

09

Faculty of  
Natural and Agricultural Sciences

# Annual Report





**Faculty of Natural and  
Agricultural Sciences  
Annual Report 2009**

## Contact details

### Acting Dean

Prof. Neil Heideman  
+27 51 401 2322  
heidemannj@ufs.ac.za

### Office of the dean

Ms René Bloem  
+27 51 401 2322  
bloemr@ufs.ac.za

### Faculty manager

Mr Johan Kruger  
+27 51 401 2490  
krugerjd.sci@ufs.ac.za

### Marketing and Liaison

Ms Stefanie Naborn  
+27 51 401 2531  
nabornsa.sci@ufs.ac.za

### Physical address of the office of the dean

Room 9A, Biology Building, Main Campus,  
Bloemfontein

### Postal address

University of the Free State  
PO Box 339  
Bloemfontein  
South Africa  
9300

**Fax:** +27 51 401 3728  
**Email:** natagri.sci@ufs.ac.za  
**Faculty website:** www.ufs.ac.za/natagri

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## Preface

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# From the Dean's Office

It is with great pride and gratitude that I write this preface to the 2009 Annual Report of the Faculty of Natural and Agricultural Sciences because in spite of the ramifications of the global economic downturn on the core business of institutions of higher learning across the world, the Faculty remained steadily on course with respect to its vision and mission. Through dedication and hard work staff and students continued to excel, once again with some notable special achievements, of which a few are highlighted below.

Our student enrolments continued to rise as young men and women both nationally and from other parts of Africa and the rest of the world remain attracted to the diverse and high quality training and research opportunities we offer. To mention but a few, our expertise in plant pathology, lipid biotechnology and nanoscience is world renown, and we are one of only a few South African universities involved in forensic science. We do training and research in disaster risk management and mitigation, and offer a postgraduate course with the largest footprint in Africa. Agriculturally

we have the most specialized group servicing the farming industry, including capacity building programmes for newly settled and prospective emerging commercial farmers. Our building science departments are leaders in the country and are consistently successful in accreditation processes (often unconditionally) by national and international professional bodies.

The highly successful equipment strategy remained on track as we systematically continued to grow our capacity in state-of-the-art equipment, bearing fruit in further improving the quality and quantity of research and training outputs. We are also grateful for a substantial grant received from the Department of Higher Education and Training which will enable us to relieve some of the pressure on our physical facilities and better equip several laboratories. Our cadre of NRF-rated researchers grew including the attainment of B-ratings by a number of staff members. The Strategic Academic Clusters (Water Management in Water-scarce Areas, Technologies for Sustainable Crop Industries in Semi-arid Regions, Materials and Nanosciences,

and Advanced Biomolecular Sciences) also continued to gain momentum as vibrant hubs of multidisciplinary research and training, focusing on key Southern African problems and the expanding of knowledge for greater technological advancement and innovation.

As mentioned earlier, staff and students were once again prominent in focusing national and international attention on the faculty as recipients of significant research awards, the sharing of expertise, their election to high profile academic bodies and the organization of special events. I highlight but a few of these:

- Prof. Esta van Heerden (Department of Microbial, Biochemical and Food Biotechnology) won the 2009 Third World Academy of Science Young Scientist Award.
- At the congress of the South African Society for Plant Pathology Prof. Neal McLaren (Department Plant of Sciences) received the society's award for applied plant pathology research, while Prof. Zakkie Pretorius received the C.H. Persoon medal



(gold), which is the highest award for contributions to this field of study in South Africa. It was only the fifth time since its inception that the award was made.

- Under the leadership of Prof. Jo van As (Department of Zoology and Entomology) a highly successful year long public scientific programme was offered to commemorate Charles Darwin's birthday and the publication of his book, *The Origin of Species*, 150 years ago. It involved lectures by staff from several departments within our faculty, from other faculties, the National Museum (Bloemfontein) and the Central University of Technology.
- Prof. Marian Tredoux (Department of Geology) was nominated Fellow of the Geological Society of South Africa.
- Prof. Gideon Steyl (Department of Chemistry) was awarded the first Jan Boeyens medal for outstanding work in theoretical Chemistry/Physics by a young scientist (younger than 40 years) in the process outclassing nominees from WITS, UP, US and UCT at the locally held international INDABA congress. Prof. André Roodt, Departmental Chairperson, was elected Vice-president of the European Crystallographic Association which has approximately 45 member countries from Europe, Africa and the Middle East.
- Prof. Hendrik Swart, Departmental Chairperson, and Dr Martin Ntwaeaborwa (Department of Physics) were both recipients of NSTF awards, the former for Research Capacity Development and the latter as a Distinguished Young

Black Researcher. At the South African Institute of Physics congress Ms A Dhlamini received the Publication Award for the best publication in a scientific journal, originating from a Ph.D. thesis (Promoters, Proff. HC Swart and JJ Terblans) while Mr. WA Jordaan received it for the best publication in a scientific journal, originating from an MSc. dissertation (Supervisors, Proff. JJ Terblans and HC Swart).

- Prof. Johan Greyling (Department of Animal, Wildlife and Grassland Sciences) received a silver medal for his contribution to research at the Annual Meeting of the SA Society for Animal Sciences in November 2008 and was also re-elected to the SASAS Council. Prof. Hennie Snyman was named Free State's Agriculturalist of the Year by the Central Agricultural Writers Association.
- From the Department of Soil, Crop and Climate Sciences Prof. Cornie van Huyssteen was elected President and Dr. Piet le Roux as Council Member of the Soil Science Society of South Africa.
- Mr. Andries Jordaan, Head of the Disaster Management Training and Education Centre for Africa (DiMTEC) was approached by the government of the Republic of the Congo for assistance with their national disaster management plan, focusing specifically on Brazzaville, as well as the establishment of a disaster management centre.
- The Department of Quantity Surveying and Construction Management received unconditional accreditation

for construction management from the Chartered Institute of Building, as well as confirmation that they complied with the requirements for recognition as an accredited centre. Prof. Verster, the Departmental Chairperson, was elected Vice-President (Education) of the CIOB (Africa).

- The Department of Architecture brought out a special edition of the academic publication *Architecture South Africa*. Craig Atkins was among the top ten students on the shortlist for the Africa Thesis Awards.

The faculty and the university are greatly indebted to these and all the staff members and students who again worked tirelessly to excel and further raise the academic stature of our institution both nationally and internationally. As a faculty we also express our sincere gratitude to our former Dean, Prof. Herman van Schalkwyk, who once again led us with great distinction in 2009. It is now my pleasure to present to you this Annual Report with the hope that it will not only make for informative and stimulating reading but that it will also open up possibilities for mutually beneficial and productive collaboration.



**Prof. N.J.L. Heideman**  
Acting Dean

Faculty of Natural and  
Agricultural Sciences  
University of the Free State



# Centres







# 18 Disaster Management Training and Education Centre for Africa (DiMTEC)


## Overview

**D**iMTEC made its mark during 2009, not only in Africa, but in Europe as well. The year was characterised by many new opportunities and new developments.

Sixty-one students enrolled during 2009 for the Higher University Diploma in Disaster Management. This is the biggest number ever. The department is very proud of its 11 students who graduated with their Master's degrees in Disaster Management. Because of its multidisciplinary focus and the relevance of the course in the developing African environment, it is expected that the interest in the master's programme will remain high. The graduate course offered by Disaster in Management Training and

Education Centre for Africa (DiMTEC) at the University of the Free State (UFS) possibly has the largest footprint in Africa, with students from Sudan, Israel, Palestine, Nigeria, Kenya, Democratic Republic of the Congo, Zambia, Mozambique, Swaziland, Lesotho, Namibia and Zimbabwe. These students represent their countries, the United Nations and several non-governmental organisations (NGO) such as OXFAM, Save the Children, the International Red Cross and Red Crescent Movements, CARE International, the Food and Agricultural Organisation (FAO), etc.

Practical work for first-year students and practical exams for final-year students were implemented during 2008. Through





***“DiMTEC is the centre with the biggest footprint in Africa.”***

***- Mr Andries Jordaan***





*DiMTEC staff as speakers at the DMISA conference. From the left are: Mr Derrick Sissons, Mr Tichaona Muzuwa, Ms Alice Ncube and Mr Andries Jordaan who presented the paper on behalf of Ms Olivia Kunguma.*



these practical sessions students are exposed to reality and are given the opportunity to apply their theoretical knowledge. The first-year students were sent to a Botshabelo where they had to do Community Resilience Profiling. The second years had to compile a Disaster Management plan for the Eden District Municipality for their practical examination.

DiMTEC received funding in 2008 of nearly R6 million from the Department of Science and Technology (DST) and the Department of Water Affairs and Forestry (DWAF) for a bursary programme that enables students to gain experience in disaster management in different government departments, while completing their master's degree studies in Disaster Management. This bursary learnership programme will accommodate students until 2011.

The programme caters for postgraduate students in Disaster Management and Early Warning Systems. It comprises full-time students who will be placed in different organisations to gain practical experience and provide voluntary service. Part-time students will be assisted financially. Six students are full-time and two students are part-time. The six full-time students are first years and worked at the DiMTEC offices for the first six months and were afterwards placed at different Disaster Management Centres. The centre had 16 part-time first-year students, six full-time second-year students and three part-time second-year students.



Staff involved in the World Vision International training project are, from left: Ms Alice Ncube, Short Course Coordinator from DiMTEC, Mr Goodson Murenje from World Vision, Mr Andries Jordaan, Director of DiMTEC and Ms Olivia Kunguma, Masters Degree Coordinator of DiMTEC.

The students attended the Disaster Management Institute of South Africa (DMISA) conference in Durban as part of an educational tour. The students visited the Disaster Management Centre in Durban, Call Centre and the Airport to educate them on the different operational structures and how they will handle disasters. The bursary also provided a laptop for each bursary student.

### Activities and achievements

The centre's 2nd Annual International Conference in Disaster Risk Reduction was held on 26 and 27 May 2009. The theme for this year was Water-related disasters.

Dr Anthony Turton, Director of Touch-Stone Resources (Pty) Ltd., delivered the main presentation. A number of international key speakers such as Dr Fabrice Renaud, Associate Director at the United Nations University's Institute for Environment and Human Security (UNU-EHS) in Bonn, Germany; Dr Ing Jörn Birkmann, Head of Section: Vulnerability Assessment at the UNU-EHS in Bonn; Germany, Mr Eugene Poolman, Chief Forecaster: Disaster Risk Reduction, South African Weather Service; and Prof. Rob Bragg from the UFS's Department of Microbial, Biochemical and Food Biotechnology, were speakers at the conference.

During the conference, ADRA, as the main role player, along with New World Sanitation (NWS) and Scan Water, assisted DiMTEC with a demonstration of an Internationally Displaced Persons (IDP) camp. The demonstration showed exactly how the camps operate and what the facilities available to the people look like.

The aim of the conference was to educate the public, the private sector and DiMTEC students as well as to give graduated DiMTEC students the opportunity to share their research and findings with the public. There were 101 attendees from 11 different countries at the conference, many of whom were

keen to gain more insight into water-related disasters.

The attendees enjoyed the conference and praised DiMTEC for a well-organised and professional conference. The speakers were praised as very good and credible on the topics covered.

The biggest NGO, World Vision International, requested UFS-DiMTEC to assist with the following two programmes:

- **Disaster Risk Reduction (DRR) and Community Resilience training package**

World Vision International wants to have a memorandum of understanding (MOU) with UFS-DiMTEC. The main objective of the programme is to equip development practitioners to implement DRR activities in the communities where they work in order to ensure community resilience. The modules will have a practical approach.

- **HEARRT project**

World Vision International (WVI) wants to add value and credibility to this programme, thus involving UFS-DiMTEC, so that the graduates can obtain a credible qualification after undergoing the three year programme. The programme is undertaken in different countries in Africa. In February 2010, the contact session will be in Dakar, Senegal. The course only involves WVI personnel.

UFS-DiMTEC proposed that the HEARRT course also involve other agencies. Humanitarian work is all about coordination and working together for the same people – those who need assistance. The program-

me will start in 2011 after all legal registration procedures have been completed.

The training programme will last four or five days, depending on the people to be trained. Case studies from field workers of World Vision International will be made available to the DiMTEC team so that they can use it as activities in the modules. The accreditation of this particular course will be at NQF 6 level. The UFS will confer certificates that will include the World Vision logo and possibly that of the UNU-EHS.

The MOU still needs to be finalised with input from both UFS-DiMTEC and World Vision. However, as soon as the cost projection is agreed on, the plan is to start work immediately.

Staff of DiMTEC presented short courses on various aspects of Disaster Management to government departments, and non-governmental and private organisations in the Southern African Development Community (SADC) region. During 2009 the Sphere Project and Minimum Standards in Disaster Response course were presented at the UFS, Umthata, Port Elizabeth, King Williams Town and Cape Town and two personnel members did the Sphere Training of Trainers course in Nairobi, Kenya. Other courses included the Introduction to Disaster Management course that was presented in Kokstad and at the UFS, the Risk Assessment Course in Cape Town and the Geographic Information Systems (GIS) course in Bloemfontein. The short courses are growing in popularity and there is a high demand for this in South Africa.

UFS-DiMTEC, in collaboration with UN-SPIDER (Platform for Space-based Information for Disaster Management and Emergency Response; United Nations Office of Outer Space Affairs), will present a short course in South Africa in 2010, focusing on Space-Based Information Technology. UFS-DiMTEC and UN-SPIDER are currently developing a new module in Space-based Information Technology to be included in the Master's Degree programme for 2010.

The DMISA conference is the largest disaster management conference in Africa, and routinely attracts more than 350 delegates. The institute is recognised as the mouthpiece of the Disaster Management profession in Southern Africa and is accredited by the South African Local Government Association (SALGA) as well as the United Nations' International Strategy for Disaster Reduction (UN/ISDR). The conference provides an annual opportunity for a diverse range of stakeholders in disaster risk management from across Africa to gather and share skills, knowledge and experience. The annual Disaster Management Conference for Africa was held on 7 and 8 October 2009 in Durban.

DiMTEC staff presented four papers at the conference:

Ms Alice Ncube – Survival mitigation strategies – challenges and opportunities: a case study of women in stokvels in Botshabelo, Motheo District, Free State Province

Ms Olivia Kunguma – The experience and coping strategies of rural women in Riverside, Zimbabwe with regard to water scarcity





*Two of our graduates of 2009 are, from left: Ms Yande Prodence Mwape, Mr Andries Jordaan (Director: DiMTEC) and Ms Olivia Kunguma.*



*Speakers at the second Annual Conference in Disaster Risk Reduction were, from the left: Mr Andries Jordaan, Director of DiMTEC, Dr-Ing Jörn Birkmann, Head of Section: Vulnerability Assessment at the UNU-EHS in Bonn, Germany, Dr Anthony Turton, Director: TouchStone Resources (Pty) Ltd and Dr Fabrice Renaud, Associate Director at the UNU-EHS in Bonn, Germany.*

Mr Derrick Sissons – An economic comparative study between household national and food security in South Africa

Mr Tichaona Muzuwa – A disaster is multi-dimensional. A comprehensive approach to disaster management. A case of conflicts in Africa

The conference was also attended by the DIMTEC bursary students to give them exposure and educate them in Disaster Management in South Africa.

The Geo-Information Society of South Africa is a registered professional body of Geographical Information System specialists in the Free State Province. They held their 11th Annual Conference on 20 and 21 August 2009 in Bloemfontein. The focus of the conference was to reflect on issues affecting the body and to have a look at possible resolutions. Various speakers showcased how they were using Geographical Information Systems (GIS) Software in their organisations.

