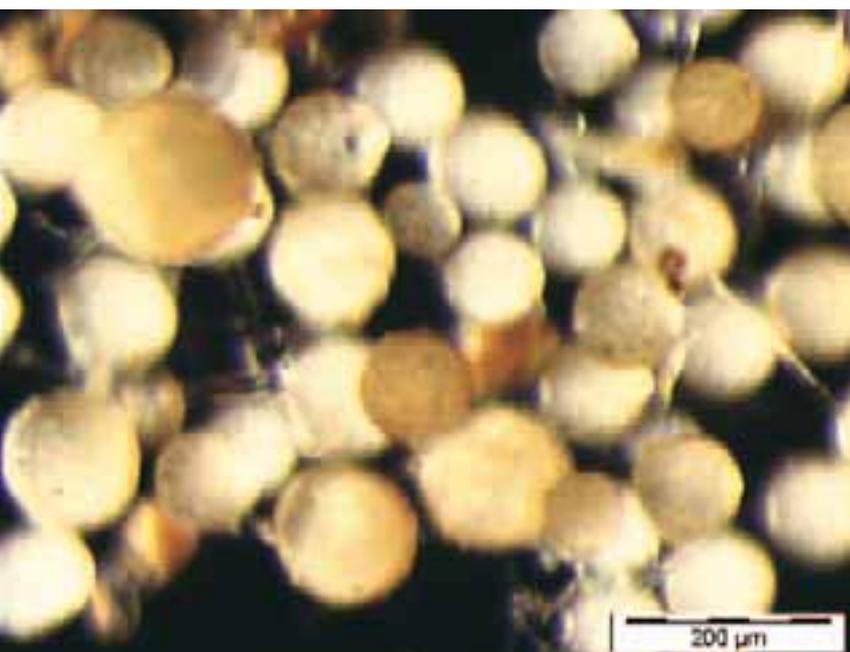
This project aims at discovering a possible relationship between the community composition and activity of arbuscular mycorrhizal fungi (AMF) and yields of maize (*Zea mays* L.) grown on forest, chromolaena fallow, and continuously cropped land.

The field experiment was conducted for three subsequent cropping seasons on the three sites differing in their previous land use. Growth and yield of maize were observed under different phosphorus (P) fertilisation regimes and upon application of a systemic fungicide (benomyl). Grain yield and shoot biomass of maize consistently declined from the first to the third cycle of cultivation and both were positively affected by P fertilisation. Given the difficulty in establishing adequate control plots in the fields with reduced AMF colonisation levels, it was not possible to test the role of AMF in growth and yield of field plants. However, in a subsequent experiment conducted in a greenhouse in Cameroon, application of benomyl consistently reduced the shoot biomass of maize, indicating an important role of AMF in growth of maize in the local soils.

In another greenhouse experiment carried out in Switzerland, we explored the possibility of using the indigenous AMF community from forest, chromolaena fallow, and crop-

ped field to improve growth and nutrient uptake of maize. The soils of different origins were sterilised and then inoculated with non-sterile soils – either from the same land use (back-inoculation) or from different land uses (cross-inoculation). Maize biomass and P contents were always lower when deprived of AMF (sterilised soils) as compared to the inoculated treatments. This further confirmed the important role that AMF have in maize growth in these soils. Surprisingly, the greatest maize growth improvements were observed when the sterilised soil was inoculated with native AMF from fallowed or cropped soil, and not from forest soil.

To substantiate the mechanisms (by which AMF affect growth and nutrition of maize in these soils), efforts were undertaken to isolate pure cultures of AMF from the local soils. Spores of AMF were extracted from previous trap cultures and inoculated on pre-germinated maize seedlings. These were grown in a growth chamber for several months. Nine pure AMF cultures were established and will be used in the last experiment of this project in which we test the contribution of different AMF species to maize nutrition and growth using ^{33}P labelling.



Spores of *Acaulospora scrobiculata* from a pure culture

Research fellow

Martin Jemo, ETH Zurich, Switzerland

Supervisors

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Collaborators

Fritz Oehl, University of Basel, Switzerland;
Robert Abaidoo, IITA, Nigeria;
Dieudonné Nwaga and Adamou Souleymanou, University of Yaoundé, Cameroon;
Jean Kuate, Institute of Agricultural Research for Development, Cameroon

Duration

June 2007 – June 2009

Exploring the effects of anti-tick vaccines on the transmission of *Theileria parva*

Tick-borne diseases (TBD) affect approximately 80% of the world's cattle population. In Africa, they are considered to be the most important veterinary diseases. Mitigating the effects of TBD minimises both the direct and indirect constraints associated with an increased livestock production, which is fundamental to poor, small-scale farmers who rely heavily on cattle stocks. Current trends in tick and TBD control are focusing on anti-tick vaccines, which act by decreasing tick numbers in successive generations, thereby decreasing the rates of TBD transmission.

This project aims at assessing the effects of several *Rhipicephalus appendiculatus* proteins as potential anti-tick vaccine candidates by evaluating their effect on tick biology and their ability to block the acquisition and transmission of *Theileria parva* – the causative agent of East Coast Fever. In addition, our work will focus on identifying novel tick gut and salivary gland proteins that may be used as complementary vaccine candidates.

In 2008, research focused on the *R. appendiculatus* Ra86 protein, the homologue of the *Boophilus microplus* Bm86 gut protein, which forms the basis of the only commercially available anti-tick vaccine. The recombinant Ra86 protein

was produced using the baculovirus protein expression system. Due to protein aggregation, standard purification using immobilised metal affinity chromatography was problematic – despite the presence of a histidine tag. The protein aggregates were recognised by anti-RA86 sera in Western blot analysis but not with anti-his tag antibodies indicating that the tag was inaccessible. Attempts to disrupt the aggregates using standard methods (8M urea) were not successful. This confirms similar observations noted before with Ra86 as well as with its homologues Bm86 and Haa86. Consequently, protein purification was carried out using bulk protein precipitation with ammonium sulphate.

For the immunisation of recruited and screened Friesian cattle, the recombinant protein will be combined with Montanide ISA 50V. Immunised cattle will be challenged with *T. parva*-infected *R. appendiculatus* ticks in order to test protection efficacy. This first vaccine trial is expected to begin in April 2009. It will evaluate the suitability of recombinant Ra86 as an anti-tick vaccine in an autologous host-pathogen interaction system. In addition, it will generate first time data on the interference of *T. parva* transmission using anti-tick vaccines.

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Research fellow

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Supervisors

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Collaborators

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Barend Mans, Onderstepoort Veterinary Institute,
South Africa

Duration

May 2008 – April 2011



Ear tagging of cattle in the Nyeri region of Kenya for use in the vaccine trial at ILRI

The role of cooperativeness in adopting sustainable common resource management

Experimental research has shown that individual cooperation behaviour in social dilemmas often deviates from the predictions of the model of selfish agents. However, it is less clear how such social behaviour relates to the support and successful enforcement of collective rules and policies in the field. For instance, it has not yet been examined how cooperative behaviour in experiments relates to cooperation regarding the management of common resources, or how it relates to voting behaviour concerning the adoption of sustainable resource management policies.

Our research takes place in the context of an environmental programme (EP) targeting fishermen living in a natural reserve in Brazil. In this natural reserve, one of the most important income sources, fishing, is threatened by over-fishing. In addition to catching fish, many fishermen have started to catch shrimp. This has led to the decline of the shrimp population because fishermen use traps which capture large amounts of not yet fertile shrimp. The main objective of this project is (i) to better understand the roles of cooperative and less cooperative fishermen in introducing a new policy for the management of shrimp resources, and (ii) to help policy-makers to design suitable institutions in this regard.

In 2008, fieldwork was conducted with 143 fishermen. It included replacing some of the current traps, and manufacturing less exploitative shrimp traps. Additionally, the behaviour of the participating fishermen was observed in three subsequent steps. First, they were asked to participate in laboratory experiments. Second, they had to vote on participation/non-participation in the programme. Third, they took part in a survey in which we asked questions about their social networks, perceptions and beliefs. This unique sequence of measures with the same individuals will help us to understand the role of experimentally observed cooperative behaviour in the adoption of a sustainable policy.

A first glimpse at the data suggests interesting relationships between laboratory behaviour, survey responses and cooperation in the EP. For instance, a high level of integration in the social network seems crucial for cooperation within the EP. The project may shed light on the reasons why EPs sometimes fail. The results can be used as a device to predict the effects of alternative policy approaches on cooperativeness of a policy intervention. It also promises to contribute to more sustainable management of the fishing resources in a natural reserve in Brazil.



Fishermen with their new shrimp traps

Research fellow

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Elinor Ostrom, Indiana University, USA;
Jose Augusto Tosato,
Secretaria do Meio Ambiente e Recursos Hídricos, Brazil;
Luciano Vaz, Universidade Estadual de Feira de Santana, Brazil;
Marcelo Raseira, ProVárzea – IBAMA, Manaus, Brazil

Duration

May 2008 – April 2010

Understanding the views of poor households in rural municipalities

In Honduras, about half of the population live and work in rural areas dominated by steep hills and mountains. In these areas smallholder farming predominates, mostly on subsistence levels. Access to services and economic opportunities other than agriculture is low, and the poverty rate is very high at 77%. In 2001, Honduras introduced an ambitious poverty reduction strategy (PRS) in order to fight poverty and to receive debt relief. The strategy includes measures such as a general increase in social expenditure, the set-up of a decentralised poverty reduction fund for local projects, or programmes such as access to agricultural land or reactivation of the rural economy. However, neither in rural nor in urban areas did the poverty rates decrease significantly between 2001 and 2008. Mismatches and gaps between the PRS and the local livelihood realities were reported from different sources.

To examine the gap between policies and livelihoods in view of future development strategies, the research focuses on analysing (i) the current livelihood situations and livelihood patterns of poor households, (ii) the content and implementation of the PRS and related development interventions, including involvement of poor people and power distribution in decision-making, and (iii) the congruence between the livelihood situation and the PRS formulation and implementation. All three aspects are examined in two rural municipalities in Honduras.

During the first two fieldwork periods, the two municipalities in western Honduras have been selected through an analysis of secondary data and complemented with expert as well as key informant interviews. Then, using a landscape and history mapping approach, an overview of the municipalities was generated. This focused on aspects such as natural resources, economic potentials, services, as well as development programmes and agencies active in the study areas. A brief household survey was conducted that will serve, on the one hand, to complete the landscape and history mapping. On the other hand, it will be the basis for selecting the sample for the qualitative life history interviews. During the next field stay, the implementation process of PRS-related projects at local levels will be subject to analysis.

Research fellow

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University of Zurich and SHL Zollikofen, Switzerland

Supervisors

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Urs Geiser, University of Zurich, Switzerland;
Urs Scheidegger, SHL Zollikofen, Switzerland

Collaborators

Axel Schmidt, CIAT, Nicaragua;
Arie Sanders, University Zamorano, Honduras;
Andrea Flück and Rudi von Planta, SDC, Honduras

Duration

June 2008 – May 2011



Decentralised PRS funding is often allocated to rural electrification projects

Governance, collective action and development interventions in vegetable value chains

High-value agriculture is the fastest growing agricultural sector. Typical high-value agricultural products include fish, meat, dairy products, and vegetables. As opposed to traditional commodities, these products have relatively high unit values and a high income-elasticity of demand. In addition, they are rather labour-intensive, require high food safety, have to adhere to strict quality specifications, and need to be integrated in well-coordinated supply-chains.

The rapidly increasing demand for high-value products, in particular vegetables, is stimulated by altered consumer preferences and growing health and food safety awareness both at the global level and in developing countries. In developing countries, the demand for high-quality vegetable produce is stipulated by the rapid urbanisation and the emergence of a middle-class of relative wealth. Participation in these value chains offers considerable opportunities to smallholders, as vegetable value chains provide income and employment opportunities – primarily for female workers. For the consumers, they provide significant health benefits. Despite considerable efforts by development agencies to link African smallholders to global vegetable value chains, for example in Kenya, a high dropout rate of smallholders has been reported. By explicitly targeting the domestic vegetable value chains in Northern Tanzania we hope to achieve smallholder participation more easily.

The project aims at identifying, mapping and analysing the domestic and export-oriented vegetable value chains in Tanzania and assessing the opportunities and constraints for smallholder integration. Particular attention is given to (i) the governance modes along the value chains, (ii) the collective organisation of smallholder producers, and (iii) the effectiveness of interventions by external facilitators. With this perspective in mind we expect to gain important information on how to effectively integrate smallholders into lucrative vegetable value chains. The project follows a comparative case study analysis. Currently, we are compiling a list of potential vegetable value chains based on literature review and a field study. At the same time, we are developing a set of selection criteria that will be used to select the final sample for the in-depth analysis in the second year.



Traditional wholesale market in Morogoro, Tanzania

Research fellow

Marc Zoss, ETH Zurich, Switzerland

Supervisor

Bernard Lehmann, ETH Zurich, Switzerland

Collaborators

Sophie Réviron, ETH Zurich, Switzerland;
Abdou Tenkouano, World Vegetable Center AVRDC, Tanzania;
Katinka Weinberger, World Vegetable Center AVRDC, Taiwan;
Andrew Temu, Sokoine University of Agriculture, Tanzania

Duration

August 2008 – July 2011

Economic incentives for the conservation of coffee forests

Overcoming social dilemmas associated with the participatory management of commons is considered a major challenge. Lab experiments have shown that conditional cooperation and costly punishment of freeriders can be instrumental in solving social dilemmas. Though the lab evidence is strong, it is less clear as to how this behaviour affects real world participatory outcomes. Moreover, substantial spiteful sanctioning reported by some lab experiments has raised doubts on the potential of the current form of punishment institutions in sustaining cooperation. This raises the question on what could be appropriate punishment mechanisms for sustaining cooperation.

In this project, we seek answers to these gaps through two sub-projects in the context of participatory forest management (PFM) in Ethiopia. In subproject 1, we examine the link between real-world PFM outcome and measures of: (i) members' tendency to cooperate conditionally, (ii) engagement in costly monitoring, (iii) leaders' tendency to

enforce cooperation norms at a personal cost, and (iv) members' tendency to sanction non-cooperators. In subproject 2, we engage members and their leaders in three different sanctioning mechanisms to study which mechanism discourages freeriding and spiteful sanctioning the most.

Our findings reveal that a higher share of conditional cooperators in a forest-user group has a significantly positive effect on the PFM outcome. This applies even when we control for other determinants of cooperation, such as resource, user and market characteristics. We find that conditional cooperators use costly monitoring as a mechanism to achieve a better forest outcome. We also find that the leaders' tendency to punish non-cooperators has a positive effect on the PFM outcome, but the negative effect of leaders' spiteful behaviour is even stronger. Overall, these factors account for 20% variation in the PFM outcome. This implies that future participatory programmes should consider participants' behaviour for designing institutions.

