Contents

Foreword from Dean ................................................................. 1
Student Statistics ................................................................. 5
Agricultural Economics ......................................................... 7
Agronomy ................................................................................. 11
Animal Sciences ................................................................. 15
Conservation Ecology & Entomology ................................... 19
Food Science ........................................................................... 23
Forest and Wood Science ................................................... 27
Genetics .................................................................................. 31
Horticultural Science ......................................................... 37
Plant Pathology .................................................................... 41
Soil Science ............................................................................ 45
Viticulture and Oenology .................................................... 49
Editorial team ....................................................................... 53
The Faculty of AgriSciences is a key stakeholder in addressing the growing challenges of South African agriculture and forestry, and ensuring that the country’s natural resources are utilised and managed both ethically and scientifically. AgriSciences is still acknowledged as the top faculty for studies in agriculture and forestry on the African continent. The Faculty also ranked 23rd among the BRICS countries and within the top 51-100 globally on the 2018 QS world rankings. This acknowledgement strengthens the Faculty’s resolve to continue to offer quality education and applied research in agricultural sciences.

In terms of teaching excellence, the Faculty continued its focus on programme renewal with an in-depth review of the programme offering and academic module content in the fields of, among others, crop production, conservation ecology, animal sciences as well as viticulture and oenology. This occurred in close collaboration with external stakeholder groups, including the South African agricultural sector as well as international collaborators and moderators. The programme renewal process is supported by the ongoing development of pedagogy and didactics led by the Faculty’s blended learning coordinator, Dr Kathryn Wirth. Marianne McKay, from the Department of Viticulture and Oenology, a recipient of a SU Distinguished Teacher Award received a scholarship from the University’s Centre for Learning and Teaching as an acknowledgement of her contributions to excellence in this field. The Department of Food Science obtained the highest ranking of an African university in their field with an overall Shanghai Ranking of 76-100, paying testament to the excellence of the Faculty’s teaching over a wide range of disciplines.

The Faculty is home to a large postgraduate student cohort with 295 master’s and 208 PhD candidates registered in 2017, of which 103 master’s and 38 PhD students graduated during the 2017 academic year.

A number of researchers and students garnered accolades in the year in review. These include Prof Karen Esler appointed as Regional editor for Africa for Journal of Conservation Biology; Johané Nienkem-per-Swanepoel received the Helga and Wolfgang Gaul Stiftung Award from the the International Federation of Classification Societies for outstanding research; Martina Treurnicht, PhD student in Conservation Ecology was awarded the Harper Prize for the best paper in the prestigious Journal of Ecology by an early career author; Heinrich Jantjies and Johann Boonzaier, PhD students in the Department of Agricultural Economics, were winners of the International Student Case Study Competition presented by the International Food and Agribusiness Management Association, whilst Stephanie du Toit, Emma Phillips and Philippa Grylls, undergraduate students form the Department of Food Science, received gold, silver and bronze awards from South African Association for Food Science and Technology for their submissions on packaging materials and related technologies.

A particular milestone was the launch of Plant Breeding Laboratory at Welgevallen Experimental farm, under the leadership of Willie Botes that stems for the helustrious engagement of the Department Genetics with the development of locally adopted wheat cultivars and related research.

A number of international conferences were also hosted by the Faculty, which include that of International Society for Horticultural Science, the International Conference on Managing Quality in Chains, the Precision Forestry Symposium hosted by Dept. Forest and Wood Science and the Regional Network of Agricultural Policy Research Institutes.
Fully aware that its staff are its biggest asset, the Faculty continues to develop systems aimed at enhancing the working environment and conditions of staff within tight budgetary confines. A representative forum for Professional and Support Staff was also established.

BROADENING ACCESS

Providing the broadest possible access to a diverse pool of students and staff remains a priority. In 2017, the Faculty further boosted academic staff diversity with two appointments with support from the Next Generation of Academics Programme of the NRF. This now offers these appointees the opportunity to pursue an academic career and improve their employability at Stellenbosch University and other tertiary institutions.

AgriSciences achieved the increased enrolment targets of the University and the Department of Higher Education and Training for 2017 together with the successful implementation of higher admission requirements and the change in the Language Policy of the University. The enrolment plan is focusing on expanding diversity and improving the academic profile of students. Combined with continued academic student support in the form of monitoring and tutor programmes, this is aimed at increasing student success and throughput rates into postgraduate studies. The AgriSciences@Maties programme and marketing initiatives of the University’s Centre for Student Recruitment is also making a significant contribution to introduce high school learners to careers and study opportunities in Agriculture. The merit bursary programme aimed at attracting the top learners from the three agriculture schools in the Western Cape Province saw the registration of the first three learners. With the assistance of various agricultural industries, financial support to students could also be further expanded with 48 bursaries awarded to undergraduate students, including students in financial need. Post graduate student numbers has also increased, in particular that of female students (52% of total) and students from other African countries (8% of total).