Mr Tichaona Muzuwa, a staff member of DiMTEC, had the opportunity to present a paper on how GIS can be used in Disaster Management, specifically looking at conflicts in Africa.

Mr Regardt Ferreira attended the Incident Command System training in Parys, Free State from 1 to 5 March 2009. The training was hosted by Working on Fire South Africa. The course mainly focused on the proper handling of disaster situations. Case studies of major disasters in the world like the 9/11 Disaster and Hurricane Katrina were looked at. The disasters were analysed and applied to the South African context.

The very best instructors from the United States presented the course. Chief Ron Spadafora, Fire Chief: New York City, who worked on the 9/11 Disaster and Hurricane Katrina as a planning specialist, was one of the presenters. The attendees were mainly Working on Fire staff and specialists on disasters from the private sector.

**Projects completed include:**

- Agriculture Section 4 Environmental Management Framework for the Msukaligwa and Albert Luthuli Municipalities (Mpumalanga Lake District)
- Mconumbe Project – Evaluating Statistical Data for Elundini livestock program
- GAP Analysis: Development of an Agriculture Disaster Risk Management plan for the Department of Agriculture and Land Reform in the Northern Cape
- Drought Strategies for farmers in the Dinder area, Sudan

**Current projects include:**

- Disaster Risk Management and Prevention System for the Republic of the Congo
- Ukhahlamba District Municipality Agricultural Plan in Eastern Cape

DiMTEC staff is well represented in provincial and national bodies such as the South African Qualifications Authority's (SAQA) Scoping Committee for Disaster Management Training in South Africa, the National Disaster Management Technical Advisory Committee for Disaster Risk Assessments, the Free State Disaster Management Advisory Forum and the Regional Consultative Forum for Africa of the International Council for Science (ICSU). Mr Andries Jordaan is part of the

organising committee for the International Wildland Fire World Conference in 2011 that will be hosted in South Africa.

## Networking

One of the highlights was the memorandum of understanding (MOU) signed with the United Nations University. The University of the Free State is the first university in Africa to sign a MOU with the United Nations University. The Director of DiMTEC, Mr Andries Jordaan, negotiated with the United Nations University Institute for Environment and Human Security (UNU-EHS) to foster a relationship and combine their pool of resources for training in different aspects of Disaster Management. A triangular agreement between UFS-DiMTEC, UNU-EHS and the University of Novi Sad in Serbia will be concluded in three phases.

The first phase was the signing of the MOU between UFS-DiMTEC and UNU-EHS. This phase was completed on 25 September 2009, when Prof. Konrad Osterwalder, Under-Secretary-General of the United Nations and Rector of the United Nations University, and Prof. Herman van Schalkwyk, Dean of the Faculty of Natural and Agricultural Sciences at the UFS, signed the MOU in Bonn, Germany. The second phase is an MOU between UNU-EHS and the University of Novi Sad. The third and final phase is an MOU between UFS-DiMTEC and the University of Novi Sad, which will take place in 2010.

**The MOU involves the following:**

Joint projects will be conducted between the UNU-EHS and UFS-DiMTEC

Research will be conducted by the UNU-EHS and UFS-DiMTEC for specific projects

Exchange of lecturers for different courses

The UNU will help with external evaluation

As a result of the MOU, the two universities have already combined their pool of resources, by presenting a vulnerability short course and a visitation to the Republic of the Congo.

A delegation of two representatives of UNU-ViE and UFS-DiMTEC, including Ms Jessica Johmann (Head of Executive Office of the UNU Vice-Rectorate in Europe (ViE) and the Institute for Environment and Human Security (UNU-EHS) and IDEAS programme coordinator) and Mr Andries Jordaan, Director of DiMTEC, visited Brazzaville, capital city of the Republic of the Congo, from 8 to 15 August 2009. They attended several meetings with high-level executives in Brazzaville and also carried out field visits to major vulnerable sites in the area. This visit followed the agreement concluded last June that stipulated that a team comprising of representatives of both institutes, UNU-ViE and DiMTEC, would undertake a principal mission to Congo-Brazzaville for field analyses and face-to-face meetings with various ministries, relevant institutions and national agencies, as well as with the Mayor of the City of Brazzaville.

The ultimate goal of this fact-finding mission was to establish an integrated disaster risk management and prevention system in Brazzaville that included the creation of a disaster risk management centre. Indeed, the estab-

lishment of a disaster management centre in itself is only a means to the objective, which is disaster risk reduction in the Congo in accordance with the Millennium Development Goals, the Johannesburg Summit on Sustainability and the Hyogo Declaration of 2002. Environmental risks such as sedimentation, floods, storms, erosion, mud-slides or anarchic occupation are observable in various parts of Brazzaville, making the land unsafe for its inhabitants. However, despite this situation of human vulnera-

bility, there is currently no infrastructure in the city that specifically deals with these environmental and societal problems, thus the slowly deteriorating state of the land. This is why the UNU-VIE in Bonn is working in close collaboration with the government of Congo-Brazzaville and UFS-DiMTEC to bring a new centre for disaster risk management and prevention to its capital. This is being implemented through field studies and meeting the key role players at all levels of governance – governmental, local

or even non-governmental – that play a key role in this project, consequently fostering a constructive dialogue. Since its inception almost one year ago, the project has made outstanding progress.

During their stay in Congo-Brazzaville, the delegation not only met government members such as the Minister of Cooperation, Humanitarian Action, and Solidarity, the Director-General of the National Agency for Civil Aviation (ANAC) and the Director-Europe of the Ministry of Foreign Affairs and Cooperation, but also



*Mr Andries Jordaan with other representatives of Congo-Brazzaville in the field.*



municipal representatives like the Mayor of Brazzaville, the Secretary General of the Municipality of Brazzaville and even the head of the UNPD in Congo and the Vice-Rector of the National University Marien NGOUABI. Some of these events were covered by the Congolese media and the delegation participated in a press conference of the national TV channel "Tele Congo". Moreover, the UNU-ViE/ UFS-DiMTEC representatives visited relevant areas like the national route and also the Talangai, Mfilou, Makelekele and Bacongo urban districts. All this was done to obtain an understanding and clearer picture of the actual situation in Congo-Brazzaville and to promote sustainable solutions for disaster management and prevention, economic growth and human vulnerability. Some key objectives have been set, such as adapting the South African legislation and framework to the Congolese state of law. Another objective is the fostering of public awareness and the training of a Congolese expert committee through a Master's degree programme on Disaster Risk Management offered by UFS-DiMTEC. This programme is aimed at transferring skills and knowledge in an intra- and multi-disciplinary way over a two-year period to understand and manage disasters and their consequences.

On 22 September 2009 a meeting was held between the UNU-ViE, UFS-DiMTEC and the Ambassador of the Republic of the Congo in Germany. The meeting was a follow-up of the visit to Congo-Brazzaville in August 2009.

### **The following was decided and established:**

To establish a Disaster Management System in the Republic of the Congo Training of Congolese students in Disaster Management by UFS-DiMTEC

Presentation of the UFS-DiMTEC course in French from 2011 for francophone Africa.

The Ambassador of the Republic of the Congo in Germany will secure funding.

A high level government delegation consisting of a representative of the President's office, two Ministers and the Mayor of Brazzaville will come to South Africa to have a look at the Disaster Management System. UFS-DiMTEC will be hosting the delegation.

Mr Andries Jordaan was invited as a lecturer for a Ph.D. Block Course in Bonn, Germany (24 March – 4 April 2009) with the theme From vulnerability to resilience in Disaster Risk Management. Three personnel members were also invited to attend the course with Mr Jordaan to strengthen linkages and to meet other people in the Disaster Risk Management field. The participants were observers at the UNESCO World Conference on Education for Sustainable Development.

DiMTEC presented the same course on Vulnerability and Disaster Risk Management in collaboration with the United Nations University Institute for Environment and Human Security (UNU-EHS) at the University of the Free State from 1 to 5 June 2009. The focus was on

social, environmental and economical vulnerability, global warming and early warning systems. Dr Fabrice Renaud (Associate Director: United Nations University Institute for Environment and Human Security), Dr-Ing Jörn Birkmann (Head of Section: Vulnerability Assessment: United Nations University Institute for Environment and Human Security) and Prof. Dusan Sakulski (Africa Representative: United Nations University Institute for Environment and Human Security) from Bonn, Germany presented the course, together with Mr Andries Jordaan (Director: DiMTEC) and Mr Eugene Poolman (Chief Forecasting Specialist: Disaster Risk Reduction, South African Weather Service). This course was the first ever of its kind and will be presented at the Novi Sad University, Serbia in September 2010 as well as in Bonn, Germany in May 2010, where it will be part of the UNU Ph.D. Block Course.

The course in Serbia was presented in October 2009 and hosted by the University of Novi Sad. Lecturers from UFS-DiMTEC, UNU-EHS and the University of Novi Sad did the presentations. Ms Olivia Kunguma (Masters' Degree Coordinator, DiMTEC) attended the course in Serbia. The aim of the Ph.D. Block Course presented in different countries is to educate students in different parts of the world and make it more easily accessible to students from especially Africa and Europe:

South Africa – African students  
Germany – Western Europe Students  
Serbia – Eastern Europe Students

## Contact details

### Mr Andries Jordaan

Faculty of Natural and Agricultural Sciences  
Disaster Management Training and Education  
Centre for Africa (DiMTEC)  
University of the Free State  
PO Box 339  
Bloemfontein  
South Africa  
9300

**Telephone:** +27 51 401 2721

**Fax:** +27 51 401 9336

**E-mail:** [dimtec@ufs.ac.za](mailto:dimtec@ufs.ac.za)

**Website:** [www.ufs.ac.za/dimtec](http://www.ufs.ac.za/dimtec)

## Staff

**External Lecturers:** Profs. Dusan Sakulski, André Duvenhage,  
Messrs Schalk Carstens, Anthony Keston

**Office Administrator:** Ms Annelene Schröder-Groenewald

**Financial Administrator:** Ms Gerdamarie van Copenhagen

**Coordinator:** Masters Degree Course: Ms Olivia Kunguma

**Coordinator:** Short Courses: Ms Alice Ncube

**Project Manager:** DST Bursary Students: Ms Merle Naidoo

**Project Coordinators and Researchers:** Messrs Derrick  
Sissons, Regardt Ferreira

**Marketing and Conference Coordinator:** Ms Shauneen van  
Rooyen





# 19

## Environmental Management

### Overview

The Centre for Environmental Management in the Faculty of Natural and Agricultural Sciences, incorporating the BloemWater Chair in Water Environmental Management, has established an envied niche for itself in South Africa. The niche is based on three intertwined components, namely the Masters' and Doctoral programmes, short courses and a research and contract component.

It is important to reflect on the history of the centre in order to appreciate where the centre stands today.

In the early 1990s, lecturers in different departments at the University of the Free State (UFS) were developing undergraduate courses on aspects of

environmental science and management. It soon became inevitable for a postgraduate programme in environmental management to be established. Prof. Johan Grobbelaar, Head of the Department of Botany, with the support of the then Dean of Science, Prof. Chris Small, called together a committee to consider the matter.

The programme would be “administered by an independent Chair of Environmental Management that would use expertise and *ad hoc* lecturing staff from external departments and faculties as well as carry out synthetic research on Environmental Management to identify needs.”





***“Graduates are in demand by large companies,  
government and nature conservation bodies.”***

***- Prof. Maitland Seaman***



*Mr Harald Pakendorf (left)  
guest speaker during National  
Water Week and Prof.  
Seaman, Director: Centre for  
Environmental Management.*



The envisaged programme would look much as it does today. In 1994 the first students were enrolled by Prof. Jo van As (Prof. Grobbelaar being overseas at the time). By 1996, the task of running the centre was growing as student numbers increased and Prof. Grobbelaar resigned as Head of the centre. Most of the credit is due to him for establishing the centre and the programme in Environmental Management so strongly. He was succeeded by Prof. Maitland Seaman, at the time a part-time lecturer in the programme, but full-time lecturer in the Department of Zoology and Entomology. In 1997 he was duly appointed full-time Director of the Independent Centre for Environmental Management, reporting to the Dean of Science and a Management Committee.

The centre is now an established centre of expertise in aquatic ecology that carries out a number of applied projects and provides appropriate services to communities in the central part of South Africa. BloemWater, the regional water services agency, plays a central role in the development of this aspect of the centre's work. The BloemWater Chair in Water Environmental Management came into being on 1 July 2003 and Prof. Maitland Seaman, Director of the centre, is also the incumbent of the BloemWater Chair in Water Environmental Management.

The Master's programme developed gradually and strongly around Project Management, Environmental Assessment, Environmental Management Systems, Integrated Environmental Management and Sustainable Development, into





*Ms Marie Watson, sampling micro-invertebrates for the South African Scoring System (SASS) at the Seekoei River*



*Ms Marie Watson, Mr Mahlet Bekele, Ms Ansophi van der Merwe and Mr Juan Potgieter identifying macro-invertebrates for the South African Scoring System (SASS) at Sipane Spruit*

which a number of special skills and disciplines are woven.

The Master's programme enrolled 60 students from 117 applicants in 2009. The intake increases in diversity every year. In 2009 about 30% of the students were from the Southern African Development Community (SADC) and a few were from the rest of Africa, making this a truly continental programme. The programme stretches over 37 full days of contact time at the Main Campus of the UFS in Bloemfontein, consisting of one session per semester.

The programme is an integrated one. As the environment presents a very wide field of study, there is a perceived need to produce graduates with a healthy overview of the South African environment. Graduates are in demand by large companies, government and nature conservation bodies.

Circumstances have changed. There is the growing importance of water, conservation is no longer the domain of environmentalists, environmental assessment has become more sophisticated, environmental management systems are required in even the smallest of businesses, sustainability science has become established as its own discipline and Africa needs to move beyond irrational exploitation towards cultural maturity as far as the environment is concerned.

Approximately 50 lecturers are involved in the programme, half of whom are contracted from government and the private sector for their specific competencies

In 2009 five students were registered for their Ph.D. degrees. During the April

2009 graduation ceremony, Ms Marilie Carstens received the BloemWater Prize for the Best Master's Student in Environmental Management for 2008.

The centre has a cooperation agreement with the Catholic University of Louvain in Belgium to conduct research on temporary water ecology. As a result of this agreement a Ph.D. student from Louvain has spent time working at the centre on studies initiated by the centre in 2009.

The centre is developing a methodology to assess the environmental water requirements of non-perennial rivers. The project is funded by the Water Research Commission (WRC) and consists of three phases of which the first two have been completed. The current Environmental Water Assessment methods used in South Africa were developed for perennial rivers (rivers which flow for most of the time) and have not been tested on non-perennial rivers (rivers that have variable flow, creating high levels of disturbance for the biota living in them). The first phase of the project tested the suitability of the existing methods using desktop case studies. During the second phase, a prototype method for non-perennial rivers was developed using the Seekoei River as case study and the final report is due early in 2010. The third phase of the project aims to test the prototype environmental assessment method for non-perennial rivers on three rivers with varying degrees of non-perenniality, namely the Mokolo River (Limpopo), the Touws River (Western Cape) and the Swartdorings River (Northern Cape).