Research fellow

Devesh Rustagi, ETH Zurich, Switzerland

Supervisors

Stefanie Engel, ETH Zurich, Switzerland;
Michael Kosfeld, Goethe-University, Frankfurt, Germany

Collaborators

Bruce Campbell, CIFOR, Indonesia;
Franz Gatzweiler, CoCE, ZEF, University of Bonn, Germany;
Günther Manske, BIGS, ZEF, University of Bonn, Germany;
Martin Neumann, GTZ Sun Oromia, Addis Ababa, Ethiopia

Duration

September 2008 – February 2010



A forest user society member playing the conditional cooperation game

The importance of forest fragments in local livelihood systems

On the east coast of Madagascar, forests are increasingly being pushed back as a result of the shifting cultivation pursued by the majority of the local land users. Intact forests are reduced by these burning systems and what remains are forest fragments in a mosaic landscape. The current research project will focus on ways to improve the management of forest fragments with regards to biodiversity and local livelihood strategies. At the centre of our research stand (i) the relationship between human beings and forest fragments, and (ii) the management of the forest fragments in this patchwork landscape. The main outputs should be:

- to gain a holistic knowledge about the importance of forest fragments in livelihood systems;
- to describe distribution, texture and diversity of forest fragments;
- to identify reasons for forest degradation and future driving forces;
- to find incentives and new approaches for the management of forest fragments in order to enhance biodiversity and reduce poverty.

The information should allow us to analyse the extent to which a sustainable use of forest fragments is compatible with the local livelihood systems. The information gathered

will help the local NGO Association Intercooperation Madagascar AIM to realise participatory management of forests in this area. We are two doctoral students from Madagascar and Switzerland who will conduct the study (covering an ecological and a socio-economic topic, respectively).

During the first fieldwork period of five months we presented the project in each village we are working in. In addition, we collected information on socio-economic aspects concerning forest fragments. We applied the sustainable livelihood approach in order to gain a holistic view on the importance of forest fragments in the local livelihood systems. Throughout the fieldwork we were in contact with the local organisations in order to exchange information and to compare the project framework with local systems.

Based on the first analyses of the research results achieved so far, we drew the conclusion that forest fragments have an important role in the livelihood systems. However, shifting cultivation is so important that, currently, preserving forest fragments in order to harvest forest products is no alternative. If we want to find approaches for sustainable management of forest fragments without completely changing existing livelihood systems, we have to (i) consider different land use types, and (ii) involve the landscape as a whole in our future research.



A villager preparing palm leaves for building the roof of a house

Research fellows

Zora Lea Urech, ETH Zurich, Switzerland;
Mihajamanana Fetra Rabenilalana, ESSA, Madagascar

Supervisors

Jaboury Ghazoul, Jean-Pierre Sorg and Hans-Rudolf Felber,
ETH Zurich, Switzerland;
Gabrielle Rajoelison, ESSA, Madagascar

Collaborators

Jean-Laurent Pfund, CIFOR, Indonesia;
Etienne Andriamapandry, AIM, Madagascar

Duration

September 2008 – July 2011

As part of its capacity development activities, the North-South Centre supports visiting scientists and teaching stays. Under the umbrella of visiting scientists, two types of activities are funded: research stays of scientists from partner institutions in the South, as well as support for the attendance of scientists from the South at conferences organised by the ETH Zurich.

In addition, the North-South Centre promotes teaching activities of ETH scientists or ETH emeriti at partner institutions in the South.

**Phil-Swiss Information Technology School,
University of the Philippines in Baguio**
Teaching stay of four lecturers,
January 7–11, 2008

The third Phil-Swiss Information Technology School was held at the University of the Philippines in Baguio. It was a follow-up to two previous teaching stays funded by NIDECO (one of the predecessor institutions of the North-South Centre), which were held at De La Salle University (2005) and University of the Philippines Diliman (2006), both in Metro Manila. Each of the three courses attracted between 40 and 50 Computer Science instructors from all parts of the Philippines.

In 2008, Joachim Buhmann (Institute of Computational Science), Jürg Nievergelt (Prof. em. ETH Zurich) and Thomas Hofmann (Director of Engineering, Google Zurich and Lecturer at ETH Zurich) held lectures. They addressed the following topics: Machine learning and applications, information retrieval and search, and basic concepts of probability and their application to data structures and optimisation. Peter Orbanz (Institute of Computational Science) supervised the laboratory sessions.

The Philippines' higher education system in Computer Science suffers from a shortage of students at the graduate level in any single university. In order to overcome this shortage, pooling resources and organising joint educational events for several universities would be a promising approach. The three one-week courses proved that this concept of collaboration is feasible. Hopefully, the participating universities will continue with this approach.

**Lectures and public seminars,
University of Peradeniya, Sri Lanka**
Teaching stay of Caspar Wenk,
January 14–19, 2008

Caspar Wenk conducted a postgraduate lecture and an undergraduate lecture at the Department of Animal Science, Faculty of Agriculture at the University of Peradeniya in Sri Lanka. 30 students, of which most were field veterinarians, and 183 students, respectively, attended the lectures. In addition, he held two public seminars – one on the ban of antimicrobial growth promoters and consequences for animal production, and the other one on GMO as feedstuffs, discussing facts instead of myths, and debating on what is happening with nucleic acid in farm animals. 40 to 50 people from university, government departments, and industry attended each seminar.

Furthermore, Caspar Wenk visited a broiler farm belonging to a leading agro company, CIC Feeds (Pvt) Ltd, situated in Bangadeniya. The farm had about 500 000 birds. Following the visit, he discussed matters related to broiler nutrition, management and hygiene with farm staff. Then, he visited the modern facilities of their broiler processing plant. The offal was directly converted into a by-product meal at the attached rendering plant and the meal was then sent to the feed mill. The objective of this visit was to gather first-hand information about practical broiler production in Sri Lanka. Caspar Wenk also had the opportunity to visit the Tea Research Institute in Thalawakelle and few other private plantations and farms.



A Phil-Swiss IT class in session



Interior of one of the broiler houses at the farm in Bangadeniya

Training at the Chair of Ecosystem Management

Visiting scientist Eyen Khoo

As head of the Biotechnology Programme at the Sabah Forest Department, Forest Research Centre (FRC) in Malaysia, Eyen Khoo is responsible for both managing this institution as well as guiding research and development in forest genetics and tree propagation. Eyen Khoo has been the in-country collaborator in a project on species coexistence in important tropical forest trees. This project is run by the Chair of Ecosystem Management at the ETH Zurich in collaboration with the University of Aberdeen, the Royal Botanic Gardens Edinburgh and the FRC Sabah. In February 2008, Eyen Khoo visited the Chair of Ecosystem Management in order to receive training in new molecular techniques, which have a wide application in forestry and ecology. She benefitted greatly from the interaction with researchers at the ETH Zurich and the access to the library facilities. Her visit helped to strengthen links between the two institutes and gave her the opportunity to explore future collaborations, specifically for a doctoral project that would be supervised by Jaboury Ghazoul and Chris Kettle.

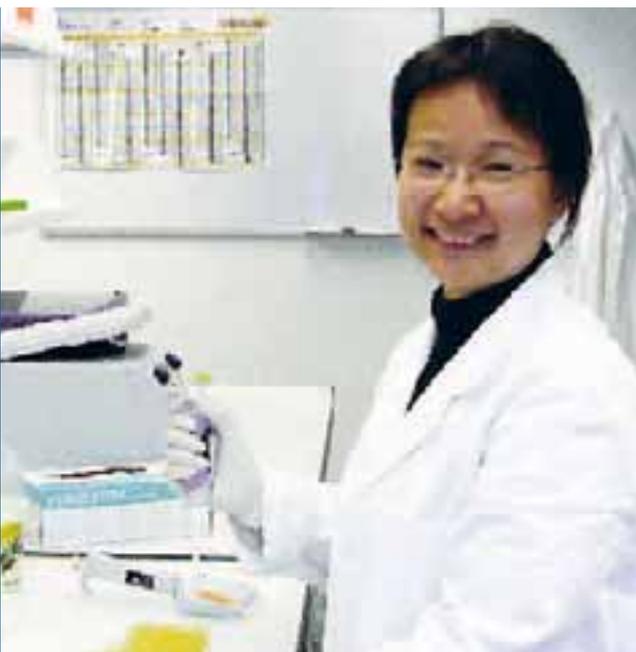
Capacity gained from Eyen Khoo's visit has already reached students in local universities and technical staff working with her at the FRC. In addition, the support of the North-South Centre enabled a strong commitment to this research partnership, directly building capacity of FRC staff.

Annual conference of the "Verein für Socialpolitik"

Travel grants to two fellows from developing countries

The "Verein für Socialpolitik" is the leading association of German-speaking economists. The third annual conference of its research committee on development economics was held in Zurich on May 30–31, 2008, co-hosted by the Chair of Environmental Policy and Economics at the ETH Zurich. The first keynote presentation, given by Thomas Sterner, elaborated on climate policy and burden sharing. The second, given by Fabrizio Zilibotti, addressed economic growth and economic policy in the development process. In addition, 14 parallel sessions focused on the overall topic of development economics and policy.

Travel grantee Fernando Borraz (Uruguay) presented a paper entitled "And what about the family back home? International migration and happiness". In his study, he and his co-authors used data on subjective well-being and migration in Cuenca, one of Ecuador's largest cities. They examined the impact of migration on the happiness of those left behind. The results indicate that migration reduces the happiness of those left behind and that the monetary inflows that accompany migration do not compensate for the increase in unhappiness. Travel grantee Sricharoen Thitiwan from Thailand presented a paper on "Health insurance in rural Northern Thailand: What is available? What would be desirable?". His study analysed the relationship between livelihood risks (health risks in particular), and risk management strategies (especially health insurance) in Northern Thailand.



Eyen Khoo receiving training in microsatellite genotyping in the Ecosystem Management Lab, ETH Zurich

International workshop at the Institute of Plant Science Visiting scientist Lucien N'Guessan Diby

Lucien N. Diby defended his doctoral dissertation in July 2005 at the University of Cocody in Abidjan, Côte d'Ivoire. His thesis on yield formation of two yam (*Dioscorea* spp.) species was an RFFP project. The project was supervised by researchers from the Group of Plant Nutrition at the ETH Zurich, the Centre Suisse de Recherches Scientifiques (CSRS, Côte d'Ivoire), the University of Cocody (Côte d'Ivoire), the Ecole Supérieure d'Agronomie (ESA, Côte d'Ivoire), and the International Institute of Tropical Agriculture (IITA, Nigeria). Lucien N. Diby currently lectures in plant nutrition at the ESA where he is an associate researcher in the laboratory of soil science. He is also the principal investigator for CSRS in a regional yam project, which aims at improving livelihoods in rural West and Central Africa through productive and competitive yam systems.

The goal of the visit to the ETH Zurich was to contribute to further scientific capacity-building of Lucien N. Diby. The specific objectives were to allow him (i) to take advantage of the scientific environment of the ETH Zurich in order to write and submit publications to peer-reviewed journals, and (ii) to organise the first international workshop on the crop physiology of yam. This workshop resulted in the definition of research priorities in yam crop physiology and the commitment of the participants to write a review on the crop physiology of yam.

A successful partnership

In 2008, the partnership between the Group of Plant Nutrition at the ETH Zurich and Lucien Diby and his institutional network in Côte d'Ivoire was used as a model case for the North-South Centre on various occasions. Together with Barbara Becker, the Managing Director of the North-South Centre, Lucien Diby presented the ETH-CSRS collaboration at the EADI General Assembly in Geneva at the panel on "Asymmetries in North-South research partnerships". At the AGS Annual Conference at the MIT in Boston, MA, USA, Barbara Becker presented this institutional collaboration together with Robert Asiedu, Lucien Diby's supervisor from IITA. At each of these occasions, it was highlighted how the researchers jointly identified the research topic, how the institutional partners contributed and shared their specific expertise, how mutual trust was built between the partners, and which obstacles had to be overcome to make this partnership successful.

In addition to these oral presentations, the partnership will be the example of the ETH Zurich in the forthcoming advocacy brochure of the KFPE – alongside with a number of other success stories by Swiss universities with their southern partners.



Lucien N. Diby organised the first international workshop on the crop physiology of yam at the ETH Zurich.

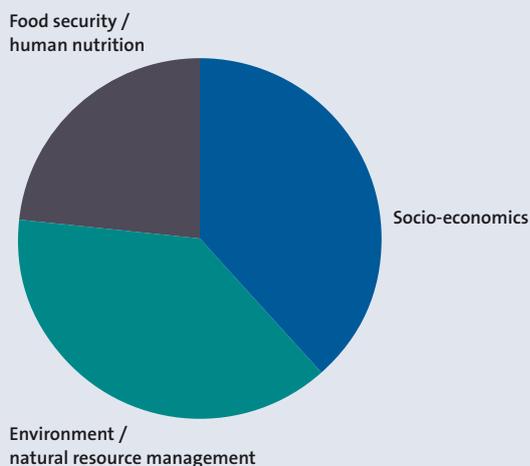
The North-South Centre's annual colloquium "Selected aspects of sustainable development" brings together scientists with different backgrounds working on development-related topics.

This interdisciplinary exchange holds its benefits and risks as the case of three projects dealing with local livelihoods illustrates.

Colloquium “Selected aspects of sustainable development”

In 2008, the colloquium was very varied both from the topics’ point of view and the participants’ disciplinary backgrounds. It brought together 13 doctoral candidates from the ETH Zurich, SHL, University of Zurich and University of Lugano with backgrounds in geography, sociology, forestry, architecture, environmental sciences, agronomy, food science and biogeochemistry. Despite this heterogeneity, a common tendency could be observed: The majority of the projects was combining approaches from both natural and social sciences when collecting data. There was a clear geographical scope on Asia with seven projects dealing with this region. Three projects were concerned with Africa and only one each with Latin America and Europe. As illustrated by the participants’ different disciplinary backgrounds, the aim of the colloquium consists in looking at a topic from different angles. In the case of this year’s colloquium, this principle is best illustrated by the topic “Liveli-

hood”: Three projects dealing with livelihood, yet with different disciplinary backgrounds and in relation to distinct geographic regions, were presented. Sandra Contzen*, a social scientist, investigates the living conditions of small farmers in Honduras in connection with the new Poverty Reduction Strategy of the country. Bernd Steinmann, a geographer, is leading a project on pasture-based livelihoods in post-socialist Kyrgyzstan. Sajad Bukobero* combines the views of a forester and a social scientist to explore the impact of devolution of forests on people’s livelihoods in Madagascar. Even though the projects are concerned with different topics and regions, they have some traits in common, as a closer look reveals: All of them are concerned with exploring the role certain assets are playing in the household economy, be it agricultural and forest products or cattle. Regarding methodology, all of them use both quantitative and qualitative instruments to gather the information, such as life history interviews or wealth ranking.