ENHANCING OUR SOCIAL IMPACT

Committed to finding solutions to the development challenges of the country and of Africa, the Faculty is actively engaging in industry, government and community interaction initiatives. A Social Impact Committee has been constituted that links the research activities and related outcomes to the direct needs of communities, including small holder farmers. The Faculty maintains strong ties with key industry stakeholders. The Agro-Hub at the Welgevallen experimental farm now hosts leading industry partners (Hortgro Science, Citrus Research International, AgriSA and Agricollages International) that strengthens relations between SU and industry, enhance the Faculty’s applied research focus, and develop additional outputs that are of value to agricultural sector industries.

Beyond South African borders, the Faculty strengthened its impact by extending its collaborative network to more universities and research institutes in various African countries and the East, where its academic interests continue to grow. The Regional Universities Forum for Capacity Building in Agriculture (RUFORUM) remains a key African partnership with regard to student and staff mobility, capacity building and research and training initiatives. RUFORUM is a consortium of 85 African universities operating within 35 countries spanning the African continent.

In addition, a number of staff members serve on the management structures of international academic associations, where they further extend the Faculty’s reach. Prof Linus Opara was elected president of the International Commission for Agricultural and Biosystems Engineering. Prof Nick Vink serves as a non-executive director on the Board of Governors of the South African Reserve Bank. Dr Lynn Hoffman was elected as vice-president of Ornamentals South Africa, Prof Pieter Gouws of Food Science was named the South African representative on the International Committee on Food Microbiology and Hygiene. While, Prof Gunnar Sigge, also from Food Science, was included in the scientific advisory panel of the International Institute for Food Technology.

LOOKING FORWARD

The prevailing drought in the Western Cape and surrounding regions and the related impacts on agriculture will receive significant attention from researchers over short and medium term in an effort to mitigate impact and to develop future resilience. The masters program on sustainable agriculture will, in response, be expand to include resource management and extended to the doctoral level. AgriSciences is also adopting a broader strategy of engagement with capacity building and research in support of agriculture development in Africa. Student mobility and staff development, in particular support to young academics, will receive a high priority. In the years ahead, AgriSciences will also seek to increase its number of postdoctoral fellows, which stood at 47 in the reporting year, together the number of research associates sponsored by industry.

ForeWord from the Dean

Photo from left to right: Prof Eugene Cloete (Vice Rector: Research, Innovation and Post Graduate Studies), Min Naledi Pandor (Min of Science and Technology) and Mr Willem Botes (Head of the Plant Breeding Lab) at the inauguration of the National Plant Breeding Laboratory at Stellenbosch University.
### Medal winners
- Hans Ritter (Farmers Weekly)
- Emma Frickel (Hofmeyer-Van Schaik)
- Karel-Hein Pool (Farmers Weekly/Eckard Kassier)
- Olivia Malie McGregor (Prof PA van der Bijl)

### Doctorate students
- Annelin Molotsi
- Bilungi Useni
- Zinash Belay
- Ebrahiema Arendse
- Kari du Plessis
- prof Danie Brink (Dean)
- Carin Basset
- Lobile Steyn
- Brink van Zyl
- Craig Galloway
- Nkululeko Nyangwe

### PhD Students
- Tersia Needham
- Samantha Fairbairn
- Carla Weightman
- Stuart Hall
- Gonzalo Banuelos
- Alanna Rebelo
- Welma Pieterse
- Grace Kangueehi
- Elma Carstens
- Martina Treurnicht
- Gerhardus van Coller
- Prof Pieter Gouws (Vice-dean: Teaching and Learning)
- Manam Saeed
- Natalie Theron-De Bruin
- Irene Orina
- Hannel Ham
- Karen Munhuwesi
- Joyful Rugari

### Degrees Awarded 2017*

#### Degree Total
- **BAgric**: 68
- **BAgricAdmin**: 5
- **BSc Conservation Ecology**: 21
- **BSc in Forestry and Wood Sciences**: 13
- **BSc in Food Science**: 60
- **BScAgric**: 100
- **HonsBAgricAdmin**: 2
- **HonsBSc**: 16

#### Programme Total
- **MSc**: 23
- **MSc Conservation Ecology**: 11
- **MSc in Forestry and Wood Sciences**: 12
- **MSc in Food Science**: 9
- **MScAgric**: 46
- **MAgric Admin**: 2
- **PhD**: 38
- **Post Graduate Diploma**: 9

**TOTAL**: 435

*2017 statistics based on the degrees awarded at the December 2017 and March 2018 graduation ceremony*
Agricultural Economics postgraduate students and personnel 2017

AGRICULTURAL ECONOMICS

FOCUS AREAS
• Agricultural Policy
• Resource Economics
• Farm Management
• Production Economics
• Structural Change In Agriculture

OVERVIEW

Over the past few years the Department has achieved a great deal of success by attracting an increasing number of undergraduate and postgraduate students, which means that a lot of time and attention have been spent on teaching. However, our research efforts have not been neglected, and even less so our social impact initiatives. In 2017, staff of the Department were responsible for a total of 22 publications in accredited journals, while 29 undergraduate students graduated, 11 students received Honours degrees and seven students were awarded Masters degrees.