At all stages this research has been interdisciplinary, with experts from the field

making a major input into each stage of the process. Important contributions in this regard have come from team members at Rhodes University, University of Cape Town, the Council for Scientific and Industrial Research (CSIR) and the UFS. Crucial to the success of the project is the capacity-building of local experts at the university. Experts from various departments are involved in the third phase of the project, namely Dr Ingrid Dennis (Institute for Groundwater Studies); Dr Piet le Roux, Prof. Leon van Rensburg and Mr Johan van Tol (all from the Department of Soil, Crop and Climate Sciences); Dr Charles Barker (Department of Geography); Prof. Johann du Preez (Department of Plant Sciences); Ms Nola Redelinghuys (Department of Sociology) and several experts from the centre namely Ms Marinda Avenant, Mr Mahlet Bekele, Ms Marthie Kemp, Ms Linda Rossouw, Prof. Maitland Seaman, Mr Frank Sokolic, Ms Tascha Vos and Ms Marie Watson.

The centre, in cooperation with Bloemwater, launched a project in 2009 to create water awareness on the campus for National Water Week (16–23 March 2009). Mr Harald Pakendorf, well-known political analyst, presenter and guest on various television and radio programmes, presented a special lecture as part of National Water Week on the topic *Will the state be able to satisfy the growing need for quality services?*

## Activities and achievements

Mr Mahlet Bekele was one of 25 students from 18 different countries in Africa, Europe and Asia, who were selected by the Tropical Biology Association based in Cambridge, United Kingdom (UK) and

Nairobi, Kenya to attend an intensive field training course in the Amani Nature Reserve in Tanzania targeted at young conservation biologists.

Mr Falko Buschke and Ms Marthie Kemp attended and presented a poster at the Fire, Timber and Grassland Symposium hosted by the Grassland Society of South Africa and the Grassland Programme, held in Pietermaritzburg.

Profs. Seaman, Marie Watson, Frank Sokolic and Falko Buschke were involved in two specialist assessments that were done as part of an environmental impact assessment for a proposed mining extension on Lyleveld Farm, south-west of Kathu, in the Northern Cape Province.

Mr Falko Buschke is involved in the monitoring of the Loch Logan urban impoundment in Bloemfontein with regard to physical, chemical and biological elements of water quality. The study includes the regular assessment of depth profiles for temperature and oxygen levels in order to determine the vertical stratification (and therefore the mixing) of water, as well as the effect of this on algal blooms.

Dr Limpho Letsela's post-doctoral research formed part of the baseline assessment contract that was awarded to the Centre for Environmental Management. The contract forms part of the Wetlands Restoration and Conservation Project (WRCP) within the Department of Water Affairs in the Ministry of Natural Resources in Lesotho. The WRCP is among the vital interventions being implemented as part of the Millennium Challenge Account-Lesotho (MCA-L) in order to enhance *poverty reduction*

*through economic growth* within the Lesotho Water Sector. The MCA-L has been established under the auspices of the Millennium Challenge Corporation (MCC), an institution administering the assistance from the Government of the United States to the Government of Lesotho (GOL) on a variety of development interventions.

The Arid Zone Ecology Forum that took place in Graaff-Reinet included a session on Arid Zone Water Issues. The session was included to bring the importance of water in the arid zone to the attention of participants at the meeting and this was done with great success. A field trip to the Sundays River gave the team of the centre the opportunity to explain the main differences between perennial and non-perennial rivers and to emphasise the importance of managing the non-perennial rivers in a sustainable way.

Prof. Seaman, Mss Marie Watson, Marinda Avenant, Linda Rossouw and Tascha Vos attended the International Conference on Implementing Environmental Water Allocations in Port Elizabeth. The objective of the conference was to identify and critique global

trends in the implementation of environmental water allocations.

Ms Marinda Avenant presented a poster at the 10th International Mammalogical Congress in Mendoza, Argentina. It was attended by more than 1 200 participants from 33 countries with more than 40 symposia, workshops and courses presented over a period of a week. She also attended the 5<sup>th</sup> EGU Alexander von Humboldt International Conference at the University of Cape Town.

Ms Tascha Vos collaborated with Ms Stephanie Cawood (project leader) of the Centre for Africa Studies on a National Heritage Council (NHC) funded project, namely *Heritage resources at sacred sites in the Free State: oral histories and the cultural uses of clay*. The project specifically focuses on the impact of environmental factors such as water quality on the heritage intrinsic to the sites (might need some rephrasing)? The project commenced in 2008 and will be concluded in 2010.

Prof. Seaman is Director of one of the six strategic clusters of the UFS, namely "Water management in water-scarce

areas". Under the umbrella of the Water Cluster, the second annual Orange River Basin Symposium was held by the UFS from 11-12 November 2009. The theme of the symposium was *The Orange River Basin – The Challenge*. Various staff members of the centre delivered papers at the symposium.

Several projects and fieldwork were carried out by the centre. Biomonitoring reports are provided by the centre to BloemWater for the Modder River and associated rivers. Two sites are monitored along the Caledon River, thirteen sites along the Modder River and its important tributaries and two sites along the Riet River.

Two important modules and short courses were added to the Master's Programme in 2009, namely Geographical Information Systems (GIS) and Environmental Managers as Leaders, Managers and Change Masters.

## **Community service**

The Centre for Environmental Management serves the environmental community and the general public with numerous workshops each year.



# Research outputs

## Research articles

**Codron, D., Codron, J., Lee-Thorp, J.A., Sponheimer, M., Grant, C.C. & Brink, J.S.** 2009. Stable isotope evidence for nutritional stress, competition and loss of functional habitat as factors in limiting recovery of rare antelope in southern Africa. *Journal of Arid Environments* 73: 449-457.

**Kaiser, W., Avenant, N.L. & Haddad, C.R.** 2009. Assessing the ecological integrity of a grassland ecosystem: the applicability and rapidity of the SAGraSS method. *African Journal of Ecology* 47(3): 308-317.

**O'Connor, T.G. & Kuyler, P.** 2009. Impact of land use on the biodiversity integrity of the moist sub-biome of the grassland biome, South Africa. *Journal of Environmental Management* 90: 384-395.

**Phillips, D.J.H., Jägerskog, A. & Turton, A.R.** 2009. The Jordan River basin 3. Options for satisfying the current and future water demand of the five riparians. *Water International* 34(2): 170-188.

**Turton, A.R.** 2009. The role of science in deepening democracy: The case for water in post-Apartheid South Africa. *The Journal for Transdisciplinary Research in Southern Africa* 5(1): 9-28.

**Van der Merwe, S.J., Avenant, N.L. & Lues, J.F.R.** 2009. Pastoral farming and wildlife management influences on lion/livestock interaction in the Kgalagadi-south, Botswana: A synopsis. *Journal for New Generation Sciences* 7(1): 203-214.

**Van Schoenwinkel, B., Hulsmans, A., De Roeck, E., De Vries, C., Seaman, M.T. & Brendonck, L.** 2009. Community structure in temporary freshwater pools: disentangling effects of habitat size and hydroregime. *Freshwater Biology* 54: 1487-1500.

## Books

**Rascher, J., Ashton, P.J. & Turton, A.R.** 2009. The strategic role of water in alleviating the human tragedy associated with HIV/AIDS in Africa. In *Water Management in 2020 and Beyond*, edited by A.T. Biswas & C. Tortajada. Berlin: Springer Verlag.

**Turton, A.R.** 2009. South African water and mining policy: A study of strategies for transition. In *Water policy entrepreneurs: A research companion to water transitions around the globe*, edited by D. Huitema & S. Meijerink. London: Edward Elgar Publishing.

## Reports

**Letsela, L.** 2009. *Integrated baseline assessment of the wetland catchments / Watersheds: Motete, Sani and Letseng La Letsie areas*. Report to the Millennium Challenge Account, Lesotho.

**Seaman, M.T. & Bekele, M.** 2009. *A biodiversity policy for the Mangaung Municipality*. Report to Mangaung Local Municipality, Bloemfontein, South Africa.

**Seaman, M.T., Watson, M. & Vos, A.T.** 2009. *State of the Modder River, First term 2009 – A biomonitoring report*. Report to Bloem Water, Bloemfontein, South Africa.

**Seaman, M.T., Watson, M. & Vos, A.T.** 2009. *State of the Modder River, Second term 2009 – A biomonitoring report*. Report to Bloem Water, Bloemfontein, South Africa.

**Seaman, M.T., Watson, M. & Vos, A.T.** 2009. *State of the Modder River, Third term 2009 – A biomonitoring report*. Report to Bloem Water, Bloemfontein, South Africa.

**Seaman, M.T., Watson, M., Avenant, M.F. & Vos, A.T.** 2009. *State of*

*the Modder River 2007 to 2009 – A biomonitoring report*. Report to Bloem Water, Bloemfontein, South Africa.

**Turton, A.R.** 2009. *An overview of water resources in South Africa and issues arising*. Report to the RAITH Foundation, Westcliff, Johannesburg, South Africa.

**Turton, A.R.** 2009. *New thinking on the governance of water and river basins in Africa – Lessons from the SADC Region*. Report to the South African Institute of International Affairs, Johannesburg, South Africa.

## Conference contributions

**Avenant, M.F.** 2009. *Challenges in assessing the ecological integrity of depauperate fish communities in non-perennial rivers*. Paper presented at the International Conference on Implementing Environmental Water Allocations (IEWA): Making it happen, Feather Market Convention Centre, Port Elizabeth, South Africa. 23-26 February.

**Avenant, M.F.** 2009. *Proposing a new prototype methodology for setting environmental flows for non-perennial rivers*. Paper presented at the Arid Zone Ecology Forum: Biodiversity Conservation in Arid Zones - People, Species and Landscapes, John Rupert Auditorium, Graaff-Reinet, South Africa. 5-8 October.

**Avenant, M.F. & Avenant, N.L.** 2009. *The role of small mammals in habitat integrity assessments in South Africa*. Poster presented at the 10<sup>th</sup> International Mammalogical Congress (IMC-10), Mendoza, Argentina. 9-14 August.

**Avenant, N.L.** 2009. *Small mammals as indicators of habitat integrity: sampling community structure effectively*. Poster presented at the Annual Southern African Wildlife



Management Association Symposium (SAWMA): Wildlife Management: Ensuring Sustainability, Protea Hotel Black Mountain, Thaba 'Nchu, South Africa. 13-16 September.

**Avenant, N.L.** 2009. *Small mammals as indicators of habitat integrity: sampling community structure effectively*. Poster presented at the 10<sup>th</sup> International Mammalogical Congress (IMC-10), Mendoza, Argentina. 9-14 August.

**Avenant, N.L. & Du Plessis, J.** 2009. *Sampling small mammal community structure and its relevance in assessing habitat integrity in the Free State grasslands*. Poster presented at the 50<sup>th</sup> Anniversary Conference of the Zoological Society of Southern Africa (ZSSA): 50 years of Zoological Research: Reflection and insights, Natalia, Illovo Beach, KwaZulu-Natal, Durban, South Africa. 21-25 July.

**Avenant, N.L., Steenkamp, E. & De Waal, H.O.** 2009. *Reviewing a case study on the effects of different management options to reduce predation on small livestock in the Karoo*. Paper presented at the Annual Southern African Wildlife Management Association Symposium (SAWMA): Wildlife Management: Ensuring Sustainability, Protea Hotel Black Mountain, Thaba 'Nchu, South Africa. 13-16 September.

**Bekele, M.S.** 2009. *Communities and biodiversity conservation in Abijata-Shalla Lakes National Park, Central Rift Valley Region, Ethiopia*. Paper presented at the Arid Zone Ecology Forum: Biodiversity Conservation in Arid Zones - People, Species and Landscapes, John Rupert Auditorium, Graaff-Reinet, South Africa. 5-8 October.

**Bezuidenhout, Y.** 2009. *Implementing an efficient mine water monitoring and management program: Key considerations*. Poster presented at the International Mine Water Conference (MWC), CSIR International Convention Centre, Pretoria, South Africa. 19-23 October.

**Buschke, F.** 2009. *The application of aquatic bio-assessment techniques in terrestrial ecosystems*. Paper presented at the 2<sup>nd</sup> Annual Orange River Basin Symposium: Current challenges faced in the Basin, Centre for Environmental Management, University of the Free State, Bloemfontein, South Africa. 11-12 November.

**Buschke, F. & Kemp, M.** 2009. *The merits of using insect communities in the bio-assessment of grassland ecological integrity*. Poster presented at the Grasslands, Timber and Fire Symposium of the Grassland Society of Southern Africa, Bishopstowe, Pietermaritzburg, South Africa. 14-15 October.

**Du Plessis, J. & Avenant, N.L.** 2009. *An analysis of the availability of ecological information on black-backed jackal and caracal in southern Africa*. Poster presented at the 50<sup>th</sup> Anniversary Conference of the Zoological Society of Southern Africa (ZSSA): 50 years of Zoological Research: Reflection and insights, Natalia, Illovo Beach, KwaZulu-Natal, Durban, South Africa. 21-25 July.

**Letsela, L.** 2009. *Tackling challenges of grassroots wetlands governance at the Senqu River Sources in Lesotho*. Paper presented at the 2<sup>nd</sup> Annual Orange River Basin Symposium: Current challenges faced in the Basin, Centre for Environmental Management, University of the Free State, Bloemfontein, South Africa. 11-12 November.

**Olivier, H., Kemp, M. & Lötter, M.** 2009. *The composition of natural and disturbed grasslands following the removal of pine plantations in Mpumalanga*. Paper presented at the Grasslands, Timber and Fire Symposium of the Grassland Society of Southern Africa, Bishopstowe, Pietermaritzburg, South Africa. 14-15 October.

**Potgieter, J.C.** 2009. *Impacts of flow reductions, low turbidity and the presence of alien species on a fish*

*community structure*. Paper presented at the 2<sup>nd</sup> Annual Orange River Basin Symposium: Current challenges faced in the Basin, Centre for Environmental Management, University of the Free State, Bloemfontein, South Africa. 11-12 November.

**Rossouw, L.** 2009. *Water quality: Be careful of extrapolation of data in non-perennial rivers*. Paper presented at the 2<sup>nd</sup> Annual Orange River Basin Symposium: Current challenges faced in the Basin, Centre for Environmental Management, University of the Free State, Bloemfontein, South Africa. 11-12 November.

**Rossouw, L. & Vos, A.T.** 2009. *Challenges in the methodology of determining the water quality reserve in non-perennial rivers*. Paper presented at the International Conference on Implementing Environmental Water Allocations (IEWA): Making it happen, Feather Market Convention Centre, Port Elizabeth, South Africa. 23-26 February.

**Rossouw, L., Avenant, M.F. & Watson, M.** 2009. *Understanding water quality and biota of a non-perennial river*. Paper presented at the Arid Zone Ecology Forum: Biodiversity Conservation in Arid Zones - People, Species and Landscapes, John Rupert Auditorium, Graaff-Reinet, South Africa. 5-8 October.

**Seaman, M.T.** 2009. *Pans and rock pools as model ecosystems in dry areas*. Paper presented at the Arid Zone Ecology Forum: Biodiversity Conservation in Arid Zones - People, Species and Landscapes, John Rupert Auditorium, Graaff-Reinet, South Africa. 5-8 October.

**Seaman, M.T.** 2009. *The Water Cluster in perspective*. Paper presented at the 2<sup>nd</sup> Annual Orange River Basin Symposium: Current challenges faced in the Basin, Centre for Environmental Management, University of the Free State, Bloemfontein, South Africa. 11-12 November.

