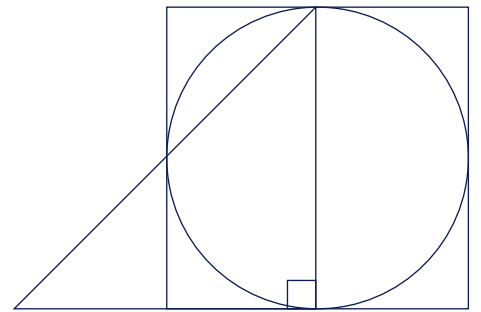


Report

05/06



Faculty of Natural and Agricultural Sciences



Faculty of Natural and Agricultural Sciences

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From the Dean's office



Prof. Herman van Schalkwyk.

The Faculty of Natural and Agricultural Sciences at the University of the Free State (UFS) leads the way in the practising of natural and agricultural sciences in South Africa and the highest levels of quality and credibility are reflected.

Our commitment, however, reaches far beyond just this. It reaches beyond the borders of the country and across continents; its multi-disciplinary and practical approach is vested in all the disciplines presented by the faculty.

In 2005/06 the Faculty experienced significant growth in measurable outputs. A contributing factor was the comprehensive apparatus strategy and plan which was implemented in 2005. With this strategy, university funds were used to leverage other funds in order to obtain huge discounts from suppliers of apparatus. In this way the faculty managed to obtain almost R50 million worth of apparatus in 2005.

The strategy was continued in 2006 when an agreement to the value of R7 542 531 was reached with Shimadzu, according to which apparatus was supplied to the faculty at discount prices. The agreement, which is valid for three years, entails the free replacement of apparatus which is purchased during this period with upgraded versions.

The new apparatus forms part of the UFS vision to compete internationally with quality research outputs in certain niche areas, to provide leadership in advanced training to students from the African continent and to establish the university as a leader among South African universities.

Two researchers with a B rating from the National Research Foundation (NRF) were also appointed. Both of these initiatives bore fruit and in 2006 the faculty increased its total research outputs by

about 13%. As an example, the Department of Chemistry's outputs increased by 100%.

The faculty has been bursting at the seams over the past couple of years. Student figures rose from 3 935 undergraduate, postgraduate and occasional students in 2005, to 4 224 in 2006. There is also strong representivity of students from other African countries and in 2005/06 almost 600 students studied at the faculty.

An extended B.Sc. programme has been presented to students since 2005. The programme aims at providing students who do not comply with all the requirements for the B.Sc. programme with the necessary sub-structure to complete the B.Sc. degree successfully. A preliminary evaluation of the results indicates that the programme is delivering the desired results.

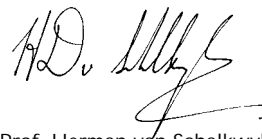
The alignment of the Qwaqwa Campus, which was incorporated into the UFS in January 2003, remains a challenge. Regular discussions are held with staff on the campus in order to make the faculty's programmes more sustainable and to align it with the broader strategic plan of the UFS.

On a national level, the faculty is in the process of making its mark in terms of teaching and community service. In 2005 the faculty again actively began utilising its

experimental farms. A three-way agreement between the UFS, the National Farmers Union (NAFU) and the Mangaung Local Municipality led to the establishment of the Lengau Agricultural Development Centre on the Sydenham Experimental Farm. The centre provides training and mentorship to small-scale upcoming farmers.

To be dynamic and progressive requires innovative thinking. It requires commitment and a desire to deliver excellent teaching and learning opportunities to students. It requires a willingness to form partnerships, and a multi-disciplinary and practical approach to the tertiary education environment in South Africa.

This report covers the faculty's activities in 2005/06. It is a reflection of two years' commitment on the part of a team of skilled and motivated academics and support staff.



Prof. Herman van Schalkwyk
Dean: Faculty of Natural and Agricultural
Sciences
University of the Free State

Nguni stud farmers. There are about 153 Nguni's involved in the project. The cattle were purchased from the Kalahari Nguni Club with money granted to the project by the IDC.

First-time farmers are selected to take part in the project and they receive ten cows in calf and two stud bulls. The farmers receive training and guidance in aspects such as veld management, animal health and meat management. The cattle are the property of a trust for five years. When the farmers completed their training after five years, the animals become theirs. They have to return ten registered cows and two bulls to the IDC as these animals are then passed on to the next first-time farmers.