Thematic distribution of the presentations

All projects eventually aim at developing recommendations for policy-makers of the concerned country. As this example shows, the colloquium offers the unique opportunity to draw such parallels between projects which look so different at the first glance. To go into details and make such comparisons is a very rewarding experience. At the same time, it is obvious that each discipline has its own rules, requirements and codes, which make a fruitful exchange between people with different backgrounds a demanding task. This richness and complexity remain a challenge which we will meet again in 2009 with a new and interesting programme.

* See project reports in the RFPP section, pp. 56 and 66.

Several departments of the ETH Zurich offer lectures and other courses related to developing countries on a regular basis. In addition, the Postgraduate Study Programme on Developing Countries (NADEL) provides training courses in the field of cooperation with developing countries. The programme admits graduates of all disciplines.

The list on the following pages provides an overview of teaching activities related to developing countries conducted by members of the North-South Centre.

Teaching activities at the ETH Zurich related to developing countries

Title of course unit	Lecturer(s)	Periodicity	Type of course unit	% related to DC
Agricultural and Food Sciences (D-AGRL)				
Agri-food & Agri-environmental Economics				
Entwicklungsökonomie II	A. Crole-Rees	annually	Lecture	50
International competition and local outcome	B. Lehmann	annually	Lecture	30
Agronomy and Plant Breeding				
Kulturpflanzen	P. Stamp	annually	Lecture	10
Crops and cropping systems	U.R. Sangakkara	annually	Lecture with exercise	10
Animal Nutrition				
Ruminant science; tropical ruminant systems	A.C. Mayer M. Kreuzer M. Senn M. R. Goe T. T. Tiemann K. Bartl	annually	Lecture / Seminar	15
Applied Entomology				
Angewandte Entomologie	S. Dorn	annually	Seminar	20
Plant protection in the tropics: Entomology	S. Dorn K. Mody	biennially	Lecture	100
Recent advances in applied entomology	S. Dorn	annually	Lecture / Seminar	20
Breeding Biology				
Tropical animal genetics and breeding	M. R. Goe	annually	Lecture	100
Food Biotechnology				
Expt. Lebensmittelmikrobiologie und -biotechnologie	L. Meile	annually	Practical / lab. course	30
Grassland Science				
Biodiversity and ecosystem goods and services	N. Buchmann M. Scherer-Lorenzen	annually	Lecture with exercise / Seminar	30
Biogeochemistry and sustainable management	N. Buchmann	annually	Lecture	50
Carbon mitigation	N. Buchmann N. Gruber	annually	Lecture / Seminar	50
Global change biology	N. Buchmann H. Bugmann R. Barnard A. Knohl	annually	Lecture / Seminar	50
Graslandssysteme	N. Buchmann	annually	Lecture with exercise	70
Öko- und Ertragsphysiologie	N. Buchmann J. Leipner	annually	Lecture with exercise	5
Human Nutrition				
Human nutrition I	R. Hurrell	annually	Lecture	10
Human nutrition II	I. Egli M. Zimmermann	annually	Lecture	15

Title of course unit	Lecturer(s)	Periodicity	Type of course unit	% related to DC
Human Nutrition, continued				
International nutrition, food fortification	I. Egli	annually	Lecture	80
Nutrition of different population groups	R. Hurrell	annually	Lecture	30
Nutrition and chronic disease I	R. Hurrell	annually	Lecture	10
Nutrition Biology				
The food chain	C. Wenk	annually	Lecture	30
Tropical animal nutrition	C. Wenk K. Samarasinghe	annually	Block course	100
Plant Nutrition				
Plant Nutrition II: Integrated nutrient management	E. Frossard A. Oberson Dräyer	annually	Lecture	50
Civil, Environmental and Geomatic Engineering (D-BAUG)				
Sustainable Construction				
Internationale Sommerakademie Nachhaltiges Bauen	H. Wallbaum	annually	Lecture	5
Nachhaltiges Bauen	H. Wallbaum	annually	Lecture	5
Sustainable product design	A. Köhler J. Baumann H. Wallbaum	annually	Lecture	5
Environmental Sciences (D-UWIS)				
Ecosystem Management				
Agroforstwirtschaft	J.-P. Sorg	annually	Lecture	90
Erd- und Produktionssysteme (forest part)	J.-P. Sorg	annually	Lecture	50
Agrar- und Waldwirtschaft	J.-P. Sorg R. Felber T. Braunschweig R. Pfeiffer	annually	Seminar	80
Weltwaldwirtschaft	J.-P. Sorg	annually	Lecture	50
Environmental Policy and Economics				
Policy and economics of ecosystem services	S. Engel	annually	Lecture	90
Environmental governance	S. Engel W. Zimmermann	annually	Lecture	50
Introduction to the theory of human-environment systems	S. Engel R. Scholz	annually	Lecture	50
	M. Siegrist K. Seeland	annually	Lecture	50
Seminar für Bachelorstudierende: Anthroposphäre	K. Seeland S. Engel T. Köllner M. Siegrist	annually	Seminar	50
Concepts and perspectives of sustainable development	C. Pohl W. Zimmermann S. Engel	annually	Lecture	50

Title of course unit	Lecturer(s)	Periodicity	Type of course unit	% related to DC
Natural and Social Science Interface				
Economics in nature conservation	T. Koellner T. Coch	annually	Lecture	50
Terrestrial Systems Ecology				
Systems ecology: Principles and modelling	A. Fischlin H. Lischke	annually	Lecture with exercise	25
Humanities, Social and Political Sciences (D-GESS)				
Economic Research				
Entwicklungsländer in der Weltwirtschaft I	R. Kappel R. Schubert	annually	Lecture	100
Entwicklungsländer in der Weltwirtschaft II	R. Kappel K. Hoffmann R. Schubert	annually	Lecture	100
Business and politics of climate change	R. Schubert V. Hoffmann	annually	Lecture	60
Umweltökonomie	R. Schubert M. Ohndorf	annually	Lecture	30
NADEL				
Bevölkerung, Umwelt und Ressourcen	R. Felber I. Guenther R. Kappel R. Pfeiffer J. Werner	biennially	Lecture	100
Entwicklungsökonomie und internationale Wirtschaftsbeziehungen	R. Kappel I. Guenther	biennially	Lecture	100
Information Technology and Electrical Engineering (D-ITET)				
Technik, Energie und Umwelt	O. Zenklusen T. Flüeler C. Küffer M. Kurath	annually	Lecture	20

At the ETH Zurich, a large number of doctoral students do research related to developing countries. The topics cover various disciplines and the candidates come from a wide variety of countries. Many of these doctoral dissertations are funded via the North-South Centre. This underlines the role of the centre in individual capacity development.

The list on the following pages provides an overview of doctoral dissertations related to developing countries supervised by members of the North-South Centre.

Supervision of doctoral dissertations related to developing countries

Supervisor(s)	Candidate	Title of dissertation	Funded via the North-South Centre
Agricultural and Food Sciences (D-AGRL)			
Agri-food & Agri-environmental Economics			
B. Lehmann S. Réviron	Marguerite Paus	Collective agro-food supply chain and sustainable rural development: articulation between internal governance and rural governance	
B. Lehmann	Martijn Sonneveld	Integrating agronomic and socioeconomic aspects of reversing soil degradation by tropical legume trees by GIS analysis	■
B. Lehmann S. Réviron	Enkh-Amgalan Tseelei	Building up value chains in the countryside of Mongolia for pro poor economic development	
B. Lehmann M. Dumondel	Bertrand Youan Bi Trazie	Efficacité managériale des éleveurs de bovins en Côte d'Ivoire: le cas des régions de Toumodi et de Korhogo	■
B. Lehmann S. Réviron	Marc Zoss	Linking smallholders to high-value supply chains: Collective organizations and development interventions in domestic and export-oriented vegetable value chains in Tanzania	■
Agronomy and Plant Breeding			
P. Stamp Ham Le Huy (Ministry of Agriculture and Rural Development, Vietnam)	Chi Dang Ngoc	Protein quality improvement of waxy maize by incorporation of QPM in South East Asia	
P. Stamp R. Sangakkara (University of Peradeniya, Sri Lanka)	Chaminda Egodawatte	Integrating agronomic and socioeconomic aspects of reversing soil degradation by tropical legume trees by GIS analysis	■
P. Stamp S. Jampatong (Kasetsart University, Thailand)	Quanjai Rupitak	The dynamics of female flowering and grain set in sweet corn	
Animal Nutrition			
M. Kreuzer A. Oberson H.D. Hess (ALP, Switzerland)	Souheila Abbeddou	Improving small ruminant productivity in dry areas through cost-efficient animal nutrition and improved quality of milk and dairy products	■
M. Kreuzer	Blasius Azuhwi	Renaissance of a neglected forage plant: Nutritional and anthelmintic potential of sainfoin	
M. Kreuzer	Karin Bartl	Options for the improvement of dry season feeding for milk production at high altitudes in Peru, and the response of local Criollo and Brown Swiss cows to improved nutrition	■
M. Kreuzer	Céline Clément	Development of a fertility enhancing supplement for breeding bulls and cows based on the Andean plant species Maca (<i>Lepidium meyenii</i> Walp.)	
M. Kreuzer N. Buchmann	Svenja Marquardt	Characterization of the value and utilization of forage plants on tropical wood pastures: the case of the Bolivian Chaco and Subandino	
M. Kreuzer	Tassilo Tiemann	Effects of environmental factors on tropical shrub legume species with and without tannins and consequences for their use in ruminant nutrition	■

Supervisor(s)	Candidate	Title of dissertation	Funded via the North-South Centre
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Applied Entomology

S. Dorn K. Mody	Mirco Plath	Increased plant health in silvopastoral and pasture-afforestation systems	■
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Food Biotechnology

C. Lacroix L. Meile	Stephan Wullschleger	Biodiversity and microbial safety of artisanal Malian sour milk “fènè” and development of adapted starter cultures for controlled production	
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L. Meile C. Lacroix	Christoph Jans	Microbiological analysis of spontaneously fermented camel milk and its impact on the development of biotechnological processes for new safe products	■
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L. Meile	Sabine Kastner	The inoculum of the cassava product attiéké: microbiological diversity, impact on product quality and safety, and development of a controlled fermentation process	
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L. Meile J. Wangoh (University of Nairobi, Kenya)	Patrick Njage	Safety analysis of the microflora in spontaneously fermented camel milk products and interventions in the production chain	■
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Grassland Science

N. Buchmann W. Eugster	Sebastian Wolf	Carbon sequestration potentials of different land use types in the tropics (Panama)	■
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Human Nutrition

R. Hurrell	Maria Andersson	Efficacy trial of dual fortified salt in southern India	
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R. Hurrell	Ralf Biebinger	Controlling multiple micronutrient deficiencies: potential interaction and strategies for prevention	
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R. Hurrell I. Egli R. Wegmüller	Colin Cercamondi Marica Brnic	Novel staple food-based strategies to improve micronutrient status for better health and development in sub-Saharan Africa	
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R. Hurrell I. Egli	Stéphanie Good	Animal source foods and nutrition during early life: an evaluation of possible links between livestock-keeping, food intake and nutritional status of young children	■
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R. Hurrell I. Egli	Nico Petry	Identification of iron rich varieties of common beans (<i>Phaseolus vulgaris</i>) for iron biofortification	
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R. Hurrell	Fabian Rohner	Strategies to reduce anemia and iron deficiency in Sub-Saharan African children: Technological and physiological approaches	
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R. Hurrell	Barbara Troesch	Optimizing iron absorption from the DSM/WFP complementary food powder mix	
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R. Hurrell R. Wegmüller	Siwaporn Pinkaew	Triple fortification of rice with iron, zinc and vitamin A	
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Plant Nutrition

E. Frossard A. Oberson I. Rao (CIAT, Colombia)	Sabine Douxchamps	Realizing the benefits of cover crop legumes in smallholder crop-livestock systems of the hillsides of Central America	■
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E. Frossard E. Bünemann A. Oberson	Knut Ehlers	Composition and dynamics of bacterial phosphorus in phosphorus deficient soils	
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Supervisor(s)	Candidate	Title of dissertation	Funded via the North-South Centre
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Plant Nutrition, continued

E. Frossard A. Gaume (ACW, Switzerland) I. Rao (CIAT, Colombia)	Anna Elizabeth Louw-Gaume	Adaptation of Brachiaria grasses to low-P soils of the hillsides of Central America	■
E. Frossard A. Assa and S. Ake (University of Cocody, Côte d'Ivoire) T. Bi Tra (Ivorian Institute of Technology, Côte d'Ivoire) A. Tschannen (CSRS, Côte d'Ivoire)	Hgaza Kouassi Valery Kouamé	Understanding yam (<i>Dioscorea</i> spp.) response to fertilizer application	■
J. Jansa M. Scherer-Lorenzen (University of Freiburg, Germany)	Fabienne Zeugin	FUN_DIV: Functional significance of tree diversity for nutrient dynamics in a tropical plantation	

Biology (D-BIOL)

Plant Biotechnology

W. Gruissem H. Vanderschuren	Li Kuan-Te	Protein and vitamin biofortification of cassava roots and rice seeds	
W. Gruissem H. Vanderschuren	Isabel Moreno	Engineering cassava brown streak virus resistance in cassava	
W. Gruissem P. Zhang H. Vanderschuren	Judith Owiti	Investigating the modulation of post-physiological deterioration in cassava roots	

Civil, Environmental and Geomatic Engineering (D-BAUG)

Computational Physics of Engineering Materials

H. J. Herrmann	Petruccio Barrozo da Silva	Organizing particles and pedestrians counter flow by ratchet design	
H. J. Herrmann	Neto Apiano Ferreira de Morais	Non-newtonian flow through three-dimensional porous media	
H. J. Herrmann	Hansjörg Seybold	Modeling river delta formation	

Sustainable Construction

H. Wallbaum	Sabrina Krank	Assessment of sustainable urban development in Asian megacities of developing countries: Review of existing practices and method development based on lessons learned	
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Environmental Sciences (D-UWIS)

Aquatic Physics, Eawag

A. Wüest	Natacha Pasche	Nutrient cycling and methane production in Lake Kivu	
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Ecosystem Management