The Department remains embedded in the agricultural sector of the Western Cape and South Africa, but increasingly also in the rest of the African continent. In 2017 our commitment to the Bureau for Food and Agricultural Policy (BFAP) was strengthened through our collaboration with our partners at the University of Pretoria and in the Western Cape Department of Agriculture.

Highlights of the years included the appointment of Mr Hein Gerwel to the Department as a lecturer in rural development and development economics. Furthermore, Prof Johann Kirsten joined the Department as a guest lecturer after he was appointed as director of the Bureau for Economic Research. We are also excited about the appointment of Prof Phil Pardey from the University of Minnesota as a professor extraordinary within the department. Ms Kandas Cloete and Mr Siphe Zantsi joined us as full-time PhD students as part of the ILUPSA project (see next page). They spent three months in Switzerland this year with our project partners at the Tänikon agricultural research station.

RESEARCH

ILUPSA (Photo 1)
Funding was secured for a land reform research project through the Swiss South African Joint Research Programme (SSAJRP).

Most stakeholders agree that the land reform programme has failed to achieve its objectives of redress, poverty alleviation, economic growth and the establishment of vibrant, equitable and inclusive rural communities. However, agreement is lacking on how to proceed with the programme to achieve its goals.

The objective of the Impacts of Land Use Patterns in South Africa (ILUPSA) project is to apply novel, agent-based modelling techniques to test the impact of various land reform policy scenarios on land-use patterns, agricultural output and employment within the South African agricultural sector.

A total of R2.2 million was secured for the four-year project from the South African National Research Foundation (NRF).

Centre for Agribusiness (Photo 2)
The Centre for Agribusiness, which is focused on competitiveness and value chain analysis, currently boasts four PhD and six M students. This year the Centre led a United Nations Industrial Development Organization (UNIDO) project investigating the value chain linkages of small- and medium-scale farmers in the Transkei region, with the output report, “Competitiveness of the SA agricultural industry”, supported by the Western Cape Department of Agriculture and Standard Bank Agribusiness.

The Centre provided regular inputs on competitiveness to BFAP and played a prominent role in activities of the International Food and Agribusiness Management Association (IFAMA) and IFAMA Africa. Prof Johan van Rooyen, as director of the Centre, is the current president of IFAMA and was recently elected as the chair of the National Agricultural Research Forum (NARF).

Karoo Lamb (Photo 3)
Prof Johann Kirsten has studied and advocated for the certification of Karoo lamb for a number years, and a number
of PhD students (at the University of Pretoria) were inspired to take on various critical theoretical questions regarding the challenge in the fields of institutional and behavioural economics. Amongst others, this has resulted in the publication of “Information sharing as a safeguard against the opportunistic behaviour of South African Karoo lamb farmers” in the prestigious academic journal Agricultural Economics. For this paper, Johann and his co-authors applied a new institutional economics (NIE) framework to the Karoo lamb case to evaluate how to deal with opportunistic behaviour in niche markets such as geographical indication (GI).

Publications


Prof Kirsten presented his inaugural lecture at SU, providing an overview of his academic engagement with the land reform debate in South Africa since 1992.

Wine per glass (Photo 4)

Professors Bruwer and Vink are currently conducting a first-of-its-kind study focused on the potential for single-serve wine by the glass (WBG) in South African restaurants. Wine is a R36 billion industry in South Africa, with the on-premise trade accounting for 27% of volume and 44% of value sales.

Many restauranteurs do not actively promote WBG sales, or regard it as a necessary evil required to please some demanding customers. In the process, they overlook what has been referred to as the “billion-dollar opportunity in single-serve food”. Why restaurants are hesitant to fully pursue this strategy is understandable, given the association of a high level of risk and limited information at hand.

The first part of the study conceptualised the consumption of wine by the glass in South African restaurants from a risk-perception viewpoint through a wine-by-the-glass scale that measures the risk dimensions associated with the consumption of wine by the glass.

The study is funded by the South African National Research Foundation (NRF).

Social Impact

ReNAPRI (Photo 5)

The Regional Network of Agricultural Policy Research Institutes (ReNAPRI - renapri.org) is a network of nine national agricultural policy research institutes in the Eastern and Southern African regions. ReNAPRI provides research and policy recommendations on agricultural and food security issues to national governments, regional economic communities, and pan-African organisations.

As a part of its outreach objectives, ReNAPRI hosts an annual conference, inviting academia, research think-tanks, NGO/development partners, government and the private sector to in-depth dialogues on trends in the agriculture sector. The 4th Annual ReNAPRI Stakeholders Conference, with the theme “Unfolding Agricultural Transformation in Africa: Strategies for Sustainable Development”, was held in Cape Town and was organised by BFAP as the South African member of ReNAPRI. The cross-continental event was attended by delegates from twelve countries and various high-level MPs from several African countries discussing, amongst others, the roles and challenges of parliamentarians in supporting the agriculture sector. SA MPs in attendance were the President of the UDM and the Shadow Minister of Agriculture and of Trade and Industry.