To maintain the active research programme, external funding from different national and international institutions is of the utmost importance. Here the National Research Foundation (NRF), Cape Mohair & Wool, the NWGA, Alexander Forbes, Meadow Feeds, Voermol, the Central Research Fund of the UFS, the National Lucerne Organisation and the May and Stanley Smith Charitable Trust, amongst others, played a pivotal role.

Research highlights include a study to determine the small-scale habitat and feeding preference of springbok, blesbok and black wildebeest as the fencing of small areas and stocking them with game species is becoming a common tendency in South Africa. Seasonal variation in the natural pasture utilisation was demonstrated with a larger number of certain plant species being used during the rainy season. A seasonal trend in root distribution and root:shoot ratio was also recorded, demonstrating that maintaining grassland in good condition ensures greater utilisation of plant-available water.

A study on the restoration of degraded natural pastures on game-managed areas of the Free State and possible rehabilitation techniques to be implemented was undertaken. In the field of Grassland Science, the production, adaptability and distribution of two tasty and dominant Karoo bushes is being investigated. This involves above- and underground development and production – an aspect that could have great application in the sustainable utilisation of the Karoo vegetation ecosystem.

In the discipline of Animal Nutrition, acceptable egg shell quality in layers was obtained, irrespective of the limestone

The UFS, in conjunction with the University of Stellenbosch (US) and the Ins Production, hosted Dr Arthur Gilmour, well-known biometrician from New South Australia. Dr Gilmour presented a two-day workshop at the UFS on the application of Restricted Maximum Likelihood (ASREML) to common animal breeding problems. The software programme suitable for the estimation of genetic and environmental variances in animal breeding, amongst other things, and is the preferred software for animal breeding experimentation. The workshop was attended by postgraduate researchers in animal breeding from different universities. At the workshop, Dr Gilmour, Ms Puleng Matebesi, M.Sc. student at the UFS, Profs Japie van Wyk and Dr. H.O. de Waal of Animal Breeding at the department and one of the organisers of the workshop, Dr. Schalkwyk, Dean: Faculty of Natural and Agricultural Sciences at the UFS, and Dr. Schalkwyk, Lecturer at the department's Animal Breeding Division.

Prof. H.O. de Waal (left) and Dr Luis Schwalbach (second from the right) with farmers involved in the Northern Cape IDC Nguni Development Project.

Prof. Johan Greyling, Departmental Chairperson, (second from the right) was the main Voermol Cattle and Sheep Farmer of the year competition.

(CA⁺⁺) source, particle size and/or distribution ratios. Adequate Ca is the most determining factor affecting shell quality. Large limestone particles are however important to ensure increased tibia bone breaking strength in high-producing hens. The cactus pear (*Opuntia*) was evaluated as feed supplementation during period of feed shortages. In a study on sheep it was found that the ADG and changes in live body weight decreased slightly over time (63 days) as the inclusion increased – possibly restricting its potential use.

The effect of different inclusion levels of mono-, poly-unsaturated and saturated fatty acids in the feed on the production (growth) and carcass quality of broilers was investigated. Preliminary results show the diet composition to have an effect on the carcass quality and consumer acceptability.

Other pioneer research is being done in the field of in vitro embryo production in cattle, multi-ovulation and embryo transfer in goats and interspecies cloning in game. These are all techniques aimed at accelerating genetic progress and the possible preservation of endangered species.

Regarding animal breeding, one of the projects addressed was the genetic and phenotypic characterisation of indigenous chickens in Ethiopia, with the growth and

egg production performance of native and exotic chickens also being investigated. In livestock and specifically the dairy industry, the genotype by environmental interaction for milk production in the South African Jersey population was also determined. Animal breeding is on the brink of a new era where information from traditional breeding value estimation will be combined with molecular genetic information of an animal in order to provide the animal with a more accurate breeding value.

Community service and involvement form a particular pillar of strength in the department. Projects in the Thaba Nchu and Kaalspruit areas were again maintained. The team of Prof. Greyling, Dr Schwalbach, Ms Lehloenyia and Mr De Witt facilitated small-scale egg production in the rural areas, together with broiler production at black schools for the handicapped. These actions would not have been possible without the financial support of Alexander Forbes (Johannesburg).