**Seaman, M.T., Avenant, M.F., Armour, J., Barker, C.H., Du Preez, P.J., Hughes, D.S., King, J.M., Rossouw, L., Van Tonder, G.J. & Watson, M.**

2009. *Proposing a new method for determining the environmental water requirements for non-perennial rivers*. Paper presented at the International Conference on Implementing Environmental Water Allocations (IEWA): Making it happen, Feather Market Convention Centre, Port Elizabeth, South Africa. 23-26 February.

**Toerien, D. & Seaman, M.T.** 2009. *Ecology, water and enterprise development in South African towns*. Paper presented at the 2<sup>nd</sup> Annual Orange River Basin Symposium: Current challenges faced in the Basin, Centre for Environmental Management, University of the Free State, Bloemfontein, South Africa. 11-12 November.

**Turton, A.R. & Gadd-Claxton, D.** 2009. *The market as a driver or constraint in the move towards renewable energy in Southern Africa*. Paper presented at the 6<sup>th</sup> Southern African Forum on Trade (SAFT) IGD/FES Conference of the Institute for Global Dialogue (IGD) and the Friedrich Ebert Stiftung (FES), Pretoria, South Africa. 17-18 August.

**Turton, A.R.** 2009. *Pushing the limits*. Keynote paper presented at

the Biennial Groundwater Conference: Groundwater - Pushing the limits, NH The Lord Charles, Somerset West, South Africa. 16-18 November.

**Vos, A.T.** 2009. *Physical, chemical & biological interactions with periphyton*. Paper presented at the 2<sup>nd</sup> Annual Orange River Basin Symposium: Current challenges faced in the Basin, Centre for Environmental Management, University of the Free State, Bloemfontein, South Africa. 11-12 November.

**Watson, M.** 2009. *Constraints and challenges in applying macro-invertebrate methods as part of Environmental Water Assessments (EWAs) in non-perennial rivers: The Seekoei River Example*. Poster presented at the International Conference on Implementing Environmental Water Allocations (IEWA): Making it happen, Feather Market Convention Centre, Port Elizabeth, South Africa. 23-26 February.

**Watson, M.** 2009. *Depauperation and generalization of freshwater invertebrate communities because of non-perenniality*. Paper presented at the Arid Zone Ecology Forum: Biodiversity Conservation in Arid Zones - People, Species and Landscapes, John Rupert Auditorium, Graaff-Reinet, South Africa. 5-8 October.

# Contact details

## Prof. Maitland Seaman

Faculty of Natural and Agricultural Sciences  
Centre for Environmental Management  
University of the Free State  
PO Box 339  
Bloemfontein  
South Africa  
9300

**Telephone:** +27 51 401 2863

**Fax:** +27 51 401 2629

**E-mail:** [cem@ufs.ac.za](mailto:cem@ufs.ac.za)

**Website:** [www.ufs.ac.za/cem](http://www.ufs.ac.za/cem)

# Staff

**Director and BloemWater Chair:** Prof. Maitland Seaman

**Lecturer:** Ms Marinda Avenant

**Associated Researchers:** Drs Ziets Zietsman, James Brink, Nico Avenant, Daan Toerien

**Affiliated Professor:** Dr Anthony Turton

**Course Coordinator:** Ms Marthie Kemp

**Senior Professional Officer:** Ms Marie Watson  
(Macro-Invertebrates)

**Professional Officers:** Mr Mahlet Bekele (Biodiversity Conservation), Ms Tascha Vos (Water Quality and Algae), Ms Ansophi van der Merwe (Ecology), Dr Liphoo Letsela (Sociology), Ms Betty Phillips (Finance), Ms Sanet Neethling (Marketing), Ms Donné Kolesky (Administration) and Messrs Frank Sokolic (GIS), Falko Buschke (Research Ecology) and Juan Potgieter (Fish)

**Messenger:** Ms Evodia Khalata







# 20 Lengau Agricultural Development Centre



## Overview

**T**he Agricultural Skills Development, Training and Mentorship Programme of the Lengau Agricultural Development Centre of the University of the Free State (UFS) is strong evidence of the fact that the Faculty of Natural and Agricultural Sciences is a faculty engaged in the greater good of the community it serves. It utilises its academic capacity and facilities to face the challenges of sustainable agriculture in the region, country and continent.

Human resource development is being realised in all sectors of the economy, but a particular need exists within the agricultural sector, since black farmers

were excluded from participating in mainstream agriculture for many decades. Most prospective black farmers used to engage in subsistence farming on communal land and had limited access to the commercial sector. The development and growth from subsistence to commercial farming is difficult in a highly competitive sector. It requires innovative skills and knowledge and diverse inputs to be successful.

One of the three experimental farms of the UFS is earmarked for agricultural skills development and training of emerging farmers, farm workers and entrepreneurs. The buildings, facilities



***“The centre utilises its academic capacity and facilities to face the challenges of sustainable agriculture in the region, country and continent.”***

***- Dr Léan van der Westhuizen***





*Red SA Angus bull in use for the herd improvement programme at the centre.*



and a portion of the land of the Sydenham Experimental Farm are being used for animal and crop production and for the development of alternative natural and agricultural skills development in marketing and value-adding practices.

The UFS, Mangaung Local Municipality, Free State Provincial Department of Agriculture and the National African Farmers Union embraced the programme as partners in agricultural transformation. The facilities at the centre are utilised extensively to address the needs of newly-settled and prospective emerging and commercial black farmers. Services range from livestock auctioneering, herd improvement, branding, dehorning, castration, primary herd, ordinary and advanced food gardening. The centre also serves as a centre for education of under- and postgraduates, mentors, farmers and black entrepreneurs in many aspects of livestock, crop farming and agri-business.

The centre aims to simultaneously undertake systematic small farmer training, address local development issues and enrich the curriculum in terms of research and training at the UFS. Some of the agricultural know-how and skills training are in the form of:

- using the facilities as part of an apprenticeship programme for prospective farmers, with a mentorship and support system in place to facilitate "learning by doing" before moving to a commercial farm. Prospective trainee farmers will select a programme in beef cattle farming, dairy farming, small stock



- farming, pig farming, poultry farming or vegetable production;
- providing skills training for agricultural entrepreneurs, farm workers, young people wanting to make a livelihood in the agricultural sector, farmers in the farmer trainee programme and recently settled farmers. This is done through short courses at the centre, a mobile training capacity to serve municipalities in the Free State Province, educational tours to key centres relevant to ongoing projects and designing and soliciting accreditation of appropriate learnership courses;
- supporting emergent farmers/entrepreneurs through livestock auction at the centres every Friday, linkages to input suppliers and markets, after-care of newly settled farmers and start-up entrepreneurs. The centre provides appropriate infrastructure on municipal land for small-scale farming entrepreneurs. The centre enhances lobbying capacity by establishing commodity groups with linkages to regional and national farmer organizations. Assistance is also given to process applications to the Land Redistribution for Agricultural Development (LRAD) programme;
- an outreach programme through partnerships to extend the clientele through a “hub-and-spokes” framework to different parts of the country; and
- establishing an HIV/AIDS prevention, care and support initiative among farmers, farm workers and associated communities.

An agreement was concluded with BKB Louwid Auctioneers during 2008 to conduct weekly livestock auctions for the Bloemfontein area at the Lengau Agricultural Development Centre. This brings together commercial and small-scale farmers and makes the latter aware of the commercial value of their livestock. Two of the trainee farmers canvass livestock from the commonage farmers on a regular basis. Another trainee has become a real entrepreneur, making good profit out of buying and selling animals from and at the auctions. The auctioneering activities resulted in an average monthly turnover of approximately R1 624 000. The trainee, commonage and smallholder and emergent farmers also take note of the price-determining factors and are in the process of changing their type of stock and management accordingly.

In conjunction with the Mangaung Local Municipality and Free State Provincial Department of Agriculture, four farmers' days were held at the centre where farmers were trained in vaccination, branding, dehorning, castration and tick control. They also received training and advice in breeding and bull selection for the improvement of livestock. More than 5 000 head of cattle were handled and 18 farmers attended the sessions.

Six hydroponic units have been erected at the centre since 2007 with financial support from the Mangaung Local Municipality and Free State Provincial Department of Agriculture. The hydroponic units and approximately half a hectare of open garden space are used to train 14 trainees in vegetable production skills at the centre. Another six units were erected by the 12 Blackthorn beneficiaries at Falaona in the

Eastern Free State and two units are in production at Wepener. Tomatoes, green peppers, spinach and lettuce are the main crops produced in the hydroponic units. A pick-up truck for vegetables produced at the Lengau Centre was donated to the Bartimea School for the Blind and Deaf.

Twenty-two people were trained in broiler production skills at the centre and at Reddersburg. Three trainees made a success of the first trails in broiler production of 300 birds per cycle achieving a mortality rate of 3,5% and slaughter mass of 2 017 kg per bird on average. The production cost per dressed broiler was on average R10,78 per kg.

Two trainee stock farmers were successfully allocated land and another two were granted funding for land in 2010. These farmers are mentored on a continuous basis and sell and buy livestock at the Lengau auctions.

The Thusano Animal Feeds entrepreneurship of eight shareholders was established at the Lengau Agri Centre to market lucerne, teff, maize and straight run. One of the storage facilities at the centre is used to handle the fodder bought in bulk and sold to mainly developing farmers. Furthermore, four entrepreneurs are utilising the eucalyptus (bluegum) trees at the Lengau Agricultural Development Centre as a source of firewood for the local community. The first samples of fire bricks were produced and the marketing of the products is currently being investigated by the Students in Free Enterprise (SIFE) of the Faculty of Economic and Management Sciences at the UFS.

A skills audit, strategic planning and gap analysis was done in five districts

in the Limpopo Province. The centre successfully tendered for the follow-up agricultural skills development of the beneficiaries of these projects.

Sixty-four Pest Control Operators wrote their qualifying examination papers of the South African Crop Life and Animal Health Association at the centre.

Ms Doretha Jacobs of the Department of Microbial, Biochemical and Food Biotechnology trained 14 beneficiaries in sewing skills. The Mangaung Local Municipality funded the equipment. A variety of products were produced and marketed at the Langenhoven Park Market. Consumer Science students apply their knowledge and skills in this project for community service learning purposes.

The Lengau HIV and AIDS Prevention, Care and Support programme was officially launched in 2007. Information sessions were regularly held at various centres to improve the awareness of employees, emerging farmers and local sex workers of certain aspects regarding HIV/AIDS. The programme also participated in the Free State Rural Development Partnership Project (FSRDPP) with particular focus on farming communities in the Trompsburg, Springfontein and Philippolis rural areas. The objective of these sessions and workshops was to equip attendees with basic information on HIV/AIDS and to impress upon them the importance of knowing one's HIV/AIDS status. Feedback received from the participants during and after the sessions was very positive.

Ms Estelle Heideman facilitated a powerful grassroots project very close to the N1 highway in the Springfontein



*Donation of vegetables by vegetable farmers to Bartimea School for the Blind and Deaf.*

community. Women naturally identify and respond to social issues of the community and this initiative is driven by twelve women at Springfontein, most of whom are farmers' wives or are closely linked to the agricultural community. These women have participated in an eight-week HIV and AIDS education and prevention workshop as part of the Free State Rural Development Partnership Programme. The women and their partners are stakeholders in a broader implementation programme to facilitate HIV and AIDS workshops with farm labourers from six newly identified farms in the Springfontein area. Training and educating the women was a critical step in this programme to lay the groundwork for training the farm labourers. With the women having been exposed to the same workshop material that will now be presented to the labourers, it is hoped that their increased knowledge and skills will create an open environment where

issues of HIV testing, transmission, prevention, ongoing health-care needs, nutrition and confronting the stigma can be addressed on their farms and in the Springfontein community. These women are extremely excited to respond to other social needs beyond HIV and AIDS as a result of this training programme. The farm workers have completed their ten-week basic HIV and AIDS education and prevention programme. There were 28 adults participating in these sessions from the ages of 19-63. The topics discussed included basic HIV/AIDS facts, positive living and testing. On 22 May 2010 voluntary counselling and testing were offered in partnership with New Start. All farm workers were tested and the programme ended on a very positive note. The farmers' wives, known as the Springfontein Caregivers are now ready to take up their role as a support network in order to ensure sustainability of the programme.

## Contact details

**Dr Léan van der Westhuizen**

Faculty of Natural and Agricultural Sciences  
Lengau Agricultural Development Centre  
University of the Free State  
PO Box 12544  
Brandhof  
Bloemfontein  
South Africa  
9324

**Telephone:** +27 51 443 8859

**Fax:** + 27 51 443 8092

**E-mail:** [mcvdw@telkomsa.net](mailto:mcvdw@telkomsa.net)

**Website:** [www.ufs.ac.za](http://www.ufs.ac.za)

## Staff

### Permanent:

**Senior Lecturer:** Dr Léan van der Westhuizen

### Temporary:

**HIV/AIDS Prevention, Care and Support Coordinator:**  
Ms Estelle Heideman

**Farm Assistants:** Messrs Albert Khumalo, Raymond Melusi

**Farm Guards:** Messrs Alfred Mxhaka, Esau Selepe





# 21 Microscopy

## Overview

The Centre for Microscopy renders a service to departments in the Faculty of Natural and Agricultural Sciences and outside institutions. Research and training outputs at the centre are determined by the hours of usage of the apparatus and laboratories.

In 2009 the total usage of the scanning electron microscope (SEM) amounted to 700 hours, for the transmission electron microscope (TEM) 85 hours, and for the confocal laser scanning microscope (CLSM) 66 hours. The total microscope usage for 2009 was 841 hours, compared to the 920 hours of 2008. The average usage of the

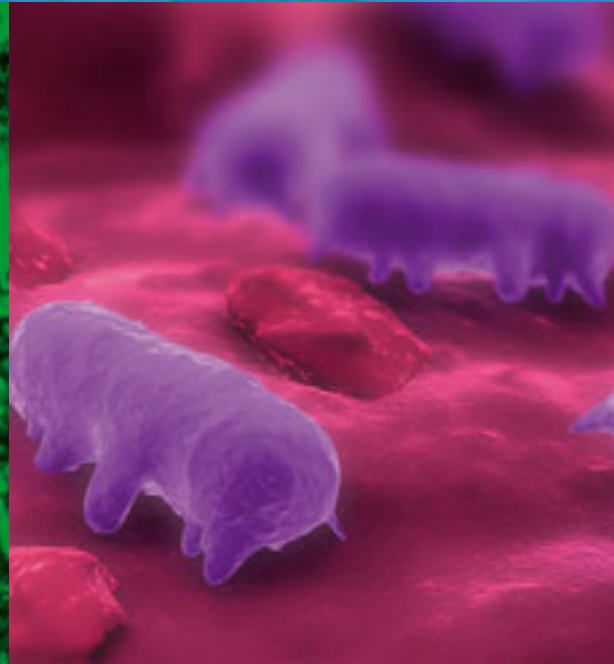
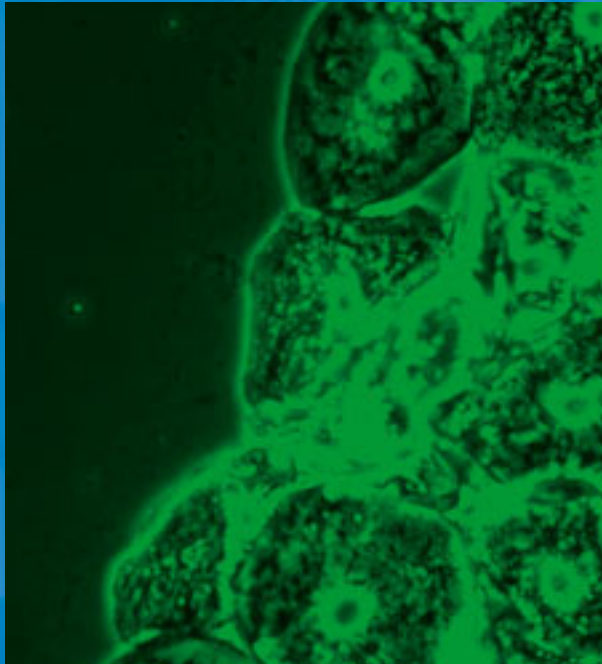
respective microscopes over the past four years amounted to 677 hours per year for the SEM, 99 hours for the TEM and 66 hours for the CLSM. Variations in the average usage remain representative as students and researchers complete projects and start new ones.