Representing SU on the programme were Prof Hester Klopper, Deputy Vice-Chancellor of Strategy and Internationalisation, and Ms Lulama Ndigbongo-Traub, lecturer in the Department of Agricultural Economics and Chair of ReNAPRI’s Technical Committee. Several SU faculty members and students were in attendance, including the Dean of the Faculty of AgriSciences, Prof Danie Brink, and the Chair of the Department of Agricultural Economics, Prof Nick Vink.

Stellenbosch University (SU) co-sponsored the conference under SU’s International African Collaboration Grant (ACG). The ACG rewards projects that promote academic and collaborative partnerships with other African institutions.
AGRONOMY

FOCUS AREAS
• Cool Weather- and Pasture Crops
• Vegetable Production Systems
• Weed Management

OVERVIEW

The research in the department focusses on soil-less as well as open field production systems of vegetables, herbs and flowers (Dr Marcellous le Roux); sustainable production systems for winter cereal, oilseed and planted pasture crops (Prof Nick Kotze and Dr Pieter Swanepoel); and the management of weeds in agronomic crops (Dr PJ Pieterse). Dr Marcellous le Roux was appointed in 2017 as full-time lecturer in vegetables, herbs and flowers and Ms Farida Martin was appointed as technician in the same section. The department also welcomed a post-doctoral fellow, Dr Ethel Phiri. Dr Phiri brings lots of experience in molecular techniques and is also closely involved with the so-called orphan crops, that play an important role in food production, but are not mainstream crops that receive much attention in terms of research. The contract of the Agricol Chair in Agronomy has expired but the Chair will be funded by AB InBev for the next three years as from January 2017. Prof Nick Kotze still occupies the Chair. Drs Pieter Swanepoel and PJ Pieterse travelled abroad to attend congresses and visit research partners. Pieter le Roux, Rens Smit and PJ Neethling, three MSc students, attended the World Conservation Agriculture Congress in Rosario, Argentina. Dr Pieter Swanepoel received the NRF Y category evaluation for a recognized, promising young researcher. AGT Foods Africa again sponsored shirts for Agronomy students and Yara sponsored fertilizers for use in greenhouses. Student bursaries were sponsored by companies such as Villa Crop Protection, Monsanto and Yara.

RESEARCH

Kikuyu-ryegrass pastures for dairy production in the southern Cape of South Africa often receive nitrogen (N) fertilization rates in excess of 500 kg ha-1 yr-1. To reduce the high N fertilization inputs of the region, legumes have been incorporated into these grass pasture systems. Research concerning N fertilization guidelines of grass-legume pastures in the southern Cape is limited. Bernhard Jordaan, MSc student, (Photo 1) investigated the effect of N fertilization regimes on soil and pasture parameters of kikuyu-ryegrass perennial and legume pastures. Total soil N, potentially mineralizable N, and urease enzyme activity was minimally affected by N fertilization. For all pasture types, total inorganic soil N built up in soil through time under high fertilization regimes. The clover component in the pastures was negatively correlated with N fertilization in most seasons. The lucerne component responded to N fertilization in summer. His study showed that farmers over-fertilize pastures, which can have detrimental effects on the environment, and also decrease profitability. A new strategic N fertilization programme for dairy farmers in the southern Cape is suggested, by which farmers can save up to 50% of fertilizer costs, without compromising yield. These findings are currently being investigated further, and can have a significant effect on efficiency of dairy farming systems (Photo 2).

Potato production in South Africa occurs in 16 production areas in all nine provinces of South Africa. When producers export or sell seed or ware potatoes it is important for the buyer to know in advance the quality of the product. If the keeping quality can be predicted compensation can be arranged more accurately, since good keeping quality potatoes should have higher value. An MSc study was undertaken by Rian Gericke in the Sandveld and Ceres production areas (Photo 3). Dry and warm weather in summer in these areas presents challenges to produce high-volume quality potatoes.

The main objective for this study was to develop a measuring tool that can be used to routinely predict the keeping quality of potato tubers. To predict the keeping quality various quality characteristics were identified and used. The role of calcium (Ca) in quality of fruit and vegetables, especially potatoes have been studied extensively in literature, thus it was expected to...
correlate positively with keeping quality. Findings from this study strongly refute this notion. Although Ca correlated positively with weight loss, it seemed as if magnesium (Mg) correlated negatively with weight loss. Thus, potatoes with higher Mg levels had lower weight loss and better keeping quality. Decreasing the Ca/Mg ratio in tubers might improve storability. Future research on potato quality should rather try to find the balance between nutrients for specific cultivars.

Weed control by small scale farmers usually comprise of physical removal of the weeds. Due to the fact that conservation agriculture is also recommended for small scale farmers, soil disturbance is discouraged. Small scale farmers must therefore use chemical weed control methods that are in the first place, not affordable and secondly, chemicals are difficult to obtain in rural areas.

PhD student Joyful Rugare addressed this problem by planting tropical pasture cover crops as rotational crops in maize production systems (Photo 4). He found that the cover crops decreased weed numbers in maize crops slightly in the short term. However, two particular cover crops have shown the ability to suppress two dominant weed species, probably due to allelopathic effects, without any negative effects on the maize crop. Soil incorporation of cover crop material inhibited germination and growth of weeds without any effect on maize germination and growth. Extracts of leaves from the cover crops was applied to the weeds as biological herbicides with excellent results, again with no negative effects on maize plants. It is expected that the use of rotational cover crops in maize production systems will result in effective weed management in the long run. The maize is not negatively influenced by the cover crops and the soil benefits from the effects of the cover crops, which are usually legumes that can fix nitrogen. These findings are of great importance to small scale farmers.