Other agricultural community service activities included the training of upcoming small-scale livestock farmers in basic husbandry skills in Bothaville by Prof. De Waal and Dr Schwalbach, and cattle and sheep AI courses were conducted in conjunction with the Glen Agricultural Development Institute by Prof. Greyling, Dr Schwalbach and Ms Lehloenyia.

Staff

Professors: Profs Johan Greyling, Frikkie Naser, Nico Smit, Hennie Snyman, Hentie van der Merwe, Japie van Wyk

Professors Extraordinary: Profs Amie Aucamp, Schalk Cloete, James Hayes, Nadia Loskutoff, Machiel Scholtz

Associate Professors: Prof. H.O. de Waal

Senior Lecturers: Dr Luis Schwalbach, Mr Wikus Vorster (contract)

Lecturers: Messrs Foch de Witt, Mike Fair, Paul Malan, Ms Khoboso Lehloenyia

Junior Lecturer: Mr Ockert Einkamerer

Professional Officer: Mr Gideon Janse van Rensburg

Technician: Mr Willie Combrinck

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Animal, Wildlife and Grassland Sciences





Prof. Johan Greyling

Overview

As the largest animal production department and the most specialised group at a South African tertiary institution, the Department of Animal, Wildlife and Grassland Sciences made a significant impact on the livestock industry during the year.

Various aspects ranging from alternative feed supplementation, the manipulation of reproductive techniques (in vivo and in vitro)

Statistical data of the faculty



Student figures

Faculty of Natural and Agricultural Sciences, 2005/06

Male

2005

Description	African	Coloured	Indian	White	Total
Undergraduate	676	31	26	724	1457
Postgraduate	351	22	15	400	788
Occasional	84	3	4	17	108
Total 2005	1111	56	45	1141	2353

2006

Description	African	Coloured	Indian	White	Total
Undergraduate	729	28	21	768	1546
Postgraduate	385	21	16	431	853
Occasional	68	2	2	23	95
Total 2006	1182	51	39	1222	2494

Female

2005

Description	African	Coloured	Indian	White	Total
Undergraduate	563	41	11	394	1009
Postgraduate	206	16	11	221	454
Occasional	101	5	2	11	119
Total 2005	870	62	24	626	1582

2006

Description	African	Coloured	Indian	White	Total
Undergraduate	641	39	17	401	1098
Postgraduate	243	15	17	234	509
Occasional	103	2	2	16	123
Total 2006	987	56	36	651	1730

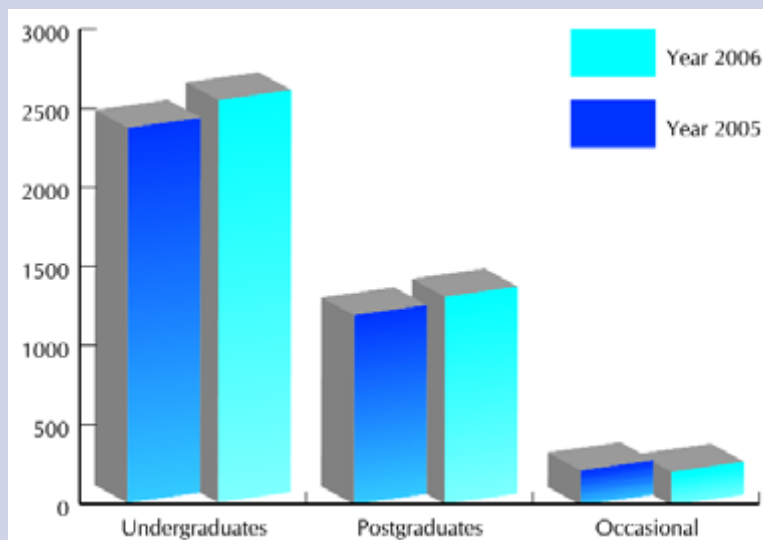
Total

2005

Description	African	Coloured	Indian	White	Total
Undergraduate	1239	72	37	1118	2466
Postgraduate	557	38	26	621	1242
Occasional	185	8	6	28	227
Total 2005	1981	118	69	1767	3935