J. Ghazoul J.-P. Sorg R. Felber G. Rajoelison J.-L. Pfund	Zora Urech	Remaining forest fragments in a mosaic landscape in Madagascar: Ways to improve their management with regards to biodiversity and local livelihood strategies	■
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Supervisor(s)	Candidate	Title of dissertation	Funded via the North-South Centre
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Ecosystem Management, continued

J. Ghazoul G. Rajoelison (Ecole Supérieure des Sciences Agronomiques ESSA, Madagascar)	Lanto Herilala Andriambelo	Critères d'aménagement de l'espaces forestier villageois dans le Menabe central	■
J.-P. Sorg M. Hufty (University of Geneva, Switzerland) B. Campbell (CIFOR, Indonesia)	Sajad Bukobero	Social practices and conservation policies. Enhancing livelihoods through sustainable forest management in Madagascar	■
J.-P. Sorg A. Buttler (EPFL, Switzerland)	Clémence Dirac	Contribution à l'aménagement multifonctionnel et participatif des espaces forestiers du Menabe central, Madagascar	■
J.-P. Sorg B. Lehmann R. Steppacher (University of Geneva)	Isabelle Gambetta	L'importance des produits forestiers non ligneux pour les communautés villageoises des environs de la cordillera Huacamayos, province de Tena, Amazonie équatorienne	
J.-P. Sorg G. Rajoelison (ESSA, Madagascar) J.-L. Pfund (CIFOR, Indonesia)	Mihajamanana Rabenilalana	Intégration de la conservation de la biodiversité et des moyens d'existence des communautés rurales dans les paysages forestiers fragmentés de Manompana (Madagascar)	■
J.-P. Sorg J.-M. Gobat (University of Neuchâtel) A. Buttler M. Reinhard (EPFL)	Olga Raharimalala	Optimisation des stades de formations forestières secondaires dans la pratique de la culture sur brûlis. Cas d'Andranolava dans le Menabe central (Madagascar)	
J.-P. Sorg G. Rajoelison (ESSA, Madagascar)	Eliane L. Raminoarisoa	Analyse de l'interface homme-forêt. Elaboration de modèles de gestion participative des forêts secondaires très dégradées dans le nord-ouest de Madagascar	
J.-P. Sorg G. Rajoelison	Voahiraniaina Razafintsalama	Rôle et importance des formations secondaires dans l'aménagement des espaces forestiers. Cas du Menabe central (Madagascar)	

Environmental Policy and Economics

S. Engel	Astrid Zabel	New policy mechanisms to mitigate wildlife-livestock conflicts	■
S. Engel	Tobias Wünscher	Spatial targeting of payments for environmental services in Costa Rica	
S. Engel	Carina Cavalcanti	The role of cooperativeness in the adoption of sustainable common resource management: A shrimp trap exchange programme in a natural reserve in Brazil	■
S. Engel	Devesh Rustagi	Economic incentives for the conservation of coffee forests in Ethiopia: Incorporating social preferences through experimental approaches	■
S. Engel	Sarly De Andrade Sa	Direct and indirect impacts of biofuel production in Brazil: Land use, forest conversion and social welfare	■
S. Engel	Renata Saizaki	Climate change, land use and external changes	

Natural and Social Science Interface

R. W. Scholz T. Koellner	Raffaele Vignola	Hydrological ecosystem services and belief systems of policy-makers in Costa Rica	
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Supervisor(s)	Candidate	Title of dissertation	Funded via the North-South Centre
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Soil Protection

R. Schulin M. Afyuni (Isfahan University of Technology IUT, Iran) A. Khoshgoftarmansh (IUT, Iran)	Mahin Karami	Modelling Zn fluxes from soil into selected crops and the dependence of the fluxes on soil, plant and land management factors under arid agro-ecosystem conditions	■
R. Schulin M.R. Mosaddeghi A.A. Mahboubi	Mohsen Morshedizad	Estimation of optimum and limiting soil water contents for tillage in selected Hamadan soils	
R. Schulin R. Hurrell A. Khoshgoftarmansh R. Wegmüller	Nazanin Roohani Sharaki	The role of Zn fluxes through the food chain for human nutrition in Zn deficient agro-ecosystems of Iran	■

Humanities, Social and Political Sciences (D-GESS)

Economic Research

R. Schubert	Kristin Hoffmann	Financial disaster risk transfer in developing countries
R. Schubert	Markus Ohndorf	The Clean Development Mechanism – An institution economic analysis

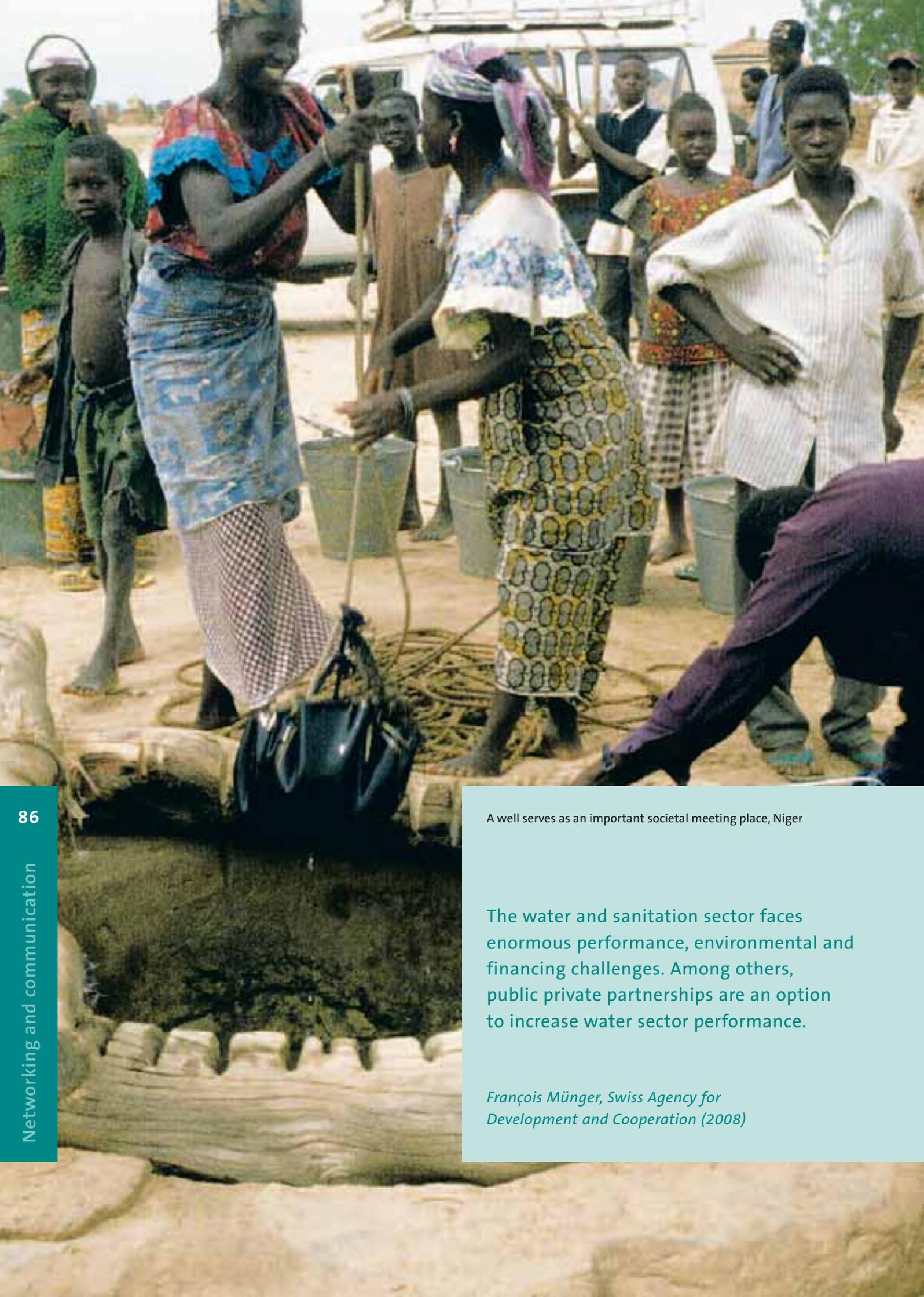
NADEL

I. Guenther	Elena Gross	Impact of water interventions in sub-Saharan Africa
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Management, Technology, and Economics (D-MTEC)

Centre for Energy Policy and Economics (CEPE)

M. Filippini	Mozhgan Alaeifar	Market behavior of OPEC countries and the effect on oil prices
M. Filippini	Kaushik Deb	Efficiency, demand, and pricing of public bus transport in India



A well serves as an important societal meeting place, Niger

The water and sanitation sector faces enormous performance, environmental and financing challenges. Among others, public private partnerships are an option to increase water sector performance.

François Münger, Swiss Agency for Development and Cooperation (2008)

Networking and communication

Some of the most visible communication activities of the North-South Centre (besides the production of the annual report) are conferences and other events organised throughout the year. At the same time, events are important networking platforms which complement the institutional operational networking activities of the North-South Centre and the manifold strategic networking activities of its members.

The year 2008 could be characterised as the year of events. By organising events, the North-South Centre takes up hot issues for high-quality discussions. Furthermore, events provide a platform for researchers from the ETH Zurich to present their projects. Finally, these events position the North-South Centre and the ETH Zurich as important actors in the field of research for development.

In February, the North-South Centre, supported by the Swiss Agency for Development and Cooperation SDC, was the Swiss host organisation for an exhibition that was prepared by the International Potato Center (CIP) in Peru to mark the International Year of the Potato 2008. The exhibition illustrated the history, evolution and impact of the potato in today's world. The exhibition ended with a symposium on potato research for development.

The first North-South Forum addressed the topic of ecosystem services. This Forum is a half-day event providing a platform for a lively exchange of knowledge from different perspectives and disciplines. The question whether payments for ecosystem services can contribute to alleviate poverty was discussed by speakers representing academia, the United Nations, as well as the government and NGO sectors.

In June, the North-South Centre held its Annual Conference in collaboration with the Swiss Federal Institute of Aquatic Science and Technology (Eawag). The conference "Water for Development" addressed the prospects for integrated water resources management to contribute to an equitable and sustainable allocation of water in the development context. In particular, it highlighted the role and contribution of research for development in the water sector.

Throughout the year, the North-South Centre organised several smaller events. In April, Hartmann, General Director of the International Institute of Tropical Agriculture (IITA), lectured on agricultural potential in Africa. In June, an evening event organised in collaboration with the Swiss Academy of Engineering Sciences (SATW) featured Prof. Alex Zahnd, who presented his views on whether the Millennium Development Goals could be attained. Finally in October, the North-South Centre held a workshop with Dr. M. Hassan, Executive Director of the Academy of Sciences for the Developing World (TWAS). Representatives of the North-South Centre and related entities of the ETH Zurich discussed with M. Hassan on experiences and best practices in capacity development for research with developing countries.

The food security conference in December was a successful and rewarding final event in 2008. Organised in collaboration with the Syngenta Foundation for Sustainable Agriculture, this conference provided a platform for a renowned group of speakers and a very interested audience to discuss how food security could be ensured – today and tomorrow. Innovative approaches in agriculture in developing countries, including new research priorities in response to changing needs, were presented from a broad range of disciplines.

All these events mentioned above offer networking opportunities in many ways. However, at the North-South Centre, conference networking is complemented by operational networking activities, namely the management of two European Research Area Networks on behalf of the SDC and the secretariat of LivestockNet. Ultimately, the strategic partnerships of the members and the Managing Director account for the main networking activities of the North-South Centre.

The North-South Centre is involved in networking both at the operational and the strategic level. “Operational networking” embraces all activities where an institution has assigned a specific function to a member of the North-South Centre management team.

Thus, the North-South Centre has been entrusted by the Swiss Agency for Development and Cooperation (SDC) to manage two EU-funded projects for research policy harmonisation. In addition, the North-South Centre is in charge of the secretariat of LivestockNet.

The European Research Area in Agricultural Research for Development

The European Research Area in Agricultural Research for Development (ERA-ARD) seeks (i) to improve synergies between the national ARD programmes in Europe, (ii) to increase the effectiveness and efficiency of European agricultural research planning, funding and implementation, and (iii) to launch new transnational programmes. 13 EU member states plus Switzerland – represented by SDC – take part in this EU-funded project. The Swiss consortium for the ERA-ARD project comprises the North-South Centre (ETH Zurich), the Swiss College of Agriculture (SHL, Zollikofen) and the Centre for Development and Environment (CDE, Berne). The North-South Centre has been entrusted by SDC to manage and coordinate the Swiss contribution to the ERA-ARD project, which started in April 2005 and will end in December 2009.

ERA-ARD works along two main lines of activities: Joint activities to foster the collaboration of existing research programmes for agricultural development, and transnational calls to set up new international research programmes.

“Capacity development” and “Agri-food chain safety” were the topics for joint activities. ERA-ARD conducted a workshop on sharing experiences between interdisciplinary doctoral research programmes related to agricultural and rural development. The workshop paved the way to identify European instruments that could support such programmes, linking European with southern universities. In addition, ERA-ARD established a knowledge portal in order to collect and disseminate information on agri-food chain safety (http://www.kitabu.info/food_safety).

ERA-ARD consortium members have committed more than two million Euros to a transnational call “Bio-energy – an opportunity or threat to the rural poor”. The call considered key ecological, economic and social consequences of the rapidly growing market for bio-energy, specifically focusing on the challenges and issues faced at the household level by the rural poor in developing countries. The major objectives of the call are (i) to explore how bio-energy production impacts the rural poor in terms of food security, poverty alleviation and rural development, and (ii) to investigate how bio-energy production influences land use and affects natural resources. Each research consortium had to be transnational, consisting of a minimum of three legal entities, of which at least one had to be from a developing country. Six Swiss institutions participated in consortium proposals (of which two received funding).



Bio-energy influences land use and affects natural resources. Sugarcane field, Brazil

SPLASH – The European Research Area Network of the European Water Initiative

SPLASH is a consortium of 16 ministries, funding agencies and national research and technology development authorities from eleven European countries. It aims to coordinate European water research for development. As such, SPLASH is a practical example of an international effort to improve aid effectiveness as formulated in the Paris Declaration. It provides a framework through which European partners can work together more effectively, by:

- coordinating existing programmes to minimise duplication and identify gaps;
- ensuring that good research management practice is known and used;
- improving knowledge-sharing between researchers and practitioners in order to speed up the transfer of research findings into policy and practice;
- formulating a research agenda and jointly-funded activities which can benefit from a transnational approach.

Switzerland is represented by SDC in the SPLASH consortium. The North-South Centre is involved in the management and coordination of the Swiss contribution to the project.