**SOCIAL IMPACT**

Research carried out in the department impacts on communities in various ways. Research results are conveyed to the public by means of popular articles, radio contributions, presentations on farmer’s days etc. Research results on nitrogen fertilization of wheat, pasture crops and canola are conveyed to the industry on continuous basis and help to make farming economically and ecologically more sustainable. Research on calcium and magnesium fertilization that influence the keeping quality of potatoes also may have great impact on production systems. Studies to maximize efficacy of herbicides under conservation agriculture conditions aim to increase profitability and decrease environmental pollution. The same objectives are achieved by optimizing nutrient mixtures for hydroponically grown crops as well as research on recirculation of nutrient mixtures in greenhouses. The benefits of conservation agriculture and modern crop planters are continuously investigated and made public. The “Walk and Talk” meetings of the Western Cape department of Agriculture provide opportunities for staff and postgraduate students to share their results with the public (Photo 5). Small scale farming research is not neglected. The ideal crop for intercropping with orange-fleshed sweet potatoes and groundnuts, has been identified in Mozambique as well as the optimal irrigation and harvesting frequencies for amaranths, an indigenous vegetable crop. The best combination of chemical and organic fertilizers for orange-fleshed sweet potato has been determined. Environmentally friendly weed management systems by means of rotational cover crops in small scale maize farming systems has been developed and are currently recommended to farmers. All the above-mentioned recommendations can lead to more profitable and sustainable farming systems for small scale farmers.
ANIMAL SCIENCES

• FOCUS AREAS
  • Animal Breeding
  • Animal Nutrition
  • Animal Physiology
  • Aquaculture
  • Processing & Product Development

OVERVIEW

The Department centers on the three pillars of Animal Breeding, Animal Nutrition and Animal Physiology. The holistic training of future Animal scientists is achieved by an integrated approach. Research focuses on profitability, efficiency and sustainability of animal production industries. Postgraduate projects encompass studies on various livestock species traditionally used in farming such as dairy and beef cattle, sheep, chickens, pigs as well as wildlife species and marine and freshwater aquaculture species. To ensure that our research stays current, scientific findings are converted into industry friendly formats and propagated on scientific and producer platforms.

The first World Aquaculture Society’s (WAS) annual conference and exhibition was held on African soil in Cape Town. The Stellenbosch delegation totaled 26, with 18 postgraduate students and eight staff members (Photo 1) attending. The 50th annual SASAS (South African Society for Animal Science) Congress was attended by seven researchers and 15 students from Stellenbosch. Prof Kennedy Dzama (Photo 2) received a silver medal from the Society for his contribution to the discipline of animal breeding. Daniel van der Merwe, a doctoral student, received the AFMA prize for the best animal nutrition poster for the second time. Master student, Alretha van Heerden, received first price for the best student oral titled “Influence of production system on the carcass yield of blue wildebeest”. Retha Engels received a postgraduate bursary as the best undergraduate student in Animal science from the previous academic year.

Other research meetings attended include the 4th Food Integrity Conference (Parma, Italy), the 68th Annual Meeting of the European Federation of Animal Science (Tallin, Estonia) and the South African Wildlife Management Association (SAWMA) symposium (Goudini Spa).

RESEARCH

Aquaculture

The research team completed a third Water Research Commission project entitled ‘Knowledge exchange on water resource management for improved integrated aquaculture farming systems’. The first joint PhD in Aquaculture between Ghent and Stellenbosch Universities is concluding with Richard Bwala graduating in December 2018. Other masters and doctorate students are doing research on relevant topics including alternative protein sources for aquafeeds, optimizing fish larval feeding and nutrient extraction from fish waster and oval. There is also collaboration with Ghent (Belgium) and Canto (Vietnam) Universities on a Joint English Masters.

The first training on how to incorporate Aquaculture in the curriculum of the Agricultural Training Institutes has been completed with Department of Agriculture, Forestry and Fisheries officials.

Insects: The future of farming

The research findings of the Department of Animal Sciences research team working on insects as feed and food, has indicated that insects hold the potential to solve a number of the problems created by population growth, waste accumulation and water contamination.

The program is divided into three sections, with the first section addressing the problem of sanitation. In areas where bucket or bag systems are used, These insects can be used on site for the biocorversion of human faecal matter. The subsequently produced insects can be used in the production of livestock species, by including larvae meal in poultry diets. The insect residues can be used as a soil enhancer for increasing the productivity of soils for crop production.

The second part of the program focusses on the utilisation of these insects to break down waste produced in the food production chain (Photo 3). This include everything from manure through kitchen and restaurant waste to factory effluent. These insects are harvested and processed for use in the animal feed industry. The resultant feed has been tested in poultry (layers and broilers), ruminants and aquaculture (abalone, catfish and different species of Tilapia). Insects can be processed to be fed to animals as full fat, defatted or fractioned.