2006

Description	African	Coloured	Indian	White	Total
Undergraduate	1370	67	38	1169	2644
Postgraduate	628	36	33	665	1362
Occasional	171	4	4	39	218
Total 2006	2169	107	75	1873	4224



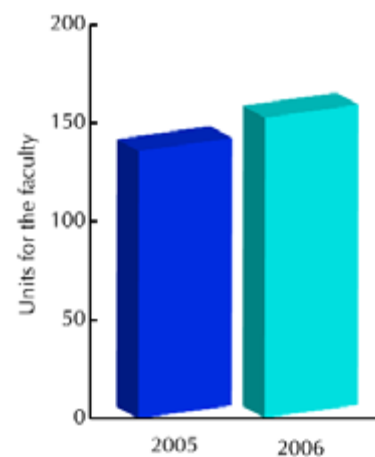
Student figures

Student nationality

Nationality	2005	2006
Angola	1	
Asian countries	21	18
Botswana	20	20
European countries	6	6
Lesotho	142	142
Malawi	2	1
Mauritius		2
Mozambique	8	7
Namibia	40	42
No information	1	
North America	4	4
Other Africa	45	48
South Africa	3610	3893
South America		1
Swaziland	13	13
Zambia	4	6
Zimbabwe	18	21
Total	3935	4224

Research outputs

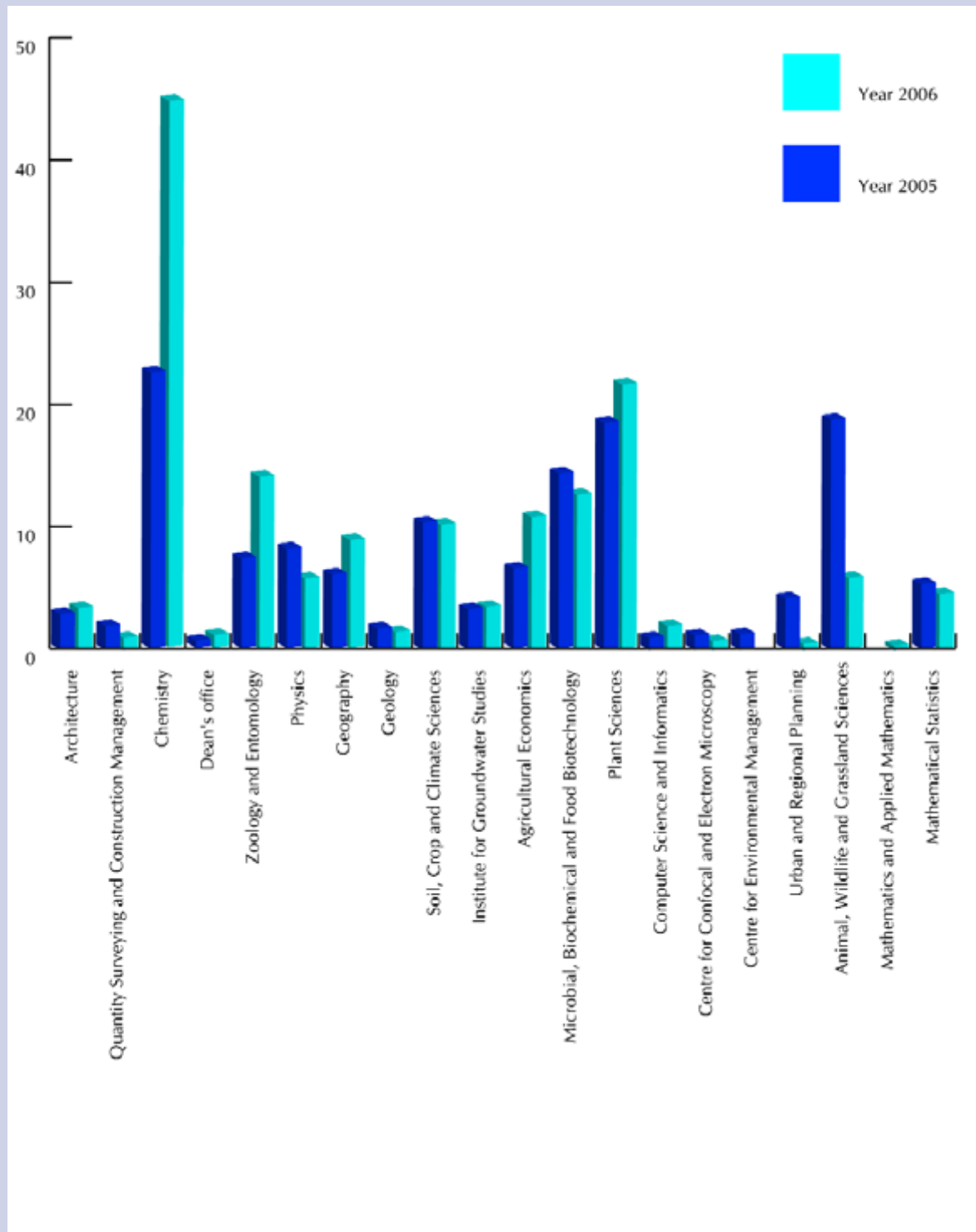
for the Faculty of Natural and Agricultural Sciences