SPLASH has conducted stakeholder consultations, workshops and desk studies on (i) the transfer of research findings into policy and practice, (ii) research management, and (iii) the demand-led setting-up of joint research programmes in the water sector. The findings were summarised in a report on key lessons and actions for the design and coordination of water research for development. It was found that research is more likely to be used if relevant stakeholders are involved throughout the research cycle. As a result, guidelines on improved dialogue practices have been developed. The work has also shown that the uptake of research by decision-makers and practitioners depends on effective communication of research findings. These lessons will impact the design of all future SPLASH activities.



Water sampling at a well performed by an ETH researcher, Niger

LivestockNet

LivestockNet is a Swiss network of university, private sector, NGO and government stakeholders working in livestock and development. Since 2007, the North-South Centre has managed the secretariat of this association. In 2008, the primary activities of LivestockNet consisted of two meetings.

At the first meeting, Willi Graf (SDC) presented an overview of the “World Development Report” published by the World Bank in 2008. While the report does not emphasise livestock as a key element, the renewed recognition of investments in agriculture as an effective means to fight poverty is an encouraging statement. In the wake of the food crisis, the soaring price for fuel and, ultimately, the financial crisis, the discussion also shed light on new perspectives for research on livestock for development. On the occasion of this first meeting, LivestockNet bid farewell to Willi Graf who left to his new mission in Afghanistan.

The second meeting focused on the future of LivestockNet, its mission, and its structure. Amongst others, the discussion addressed the new structure of SDC with the four thematic fields “food security”, “climate change”, “water”, and “migration”, as well as its implications for LivestockNet. In this context, Felix Bachmann and Fritz Schneider (both SHL) presented a study (commissioned by SDC) on the involvement of SDC in research activities related to livestock in development. The study served as an input for the reassessment of livestock-related activities by SDC. One of the main results is that – contrary to a widespread perception – SDC is still strongly committed to such activities. A substantial part of this commitment is the livestock systems research programme of the North-South Centre. The re-evaluation of LivestockNet will continue into 2009, when the network will celebrate its tenth anniversary.

Apart from organising these meetings, the main task of the secretariat was the redesign of the website www.livestocknet.ch. In an attempt to make the site more dynamic and to facilitate updates, the pages were transferred to a content management system.



Camels are also commonly kept as livestock for subsistence or for profit

Strategic networking consists of formal memberships in national and international governance bodies or fora and selective interaction with strategic partners. In its first fully operational year, the strategic networking of the North-South Centre focused on the consolidation of its position within the ETH Zurich.

The increased visibility of the North-South Centre has opened new options for strategic networking in Switzerland and beyond. Overall, our network has grown and become stronger – an asset to build future activities on.

Strategic networking

The North-South Centre and its members are actively involved in many strategically important networks at the national and international levels. This involvement ranges from membership in these institutions to functional responsibilities in their governing bodies. Strategic partnerships relate to institutions from various fields, such as development cooperation, research for development or advocacy.

Networking within the ETH Zurich

In 2008, emphasis was given to strategic interaction with other units and colleagues within the ETH Zurich. First and foremost, we could establish a very constructive relationship with the School Board and its individual members. The School Board is fully aware of the role and strategic contribution of the North-South Centre to the portfolio of the ETH Zurich, and has paid tribute to this role on various occasions.

In October 2008, the School Board created the unit *International Institutional Relations*, headed by the former Vice-President Gerhard Schmitt. The President of the North-South Centre was a member of the working group preparing the new international strategy of the ETH Zurich, which was approved in December 2008. Since then, the management of the North-South Centre and International Institutional Relations have entered into a constructive working relationship.

Administratively, the North-South Centre is now attached to the *Department of Environmental Sciences (D-UWIS)*. We have established various links with the managerial units of D-UWIS, and presented the North-South Centre to the D-UWIS Advisory Board.

The management of the North-South Centre established strategic links with a number of units with whom we share similar goals. We have been supporting the group in charge of the new *MAS in Sustainable Water Resources*, which targets professionals from Latin America. We have also started to collaborate with the *Energy Science Center* of the ETH Zurich, notably for preparing the joint Annual Conference in 2009. The re-launched *ETH Sustainability* unit is a natural ally for future activities, for which we have laid the foundation after the arrival of their new director in late 2008. Regular interaction was established with the staff of the *ETH Foundation*, mainly in order to explore opportunities to position the North-South in their future profile of strategic priorities for attracting external funding. Similarly, the brokerage of the *ETH Alumni Association* yielded the contact with Samih Sawiris, which led to the donation of ten doctoral scholarships to the North-South Centre.

Individual members of the North-South Centre are involved in various strategic bodies of the ETH Zurich, such as the Strategy Taskforce of the School Board (N. Buchmann), the Research Commission (H. Herrmann, J. Ghazoul), or the Ethics Commission (I. Egli, C. Wenk).



Maximo Torero, IFPRI, at the food security conference in December

Networking within Switzerland

In order to intensify our relationships with Swiss partner organisations, we invited several of these to visit our steering committee. In January, we welcomed our EPFL counterparts from *cooperation@epfl*, and in August from the *NCCR North-South*. Throughout the year, we continued our friendly ties with the office for international relations of the *University of Zurich*, which expanded its profile to include North-South cooperation.

Several longstanding memberships and interactions with partners continued as fruitful as in the past. The Managing Director continued her commitment as *ad personam* member of the *Commission for Research Partnerships with Developing Countries (KFPE)* of the *Swiss Academy of Sciences (scnat)*. Our links with the Swiss academies extended to a joint event with the *Swiss Academy of Engineering Sciences (SATW)*, and the participation of representatives of the *scnat* at a workshop, which we organised with the President of the *Academy of Sciences for the Developing World (TWAS)*, Mohamed H.A. Hassan.

The North-South Centre remained an active partner in the *Swiss Forum for International Agricultural Research (SFIAR)*. The ceremony for the first SFIAR Award took place at the food security conference hosted by the North-South Centre. This conference was a unique opportunity to strengthen our relationship with the *Syngenta Foundation for Sustainable Agriculture (SFSA)*, who co-organised this event with us.

In 2008, our most important Swiss partner, the *Swiss Agency for Development and Cooperation (SDC)*, went through a profound reorganisation with a new director, new structures and new responsibilities. In November 2008, a delegation of the North-South Centre with the Vice-President Research of the ETH Zurich, Peter Chen, visited the new SDC Director, Martin Dahinden, to establish new links between the two federal institutions.

Throughout the year, we presented our research collaboration activities at various national and international events, such as the triannual conference of the *NCCR North-South*, the *AGS* conference in Boston, the *EADI* conference in Geneva and the biannual *forum cinfo* in Biel.

Networking with international partners

The majority of networking activities of the North-South Centre takes place at the level of its members, who maintain their networks of research partners. Beyond these bilateral partnerships, many members assume strategic functions in various national and international bodies. These memberships are shown on our website and on the following page.

Due to our continued focus on food and agriculture, the centres of the *Consultative Group for International Agricultural Research (CGIAR)* have remained strong partners in our research programme. This partnership also materialised in the exhibition of the *International Potato Center (CIP)* on the International Year of the Potato that we hosted. The Managing Director continued her commitment on the Boards of Trustees of the *International Institute for Tropical Agriculture (IITA)* and the *Africa Rice Center (WARDA)*, respectively. These links led to the visit of the IITA Director General at the ETH Zurich, and the participation of the WARDA Director of Research at our food security conference.

The (former German) *Tropentag* has developed into the leading platform for regular networking with European colleagues in international agriculture. In 2008, the North-South Centre was represented in Stuttgart-Hohenheim with 17 participants with 14 oral or poster presentations. This was even more significant and relevant than in the years before, because in 2010 the North-South Centre will be hosting the first *Tropentag* outside Germany.

Memberships in organisations related to developing countries

Institution	Member, function	Further information
Asian Association of Remote Sensing (AARS)	<i>Armin Grün</i> , Representative of Associate Member Switzerland	www.aars-acrs.org
Biore Foundation	<i>Margrit Hugentobler</i> , Member of the Board	www.remei.ch/en/biore/biore-stiftung.html
Brazilian Academy of Sciences	<i>Hans Jürgen Herrmann</i> , Member of the Editorial Board of the of the “Revista de Ingeuiera”	www.abc.org.br
Chinese Academy of Surveying and Mapping (CASM)	<i>Armin Grün</i> , Member of the First Academic Committee of the Key Laboratory of Mapping from Space	english.casm.ac.cn
International Council for Research and Innovation in Building and Construction (CIB)	<i>Holger Wallbaum</i> , Member of the Working Commission 115: Construction Materials Stewardship	www.cibworld.nl
Council for European Congresses of Entomology (ECE)	<i>Silvia Dorn</i> , Vice-President of the Council	www.ece2010.org
Council for International Congresses of Entomology (ICE) (Entomology Section of the International Union of Biological Sciences)	<i>Silvia Dorn</i> , Member of the Council	www.ice2008.org.za www.iubs.org
International Centre for Agricultural Education (CIEA)	<i>Isabelle Gómez</i> , Member	www.ciea.ch
Center for Research on Environmental Decision Making (CRED) (Columbia University, USA)	<i>Renate Schubert</i> , Member of the External Advisory Board	www.cred.columbia.edu
Centre Suisse de Recherches Scientifiques (CSRS)	<i>Bernard Lehmann</i> , Membre du Conseil de Fondation	www.csrs.ch
German Association for Asian Studies (DGA)	<i>Sabrina Krank</i> , Member	www.asienkunde.de/english/index
European Tropical Forest Research Network (ETFRN)	<i>Jean-Pierre Sorg</i> , Member	www.etfrn.org
Ekta Parishad, India and Ekta Europe	<i>Margrit Hugentobler</i> , Member of the International Policy Group of Ekta Parishad India and Coordinator of Ekta Europe	www.ektaparishad.com
Food and Agriculture Organization of the United Nations / International Atomic Energy Agency (FAO/IAEA)	<i>Silvia Dorn</i> Member of the Research Coordination “Insect Pest Control”	www-naweb.iaea.org/nafa/ipc
Forum UNESCO – University and Heritage Network	<i>Armin Grün</i> , Member	www.universityandheritage.net/eng
Global Alliance for Improved Nutrition (GAIN)	<i>Richard Hurrell</i> , Member of Executive Board	www.gainhealth.org
Haute Ecole Neuchâtel Berne Jura (HE ARC)	<i>Jean-Pierre Sorg</i> Member of the “Comité scientifique pour les études postgrades en gestion de projets internationaux”	www.he-arc.ch/hearc
Holcim Foundation for Sustainable Construction	<i>Holger Wallbaum</i> Member of the Technical Competence Center	www.holcimfoundation.org

Institution	Member, function	Further information
International Atomic Energy Agency (IAEA)	<i>Michael Kreuzer</i> Agreement holder of Coordinated Research Project	www-crp.iaea.org
International Foundation for Science (IFS)	<i>Jean-Pierre Sorg</i> , Scientific advisor	www.ifs.se
International Initiative for a Sustainable Built Environment (IISBE)	<i>Holger Wallbaum</i> , Member of the international group on Education for Sustainable Construction	www.iisbe.org
International Institute of Tropical Agriculture (IITA)	<i>Barbara Becker</i> , Board of Trustees	www.iita.org
International Life Science Institute (ILSI)	<i>Richard Hurrell</i> , Member of Task Force on NaFeEDTA / Member of Technical Committee of ILSI Project IDEA (Iron deficiency elimination action)	www.ilsa.org
Initiative For Policy Dialogue (IPD) (Columbia University, USA) "Environmental Economics"	<i>Stefanie Engel</i> , Member of the Task Force	www0.gsb.columbia.edu/ipd/programs
International Society for Digital Earth (ISDE)	<i>Armin Grün</i> , Member of the Executive Committee	www.digitalearth-isde.org
International Society for Photogrammetry and Remote Sensing (ISPRS)	<i>Emmanuel Baltsavias</i> , Chair of the Special Interest Group "Promotion of Profession to Young People" of the Technical Commission VI "Education and Outreach"	www.isprs.org
International Society for Photogrammetry and Remote Sensing (ISPRS)	<i>Armin Grün</i> , Chair of the Special Interest Group "The Technology Transfer CARAVAN" of the Technical Commission VI "Education and Outreach"	www.isprs.org
International Union of Nutritional Scientists (IUNS)	<i>Richard Hurrell</i> , President of Swiss Committee	www.iuns.org
Commission for Research Partnerships with Developing Countries (KFPE)	<i>Barbara Becker</i> , Member ad personam	www.kfpe.ch
Livestock Emissions & Abatement Research Network (LEARN)	<i>Michael Kreuzer</i> , Member of the Network Advisory Group	www.livestockemissions.net
LivestockNet	<i>Michael R. Goe</i> , Board Member	www.livestocknet.ch
Munich Re Foundation	<i>Renate Schubert</i> , Member of the Board of Trustees	www.munichre-foundation.org
RedR	<i>Michael R. Goe</i> , Member	www.redr.org
Swiss Agency for Development and Cooperation (SDC)	<i>Jean-Pierre Sorg</i> , Head of the working group "Wald und Baum in der Entwicklungszusammenarbeit"	www.deza.admin.ch
Working Group Evaluation in Development Cooperation (SEVAL)	<i>Isabel Guenther</i> , Member	www.seval.ch/de/ueberuns/entwicklungsza.cfm

Institution	Member, function	Further information
Swiss Forum for International Agricultural Research (SFIAR)	<i>Barbara Becker, Silvia Dorn,</i> Members	www.sfiar.ch
Swiss Society of Agronomy (SGPW)	<i>Jan Jansa,</i> Member	www.sgpw.scnatweb.ch
University of Göttingen – Chair of Development Economics	<i>Isabel Guenther,</i> Research Associate	www.uni-goettingen.de/de/64094.html
Verein für Socialpolitik	<i>Stefanie Engel, Renate Schubert,</i> Members of the Research Committee Development Economics	www.socialpolitik.org
Africa Rice Center (WARDA)	<i>Barbara Becker,</i> Member of the Board of Trustees	www.warda.org
German Advisory Council on Global Change (WBGU)	<i>Renate Schubert,</i> Member of the Counsel	www.wbgu.de
World Health Organization (WHO)	<i>Richard Hurrell,</i> Member of Technical Consultation on Iron and Infection / Member of International Micronutrient Group of Experts	www.who.int
World Health Organization/ Food and Agriculture Organization of the United Nations (WHO/FAO)	<i>Richard Hurrell,</i> Member of Expert Committee on Food Fortification	www.who.int www.fao.org

БЕРЕЖНОЕ ОТНОШЕНИЕ К ВОДЕ, ЭКОНОМИЯ

каждой капли в масштабах Узбекистана позволяют улучшить водоснабжение населения, обеспечить все отрасли народного хозяйства Узбекистана необходимым количеством воды.