The third part of the program focusses on the use of insects as food. In this part insects are fed formulated balanced diets similar to that which would be fed to intensively produced animals. The insects are harvested and either consumed whole or processed into foods...
Insects produced in large quantities can be used for bioconversion of waste and feed additive for animals. (Photo: E Pieterse)

Dr Maxine Jones, our expert on biltong making. (Photo: H Lambrechts)

such as viennas, pizza toppings, spreads or protein shakes. All in all, the amino acid ratio of insects far better fit the amino acid requirements of monogastric mammals (including humans) therefore decreasing the amount of nitrogen being excreted and thus reducing pollution. Using insects for bioconversion of waste does not lead to the formation of methane, and it also releases water from the waste in the form of water vapour within a few days of seeding. The process is fast with bioconversion completed in eight to 18 days.

Science of biltong making

Within the research group working under Prof Louw Hoffmann, NRF-SARChI chair in Meat Science, the focus has been on the conservation and welfare of wildlife, as well as meat quality, and shelf life of processed products. The science behind the making of biltong is better understood with the work of Dr Maxine Jones (Photo 4). The industry-based research focused on different aspects of biltong processing, such as the use of standardized procedures to dry the meat. Factors such as temperature, humidity and air movement, and the presence of different yeasts, molds and even bacteria that often occur on biltong contribute to its shelf life. The project aimed to identify the parameters that consistently give great quality and delicious biltong and to create guidelines for the biltong industry. Additives such as vinegar do not necessarily have an influence on drying time. Drying rates are dependent on the type of meat muscle used and the source of the meat.

SOCIAL IMPACT

Within the Department the various research groups are closely involved with animal industries throughout the country and transfer of research findings occur at industry information days (Photo 5) or farmers’ days.

Academic staff members serve on various University and/or scientific committees.

Prof K Dzama is a panel member of the SADC Drought Monitoring Centre (Livestock Committee) and convener of the Animal Breeding and Genetics Forum. He serves on the South African Society of Animal Science Awards and the South African Red Meat Research and Development Trust Project committees. He further serves on the Red Meat Project steering committee of the NAMC (National Agricultural Marketing Council) and is convener of the Cape Town Urban Agriculture Forum. He also serves on the University’s Employment Equity Forum.

Prof LC Hoffman serves on the University’s Research Committee. He is a lifetime member of the Southern African Wildlife Management Association, Associate editor of the Journal of the Sciences of Food and Agriculture, and serves as editor on the Editorial Board of Meat Science. He was invited to present a series of lectures at Sichuan University, Chengdu, China as part of their immersion program.

Dr H Lambrechts is a sub-editor of the South African Journal of Animal Science, is the chairperson of the Western Cape branch of the South African Society for Animal Science, serves on the HEQC (Higher Education Quality Committee) new course accreditation evaluation committee, and is the secretary of the South African Reproductive Research Group.

Dr E Pieterse serves as Vice-Chairperson of the Western Cape branch of the South African Society for Animal Science and on the Faculty of AgrSciences’ Academic Program and Timetable Committees.

Dr Khalid Salie serves on the World Aquaculture Society’s Promotion and Affiliation Committee, as well as on the EXCO of the Aquaculture Association of Southern Africa. He also serves as the Secretary for the formation of the WAS African Chapter to be launched in September 2018. He facilitated a workshop on “Aquaculture Curriculum Development” for South Africa’s Agricultural Training Institutes (ATI’s) an initiative of Department Agriculture, Forestry and Fisheries (DAFF) to include and expand aquaculture training.

Dr A Molotsi serves on the Faculty of AgriSciences Marketing Committee, and is the secretary of the Western Cape branch of the South African Society for Animal Science.

Dr LC Hoffman serves on the University’s Research Committee. He is a lifetime member of the Southern African Wildlife Management Association, Associate editor of the Journal of the Sciences of Food and Agriculture, and serves as editor on the Editorial Board of Meat Science. He was invited to present a series of lectures at Sichuan University, Chengdu, China as part of their immersion program.

Dr H Lambrechts is a sub-editor of the South African Journal of Animal Science, is the chairperson of the Western Cape branch of the South African Society for Animal Science, serves on the HEQC (Higher Education Quality Committee) new course accreditation evaluation committee, and is the secretary of the South African Reproductive Research Group.

Dr E Pieterse serves as Vice-Chairperson of the Western Cape branch of the South African Society for Animal Science and on the Faculty of AgrSciences’ Academic Program and Timetable Committees.

www.sun.ac.za/english/faculty/agri/animal-science
**CONSERVATION ECOLGY & ENTOMOLOGY**

**FOCUS AREAS**
- Conservation Planning & Management
- Restoration Ecology & Landscape Ecology
- Conservation of Symbioses
- Vertebrate Conservation
- Pest Management
- Physiological Ecology

**OVERVIEW**

Conservation Ecology and Entomology bring together teaching and research in the rapidly growing and important field of the conservation of utilised landscapes and their surrounds. Expertise ranges from integrated pest management, conservation of natural communities and the management of living resources to conservation policy formulation and technology transfer. This combination helps develop a forward-thinking, dynamic department with a distinct agricultural and forestry address. The expertise of the Department contributes to meeting the demands of the outside world for trained personnel and research findings in the area of conservation and sustainable production.