The above usage represents only the actual number of hours that people handled the microscopes. Any time spent on planning the experiments and preparing the objects beforehand is not taken into account in the above-mentioned usage figures. The preparation of materials forms a very important component of microscopic



*“A number of foreign researchers conducted research at the centre”*

*– Prof. Pieter van Wyk*



*Two Ph.D. students, Desmond Ncango (far left) and Ntsoaki Leeuw (right) assist Prof. Pieter van Wyk and Ms Beanétri Janecke to unpack the new apparatus.*



research and takes up most of the time when it comes to the use of the centre's facilities.

A particular highlight of 2009 was the installation of the new Tousimis semi-automatic critical point dryer (SAMDRI-795). The old equipment was extremely difficult to handle and therefore also difficult to train students and researchers on, especially where independent after-hours work is required.

A number of foreign researchers conducted research at the centre: Godwin Amenorpe from Ghana (with Prof. Maryke Labuschagne, from the Department of Plant Sciences); Antje Wildau and Janine Kottke-Levin from Germany (with Prof. Marian Tredoux, from the Department of Geology); Ahmad Essa from the Sudan and Dr Vladimir Djoković from Serbia (with Prof. Riaan Luyt, Department of Chemistry, Qwaqwa Campus); Drs Vinay Kumar, Indrajit Nagpure and Shreyas Pitale from India (with Prof. Hendrik Swart, from the Department of Physics); Dr Suman Pradhan from India and Dr Antonio Garcia-Moyano from Spain (with Prof. Esta van Heerden, from the Department of Microbial, Biochemical and Food Biotechnology); Dr Pankaj Sharma (with Prof. Hugh Patterson, from the Department of Microbial, Biochemical and Food Biotechnology). Zaid Bello (Nigeria) and Cinsani Tfwala (Swaziland) also started Ph.D. and M.Sc. projects with Prof. Sue Walker, from the Department of Soil, Crop and Climate Sciences. These projects will include ultra structural studies.





*A group of Chemistry students from the Qwaqwa Campus uses the transmission electron microscope during a course presented to them by the Centre for Microscopy.*

A further highlight was the contribution of the centre towards the Microsoft Powerpoint presentation at the Grahamstown SciFest Africa exhibition that took place from 25-31 March 2009. The presentation contained interesting microscopic photos taken with the department's own microscopes and also a visual history of the electron microscope. The presentation was displayed on a screen throughout the event. The latest table model SEM microscope was also demonstrated. The

University of the Free State (UFS) won the prize for the best exhibition.

Prof. Pieter van Wyk and Ms Beanélrí Janecke attended a one-day workshop regarding the new acquisition policy of the UFS. This workshop was presented by Mr Antonie Lombard from the Department of Finance on 26 August 2009.

The Electronics Division again provided special support in terms of the maintenance and repair of the trans-

mission electron microscope. This division also deserves special mention, especially for their friendly assistance with the production of small parts that were required for the installation of the new SAMDRI-795. They also repaired the oil leak on the vacuum pump of the Joel SEM, thus saving the faculty additional costs.

Problems were encountered with the uninterrupted power supply (UPS) that



*Prof. Pieter van Wyk and Ms Beanéiri Janecke study the manual after the installation of the new Tousimis equipment.*

was installed in 2008. It is currently out of phase with the emergency power generator. During power failures, especially at unattended moments, damage may occur to either the UPS or the electron microscopes. Such an event already caused damage to the Joel SEM which had to be repaired at a cost of more than R20 000. This issue is receiving attention but has not been resolved yet.

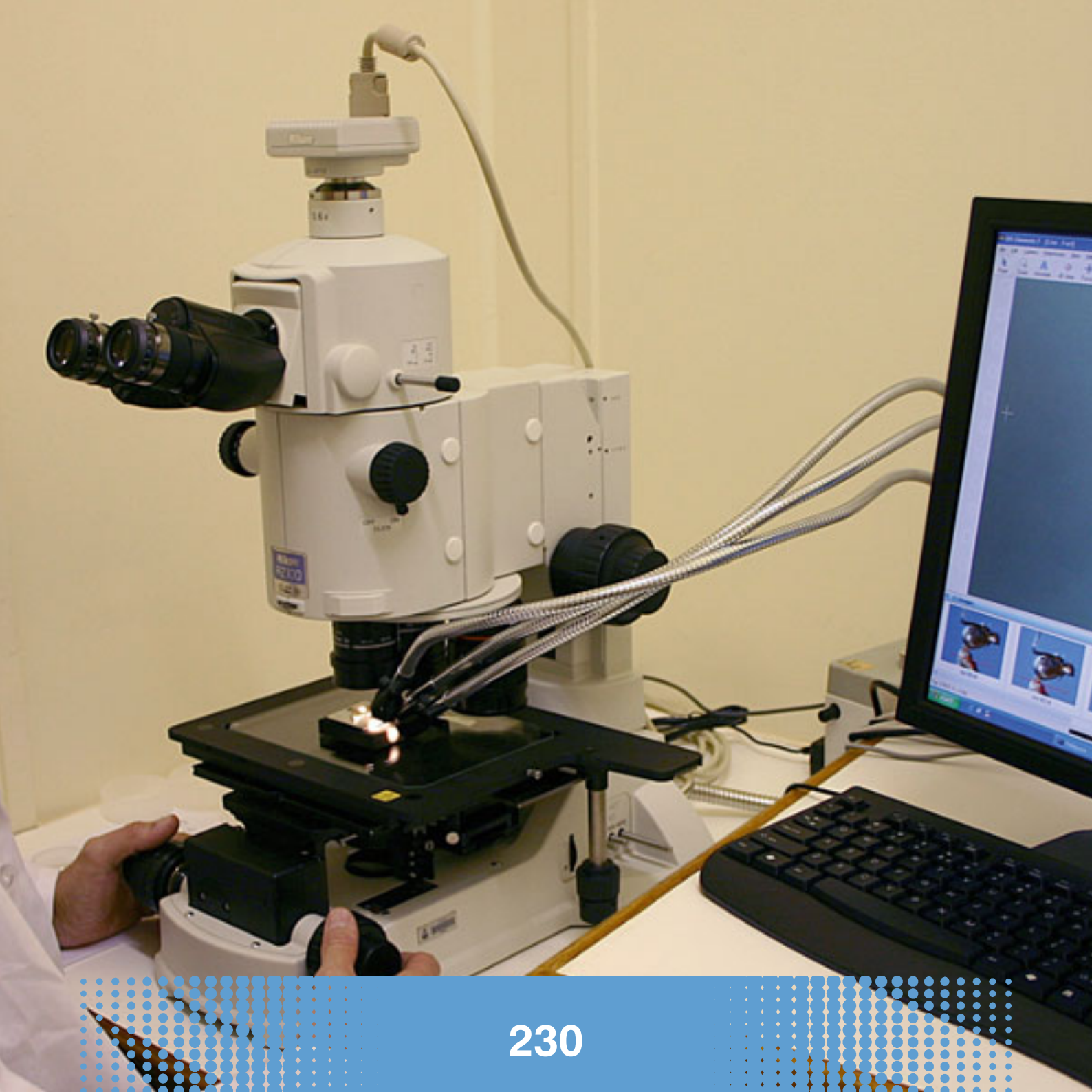
The usual courses in the preparation of materials and the handling of apparatus were presented to honours students of the Departments of Zoology and

Entomology (DRK/ENT614), Geology (GLG636), Microbial, Biochemical and Food Biotechnology (MKB/BOC614) and Plant Sciences (PWS614). These courses, lasting two days each, were presented to each group separately. A one-day course was offered to honours students from Genetics (GEN 686) and Medical Microbiology and Virology (MKM601).

The second-year students of the Departments of Zoology and Entomology and Plant Sciences attended an introductory course in microscopy on 21 April 2009

and 8 May 2009 respectively. In addition, nine of the Chemistry honours students from the Qwaqwa Campus were trained in the handling of the SEM from 17–19 August 2009.

Since 2009, individual training to post-graduate students and researchers is being offered throughout the year according to the needs of the respective departments. This teaches them the necessary skills to independently handle the microscopes. Information regarding all training opportunities at the centre can be found on our website.





# Research outputs

## Research articles

**Ells, R., Kock, J.L.F., Van Wyk, P.W.J., Botes, P.J. & Pohl, C.H.** 2009a. Arachidonic acid increases antifungal susceptibility of *Candida albicans* and *Candida dubliniensis*. *Journal of Antimicrobial Chemotherapy* 63(1): 124-128.

**Kock, J.L.F., Swart, C.W., Ncango, D.M., Kock (Jr), J.L.F., Munnik, I.A., Maartens, M.M.J., Pohl, C.H. & Van Wyk, P.W.J.** 2009. Development of a yeast bio-assay to screen anti-mitochondrial drugs. *Current Drug Development Technologies* 6(3): 186-191.

**Leeuw, N.J., Swart, C.W., Ncango, D.M., Kriel, W.M., Pohl, C.H., Van Wyk, P.W.J. & Kock, J.L.F.** 2009. Anti-inflammatory drugs selectively target sporangium development in *Mucor*.

*Canadian Journal of Microbiology* 55: 1392-1396.

## Conference contributions

**Kock, J.L.F., Pohl, C.H. & Van Wyk, P.W.J.** 2009. *Oxyllipin studies expose antifungals with dual action in Candida albicans and Cryptococcus neoformans: A review*. Poster presented at the 17<sup>th</sup> Congress of the International Society for Human and Animal Mycology (ISHAM2009), Keio Plaza Hotel, Tokyo, Japan. 25-29 May.

**Leeuw, N.J., Swart, C.W., Ncango, D.M., Joseph, M.J., Kriel, W.M., Pohl, C.H., Van Wyk, P.W.J. & Kock, J.L.F.** 2009. *Anti-inflammatory drugs selectively target sporangium development in Mucor*. Poster presented at the 17<sup>th</sup> Congress of

the International Society for Human and Animal Mycology (ISHAM2009), Keio Plaza Hotel, Tokyo, Japan. 25-29 May.

**Ncango, D.M., Pohl, C.H., Van Wyk, P.W.J., Swart, C.W. & Kock, J.L.F.** 2009. *Asci: Indicators of novel antifungals*. Poster presented at the 17<sup>th</sup> Congress of the International Society for Human and Animal Mycology (ISHAM2009), Keio Plaza Hotel, Tokyo, Japan. 25-29 May.

**Swart, C.W., Van Wyk, P.W.J., Pohl, C.H. & Kock, J.L.F.** 2009. *The life cycle of Nadsonia: A novel antifungal screen*. Poster presented at the 17<sup>th</sup> Congress of the International Society for Human and Animal Mycology (ISHAM2009), Keio Plaza Hotel, Tokyo, Japan. 25-29 May.

## Contact details

**Prof. Pieter van Wyk**

Faculty of Natural and Agricultural Sciences  
Centre for Microscopy  
University of the Free State  
PO Box 339  
Bloemfontein  
South Africa  
9300

**Telephone:** +27 51 401 2264

**Fax.:** +27 51 444 5945

**E-mail:** [vanwykpw@ufs.ac.za](mailto:vanwykpw@ufs.ac.za)

**Website:** [www.ufs.ac.za/ccem](http://www.ufs.ac.za/ccem)

## Staff

**Affiliated Professor:** Prof. Pieter WJ van Wyk

**Research Officer:** Ms Beanérlí B Janecke



# 22 Sustainable Agriculture and Rural Development

## Overview

The Centre for Sustainable Agriculture and Rural Development (CENSARD) at the University of the Free State (UFS) is designed to accommodate post-graduate students who are working full-time while furthering their studies by means of distance education. The courses on offer afford students the opportunity to acquire multi-disciplinary skills and knowledge in sustainable agricultural practices. The centre is proud of its students and their achievements.

Prof. Izak Groenewald is the director of CENSARD. The contribution of Mr Johan van Niekerk, the centre's research associate, in guiding the students in their research efforts is one of the reasons

for the centre's success in terms of the student throughput rate. The centre also has Professors Extraordinary in Profs. Edward Nesamvuni, Alice Pell, Frans Swanepoel and Monty Jones. Prof. Aldo Stroebel is a senior research fellow of the centre.

CENSARD's research is focused on rural development, the value-adding chain, agribusiness management, as well as crop and livestock management. It aims to contribute towards the development and maintenance of sustainable production systems.

Students entering this programme come from all spheres of life, although they all share the common goal of learning





*“CENSARD is the new hub of extension research,  
education and training in SADC.”*

*– Prof. Izak Groenewald*





*CENSARD staff at the April 2010 graduation ceremony with the 41 students who completed their studies in 2009.*



more about the science of sustainability in agricultural production. Most of the students are in the full-time employment of the Department of Agriculture and the Agricultural Research Council (ARC). Some are commercial, part-time or small-scale farmers, while others are employed by banks, agribusinesses and consultancies. International students account for about 35% of the students.

The course content is scrutinised by local and international partners annually to ensure local applicability, relevancy and also to remain internationally sound. In 2009, 68 students enrolled for the Master's programme.

In the same academic year, 41 students graduated with a Master's degree in Sustainable Agriculture (MSA). This was the culmination of many months of hard work for these graduates who study part-time while working full-time. This brings the total number of MSA degrees awarded since our inception in 1994, to 224. CENSARD has a proud track record of its graduates who leave the programme well equipped to address the challenges of the workplace. This is an important contribution since modern-day agriculture is a constantly changing environment with many constraints and challenges. Students develop technological, managerial and thinking skills that are embedded in the programme.

### **Activities and achievements**

Another course, an advanced diploma in extension, was developed through good relations with the Eastern Cape's Department of Agriculture.



*Prof. Groenewald with Mr Kevin Whitfield at the prize-giving ceremony.*

This Advanced Diploma in Sustainable Agriculture and Rural Development (ADSARD) aims to meet the needs of the Agricultural Extension and Advisory Service to help their workforce attain a tertiary qualification. Part of the plan is for extension officers with diplomas (NQF level 6) to be able to achieve degrees (NQF level 7).

**Other achievements by the centre's staff include:**

- Extraordinary Professor Edward Nesamvuni was appointed as the head of Agriculture in the Limpopo Province.
- Extraordinary Professor and Director: Research Development, Prof. Frans Swanepoel, was awarded a Senior Fulbright Scholarship for combined teaching-research at Cornell University, United States of America (USA). The Fulbright Scholarship is regarded as one of the most prestigious awards by the USA government.

During 2009, he was also involved with the Cornell International Institute for Food, Agriculture and Development (CIFAD) where he co-lectured a Ph.D. course on agricultural development in Africa. Prof. Swanepoel also conducted research, supported by the WK Kellogg Foundation, to revise agricultural education curricula in Africa to become more responsive to the needs of smallholding African family farms. The goal of this research programme is the emergence of an agricultural human resource and knowledge system that drives smallholding farmer-led development and innovation to achieve improved productivity, food security and economic development in Africa.