Articles published in accredited approved research journals.

Departmental research outputs

Articles published in accredited approved research journals, 2005/06



Glossary



Glossary

A

ACIAR	Australian Centre for International Agricultural Research
AEASA	Agricultural Economics Association of South Africa
ALPRU	African Large Predator Research Unit
ARC	Agricultural Research Council
ARMSCOR	Armaments Corporation of South Africa
ARS	Agri Risk Specialists
ASAQS	Association of South African Quantity Surveyors
ASSA	Anatomical Society of South Africa
ASTER	Advanced Spaceborne Thermal Emission and Reflection Radiometer
AVS	American Vacuum Society

C

CANSA	Cancer Association of South Africa
CATSA	Catalysis Society of South Africa
CBD	Convention of Biological Diversity
CCEM	Centre for Confocal and Electron Microscopy
CePHMa	Centre for Plant Health Management
CfPB	Centre for People and Buildings
CIAT	International Centre for Tropical Agriculture
CIDB	Construction Industry Development Board
CIMMYT	International Maize and Wheat Improvement Centre
CIOB	Chartered Institute of Building
CIOB-SA	Chartered Institute of Building - South Africa
CSACEE	Central South African Council on Economic Education
CSIC-INTA	Centro de Astrobiología
CSIR	Council for Scientific and Industrial Research
CSIRO	Commonwealth Scientific and Industrial Research Organisation

D

DEAT	Department of Environmental Affairs and Tourism
DiMTEC	Disaster Management Training and Education Centre for Africa
DMISA	Disaster Management Institute of South Africa
DST	Department of Science and Technology

E

EAAP	European Association for Animal Production
EASA	Education Association of South Africa
ECA	European Crystallographic Association
EIGG	Environmental Inorganic Geochemistry Group
EPWP	Expanded Public Works Programme
ESBES	European Symposium on Biochemical Engineering Science
ESREL	European Safety and Reliability
ESRP	Economic and Social Rehabilitation Programme

F

FAO	Food and Agriculture Organisation
FEMS	Federation of European Microbiological Societies
FMP	Facilities Management Programme
FOTIM	Foundation of Tertiary Institutions of the Northern Metropolis

FSRPO

Free State Red Meat Producers Organisation

G

GIS	Geographical Information Systems
Glen ADI	Glen Agricultural Development Institute
GM	Genetically Modified
GMBA	Gauteng Master Builders' Association
GMO	Genetically Modified Organisms
GWK	Griekwaland-Wes Koöperasie

H

HIV	Human Immunodeficiency Virus
HPCSA	Health Professions Council of South Africa
HPLC	High Performance Liquid Chromatography
HSPCM	Health and Safety Programme for Construction Managers

I

IAGOD	International Association on the Genesis of Ore Deposits
IAH	International Association of Hydrogeologists
ICCC	International Conference on Coordination Chemistry
ICEC	International Cost Engineering Council
ICID	International Commission on Irrigation and Drainage
ICP	Inductively Coupled Plasma
ICRBM	International Conference on Rodent Biology and Management
ICRISAT	International Crops Research Institute for the Semi-Arid Tropics
IDC	Industrial Development Corporation
IGS	Institute for Groundwater Studies
IITA	International Institute of Tropical Agriculture
INCRoP	Insects on New Crops Programme
INTSORMIL	International Sorghum and Millet Research Support Programme