The Department has continued to shine on the academic front. In an analysis of research productivity by the Division for Research and Development, no less than six academic staff appeared in the top 40 names (N = 1,491). Prof Michael Samways (Photo 2) received a Chancellor's Award and was nominated as a “legend of South African science”. Profs Michael Samways and John Terblanche and Dr Francois Roets received research productivity awards. Prof Karen Esler was appointed as Africa Regional Editor of Conservation Biology, and Dr James Pryke was appointed Chief Editor of the Journal of Insect Conservation. Dr Nomakholwa Stokwe was appointed an affiliate of the African Academy of Sciences. Dr Alison Leslie’s Earth Watch project in Malawi was voted as one of the top 10 (out of 55) projects.

**RESEARCH**

An international research team of entomologists, nematologists and plant pathologists concluded a project to look at organic fruit production in the Western Cape.

The collaborative project, entitled “Ground cover management in organic orchards in South Africa: Trade-offs between above- and belowground ecosystem services”, aimed to understand the ecological mechanisms that underlie the simultaneous provision of above- and belowground mechanisms that will assist organic growers to make informed decisions about ground cover management practices. Organic growers must rely on multiple ecosystem services, as they cannot replace these processes with synthetic inputs. In South Africa there is very little scientific information on effective organic fruit production, and consequently there are very few certified organic fruit growers, particularly in the Western Cape.

The Mondi Ecological Networks Programme (MENP), with core researchers Michael Samways, James Pryke and René Gaigher, is supported by the Mondi Group in Europe to develop sustainable new-generation plantations in South Africa. This means timber has to be produced without adversely affecting the environment. This is done by using land offsets dedicated to conservation, which are not planted to timber trees. In and among plantation blocks, areas of indigenous grassland and forest are left to function naturally. These are conservation corridors, and when they crisscross the landscapes they are known as ecological networks.

This approach conserves biodiversity and maintains all sorts of biotic interactions and natural ecosystem processes. This has been so beneficial that MENP was awarded the NSTF/GreenMatter award for sustainability. What MENP has achieved is based on a strong mission to establish resilient landscapes in South Africa, which is home to three of the 35 global biodiversity hotspots. In short, it is a special place even by global standards. The Mondi Ecological Networks Programme (MENP), with core researchers Michael Samways, James Pryke and René Gaigher, is supported by the Mondi Group in Europe to develop sustainable new-generation plantations in South Africa. This means timber has to be produced without adversely affecting the environment. This is done by using land offsets dedicated to conservation, which are not planted to timber trees. In and among plantation blocks, areas of indigenous grassland and forest are left to function naturally. These are conservation corridors, and when they crisscross the landscapes they are known as ecological networks.

This approach conserves biodiversity and maintains all sorts of biotic interactions and natural ecosystem processes. This has been so beneficial that MENP was awarded the NSTF/GreenMatter award for sustainability. What MENP has achieved is based on a strong mission to establish resilient landscapes in South Africa, which is home to three of the 35 global biodiversity hotspots. In short, it is a special place even by global standards. The Mondi Ecological Networks Programme (MENP), with core researchers Michael Samways, James Pryke and René Gaigher, is supported by the Mondi Group in Europe to develop sustainable new-generation plantations in South Africa. This means timber has to be produced without adversely affecting the environment. This is done by using land offsets dedicated to conservation, which are not planted to timber trees. In and among plantation blocks, areas of indigenous grassland and forest are left to function naturally. These are conservation corridors, and when they crisscross the landscapes they are known as ecological networks.

This approach conserves biodiversity and maintains all sorts of biotic interactions and natural ecosystem processes. This has been so beneficial that MENP was awarded the NSTF/GreenMatter award for sustainability. What MENP has achieved is based on a strong mission to establish resilient landscapes in South Africa, which is home to three of the 35 global biodiversity hotspots. In short, it is a special place even by global standards. The Mondi Ecological Networks Programme (MENP), with core researchers Michael Samways, James Pryke and René Gaigher, is supported by the Mondi Group in Europe to develop sustainable new-generation plantations in South Africa. This means timber has to be produced without adversely affecting the environment. This is done by using land offsets dedicated to conservation, which are not planted to timber trees. In and among plantation blocks, areas of indigenous grassland and forest are left to function naturally. These are conservation corridors, and when they crisscross the landscapes they are known as ecological networks.