ИЗ НЕИСПРАВНОГО КРАНА
ВЫТЕКВЕТ ЗА СУТКИ В СРЕДНЕМ
50 КУБОМЕТРОВ ВОДЫ,
ЧТО СОСТАВЛЯЕТ ДНЕВНУЮ НОРМУ
185 ЧЕЛ.

БЕРЕГИТЕ ВОДУ!

Poster calling for water conservation, Uzbekistan

Water is the basis for life, for our bodies and our souls. Water feeds both: Water quenches thirst and hunger. Water inspires our fantasies. All around the world countless myths and legends have evolved about water.

Moritz Leuenberger, Federal Councillor of Switzerland (2009)

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Dohme, F., Scharenberg, A., Kreuzer, M., 2008: Effects on nitrogen metabolism of supplementing tanniferous sainfoin hay to grass-fed dairy cows. Joint Annual Meeting of the Societies of Animal Science and Dairy Science, Indianapolis, USA, July 7–10.

Grob, C., Zeugin, F., Jansa, J., Scherer-Lorenzen, M., 2008: Detecting complementary nitrogen uptake of tropical trees adopting a ¹⁵N-labeling method. International Conference of the Society for Tropical Ecology (21st Annual Meeting), University of Hohenheim. Stuttgart, Germany, February 18–22.

Guenther, I., 2008: Inequality in mortality and life expectancy in sub-Saharan Africa. Population Association of America, New Orleans, USA, April 17–19.

Jaturasitha, S., Petra, C., Sanghuayprai, N., Vearasilp, T., Wicke, M., Kreuzer, M., 2008: Performance and carcass characteristics of mature buffalos fed diets with different roughage: concentrate ratios. Globalisierung und Klimawandel: Verändern sie die Tierernährung in der Schweiz? Tagung ETH Zurich, Switzerland, May 6.

Kastner, S., Dostal, A., Tschannen, A., Lacroix, C., Farah, Z., Meile, L., 2008: Biodiversity of lactic acid bacteria and occurrence of antibiotic resistances in enterococci from attiéké, a traditional Ivorian cassava product. How to Ensure Food Security Today and Tomorrow? Confe-

rence on the World Food Situation, North-South Centre/Syngenta Foundation, ETH Zurich, Switzerland, December 12.

Kastner, S., Dostal, A., Tschannen, A., Lacroix, C., Farah, Z., Meile, L., 2008: Diversity of lactic acid bacteria and occurrence of antibiotic resistances in enterococci isolated from a traditional Ivorian cassava product. Evolving Microbial Food Quality and Safety, Food Micro 2008, Aberdeen, Scotland, September 1–4.

Krank, S., Walbaum, H., 2008: Enhancing the assessment of sustainable urban development. AGS Annual Meeting: Designing Pathways for a Sustainable World: At Scale, in Time, and for All, MIT, Boston, USA, January 28–31.

Leiber, F., Tsvetkova, V., Petrova, I., Scheeder, M.R.L., Kreuzer, M., Angelow, L., 2008: Fettsäurenmuster von Schafmilch aus einem Selenmangelgebiet im bulgarischen Rhodopengebirge. Globalisierung und Klimawandel: Verändern sie die Tierernährung in der Schweiz? Tagung ETH Zurich, Switzerland, May 6.

Lukman, R., Affuddin, A., Stamp, P., Thiraporn, R., Khaeruni, A., 2008: A precise means to confirm purity of commercial maize varieties on the basis of SSR analysis. The 10th Asian Regional Maize Workshop, Makassar, Indonesia, October 20–23.

Marquardt, S., Alzérreca, H., Encinas, F.D., Beck, S., Kreuzer, M., Mayer, A.C., 2008: Veränderung in den Futterressourcen in bolivianischen Bergwäldern und ihrer Nutzung durch Rinder während Trocken- und Vorregenzeit. 62. Tagung der Gesellschaft für Ernährungsphysiologie, Göttingen, Germany, April 1–3.

Marquardt, S., Alzérreca, H., Encinas, F.D., Kreuzer, M., Mayer, A.C., 2008: Dry and prehumid season: Adaptations of activity patterns of free-ranging Criollo cattle in subtropical mountain forests of Southern Bolivia. Water for Development: Prospects for Integrated Water Resources Management, Annual Conference of the North-South Centre, ETH Zurich, Switzerland, June 4.

Marquardt, S., Alzérreca, H., Hillmann, E., Encinas, F.D., Kreuzer, M., Mayer, A.C., 2008: Verhalten von Criollo-Rindern in bolivianischen Bergwäldern während der Trocken- und Vorregenzeit. Globalisierung und Klimawandel: Verändern sie die Tierernährung in der Schweiz? Tagung ETH Zürich, Zurich, Switzerland, May 6.

Marquardt, S., Kreuzer, M., Beck, S., Marquez, A., Mayer, A.C., Alzérreca, H., 2008: Search for unconventional feed sources to reduce competition for food: Experimental determination of browsing intensity on young tree and shrub species in subtropical forests under different cattle stocking rates. How to Ensure Food Security Today and Tomorrow? Conference on the World Food Situation, North-South Centre/Syngenta Foundation, ETH Zurich, Switzerland, December 12.

Mayer, A.C., Koellner, T., Duerr, N., 2008: Sozioökonomische Rahmenbedingungen des Transhumanzsystems Südbolivians. Globalisierung und Klimawandel: Verändern sie die Tierernährung in der Schweiz? Tagung ETH Zurich, Switzerland, May 6.

Moreno I., Gruissem W., Vanderschuren H., 2008: Evaluation of different strategies to engineer Cassava Brown Streak Virus (CBSV) resistance in Cassava (*Manihot esculenta* Crantz). D-BIOL Symposium, ETH Zurich, Davos, Switzerland, June 2–4.

Moreno I., Gruissem W., Vanderschuren H., 2008: Evaluation of different strategies to engineer Cassava Brown Streak Virus (CBSV) resi-

stance in Cassava (*Manihot esculenta* Crantz). First Scientific Meeting of the Global Cassava Partnership, Ghent, Belgium, July 21–25.

Orek, C., Zhang, P., Gruissem, W., Morag, F., Vanderschuren, H., 2008: The gene expression associated with “stay-green” characteristic for drought tolerance in cassava (*Manihot esculenta* Crantz). How to Ensure Food Security Today and Tomorrow? Conference on the World Food Situation, North-South Centre/Syngenta Foundation, ETH Zurich, Switzerland, December 12.

Orek, C., Zhang, P., Gruissem, W., Morag, F., Vanderschuren, H., 2008: The gene expression associated with “stay-green” characteristic for drought tolerance in cassava (*Manihot esculenta* Crantz). First Scientific Meeting of the Global Cassava Partnership, Ghent, Belgium, July 21–25.

Orek, C., Zhang, P., Gruissem, W., Morag, F., Vanderschuren, H., 2008: The gene expression associated with “stay-green” characteristic for drought tolerance in cassava (*Manihot esculenta* Crantz). Plants, People, Mutual Dependence in the 21st Century, PhD Symposium of the Zurich - Basel Plant Science Center, ETH Zurich, Switzerland, June 6.

Orek, C., Zhang, P., Gruissem, W., Morag, F., Vanderschuren, H., 2008: The gene expression associated with “stay-green” characteristic for drought tolerance in cassava (*Manihot esculenta* Crantz).: Water for Development: Prospects for Integrated Water Resources Management, Annual Conference of the North-South Centre, ETH Zurich, Switzerland, June 4.

Orek, C., Zhang, P., Gruissem, W., Morag, F., Vanderschuren, H., 2008: The gene expression associated with “stay-green” characteristic for drought tolerance in cassava (*Manihot esculenta* Crantz). D-BIOL Symposium, ETH Zurich, Davos, Switzerland, June 2–4.

Owiti, J., Beeching, J., Zhang, P., Gruissem, W., Vanderschuren, H., 2008: Analysis of post-harvest physiological deterioration of cassava storage roots and identification of potential candidates for its modulation. D-BIOL Symposium, ETH Zurich, Davos, Switzerland, June 2–4.

Owiti, J., Beeching, J., Bull, S., Gehrig, P., Gruissem, W., Vanderschuren, H., 2008: Analysis of post-harvest physiological deterioration of cassava storage roots and identification of potential candidates for its modulation. How to Ensure Food Security Today and Tomorrow? Conference on the World Food Situation, North-South Centre/Syngenta Foundation, ETH Zurich, Switzerland, December 12.

Owiti, J., Beeching, J., Zhang, P., Grossmann, J., Gehrig, P., Gruissem, W., Vanderschuren, H., 2008: Analysis of post-harvest physiological deterioration of cassava storage roots and identification of potential candidates for its modulation. First Scientific Meeting of the Global Cassava Partnership, Ghent, Belgium, July 21–25.

Owiti, J., Beeching, J., Zhang, P., Gruissem, W., Vanderschuren, H., 2008: Analysis of post-harvest physiological deterioration of cassava storage roots and identification of potential candidates for its modulation. Plants, People, Mutual Dependence in the 21st Century, PhD Symposium of the Zurich-Basel Plant Science Center, ETH Zurich, Switzerland, June 6.

Pasche N., 2008: How does nutrient cycling influence methane production in Lake Kivu? International Conference on Research for

Development (ICRD, 2008), NCCR North-South, Berne, Switzerland, July 2–4.

Seifert, C., Wullschleger, S., Baumgartner, S., Lacroix, C., Meile, L., 2008: Characterization of *Vagococcus teuberi* sp. nov., isolated from spontaneously fermented sour-milk in Mali. 9th FEMS Symposium on Lactic Acid Bacteria, Egmond an Zee, the Netherlands, August 31–September 4.

Vanderschuren, H., Alder, A., Gruissem, W., Zhang, P., 2008: Engineering geminivirus resistance in cassava. First Scientific Meeting of the Global Cassava Partnership, Ghent, Belgium, July 21–25.

Wullschleger, S., Lacroix, C., Sissoko-Thiam, A., Baltzer, S., Romanens, E., Baumgartner, S., Traoré, I., Bonfoh, B., Meile, L., 2008: Characterisation of the microflora and development of an adapted starter culture for *fènè* production, a spontaneous fermented sour milk in Mali. Food Micro 2008, Aberdeen, Scotland, September 1–4.

Zeugin, F., 2008: Detecting differences in nitrogen-uptake of tropical trees adopting a ¹⁵N-labeling method. Society for Tropical Ecology (gtö), Stuttgart, Germany, February 18 – 22.

Zeugin, F., 2008: Detecting differences in nitrogen-uptake of tropical trees adopting by ¹⁵N-labeling. 9th Swiss Global Change Day, Bern, Switzerland, April 1.

Invited oral presentations

Projects funded via the North-South Centre

Becker, B., Diby, L., 2008: Asymmetries in North-South research relationships. EADI 12th General Conference: Global Governance for Sustainable Development: The Need for Policy Coherence and New Partnerships, Switzerland, Geneva, June 24–28.

Dorn, S., Schmale, I., Velten, G., Rott, A., 2008: Avoiding and reducing post-harvest losses. How to ensure Food Security today and tomorrow? Conference on the World Food Situation, North-South Centre/Syngenta Foundation, ETH Zurich, Switzerland, Dec. 12.

Dorn, S., Velten, G., Rott, A., Schmale, I., 2008: Combining top-down and bottom-up forces to control bruchids: Larval parasitoid and protein-based host plant resistance. XXIII International Congress of Entomology, Symposium on Biological Control of Stored Product Insects, Durban, South Africa, July 6–12.

Kreuzer, M., 2008: Setting the scene. Opportunities for change in agriculture and world food. How to ensure Food Security today and tomorrow? Conference on the World Food Situation, North-South Centre/Syngenta Foundation, ETH Zurich, Switzerland, December 12.

Kreuzer, M., 2008: Feed scarcity under dry conditions: forage options and adaptation of ruminant livestock – Results of the research programme of the Animal Nutrition Group at ETH Zurich. Colloquium of the International Centre for Agricultural Research in the Dry Areas (ICARDA), Aleppo, Syria, March 20.

Rustagi, D., Engel, S., 2008: Conditional cooperation norm and participatory forest management in Ethiopia. ZEF Research Seminar, Center for Development Research, University of Bonn, October 17.

Rustagi, D., Engel, S., 2008: Leadership and participatory forest management in Ethiopia. Research Seminar in Experimental Economics, Institute for Empirical Research in Economics, University of Zurich, December 19.

Wenk, C., 2008: Ban of AGP in Europe. Postgraduate Institute of Agriculture at the University of Peradeniya, Sri Lanka, January 16.

Wenk, C., 2008: GMO as Feedstuffs: Facts instead of myths. What's happening with nucleic acids in the animal? Presentation at the University of Peradeniya, Sri Lanka, January 16.

Wolf, S., 2008: Eddy covariance measurements – Lessons learned about breathing of the terrestrial biosphere. CTFs science meeting, Panama City, Panama, June 17.

Projects not funded via the North-South Centre

Bloem, S., Dorn, S., Sarvary, M., Hight, S., Bloem, K., Carperter, J.E., Zimmermann, H., Floyd, J.P., 2008: Understanding the factors that influence the geographic expansion of *Cactoblastis cactorum* in non-native habitats. XXIII International Congress of Entomology, Symposium on Sampling and Modeling the Spatial Response of Insects across Spatial Scales, Durban, South Africa, July 6–12.

Buchmann, N., 2008: Klimawandel – Eine Herausforderung für die Schweiz. Collegium Generale of the University Bern “Nehmen Konflikte und Sicherheitsrisiken unter den Bedingungen des Klimawandels eine neue Qualität an?”, Bern, Switzerland, April 22.

Buchmann, N., 2008: Climate, land use change and food security: Options for the UNCCD. Event on Climate, Land and Food Security organised by the Secretariat of the United Nations Convention to Combat Desertification (UNCCD), the Ministry for Economic Cooperation and Development (BMZ) of Germany and the German Advisory Council on Global Change (WBGU), Berlin, Germany, October 15.

Dorn, S., Häckermann, J., Hein, S., 2008: The parasitoid *Hyssopus pallidus*, a candidate biocontrol agent of the codling moth. Third Annual Biocontrol Industry Meeting, Lucerne, Switzerland, October 20–21.

Egli, I., 2008: Effect of phytic acid reduction on iron bioavailability – What is a useful level of reduction? HarvestPlus Technical Meeting, Washington, USA, March 31–April 2.