- Extraordinary Professor Alice Pell has the position of Vice Provost for International Affairs at Cornell University.
- Prof. Monty Jones has been appointed as an Extraordinary Professor at the centre and is the Executive Director of the Forum for Agricultural Research for Africa (FARA).

CENSARD also facilitated workshops with external supervisors. These were held to assist the MSA students in their research. Such workshops were held in Limpopo and Gauteng Provinces, the Dohnë Research Station and in Windhoek, Namibia.

**Some of the centre's top student achievers are:**

- The class of 2009 can all be commended for take the time to complete their studies while working full-time. The number of graduates from the 2009 academic year totalled 41 students.

- Ms Stella Heyns obtained her Masters' degree with distinction. This can only be achieved if a student completes his or her degree in two years with an average above 75%. She achieved an average of 84% and received the C. Small Award for Best Thesis in the faculty as well as the CENSARD's Merit Award for Outstanding Achievement. She also achieved the highest overall mark for a Master's student in Agriculture, the second-highest overall mark for a Masters' degree in the faculty and the fifth-highest overall mark for a Masters student at the university. Added to this list of awards is the Golden Key Award from the university. This award is for the top 15% of the university's students and forms part of the world's biggest honours society encompassing 370 universities in seven countries;
- Mr Kevin Whitfield also obtained his Master's degree with distinction. He achieved an average of 75% and for his thesis a mark of 85%. This mark is the highest awarded for a thesis since CENSARD's inception. He also received the Centre for Sustainable Agriculture's Merit Award for Outstanding Achievement;
- During his study, Mr Mathemba Gcasamba was appointed as a Senior Manager of Agricultural Extension in the Eastern Cape Province;
- Mr Wellington Ntshangase was appointed as the Head of Extension at Tongaat Hulleets. He oversees approximately 10 000 small-scale farmers who produce sugar cane.
- Mr Casper Nel, whose outstanding thesis on the economic viability of mutton- and woollen-type sheep graz-



ing on intensive pasture systems, led to publications and several farmers' day presentations on his farm.

- Mr Nico Liebenberg, one of the centre's Master's degree candidates and a top commercial farmer, produces carrots and other vegetables for Woolworths.

## Networking

CENSARD was again involved in several **international linkages**. Prof. Groenewald travelled to Minnesota and Virginia Tech Universities in the USA, while Mr Johan van Niekerk travelled to Cornell University in the USA and Dronten University in The Netherlands. The purpose of these travels was to establish links with other rural development and sustainable agricultural institutions. A Memorandum of Understanding (MOU) was established with Dronten University. Prof. Groenewald remains on the editorial board of an internationally-accredited scientific journal, the *Journal for Sustainable Agriculture*. Delegates from CENSARD attended the World Conference on Animal Production (WCAP) in Cape Town and the conference of the European Federation of Animal Science (EAAP) in Barcelona.

CENSARD is in the process of establishing networks to introduce ADSARD to the Southern African Development Community (SADC) universities.

Apart from the international and regional linkages, Prof. Groenewald, with his expertise in phosphate supplementation for free-grazing ruminants, is regularly invited to farmers' days and study groups locally. CENSARD also has strong linkages with the Departments



*Mr Mathemba Gcasamba (centre) with Mr Johan van Niekerk (left) and Prof. Groenewald (right).*



*Mr Johan van Niekerk at a workshop held in the Eastern Cape.*



*The Gauteng group.*



*Prof. Groenewald in Namibia with Ben Mouton (on the right; lawyer, farmer and vice chairman of ACRA) and John Mutorwa (centre; Minister of Agriculture, Namibia).*

of Agriculture in the Western and Eastern Cape, Free State and Limpopo. CENSARD has formalised an MOU with Limpopo and is in the process of formalising a MOU with the Eastern Cape. Delegates from CENSARD attended the local conference of the South African Society of Agricultural Extension in 2009.

## Research

Mr Johan van Niekerk's Ph.D. examines factors that influence the success of agricultural extension that will ultimately lead to an extension organisational model.

CENSARD is set to increase the number of publications from its personnel and students in the coming year.

The centre gives thanks and recognition to Prof. Frans Swanepoel – the Director of Research Development – for his continued support and commitment to CENSARD.



# Research outputs

## Conference contributions

**Carsan, S., Stroebel, A., Simons, A.J. & Jamnadass, R.** 2009. *Smallholder timber for East Africa's smallholder systems*. Paper presented at the 2<sup>nd</sup> World Congress of Agroforestry: Agroforestry - The Future of Global Land Use, Nairobi, Kenya. 23-28 August.

**Stroebel, A. & Swanepoel, F.J.C.** 2009. *Research and innovation management capacity building*. Paper presented at the 2009 Annual Meeting of the Society for Research Administrators International: Research without borders, Washington State Convention and Trade Center, Seattle, USA. 18-23 October.

**Stroebel, A. & Swanepoel, F.J.C.** 2009. *Smallholder cattle production dynamics: A case study from South Africa*. Paper presented at the 60<sup>th</sup> Annual Meeting

of the European Federation of Animal Science (EAAP 2009): Biodiversity and sustainable animal production systems, Fira de Barcelona, Barcelona, Spain. 24-27 August.

**Tshikolomo, K.A., Nesamvuni, A.E., Walker, A. & Stroebel, A.** 2009. *Cross-sectoral water uses by municipalities in the Limpopo and Luvuvhu-Letaba water management areas of South Africa*. Paper presented at the 10<sup>th</sup> Waternet/WARFSA/GWP-SA Symposium in association with the International Commission on Water Resources Systems (ICWRS): IWRM – Environmental sustainability, climate change and livelihoods, Entebbe, Uganda. 28-30 October.

**Tshikolomo, K.A., Nesamvuni, A.E., Walker, A. & Stroebel, A.** 2009. *Stakeholder participation in water issues in the Limpopo and Luvuvhu-*

*Letaba water management areas, South Africa*. Paper presented at the 10<sup>th</sup> Waternet/WARFSA/GWP-SA Symposium in association with the International Commission on Water Resources Systems (ICWRS): IWRM – Environmental sustainability, climate change and livelihoods, Entebbe, Uganda. 28-30 October.

**Tshikolomo, K.A., Walker, A., Nesamvuni, A.E. & Stroebel, A.** 2009. *Runoff and storage capacity of municipalities and rivers of Limpopo and Luvuvhu-Letaba water management areas of South Africa*. Paper presented at the 10<sup>th</sup> Waternet/WARFSA/GWP-SA Symposium in association with the International Commission on Water Resources Systems (ICWRS): IWRM – Environmental sustainability, climate change and livelihoods, Entebbe, Uganda. 28-30 October.



# Contact details

## Prof. Izak Groenewald

Faculty of Natural and Agricultural Sciences  
Centre for Sustainable Agriculture and Rural  
Development

University of the Free State  
PO Box 339  
Bloemfontein  
South Africa  
9300

**Telephone:** +27 51 401 2163

**Fax:** + 27 86 525 5371

**E-mail:** [groenei@ufs.ac.za](mailto:groenei@ufs.ac.za)

**Website:** [www.ufs.ac.za](http://www.ufs.ac.za)

# Staff

**Professor:** Prof. Izak Groenewald

**Professors Extraordinary:** Profs. Frans Swanepoel, Edward  
Nesamuvuni, Alice Pell

**Senior Researcher:** Prof. Aldo Stroebe

**Research Associate:** Mr Johan van Niekerk

**Programme Coordinator:** Ms Mia Kirsten



*Mr Casper Nel talking at a farmers' day.*



# Experimental Farm





# 23

## Paradys Experimental Farm

### Overview

**P**aradys Experimental Farm has always been characterised by constant development and renovation, and 2009 was no exception.

### Activities and achievements

#### Cultivated land:

Paradys Experimental Farm has once again shown its mettle in the agricultural section. In 2009 two new McCormicks tractors were acquired. The new B-Max 95 Power farm is used for lighter duties such as weeding, feeding and ploughing, while the C-Max 105 is used for chemical control as well as ploughing. The two tractors have brought about huge

savings in diesel and to a great extent contribute to the increased productivity of the agricultural section

The 2009/2010 production season brought many challenges in terms of the high rainfall and December winds. However, the agricultural section still managed to increase its production area with nearly 100 ha. Maize, teff and sorghum were cultivated for the dairy branch and the current crop estimate indicates that an excellent maize production yield can be expected this season.

The acquisition of the new tractors was accompanied by an extremely



*“The future of the Afrikaner stud  
appears rosy and it should  
go from strength to strength.”*

*– Mr Jannie Myburgh*





successful farmers' day attended by farmers and agricultural students in their masses. Speakers addressed the major challenge of the financial management of agriculture on marginal soil and attention was also paid to precision farming technology for our environment. After the discussion sessions the farmers and students were afforded the opportunity to take turns in driving the tractors. A few mechanical techniques were also explained to them. Proper attention was also paid to the positioning of implements in order to increase fuel as well as power effectiveness. The opportunity was attended by quite a number of emerging farmers, who gleaned a lot of information from the event.

Fodder production from maize was terminated and a more modern production system was implemented. A tipper trailer was bought, which led to more effective harvesting. This process is already a step in the direction of mechanisation for the future. The harvesting process will commence at the end of June 2010.

In the agricultural section the Experimental Farm strives towards involving as many as possible students during production and harvesting times in order to convey valuable practical knowledge, which they will in turn be able to apply in their careers ahead.

Mr Johnny Molomo, a fourth-year B.Sc. Agricultural student was appointed as part of the exceptional management team of the experimental farm.





have been attained with the exceptional Dorper stud at the Experimental Farm. The sheep that are utilised to enable AI courses perform exceptionally. Students assist in shearing sheep, and lambs placed in feeding lots to round them off performed exceptionally by obtaining record prices at a BKB auction at the Lengau Agricultural Development Centre.

#### **Afrikaners:**

The farm management can look back with great satisfaction and gratitude over a year characterised by an exceptionally high rainfall. However, such a year can present challenges of its own, for example, the recent outbreak of Rift-valley Fever. The rains have definitely given the veld, which is managed according to a pasture programme, a good chance to recover. Animal numbers are constantly monitored to ensure that it does not exceed the feeding capacity.

The future of the Afrikaner stud of the University of the Free State (UFS) appears rosy and henceforth it should only go from strength to strength. This past year the Afrikaner stud received an award from the Afrikaner Cattle Breeders' Association for the best progress. The year was also characterised by a very good calving season for 2009/2010. A weaning percentage of 90% was achieved. The farm also owe a lot to the breeders who were willing to provide help where necessary and also regularly came and visited the stud.

#### **Infrastructure:**

Currently a lot of effort is put into the development of a renewable energy

#### **Dairy:**

Currently Paradys Experimental Farm has a dairy with 120 cows in milk with a total female stud of 152 animals. This dairy aims to expand further to 200 lactating animals and steps have already been taken to realise this goal. In 2009 a second breed, namely Holsteins, was acquired to supplement the Jersey stud. This dairy has decreased the average inter-calf period by approximately 70 days. The entire stud is subjected to artificial insemination and only top bulls are selected for this.

Further steps were taken to make the dairy more accessible for student training, because it is an excellent branch of industry to train students in animal science. In 2009 regular practical sessions were presented in

order for students to gain experience in the handling of animals. These practical classes included pregnancy examinations, the dehorning of animals, clinical examinations of sick animals, the raising of heifers and general guidelines in the management of a dairy.

At the end of last year a highlight for the dairy is that the dairy's stud, thanks to good management, has been nominated by the Agricultural Research Council (ARC) for an award.

#### **Sheep:**

In 2009/2010 the focus strongly fell on artificial pasture management as source of nutrition for the animals. The systems have been developed and set in place, mainly to produce a higher quality meat at a lower production cost. Successful lambing and weaning percentages

source on the farm. Models are currently developed to utilise methane as energy source.

#### **School and student visits:**

Postgraduate students do their research for the completion of their postgraduate studies on the experimental farm. A feeding and digestion programme has been undertaken by one of the postgraduate students with great success.

Every Friday students carry out a variety of practical duties on the experimental

farm as part of their practical training, from the fields to the collection of data for monitoring programmes on the farm.

This year Paradys Experimental Farm has once again presented the PATT (agricultural management practice) programme of the Department of Education for agricultural schools. Successful progress was made during the contact sessions and the Secondary School Reddersburg's agricultural programme is in full swing with help of the inputs of the university.

#### **Staff matters:**

Good progress has also been made with the development of farm workers and facilities have been overhauled to fulfil in their needs.

A support programme has been created by the management to motivate the workers daily and discuss the necessary daily duties with them. Workers are lead to form part of the outcomes of production on the farm, thereby improving their social conditions.



*A function was held on the Paradys Experimental Farm to welcome first-year students studying agriculture.*



## Contact details

**Mr Jannie Myburgh**

Faculty of Agricultural and Natural Sciences  
Paradys Experimental Farm  
University of the Free State  
P O Box 35265  
Faunasig  
Bloemfontein  
South Africa  
9300

**Telephone:** +27 51 443 9011

**Telefax:** + 27 51 443 9010

**Website:** [www.ufs.ac.za](http://www.ufs.ac.za)

## Staff

**Farm Manager:** Mr Jannie Myburgh

**Administrative Manager:** Ms Amanda Smith

**Students:** Messrs EJ King, Werner Brand, Johan Wolither

**Farm Workers:** Mes Anna Seboniyane, Elisa Seboniyane, Messrs Thabo Khubeka, Vinie Khubeka, Jeremia Lelaka, Isaac Nkotshane, Christiaan Olivier, Daniel Somi, Paulus Somi, Samuel Motswari, Samuel Kheswa, Petrus Ramatekoane, Petrus Moriribela, Stephen Bavuma, Richard Mxhaka, Jerry Mxhaka

**Security:** Messrs Daniel Mxhaka, Azael Khoele







**Institute**





# 24 Groundwater Studies

## Overview

**T**he Institute for Groundwater Studies (IGS) was founded in 1974 and is currently under the leadership of Dr Ingrid Dennis. To date, more than 600 postgraduate students in geohydrology have qualified from this institution.

During 2009, the number of students registered at the IGS increased dramatically, with the registration of 29 Honours, 38 M.Sc. and 12 Ph.D. students. The total number of registered students amounted to 79, 11 of which were international students from Benin, Botswana, Cameroon, Eritrea, Lesotho, Namibia and Zimbabwe.

2009 was a year of many changes for the IGS. Two new staff members, Prof. Kai Witthueser and Dr Johan van der Merwe, were welcomed. Prof. Witthueser is currently a director of the Water Geosciences and has numerous years of academic experience, both in Germany and in South Africa. Prof. Witthueser is presenting the Honours course, Groundwater Quality and Pollution, and is also supervising a number of Master's and Ph.D. students. Dr van der Merwe is assisting with second-year Geology courses, following his retirement as a Deputy Director from the Department of Water Affairs. He is currently serving on the Bloemwater Board.





*“The IGS continues to strengthen  
its international ties.”*

*- Dr Ingrid Dennis*



*From the left are: Dr Ingrid Dennis (Director: IGS), Mr Andries Jordaan (Director: DIMTEC), Prof. Herman van Schalkwyk (Dean of the Faculty of Natural Agricultural Sciences) and Maitland Seaman (Director: Centre for Environmental Management) at the United Nations in Bonn, Germany.*



The entire IGS building was upgraded. The required funds, amounting to approximately R1 million, were generated entirely by the IGS staff members.

