



Smallholder Systems Innovations in IWRM: An Exciting New Research Programme

The challenge of producing food for a rapidly increasing population in semi-arid Southern Africa is a daunting one. The production of more food translates to more consumptive use of water which in turn is likely to impact on water resources downstream. The intensification of agriculture has often resulted in negative side effects in terms of land and water degradation. Furthermore, water legislation is increasingly concerned with maintaining a "Reserve" to sustain basic human water requirements and instream ecology.

To address the challenges of increasing food production, improving rural livelihoods, while safeguarding critical ecosystem functions, a research project entitled "Smallholder System: Innovations in Integrated Watershed Management" has recently been launched at the School of Bioresources Engineering and Environmental Hydrology (BEEH), one of six partners in this Swedish (the Swedish International Development Agency - SIDA) and Dutch (Directoraat-Generaal Internationale Samenwerking - DGIS) funded initiative. BEEH is a school of learn-

ing at the University of KwaZulu-Natal (UKZN). By filling these fundamental research gaps, it will enable researchers to answer currently unanswered questions regarding smallholder land and water management, and ideas on securing human livelihoods in semi-arid tropical savannahs.

PROGRAMME

The programme adopts an integrated approach to agricultural land and water management, analysing the interactions between the adop-

tion and participatory adaptation of water system innovations (such as water harvesting, drip irrigation, conservation tillage, etc.), increased water use in agriculture and water flows in order to sustain ecological functions that deliver critical ecosystem services to humans.

In addition, a core research focus of the University of KwaZulu-Natal over the past decade has been the hydrological impacts of land use change at different spatial and temporal scales.

More commonly known as the Smallholder Systems Innovations (SSI) project, this interdisciplinary programme has field sites in the Thukela Catchment in South Africa and in the Pangani Catchment in Tanzania. These two river basins are representative of typical semi-arid to dry sub-humid rainfed agrarian conditions.

WATERNET

The smallholder systems innovations partners in the SADC region are the School of Bioresources Engineering and Environmental Hydrology, the Pretoria office of the International Water Management Institute and the Sokoine University in Tanzania. They are all members of WaterNet, a regional network of university departments and research and training organisations which aims to enhance regional capacity in integrated water resources management. The other partners are UNESCO-IHE and the Systems Ecology Group at Stockholm University. The programme, lead by Prof Johan Röckström of UNESCO-IHE, is funded for four years and provides training opportunities for eight PhD and two Post-Doctoral students divided between the partner institutions and numerous MSc students.

Under the leadership of Professor Graham Jewitt, the University of

KwaZulu-Natal component of Smallholder Systems Innovations is developing a field site in the Potsheni community near Emmaus-Bergville in the Thukela Catchment. The site is part of an ongoing Landcare project managed jointly by the Agricultural Research Council - Institute for Soil Climate and Water (ARC-ISCW), the KwaZulu-Natal Department of Agriculture and the local farmers through a monthly farmers forum, in which the SSI team participates. The site was introduced to the team by Dr Terry Everson from the UKZN School of Applied Environmental Sciences. The Landcare project has been running for three years and provides an ideal entry point to the catchment and a mutually beneficial relationship with the ARC. In the Pangani river basin, the northern Makanya-Chome watershed will constitute the focal research location. The interactions between humans and the environment in this landscape are typical of Tanzania. Rapid land use changes under demographic pressure occur in a landscape already subject to severe land degradation and water scarcity. Furthermore, making Makanya-Chome even more interesting in the context of the research programme is that small-holder farmers, in a response to a growing desperation over the difficulty of making their living from low-yielding agriculture, have adopted small-scale water harvesting methodologies on a relatively large scale.

WATER HARVESTING

"Compared to other parts of Africa, South African small scale farmers are not very far advanced when it comes to optimising water use on and around their fields. We were amazed at the extent of water harvesting for crop production that occurs in the Pangani Basin when we visited Tanzania recently", said Prof Jewitt. "We're certainly learn-

ing a lot from our colleagues at the Soil and Water Group at Sokoine University in Tanzania. They've been very active in promoting these types of systems in Tanzania and have a wealth of knowledge to share and, of course, at the same time, they're learning a lot about hydrological modelling from us". As such, small systems innovations is part of an emerging group of research initiatives which highlight the importance of linkages between institutions in the Southern African Development Community (SADC) region.

The UKZN component of the programme provides PhD opportunities for three students registered at UKZN, as well as training opportunities for many other students involved in the programme. Khumbu Zuma has joined the project team from the Farmer Support Group (FSG), (who through the input of Monique Saloman, director of the Farmer Support Group, maintain an interest in the project), and will focus her PhD research on investigating the social preconditions for, and monitoring of, the uptake of water system innovations. "Smallholder Systems Innovations is a new exciting project in the School of Bioresources Engineering and Environmental Hydrology. I am enjoying my area of research immensely as it values land and water users' indigenous knowledge and because it is an interdisciplinary research project that integrates the theoretical perspectives of various fields namely, ecology, sociology, and hydrology", said Khumbu.

Victor Kongo has joined the team from Kenya and will focus his research on water resources impacts downstream. "The Smallholder Systems Innovations project provides an excellent platform upon which social and biophysical research scientists are able to address water use and management issues in a holistic



The Smallholder Systems Innovations in Integrated Watershed Management Project Team.

manner. I am happy to be part of the SSI team", said Victor when asked about his involvement in the project.


Third year BEEH PhD student Nick Walker (from the UK) will complement his PhD studies with an investigation of the benefits of water system innovations on water availability in the soil, and ultimately crop yield. "My involvement in the Smallholder Systems Innovations project involves intensive field research to analyse soil, crop, water and atmosphere interactions of innovative production systems, with the aim of improving yields in a sustainable manner while increasing water-use efficiency. It's a privilege to carry out field research in such a stunning part of the world that will hopefully have a positive economic impact on the emerging farmers in that area", said Nick Walker.

GIS DATABASE

Meanwhile Jennifer Kinoti (also Kenyan), despite being registered at UNESCO-IHE, will spend the first six months of her PhD developing a GIS database for use by the rest of the SSI partners. "The Smallholder Systems Innovations project is a multi-disciplinary scientific research project that integrates both social and natural scientists on the issues of sustainable management of water and land resources within the context of adaptation and adoption of

system innovations. I am personally proud to be part and parcel of this project and I hope that my individual research outputs will contribute in realising the vision of Smallholder Systems Innovations", said this enthusiastic researcher.

These students and researchers will form part of a wide international research community, and they will be afforded opportunities to expose research findings and share experiences at several international scientific symposia and meetings (e.g. the annual WaterNet symposia, the annual European Geophysical Society General Assemblies, and the annual Stockholm Water Symposia). More importantly, the programme will strengthen the establishment of a regional research group of international repute which will strongly contribute to consolidating a sustainable research environment and knowledge base in the region.

As well as these students, the School of Bioresources Engineering and Environmental Hydrology, will host other members of the SSI team over the next four years. So in addition to IsiZulu and English, you can expect to hear conversations in Swahili, Dutch and Swedish echoing through the UKZN "AgFac" corridors over the next four years. 



News Flash

A PhD position in the SSI project has become available. If you have a Masters degree in hydrology, soil science, agronomy or a closely related discipline, or if you have a Masters degree and experience in similar projects and are interested in a full time PhD position within SSI, please contact Prof Graham Jewitt - beeh@ukzn.ac.za (or for more information on the SSI project).