IPMA

International Project Management Association

IPMP

Intensive Project Management Programme

IRDP

Institutional Research and Development Programme

IRWH

In-field Rainwater Harvesting

IUCr

International Union of Crystallography

IUMS

International Union of Microbial Societies

IUPAP

International Union of Pure and Applied Physics

J

JFM	Journal of Facilities Management
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L

LEn	Life in Extreme Environments
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M

MIRCHEN	Microbiological Resources Centre
MIT	Massachusetts Institute of Technology
MRM	Mineral Resource Management
MSA	Master's Degree in Sustainable Agriculture
MSSA	Microscopy Society of Southern Africa
MUCPP	Mangaung University Community Partnership Programme
MURP	Master's Degree in Urban and Regional Planning

N

NaCOF	National Climate Outlook Forum
NAFU	National African Farmers Union
NAMC	National Agricultural Marketing Council
NASA	National Aeronautics and Space Administration
NASSP	National Astrophysics and Space Science Programme
NCEE	National Council for Economic Education
NDA	National Department of Agriculture
NECSA	National Energy Commission of South Africa
NELSAM	Natural Earthquake Laboratory in South African Mines
NERPO	National Emergent Red Meat Producers' Organisation
NGO	Non-Governmental Organisation
NML	National Metrological Laboratory
NMMU	Nelson Mandela Metropolitan University
NMR	Nuclear Magnetic Resonance
NRF	National Research Foundation
NUFU	Norwegian Council of Universities Committee for Development, Research and Education
NWGA	National Wool Growers' Association

O

OABS	Optimal Agricultural Business Solutions
OECD	Organisation for Economic Co-operation and Development

P

PARSA	Parasitological Association of Southern Africa
PDMIW	Processing and Disposal of Mineral Industry Wastes
POT	Peaks over Threshold
PPP	Public Private Partnership
PRT	Protein Research Trust

R

RICS	Royal Institute of Chartered Surveyors
RIEP	Research Institute of Education Planning
RNA	Research Niche Area
RPO	Red Meat Producers' Organisation

S

SA	South Africa
SAACE	South African Association of Consulting Engineers
SAB	The South African Breweries Limited
SACI	South African Chemical Institute
SACPCMP	South African Council for the Project and Construction Management Profession
SACPVP	South African Council for the Property Valuation Profession
SACQSP	South African Council for the Quantity Surveying Profession
SADC	Southern African Development Community
SAFMA	South African Facilities Management Association
SAFOI	South African Fryer Oil Initiative
SAIP	South African Institute of Physics
SAISC	Southern African Institute of Steel Construction
SAMSI	Statistical and Applied Mathematical Sciences Institute

SANCIAHS	South African National Committee for the International Association of Hydrological Sciences	SEDA	Small Enterprise Development Agency	UNEP	United Nations Environment Programme
SANCU	South African National Consumer Union	SMME	Small, Medium and Micro Enterprises	UNESCO	United Nations Educational, Scientific and Cultural Organisation
SANPAD	South Africa-Netherlands Research Programme on Alternatives in Development	SRC	Student Representative Council	USA	United States of America
SAPOA	South African Property Owners' Association	SRL	Sustainable Rural Livelihood	USAID	United States Agency for International Development
SAPS	South African Police Services	SSAG	Society of South African Geographers	UTCHEM	University of Texas Chemical Compositional Simulator
SAQA	South African Qualifications Authority	T		UWC	University of the Western Cape
SASAS	South African Society for Animal Science	THRIP	South African National Research Foundation Thrust for Industry-Related Projects	W	
SASQUA	Southern African Society for Quaternary Research	TUE	Technical University Eindhoven	WARFSA	Water Research Fund of Southern Africa
SAVAH	South African Association of Visual Arts Historians	U		WATOC	World Association of Theoretically Orientated Chemists
SBE	Sustainable Built Environments	UCT	University of Cape Town	WFP	World Food Programme
		UFS	University of the Free State	WITS	University of the Witwatersrand
		UJ	University of Johannesburg	WRC	Water Research Commission
		UK	United Kingdom	WUA	Water Users' Association
		UN	United Nations		