Numerous contracts were awarded to the IGS, including contracts from the Department of Water Affairs (DWA), the Water Research Commission, mining houses (e.g. Anglocoal) and industry (e.g. SASOL). The IGS received a research grant from Sasol for the fourth consecutive year.

### **Activities and achievements**

Acid Mine Drainage is an important issue in the mining industry and therefore continuous research is being conducted in this field by the IGS. A number of papers were presented on this subject and on other issues by Drs Ingrid Dennis, Danie Vermeulen and Rainier Dennis at the International Conference on Acid Rock Drainage (ICARD) held in Skellefteå, Sweden in June 2009.

Dr Danie Vermeulen and Prof. Gideon Steyl visited the United States of America (USA) in October 2009 for research and training. They undertook a week-long training course hosted by Rockware Colorado with a specific focus on the field of geohydrology. Training was conducted on Geochemical Workbench Professional, Surfer 9 and RockWorks 15. During this period, Dr Vermeulen also visited the head offices of the United States Geological Survey (USGS) in Washington, District of Columbia, where he held discussions on





*Dr Ingrid Dennis (left) and Ms Lore-Mari Cruywagen at the Aitik underground mine.*

the continuation of cooperative efforts between the IGS and the USGS.

Prof. Gerrit van Tonder received an honorary life membership from the Groundwater Division of the Geological Society of South Africa. The membership was given as a token of appreciation for his outstanding service and dedication to furthering the science of groundwater, and was awarded at the Biennial Groundwater Conference held in Somerset West in November 2009. Dr Ingrid Dennis and a number of the IGS postgraduate students presented papers at this conference.

## Networking

A highlight of 2009 was the international visits undertaken by staff of the IGS to Germany, Sweden and the United States of America. Prof. Van Schalkwyk, Prof. Seaman, Dr Dennis and Mr Jordaan spent four days during September 2009 in collaborative discussions with the United Nations University (UNU) in Bonn, Germany, which resulted in the signing of a Memorandum of Understanding between the IGS and the UNU. Dr Dennis and Mr Jordaan returned to Germany in December 2009 to continue discussions with the UNU, the University of Bonn and numerous departments within the German government, including the Federal Agency for Technical Relief, Federal Office of Civil Protection and Disaster Assistance and the Federal Ministry for Economic Cooperation and Development, Division on Water, Energy and Urban Development.

As a result, Dr Dennis will be assisting Mr Jordaan in a postgraduate training course on disaster risk management run in South Africa, Germany and Serbia and a number of experts from Germany will be visiting the University of the Free State (UFS) in 2010 to present other training courses.

Dr Rainier Dennis joined a team of UFS delegates to the University of Minnesota in the USA in November 2009 (Photo 3). The aim of the visit was to strengthen ties between the two universities based on a Memorandum of Understanding and to discuss the exchange of students and lecturers as well as course material. Staff from the IGS will be conducting sabbaticals at Minnesota over the next

three years to upgrade and develop new course materials.

The IGS also strengthened its ties with government. Dr Ingrid Dennis was invited to present at the regional Water Indaba of the Department of Water Affairs (DWA). The IGS also had a booth at the indaba. Dr Ingrid Dennis continues to meet with regional and national DWA officials on a regular basis.

In 2009, the South African Development Community (SADC) and the IGS resumed discussions regarding the hosting of the Groundwater Management Institute (GMI) of Southern Africa. The SADC GMI should be up and running within the IGS by the end of 2010.

## Community service

One of the goals of the IGS in 2009 was to increase its involvement in the local community. The following was the result thereof:

- Prof. Gerrit van Tonder gave several presentations to local pensioners' societies, churches and ladies' associations on subjects ranging from water quality to groundwater use.
- Dr Rainier Dennis introduced Grade 2 pupils at St Andrew's School to the subject of groundwater.
- Drs Ingrid and Rainier Dennis accompanied officials from the Department of Water Affairs on two field trips to teach them about groundwater and its incorporation into the National Water Act.
- The IGS, as part of the postgraduate training programme, drilled three boreholes for Lebone House, a care centre for Aids patients.



# Research outputs

## Research articles

**Vermeulen, P.D. & Usher, B.H.** 2009. Operation and monitoring guidelines and the development of a screening tool for irrigating with coal mine water in Mpumalanga Province, South Africa. *Water SA* 35(4): 379-386.

**Vermeulen, P.D., Usher, B.H. & Van Tonder, G.J.** 2009. Quantification of the impacts of coalmine water irrigation on the underlying aquifers. *Journal of the Southern African Institute for Mining and Metallurgy* 109: 423-431.

## Reports

**Vermeulen, P.D., Dennis, I. & Van Tonder, G.J.** 2009. *Geohydrological investigation at Secunda for the Underground Coal Gasification Project: Numerical modelling*. Report submitted to Sasol Mining, South Africa.

**Dennis, I.** 2009. *Geohydrological Modelling at the Sasol Synfuels Site Secunda: Salt load calculations*. Report submitted to Sasol Synfuels, South Africa.

**Dennis, S.R. & Dennis, I.** 2009. *Review and testing of Groundwater Resource Assessment Phase 2 (GRAII)*. Report submitted to the Department of Water Affairs, South Africa.

**Dennis, I. & Dennis, S.R.** 2009. *Review and testing of the GSFLOW software for surface-groundwater interaction*. Report submitted to the Department of Water Affairs, South Africa.

**Dennis, I.** 2009. *Review of Berg WAAS Conceptual and Numerical*

*Models*. Report submitted to the Department of Water Affairs, South Africa.

**Dennis, I. & Vermeulen, P.D.** 2009. *Mookkraal Colliery Environmental Management Plan: Groundwater Specialist Study*. Report submitted to Sasol Mining, South Africa.

**Dennis, I. & Dennis, S.R.** 2009. *Groundwater Reserve Determination Study in the Usutu to Mhlathuze Catchment: High level assessment*. Report submitted to the Department of Water Affairs, South Africa.

**Dennis, I. & Dennis, S.R.** 2009. *Groundwater Reserve Determination Study in the Thukela Catchment: High level assessment*. Report submitted to the Department of Water Affairs, South Africa.

**Vermeulen, P.D. & Dennis, I.** 2009. *Numerical Decant Models for Sasol Mining Collieries, Secunda*. Report submitted to Sasol Mining, South Africa.

**Dennis, S.R.** 2009. *Aquifer Management System - Software Requirement Specification*. Report submitted to the Department of Water Affairs, South Africa.

**Dennis, S.R.** 2009. *DWAF GISUtility Design Document*. Report submitted to the Department of Water Affairs, South Africa.

**Dennis, S.R.** 2009. *Sasol Secunda: Hydrodynamic and water quality simulation model*. Report submitted to Sasol Synfuels, South Africa.

**Dennis, S.R.** 2009. *Annual Monitoring Report for Letseng Diamond Mine*. Report submitted to Letseng Diamond Mine, South Africa.

**Vermeulen, P.D.** 2009. *Groundwater Investigation At Hippo Pond Ashing Facility, Secunda*. Report submitted to Sasol Synfuels, South Africa.

**Vermeulen, P.D.** 2009. *Groundwater Monitoring Report for Finsch Diamond Mine*. Report submitted to Finsch Diamond Mine, South Africa.

## Conference contributions

**Dennis, S.R., Dennis, I. & Steyl, G.** 2009. *Groundwater Risk Assessments related to the mining environment using the South African Groundwater Decision Tool*. Paper presented at: Securing the Future: Mining, Metals and the Environment in a Sustainable Society and the 8<sup>th</sup> International Conference on Acid Rock Drainage (ICARD), Skellefteå, Sweden. 22 June-26 June.

**Dennis, I. & Dennis, S.R.** 2009. *High Level Groundwater Reserve Determinations: Lessons Learnt*. Paper presented at the Biennial Groundwater Conference: Groundwater - Pushing the limits, NH The Lord Charles, Somerset West, South Africa. 16-18 November.

**Vermeulen, D. & Dennis, I.** 2009. *A conceptual assessment of coal mine decanting: A case study of South African coalfields*. Paper presented at: Securing the Future: Mining, Metals and the Environment in a Sustainable Society and the 8<sup>th</sup> International Conference on Acid Rock Drainage (ICARD), Skellefteå, Sweden. 22 June-26 June.

**Dennis, I. & Vermeulen, D.** 2009. *Methods to assess the impacts of mining on South African groundwater systems*. Poster presented at:

Securing the Future: Mining, Metals and the Environment in a Sustainable Society and the 8<sup>th</sup> International Conference on Acid Rock Drainage (ICARD), Skellefteå, Sweden. 22 June-26 June.

**Tredoux, M., Lithauer, A. & Vermeulen, P.D.** 2009. *The mobility of U in groundwater: A study done in a semi-arid region of South Africa*. Proceedings of the 19<sup>th</sup> Annual V.M. Goldschmidt Conference: Our volatile earth, Davos, Switzerland. 21-26 June. *Geochimica et Cosmochimica Acta* (73, Issue 13): Supplement 1.

**Verwey, P. & Vermeulen, D.** 2009. *Influence of irrigation water on the Vaalharts Irrigation Scheme*. Paper presented at the Biennial Groundwater Conference: Groundwater - Pushing the limits, NH The Lord Charles, Somerset West, South Africa. 16-18 November.

**Vermeulen, D. & Bester, M.** 2009. *Assessment of how the geohydrology of the Waterberg coal field will be affected by mining*. Paper presented at the Biennial Groundwater Conference: Groundwater - Pushing the limits, NH The Lord Charles, Somerset West, South Africa. 16-18 November.

**Pretorius, H., Andreoli, M.A.G., Faanhof, A., Vermeulen, D. & Tredoux, M.** 2009. *The behavior of radionuclides in the groundwater of Vaalputs, SA*. Poster presented at the Biennial Groundwater Conference: Groundwater - Pushing the limits, NH The Lord Charles, Somerset West, South Africa. 16-18 November.

# Contact details

## Dr Ingrid Dennis

Faculty of Natural and Agricultural Sciences  
Institute for Groundwater Studies  
University of the Free State  
PO Box 339  
Bloemfontein  
South Africa  
9300

**Telephone:** +27 51 401 3481  
**Fax:** +27 51 444 6538  
**E-mail:** dennis@ufs.ac.za  
**Website:** www.ufs.ac.za

# Staff

**Director:** Dr Ingrid Dennis

**Professor:** Prof. Gerrit van Tonder

**Researchers:** Drs Rainier Dennis, Danie Vermeulen

**Affiliated Associate Professor:** Prof. Kai Witthuesser

**Affiliated Researchers:** Prof. Jopie Botha, Dr Johan van der Merwe

**Laboratory:** Mss Lore-Mari Cruywagen, Henrihet Human, Elna de Necker, Jossie van der Merwe



*Drs Rainier Dennis (left) and Gert Ceronio at the University of Minnesota in the USA.*



*Dr Rainier Dennis presents to the Grade 2 class at St Andrew's School in Bloemfontein.*



The background features a light blue-toned image of a document with a bar chart. A silver pen is positioned diagonally across the chart. The chart has several vertical bars of varying heights. A dark blue horizontal band with a white dot pattern is located at the top right of the image.

25

**Statistical Data**



# Faculty of Natural and Agricultural Sciences

Student figures: 2008-2009

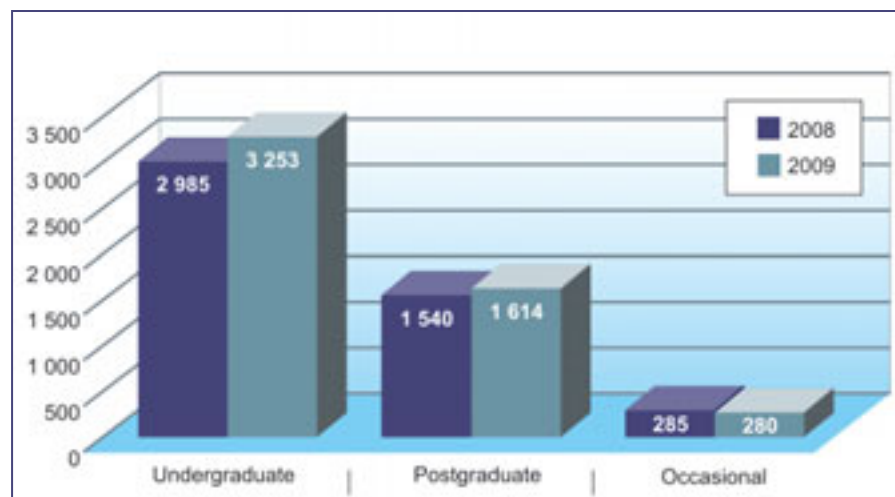
Year	Description	Female					Male					Total				
		Black	Coloured	Asian	White	Total	Black	Coloured	Asian	White	Total	Black	Coloured	Asian	White	Total
2008	Undergraduate	806	30	16	448	1300	860	21	22	782	1685	1666	51	38	1230	2985
	Postgraduate	298	19	24	257	598	458	21	19	444	942	756	40	43	701	1540
	Occasional	128	4	0	9	141	132	1	1	10	144	260	5	1	19	285
<b>TOTAL</b>		1232	53	40	714	2039	1450	43	42	1236	2771	2682	96	82	1950	4810
2009	Undergraduate	980	34	14	465	1493	901	27	19	813	1760	1881	61	33	1278	3253
	Postgraduate	304	13	21	268	606	494	20	25	469	1008	798	33	46	737	1614
	Occasional	116	2	0	16	134	125	1	0	20	146	241	3	0	36	280
<b>TOTAL*</b>		1400	49	35	749	2233	1520	48	44	1302	2914	2920	97	79	2051	5147

\*2009 Final HEMIS figures not yet available

## International students

Nationality	Year	
	2008	2009
Asian countries	24	21
Botswana	23	26
Democratic Republic of the Congo	1	-
European countries	12	11
Lesotho	146	151
Malawi	5	5
Mauritius	3	3
Mozambique	7	5
Namibia	65	83
North America	5	7
Other African countries	71	72
Swaziland	6	8
Zambia	8	8
Zimbabwe	62	64
<b>Total</b>	<b>438</b>	<b>464</b>

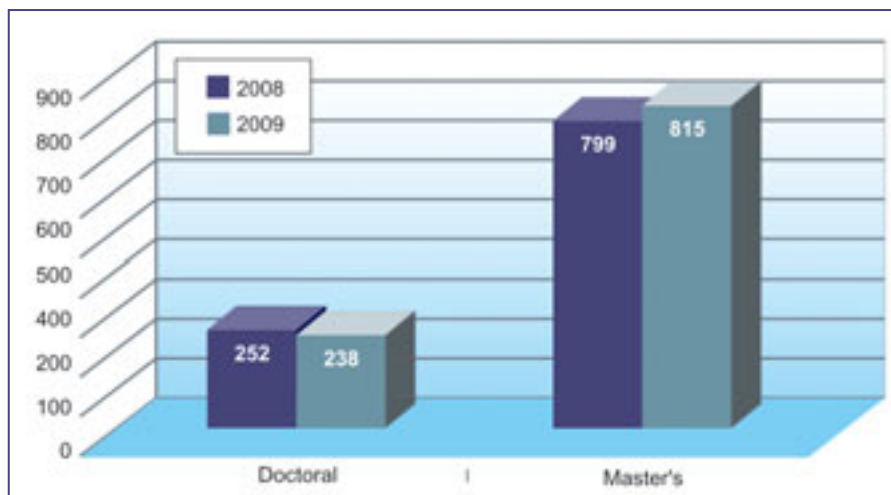
## Comparison for the Faculty of Natural and Agricultural Sciences: 2008-2009