Egli, I., 2008: Stable isotope techniques to access bioavailability of iron. First Research Coordination Meeting on Food Fortification and Biofortification to Improve Micronutrient Status during Early Life, International Atomic Energy Agency, Vienna, Austria, December 15–17.

Egli, I., Petry, N., 2008: Improving iron absorption from beans (*Phaseolus vulgaris*) in humans. HarvestPlus Bean Meeting, Butare, Rwanda, October 9.

Egli, I., 2008: Effect of bean polyphenols on iron absorption. Iron Biofortified Crops, Joint Technical Meeting IAEA/HarvestPlus, Session IV, Vienna, Austria, August 13–14.

Engel, S., Wünscher, T., 2008: Targeting international payments for environmental services (IPES): General criteria, existing global approaches, real world examples and special challenges to IPES. Workshop on International Payments for Ecosystem Services, Side-event to the Annual Conference of the International Society of Ecological Economics, Nairobi, Kenya, August 8.

Engel, S., 2008: The new governance of water resources: Payments for environmental services and other examples. Eawag, Dübendorf, Switzerland, May 16.

Engel, S., 2008: Payments for environmental services. NADEL, ETH Zurich, Switzerland, December 12.

Farah, Z., 2008: Kamel-Haltung zwischen Tradition und Moderne. Vortrag bei der Zoologischen Gesellschaft Zürich, Zurich, Switzerland, November 4.

Gruissem W., 2008: BioCassava Plus and technical bottlenecks. Bio-Cassava Plus Meeting, Kampala, Uganda, April 19–21.

- Gruissem W., 2008: Cassava priority settings. Global Cassava Partnership, Ghent, Belgium, July 21–25.
- Guenther, I., 2008: Social interactions and fertility in developing countries. European Society for Population Economics, London, UK, June 19–21.
- Guenther, I., 2008: Social interactions and fertility in developing countries. European Economic Association, Milan, Italy, August 27–31.
- Guenther, I., 2008: Vulnerability and loss aversion. International Association for Research in Income and Wealth, Portoroz, Slovenia, August 24–30.
- Guenther, I., 2008: Vulnerability and loss aversion. Frontiers of Poverty Analysis, UNU-WIDER, Helsinki, Finland, September 26–27.
- Hurrell, R., 2008: Assessment of iron bioavailability, public health significance of micronutrient deficiencies, and new studies to determine iron and zinc bioavailability from sorghum and millet. Biofortification to Improve Micronutrient Nutrition, IAEA/Harvest Plus Meeting, Vienna, Austria, August 11–13.
- Hurrell, R., 2008: Food interactions with micronutrient efficacy: Old and new emerging solutions. Nestlé Research Symposium, China, Beijing, October 29–31.
- Hurrell, R. 2008: Contradictory findings on the influence of vitamin A on iron bioavailability in human subjects. TEMA13 Symposium, Puchón, Chile, November 10–13.
- Hurrell, R., 2008: Food based strategies to combat iron deficiency. Lucille Hurley Lecture – Graduate Student Seminar, University of California, Davis, CA, USA, February 23.
- Koellner, T., 2008: Financial market innovations for ecosystem services. International Seminar on Adaptation to Climate Change: The Role of Ecosystem Services, Centro Agronómico Tropical de Investigación y Enseñanza (CATIE), Costa Rica, November 3–5.
- Kreuzer, M., 2008: Perspectives of mitigating methane and other greenhouse gases from livestock husbandry by nutritional means. World Nutrition Forum. The Future of Animal Nutrition, Maierhofen, Zillertal, Austria, September 18–20.
- Krank, S., 2008: Cultural, spatial and socio-economic fragmentation in the Indian megacity Hyderabad. Urban Planet: Collective Identities, Governance and Empowerment in Megacities, Social Science Research Center Berlin, Germany, June 11–16.
- Meile, L., 2008: Microorganisms in fermented food: Do you trust them? Introduction to Microbiology and Immunology (MIM) in Zurich, Botanical Garden, University Zurich, Switzerland, February 14.
- Mody, K., Eichenberger, D., Dorn, S., 2008: Drought effects on plant resistance: Water stress increases or reduces plant resistance to pest insects depending on stress intensity. Jahrestagung der Schweizerischen Gesellschaft für Phytomedizin, Zurich, Switzerland, September 12.
- Mody, K., Stoeckli, S., Gessler, C., Dorn, S., 2008: Apple resistance to arthropod herbivores: Genetic basis and modification by environmental factors. IOBC, VII International Conference on Integrated Fruit Protection, Avignon, France, October 27–30.
- O'Mara, F.P., Beauchemin, K., Kreuzer, M., McAllister, T.A., 2008: Reduction of greenhouse gas emissions of ruminants through nutritional strategies. Livestock and Global Climate Change. British Society of Animal Science and ICARDA Tunisia, Hammamet, Tunisia, May 17–20.
- Rustagi, D., 2008: Conditional cooperation norm and leadership and participatory forest management in Ethiopia. Centre for Development Research, University of Bonn, Germany, October 17.
- Saizaki, R., 2008: Designing PES under the uncertainties of climate change. 17th PhD Workshop on International Climate Policy, ETH Zurich, Switzerland, November 21–22.
- Schlegel, K., Bull, S., Peter, N., Owiti, O., Moreno, I., Orek, C., Zhang, P., Gruissem, W., Vanderschuren, H., 2008: Easy and reproducible cassava transformation: the “quest for the Holy Grail” of the cassava biotechnology community. Global Cassava Partnership, Ghent, Belgium, July 21–25.
- Scholz, R. W., 2008: Ecosystem services in the context of global change: The challenges for new institutions – Conflicting paradigms across market actors and nations and supranational systems. International Seminar on Adaptation to Climate Change: The Role of Ecosystem Services, Centro Agronómico Tropical de Investigación y Enseñanza (CATIE), Costa Rica, November 3–5.
- Schubert, R., 2008: Global climate change and bioenergy – Remedy or curse? Center for the Research on Environmental Decisions (CRED), Annual Meeting, New York, USA, May 5–6.
- Schubert, R., 2008: Global climate change – Can bioenergy be an option? Environmental Change Institute, Research Seminar, Oxford, UK, February 11.
- Schubert, R., 2008: Payments for ecosystem services (PES) as means to reduce poverty? North-South Forum, ETH Zurich, Switzerland, February 15.
- Sorg, J.P., 2008: Savoir local et gestion des forêts: contribution de la recherche au transfert de la gestion des forêts de noyer (*Juglans regia* L.) au Kirgizstan, Asie centrale. International Workshop on Stakeholders in Community Management of Natural Resources: Cooperation, Contradictions, Conflicts, Ecole Supérieure des Sciences Agronomiques, Antananarivo, Madagascar, July 1–3.
- Spreng, D., 2008: Energienachfrage Indiens. Ringvorlesung ETH/UNI, Herbstsemester 2008, University of Zurich, Switzerland, October 16.
- Vanderschuren, H., Alder, A., Gruissem, W., Zhang, P., 2008: Engineering RNA-mediated resistance to geminiviruses in cassava. BioCassava Plus Meeting, Kampala, Uganda, April 19–21.
- Wegmüller, R., 2008: Efficacy and effectiveness of micronutrient fortification. Egypt Ferrazone Symposium, Cairo, Egypt, January 10.
- Wenk, C., 2008: Klimawandel – Auswirkungen auf Tierernährung und Leistung der Nutztiere. BMELV/FLI-Workshop “Moderne Tierernährung – Sicher, effizient und klimaschonend”, Braunschweig, Germany, November 13–14.

Other oral presentations

Projects funded via the North-South Centre

Abbeddou, S., 2008: Effect of type of feed on the fertilization value of fresh manure, composted manure or the direct application of olive mill waste, on soil and barley response. Meeting of the Group of Plant Nutrition, Institute of Plant Science, ETH Zurich, Eschikon, Switzerland, September 19.

Andriambelo, L.H., 2008. La gestion des ressources forestières par la population locale dans une nouvelle formule d'aire protégée, cas du Menabe Central. International Workshop on Stakeholders in Community Management of Natural Resources: Cooperation, Contradictions, Conflicts, Ecole Supérieure des Sciences Agronomiques, Antananarivo, Madagascar, July 3.

Andriambelo, L.H., 2008: Projet PFM (Paysages Forestiers du Menabe), Résultats préliminaires. Annual Meeting of the Groupe de Recherche du Menabe (GRM), Morondava, Madagascar, March 26.

Andriambelo, L. H., 2008 : Critères de gestion des ressources ligneuses dans un souci de durabilité de l'espace forestier du Menabe, Madagascar. Annual Meeting of the Groupe de Recherche du Menabe (GRM), Morondava, Madagascar, March 26.

Becker, B., Douxchamps, S., Oberson, A., Meile, L., Kreuzer, M., 2008: Livestock systems in support of poor people. International Conference on Research for Development (ICRD, 2008), NCCR North-South, Berne, Switzerland, July 2–4.

Bukobero, S., 2008: Les effets pervers des normes négociées : Le cas de transfert de gestion à Beronono (Nord-ouest de Madagascar). Global Governance for Sustainable Development: The Need for Policy Coherence and New Partnerships, 12th EADI General Conference, Geneva, Switzerland, June 24–28.

Cavalcanti, C., 2008: Public participation and willingness to cooperate in common-pool resource management: A field experiment with fishing communities in Brazil. Annual Meeting of the European Association of Environmental and Resource Economists. Gothenburg, Sweden, June 25–28.

D'Alessandro, M., 2008: Herbivore-induced plant volatiles: Breaking down complexity to enhance specificity. Plant Signalling: Opportunities for Non-cidal Pest Control? The Society of Chemical Industrie (SCI), London, UK, March 4.

Dirac Ramohavelo, C., Sorg, J.-P., Palmer, C., 2008: Would payments for ecological services (PES) be effective in discouraging deforestation in Madagascar's central Menabe region? Ecosystem Services Conference, Salza, Germany, May 13–15.

Flury, C., Tapio, M., Simianer, H., Hanotte, O., Rieder, S., 2008: Missing population data for livestock breeds in developing countries – Do molecular methods offer new perspectives? International Conference on Research for Development (ICRD, 2008), NCCR North-South, Berne, Switzerland, July 2–4.

Flury, C., Tapio, M., Simianer, H., Hanotte, O., Rieder, S., 2008: Assessment of the risk status for livestock breeds in developing countries: Does the molecular estimation of effective population size offer new perspectives? SVT-Tagung, Zollikofen, Switzerland, March 26.

Hgaza Kouame, V., 2008: Source-sink relationship in *Dioscorea alata* L. First International Workshop of the Yam Crop Physiology, ETH Zurich, Switzerland, December 1–4.

Hgaza Kouame, V., 2008: Source-sink relationship in *Dioscorea alata* L. Oral presentation, Institutskolloquium, Institute of Plant Science, ETH Zurich, December 9.

Huft M., Bukobero S., 2008: Les déterminants institutionnels de l'accès aux ressources naturelles: De la gouvernance environnementale globale aux transferts de gestion à Madagascar. International Workshop on Stakeholders in Community Management of Natural Resources: Cooperation, Contradictions, Conflicts, Ecole Supérieure des Sciences Agronomiques, Antananarivo, Madagascar, July 3.

Rustagi, D., 2008: Leadership and participatory forest management in Ethiopia. Institute for Empirical Research in Economics, University of Zurich, Zurich, Switzerland, December 19.

Urech, Z., 2008: Ways to improved forest management in favour of biodiversity and local livelihoods. Presentation of project methods at the NADEL Course on Promoting Sustainable Livelihood: Approaches and Practices, NADEL, Zurich, Switzerland, March 10–14.

Urech, Z., Rabenilalana, M., 2008: Presentation of project results. Intercooperation Madagascar, December 19.

Zabel, A., Engel, S., 2008: Comparing conventional and new policy approaches for carnivore conservation. Conference on Sustainable Resource Use and Economic Dynamics (SURED 2008), Ascona, Switzerland. June 2–5.

Zabel, A., Engel, S., 2008: Comparing conventional and new policy approaches for carnivore conservation. Annual Meeting of the European Association of Environmental and Resource Economists, Gothenburg, Sweden, June 25–28.

Projects not funded via the North-South Centre

Chapuis-Lardy, L., Weber, L., Frossard, E., Razafimbelo, T., Toucet, J., Blanchart, E., 2008: Earthworm influence on carbon dioxide and nitrous oxide fluxes from two Malagasy clayey soils. XV International Colloquium on Soil Zoology, Curitiba, Brazil, August 25–29.

Chen, M.C., Dorn, S., 2008: Microsatellites reveal the genetic differentiation among populations in an insect species with high genetic variability in dispersal, the codling moth. Royal Entomological Society Annual Meeting, York, UK, September 3–5.

Chen, M.C., Dorn, S., 2008: Microsatellites reveal the genetic differentiation among populations of *Cydia pomonella* in Switzerland. Schweizerische Gesellschaft für Phytomedizin, Zurich, Switzerland, September 12.

Clément, C., Locher, N., Iten, C., Witschi, U., Kreuzer, M., 2008: Untersuchungen zur Wirkung der Andenpflanze Maca bei Zuchtstieren. Frühjahrstagung der Schweizerischen Vereinigung für Tierproduktion, Schweizerische Hochschule für Landwirtschaft (SHL), Zollikofen, Switzerland, March 27.

Clément, C., 2008: Maca, an Andean plant of the past and the future: Factors influencing the composition of bioactive compounds and perspectives for new applications. Opportunities for New Functional

Food, Healthcare & Wellness Products from Latin American Biodiversity. International Workshop of the European Action on Latin American Functional Foods (EULAFF), Het Pand, Gent, Belgium, December 8–9.

Diby, L.N., Hgaza Kouame, V., Tié, T.B., Assa, A., Carsky, R., Asiedu, R. Girardin, O., Frossard, E., 2008: Effect of soil fertility on yield formation in yams (*Dioscorea* spp.). First International Workshop of the Yam Crop Physiology, ETH Zurich, Switzerland, December 1–4.

Dorn, S., Häckermann, J., Hein, S., 2008: How preimaginal temperature exposure and adult nutrition from damaged plant tissue influence performance of a larval parasitoid of the codling moth. Entomological Society of America (ESA) Annual Meeting, Reno, NV, USA, November 16–19.

Guenther, I., 2008: Randomized impact evaluations. Swiss Agency for Development and Cooperation (SDC), Berne, Switzerland, December 10.

Guenther, I., 2008: Randomized impact evaluations. German Development Institute (DIE), Bonn, Germany, September 16–17.

Palmer, C., 2008: Fuelwood scarcity, energy substitution and rural livelihoods in Namibia. Annual Conference on Development Economics, Verein für Socialpolitik, ETH Zurich, Switzerland, May 30–31.