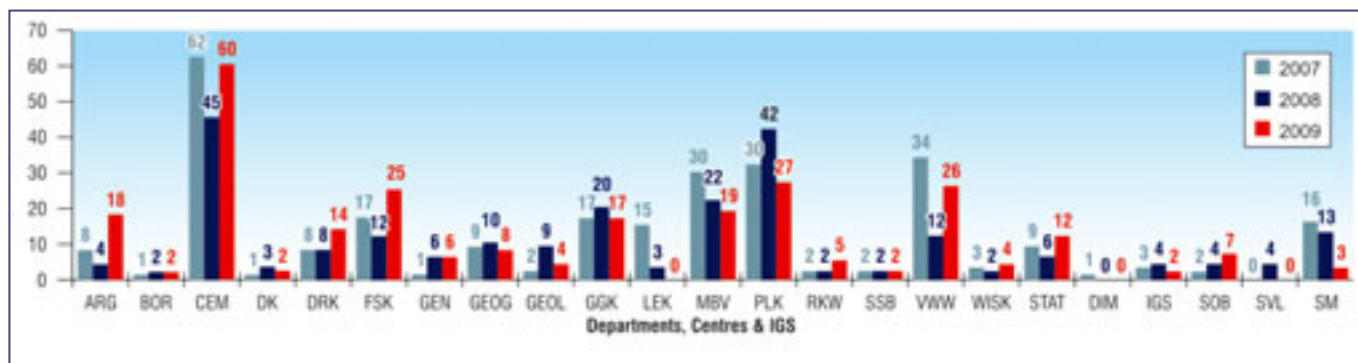
## Student figures Post-/Undergraduates

	2008	2009
<b>Undergraduate</b>	2985	3253
<b>Postgraduate</b>	1540	1614
<b>Occasional</b>	285	280
<b>Total</b>	<b>4810</b>	<b>5147</b>
	2008	2009
<b>Doctoral</b>	252	238
<b>Master's</b>	779	815
<b>Total</b>	<b>1031</b>	<b>1053</b>

## Comparison for the Faculty of Natural and Agricultural Sciences: 2008-2009



## Accredited articles



## List of abbreviations

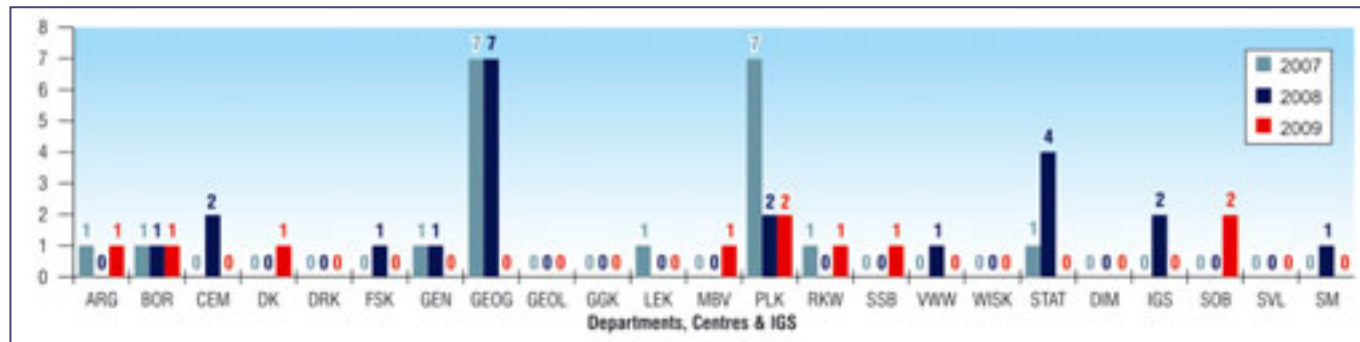
ARG Department of Architecture  
 BOR Department of Quantity Surveying and Construction Management  
 SOB Centre for Environmental Management  
 CEM Department of Chemistry  
 SM Centre for Microscopy  
 SVL Centre for Sustainable Agriculture and Rural Development

DK Dean's Office  
 DRK Department of Zoology and Entomology  
 FSK Department of Physics  
 GEN Department of Genetics  
 GEOG Department of Geography  
 GEOL Department of Geology  
 GGK Department of Soil, Crop and Climate Sciences  
 IGS Institute for Groundwater Studies

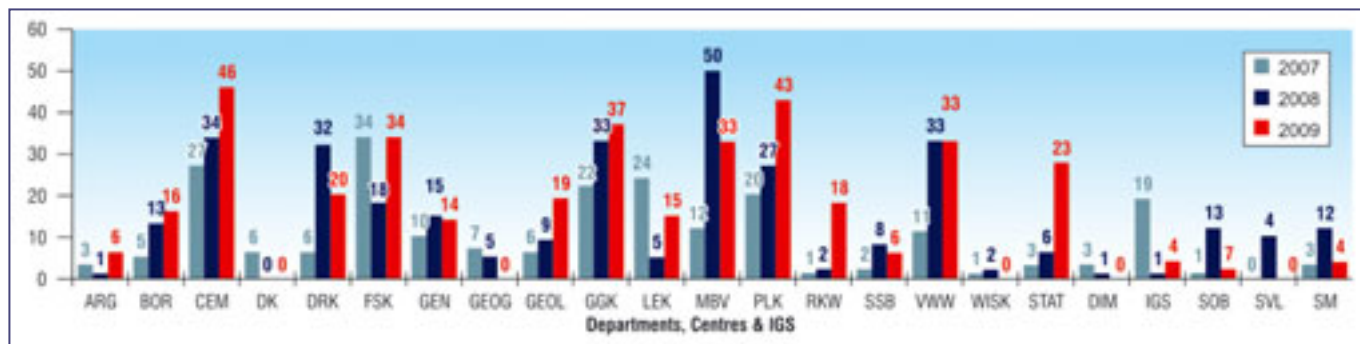
LEK Department of Agricultural Economics  
 MBV Department of Microbial, Biochemical and Food Biotechnology  
 PLK Department of Plant Sciences  
 RKW Department of Computer Science and Informatics  
 SSB Department of Urban and Regional Planning

SRB Disaster Management Training and Education Centre for Africa (DiMTEC)  
 VWW Department of Animal, Wildlife and Grassland Sciences  
 STAT Department of Mathematical Statistics and Actuarial Science  
 WISK Department of Mathematics and Applied Mathematics

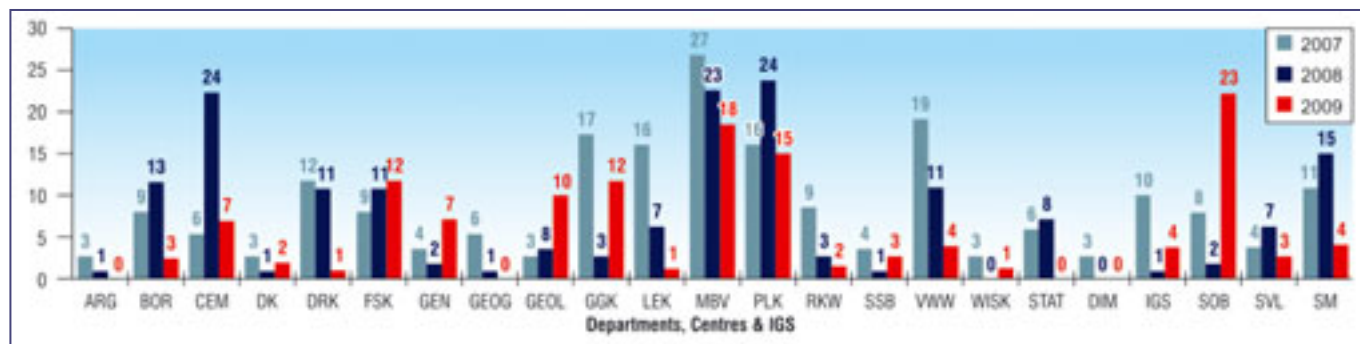
## Books



## Local conferences



## Overseas conferences contributions







# 26 Glossary

# Glossary

## A

ADF -	Amsterdam Density Functional Programme
ADSARD -	Advanced Diploma in Sustainable Agriculture and Rural Development
AGM -	Annual General Meeting
AI -	Artificial Insemination
ARC -	Agricultural Research Council
ASQAQs -	Association of South African Quantity Surveyors
ASOCSA -	Association of Schools of Construction of Southern Africa
ASSA -	Actuarial Society of South Africa
ASSA -	Astronomical Society of Southern Africa
ASSAf -	Academy of Science of South Africa

## B

BGR -	German Federal Survey of Geology
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## C

CANSA -	Cancer Association of South Africa
CCEM -	Centre for Confocal and Electron Microscopy
CCTC -	Center for Theoretical and Computational Chemistry
CEE -	Council for Economic Education
CENSARD -	Centre for Sustainable Agriculture and Rural Development
CePHMa -	Centre for Plant Health Management
CHESD -	Centre for Higher Education and Studies and Development
CHPC -	National Centre for High Performance Computing
CIDB -	Construction Industry Development Board
CIIFAD -	Cornell International Institute for Food, Agriculture and Development
CIOB -	Chartered Institute of Building
CLSM -	Confocal laser scanning microscope
CMW -	Cape Mohair and Wool
CNRS -	French National Centre for Scientific Research
COE -	Centre of Excellence
COLA -	Conference on Laser Ablation
CPU -	Central Processing Unit

CSIR -	Council for Scientific and Industrial Research Organisation
CUT -	Central University of Technology

## D

DFG -	Deutsche Forschungsgemeinschaft
DiMTEC -	Disaster Management Training and Education Centre for Africa
DMISA -	Disaster Management Institute of Southern Africa
DRR -	Disaster Risk Reduction
DSC -	Differential Scanning Calorimetry
DST -	Department of Science and Technology
DWAF -	Department of Water Affairs and Forestry

## E

EAAP -	European Association for Animal Production
ECA -	European Crystallographic Association
EPWP -	Expanded Public Works Programme

## F

FAO -	Food and Agricultural Organisation
FFSC -	Farm Financial Standard Council
FLIP -	Facilitation Learning in Practice
FMP -	Facilities Management Programme
FP7 -	European Funding Program Seven

## G

GIS -	Geographical Information Systems
GMI -	Groundwater Management Institute
GOOT -	Grow our Own Timber
GOL -	Government of Lesotho

## H

HPC -	High Performance Computing
HRTEM -	High Resolution Transmission Electron Microscopy

## I

IBREAM SA -	Institute for the Breeding of Rare and Endangered African Mammals
ICARD -	International Conference on Acid Rock Drainage
ICEC -	International Cost Engineering Council
ICPOES -	Inductively Coupled Plasma Optical Emission Spectroscopy
ICSU -	International Council for Science
ICY -	International Yeast Commission
IDC -	Industrial Development Corporation
IDP -	Internationally Displaced Persons
IFMA -	International Farm Management Association
IGS -	Institute for Groundwater Studies
INTSORMIL -	International Sorghum and Millet Research Support Programme
IPMP -	Intensive Project Management Programme
IRDP -	Institutional Research and Development Programme

## K

KIST -	Korea Institute of Science and Technology
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## L

LRAD -	Land Redistribution for Agricultural Development
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## M

MANIT -	Maulana Azad National Institute of Technology
MCA-L -	Millennium Challenge Account-Lesotho
MCC -	Millennium Challenge Corporation
MNS -	Material and Nanosciences Cluster
MOU -	Memorandum of Understanding
MS -	Mass Spectrometry
MSA -	Masters degree in Sustainable Agriculture
MSDN -	Microsoft Developer Network
MUCPP -	Mangaung University Community Partnership Programme

## N

NAMC -	National Agricultural Marketing Council
NECSA -	South African Nuclear Energy Corporation
NEP -	National Equipment Programme
NGO -	Non-Governmental Organisation
NIRS -	Infrared Spectrophotometer
NMMU -	Nelson Mandela Metropolitan University
NNSCF -	National Nano-Surface Characterisation Facility
NRF -	National Research Foundation
NSTF -	National Science and Technology Forum
NUFU -	Norwegian Council of Universities Committee for Development, Research and Education
NWS -	New World Sanitation

## P

PEGG -	Primate Ecology and Genetics Group
PHP -	Peoples' Housing Process
PRT -	Protein Research Trust

## R

RICS -	Royal Institute of Chartered Surveyors
RPO -	Red Meat Producers' Organisation

## S

SA -	South Africa
SAAWK -	South African Academy of Sciences
SAB -	The South African Breweries Limited
SACAP -	South African Council for the Architectural Professions
SACLA -	Southern African Computer Lecturers Association
SACPCMP -	South African Council for the Project and Construction Management Professions
SACPVP -	South African Council for the Property Valuation Profession
SACQSP -	South African Council for the Quantity Surveying Profession

SADC -	Southern African Development Community
SAFEFE -	South African Foundation for Economic and Financial Education
SAFOI -	South African Fryer Oil Initiative
SAGA -	South African Geophysical Association
SAIA -	South African Institute of Architects
SAIP -	South African Institute of Physics
SAJAH -	South African Journal of Art History's Institute
SANBI -	South African National Biodiversity Institute
SANPAD -	South Africa-Netherlands Research Programme on Alternatives in Development
SAPOA -	South African Property Owners' Association
SAQA -	South African Qualifications Authority
SASAS -	South African Society for Animal Science
SASAS -	South African Society of Atmospheric Sciences
SASCP -	South African Society of Crop Production
SASHS -	Southern African Society for Horticultural Sciences
SASPP -	Southern African Society for Plant Pathology
SASQUA -	Southern African Society for Quaternary Research
SASS -	South African Scoring System
SAWMA -	South African Wildlife Management Association
SEM -	Scanning Electron Microscope
SIDA -	Swedish International Development Cooperation Agency
SIFE -	Students in Free Enterprise
SKA -	Square Kilometre Array
SOI -	Southern Oscillation Index
SSSSA -	Soil Science Society of South Africa

## T

TAD -	Teaching Astronomy for Development
TEM -	Transmission Electron Microscope

TGA -	Thermal Gravimetric Analysis
THRIP -	South African National Research Foundation Thrust for Industry-Related Projects
TRAC -	Trans African Concessions (Pty) Ltd
TUT -	Tshwane University of Technology

## U

UACH -	Autonomous University of Chapingo
UCT -	University of Cape Town
UEC -	Unit for Earth Construction
UFS -	University of the Free State
UJ -	University of Johannesburg
UK -	United Kingdom
UKZN -	University of KwaZulu-Natal
UMN -	University of Minnesota
UN -	United Nations
UNU -	United Nations University
UNU-EHS -	United Nations University's Institute for Environment and Human Security
UP -	University of Pretoria
UPS -	Uninterrupted Power Supply
US -	United States
USA -	United States of America
USGS -	United States Geological Survey
UWC -	University of the Western Cape
UWM -	University of Milwaukee-Wisconsin

## V

ViE -	Vice-Rectorate in Europe
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## W

WCAP -	World Conference on Animal Production
WITS -	University of the Witwatersrand
WRC -	Water Research Commission
WSSSA -	Weed Science Society of South Africa
WVI -	World Vision International
WWU -	Muenster University

## X

XPS -	X-ray photon spectroscope
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