Palmer, C., 2008: Fuelwood scarcity, energy substitution and rural livelihoods in Namibia. Annual Meeting of the European Association of Environmental and Resource Economists, Gothenburg, Sweden, June 25–28, 2008.

Pasche, N., 2008: Nutrient cycling and methane production in Lake Kivu. IBP Congress, ETH Zurich, March 28.

Pasche, N., 2008: Nutrient cycling and methane production in Lake Kivu. Kastanienbaum Seminar, April 14.

Pasche, N., 2008: Nutrient cycling in Lake Kivu. Great Lakes of the World and Rift Valley Lakes: Sustainability, Integrity and Management, International Symposium, GLOW 5, Sodore, Ethiopia, April 28–30.

Schmid M., 2008: The importance of double diffusion for mixing processes in Lake Kivu. 12th workshop on Physical Processes in Natural Waters (PPNW), Lake Tahoe, USA, September 3.

Schubert, R., 2008: Climate policy making for enhanced technological and institutional innovations (ClimPol), Smart Energy Strategies Conference, ETH Zurich, Switzerland, September 10.

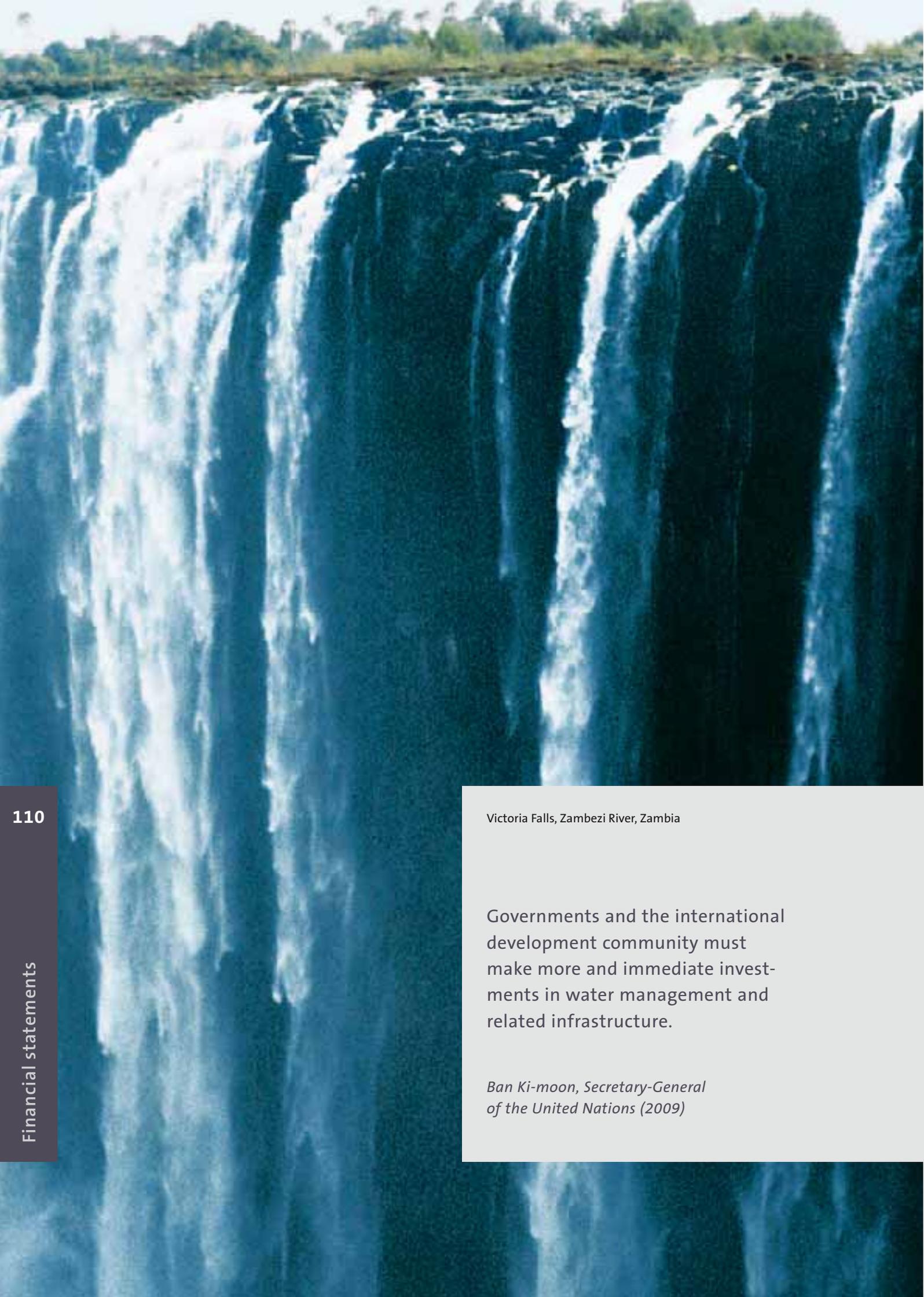
Vanderschuren H., Owiti, J., Moreno, I., Orek, C., Schlegel, K., Peter, N., Bull, S., Zhang, P., Gruissem, W., 2008: The contribution of biotechnology to problem solving in Africa: The case of cassava. International Conference on Research for Development (ICRD, 2008), NCCR North-South, Berne, Switzerland, July 2–4.

Wüest, A., 2008: Methane in Lake Kivu. Seminar at IGB, Berlin, June 6.

Wüest, A., 2008: Lake Kivu Methane Extraction: Options – Simulations. 12th workshop on Physical Processes in Natural Waters (PPNW), Lake Tahoe, USA, September 3.

Wullschlegler S., 2008: Gesundes Joghurt für Westafrika. Vortrag an der Nacht der Forschung, Zurich, Switzerland, September 26.

Wullschlegler S., 2008: Une laiterie pour la commune de Siby. Vortrag zur Eröffnung der Kleinmolkerei DJOM-KOSSAM, Bamako, Mali, July 18.



Victoria Falls, Zambezi River, Zambia

Governments and the international development community must make more and immediate investments in water management and related infrastructure.

Ban Ki-moon, Secretary-General of the United Nations (2009)

Financial statements

Administratively, the North-South Centre is a unit of the ETH Zurich funded partially by ETH credits and by third-party contracts, primarily from the public sector. All funds are allocated to predefined activities according to the objectives of the Centre and its specific contracts.

All accounts were audited externally and internally and were unconditionally approved.

Balance sheet North-South Centre

Assets	
Management	
Cash	300
Operating funds (ETH accounts)	796 529
Receivables, third parties	54 491
Subtotal assets, management	851 320
Programmes	
Operating funds (ETH accounts)	1 269 762
Receivables, third parties	8 447
Subtotal assets, programmes	1 278 209
Total assets	2 129 529
Liabilities	
Management	
Equity	617 147
Liabilities, third parties	29 065
Accruals (S-ENETH contribution 2009–11)	150 000
Under-expenditure	55 108
Subtotal liabilities, management	851 320
Programmes	
Equity	1 538 335
Liabilities, third parties	52 265
Over-expenditure	-312 391
Subtotal liabilities, programmes	1 278 209
Total liabilities	2 129 529

Income statement North-South Centre

Expenditure	
Management	
Personnel *	391 393
Operations	31 105
Public relations	116 773
Subtotal expenditure, management	539 271
Programmes	
Seed money and grants (ETH contribution)	10 879
Livestock systems programme (SDC contribution)	857 222
RFPP fellowships (SDC contribution)	878 071
Subtotal expenditure, programmes	1 746 172
Total expenditure	2 285 443

* Personnel expenses for the Managing Director are covered by the ETH Zurich through the D-UWIS directly. Personnel and operational expenses for ERA-NET are covered by SDC directly.

Income	
Management	
Member contributions	33 300
Contribution S-ENETH 2008	50 000
SDC management contributions (livestock systems programme & RFPP)	319 069
Other income, third parties	94 859
Subtotal income, management	497 228
Programmes	
ETH contribution (seed money and grants)	50 000
SDC contribution (livestock systems programme, research projects)	690 470
SDC contribution (RFPP fellowships)	790 461
Subtotal income, programmes	1 530 931
Total income	2 028 159
Over-expenditure	-257 284

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(Well with handpump in Niger and aqueduct
supplying settlements with water from the
mountains in Oman)

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List of acronyms

All units of the ETH Zurich are in italics.

ACW Agroscope Changins-Wädenswil
ADAPT African dams project, CCES
AGS Alliance for Global Sustainability
AIT Asian Institute of Technology, Bangkok
ALP Agroscope Liebefeld-Posieux
ARD Agricultural Research for Development
ART Agroscope Reckenholz-Tänikon
BIGS Bonn International Graduate School for
Development Research
BLW Federal Office for Agriculture
C Chlorophyll
CAS CAS Funding Resources, Case Western Reserve
University
CATIE Centro Agronómico Tropical de Investigación
y Enseñanza
CCES Competence Centre for Environment and
Sustainability of the ETH Domain
CDE Centre for Development and Environment,
University of Berne
CEPE Centre for Energy Policy and Economics
CFPF Centre de Formation Professionnelle Forestière,
Madagascar
CGIAR Consultative Group on International
Agricultural Research
CIAT International Center for Tropical Agriculture
CIFOR Centre for International Forestry Research
CIMMYT International Maize and Wheat
Improvement Centre
CIP International Potato Centre
ClimPol Climate Policy Making for Enhanced
Technological and Institutional Innovations, CCES
CNRE Centre National de Recherches sur
l'Environnement, Madagascar
CoCE Conservation and use of the wild
populations of Coffea arabica in the montane
rainforests of Ethiopia (ZEF Project)
CO₂ Carbon dioxide
CSRS Centre Suisse de Recherche Scientifique, Côte
d'Ivoire
DC Developing countries
D-AGRL Department of Agricultural and Food
Sciences
D-ARCH Department of Architecture
D-BAUG Department of Civil, Environmental and
Geomatic Engineering
D-BIOL Department of Biology
D-ERDW Department of Earth Sciences
DFG Deutsche Forschungsgemeinschaft
D-GESS Department of Humanities, Social and
Political Sciences
D-INFK Department of Computer Science
D-ITET Department of Information Technology and
Electrical Engineering
D-MTEC Department of Management, Technology
and Economics
D-UWIS Department of Environmental Sciences
EADI European Association of Development
Research and Training Institutes
Eawag Swiss Federal Institute for Environmental
Science and Technology
ECOS Laboratory of ecological systems, Lausanne
EPFL Federal Institute of Technology Lausanne
ERA-ARD European Research Area on Agricultural
Research for Development
ERA-NET European Research Area Networks
ES Ecosystem service
ESA Ecole Supérieure d'Agronomie, Côte d'Ivoire
ESSA Ecole supérieure des sciences agronomiques,
Université d'Antananarivo
EU European Union
FAO Food and Agricultural Organisation of the
United Nations
FIBL Forschungsinstitut für biologischen Landbau
FOAG Federal Office for Agriculture
GEF Global Environmental Facility
GFAR Global Forum on Agricultural Research
GIS Geographical Information System
GMO Genetically modified organism
GTZ Deutsche Gesellschaft für Technische
Zusammenarbeit
ha Hectare
HGU School of Business, Economics and Law,
University of Gothenburg
IAASTD International Assessment of Agricultural
Knowledge, Science and Technology for
Development
IAEA International Atomic Energy Agency
IBAMA Instituto Brasileiro do Meio Ambiente e
dos Recursos Naturais Renováveis
ICARDA International Centre for Agricultural
Research in the Dry Areas
ICIPE International Centre of
Insect Physiology and Ecology

IED Institute for Environmental Decisions
IHEID Graduate Institute of International and
Development Studies
IIM Indian Institute of Management
ITA International Institute of Tropical Agriculture
ILRI International Livestock Research Institute
ILW Institute of Food Science and Nutrition
INRA French National Institute for Agricultural
Research
INTA Nicaraguan Institute of Technology
INW Institute of Animal Sciences
IPES International payments for ecosystem
services
IPW Institute of Plant Science
IUCN International Union for the Conservation of
Nature
IUT Isfahan University of Technology
IWMI International Water Management Institute
IWRM Integrated Water Resources Management
KARI Kenya Agricultural Research Institute
KFPE Commission for Research Partnerships
with Developing Countries
KfW KfW Entwicklungsbank (ehemals
Kreditanstalt für Wiederaufbau)
KIRFOR Kyrgyz-Swiss Forestry Support Programme
LAB lactic acid bacteria
Lb. Lactobacillus
LCA Life cycle assessment
LCV Laboratoire Central Vétérinaire du Mali
MAS Master of Advanced Studies
MDGs Millennium Development Goals
MIT Massachusetts Institute of Technology
MO Microorganism
MoU Memorandum of Understanding
N Nitrogen
N₂ Molecular nitrogen
NADEL Postgraduate Study Programme on
Developing Countries
NAPPO North American Plant Protection
Organization
NATURA Network of European Agricultural
(Tropically and Subtropically Oriented) Universities
and Scientific Complexes related with Agricultural
Development
NCCR North-South National Centre of Competence
in Research North-South
NGO Non-governmental organisation
NIDECO Network for International Development
and Cooperation
OECD Organisation for Economic Co-operation
and Development
P Phosphorus
PES Payments for ecosystem services
RFPP Research Fellow Partnership Programme
SAHA Programme de Développement Rural,
Intercoopération – Délégation Madagascar
Sandec Department of Water and Sanitation in
Developing Countries, Eawag
SATW Swiss Academy of Engineering Sciences
SCIB South China Institute of Botany
scnat Swiss Academy of Sciences
SDC Swiss Agency for Development and
Cooperation
SFIAR Swiss Forum for International Agricultural
Research
SFSA Syngenta Foundation for Sustainable
Agriculture
SHL Swiss College of Agriculture
SLU Swedish University of Agricultural Sciences
SNF Schweizerischer Nationalfonds
SNSF Swiss National Science Foundation
SPLASH European Research Area Network of the
European Water Initiative
spp. Species
STRI Smithsonian Tropical Research Institute
subsp. Subspecies
TWAS Academy of Sciences for the Developing
World
UAS University of Agricultural Sciences Bangalore,
India
UNEP United Nations Environment Programme
UNESCO-IHE United Nations Educational,
Scientific and Cultural Organization-Institute for
Water Education
USDA-ARS Agricultural Research Service of the U.S.
Department of Agriculture
WARDA Africa Rice Center
WBGU German Advisory Council on Global
Change
WHO World Health Organisation
WWF World Wide Fund for Nature
ZALF Leibniz Centre for Agricultural Landscape
Research
ZEF Center for Development Research, University
of Bonn
ZIL Swiss Centre for International Agriculture
Zn Zinc

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