This approach conserves biodiversity and maintains all sorts of biotic interactions and natural ecosystem processes. This has been so beneficial that MENP was awarded the NSTF/GreenMatter award for sustainability. What MENP has achieved is based on a strong mission to establish resilient landscapes in South Africa, which is home to three of the 35 global biodiversity hotspots. In short, it is a special place even by global standards. The Mondi Ecological Networks Programme (MENP), with core researchers Michael Samways, James Pryke and René Gaigher, is supported by the Mondi Group in Europe to develop sustainable new-generation plantations in South Africa. This means timber has to be produced without adversely affecting the environment. This is done by using land offsets dedicated to conservation, which are not planted to timber trees. In and among plantation blocks, areas of indigenous grassland and forest are left to function naturally. These are conservation corridors, and when they crisscross the landscapes they are known as ecological networks.
that will sustain all human impacts, well into the future. This benefits humans, but it also benefits all other animals and plants. The approach feeds into leaving an environmental legacy of which our grandchildren will be proud. Interestingly, in conservation the approach is normally taken of “thinking globally and acting locally”, but in the case of these ecological networks it has stimulated great interest internationally and is being implemented in other parts of the world. MENP has developed a manual for freshwater assessment methods that has been modified for use across Africa.

**SOCIAL IMPACT**

(Photo 1 & 5). Virtually all of our Consent staff have a profile beyond the Department and have been involved in activities that promote social impact.

Prof Sonja Matthee organised an international conference (3rd International Congress on Parasites of Wildlife).

The Honeybush Knowledge Partnership has continued to be active in the Overberg. Local land users continue to contribute to research and teaching on topical issues around honeybush harvesting, agro-ecological production, land-use and local ecological knowledge. The initiative is registered with the Division for Social Impact, and is recognised as a flagship example within the Faculty of AgriSciences.

Now in its second year, the Integrated Pest Management (IPM) Initiative has made great strides in increasing the awareness of IPM strategies though technology transfer and dissemination of scientifically rigorous information. A new website featuring biological information on South African pests and an insect identification service using WhatsApp support farmers to make sustainable decisions on pest management. The group also hosted several successful workshops. The first annual Insect Mass-Rearing Workshop, co-organised by Dr Corey Bazelet, Prof Des Conlong and Dr Elsje Pieterse of the IPM Initiative, hosted 42 attendees from government, private industry and universities from five countries. Participants learned best practices for the mass production of high-quality insects for a variety of applications, including sustainable pest control, alternative protein production, and reduction of waste products using insect decomposers.

In two Moth Larva Identification Workshops, 29 agriculture industry representatives were trained to differentiate false codling moth larvae, a native pest which threatens to become invasive in Europe and the Americas and that poses serious economic implications for the South African fruit industry (Photo 5).
2017 was another interesting and eventful year for the Food Science Department. The year started off with the arrival of a new Lecturer, Dr Diane Rip. She obtained a PhD in Biotechnology (Food Microbiology) from University of the Western Cape (UWC) in 2011. She also lectured at UWC and also worked at Cape Peninsula University of Technology and at the University of Cape Town (Photo 1).

Two long-serving staff members also retired at the end of 2017. Daleen du Preez and Nina Muller had previously been attached to the Department of Consumer Science, but joined Food Science in 2005 and 2007, respectively. Nina Muller established the Sensory Science facility and research group within the Department, which is recognised locally and internationally. She will also be remembered for her hard work, excellent research record and dedication to her students. Daleen du Preez was the Departmental Secretary and worked with three different Departmental Chairs in her time at Food Science. Daleen will be remembered for her eye for detail and commitment to helping students (Photo 2).

Prof Marena Manley has recently received her (National Research Foundation) NRF B-rating. She is nationally and internationally recognised for her expertise in and research on near infrared (NIR) and NIR hyperspectral imaging applied to especially cereal grains, but also other food commodities. Her research nowadays also includes the use of X-ray microcomputed tomography to study micro-structure of cereal grains and other food products. She recently received an NRF grant to the value of almost R8 million to purchase NIR hyperspectral imaging equipment. With this and other already existing equipment, a Central Analytical Facility Vibrational Spectroscopy Unit will be established within the Department of Food Science (Photo 1).

Another highlight in 2017 was the 4th year Product Development presentations held in October. Product Development is a 4th year undergraduate module with the aim being to allow students to gain insight into the entire food product development process. The students, who worked in randomly assigned groups for the entire year, had to integrate all fundamental food science principles and related disciplines in order to research and develop the food products and appropriate packaging. To address the increasing global challenge of food waste, the theme for 2017 was “Profit rather than waste”. Waste streams included, amongst others, grape pomace, bread, various vegetables, spent coffee grounds and banana peels (Photo 5).

ShanghaiRanking’s annual Global Ranking of Academic Subjects (GRAS) 2017 was released earlier this year by the ShanghaiRanking Consultancy. We are proud to announce that Stellenbosch University’s Food Science Department was the only Food Science and Technology department on the African continent to be ranked in the top 100. Stellenbosch is ranked in the 76-100 category with a 46.7 publication count.

The 49 BSc graduates at the December 2017 Graduation were another record for the Department. With at least eight more students to graduate with BSc’s at the March ceremony, it will have been an even bigger record. Between the two graduation ceremonies for studies completed during 2017, there are also 10 MSc’s and five PhD’s being conferred in Food Science – another indication of the strong research focus.

FOOD SCIENCE
FOCUS AREAS
- Food Safety
- Cereal Quality
- Spectroscopy
- Water Safety
- Sensory Science
- Sensometrics

OVERVIEW

2017 was another interesting and eventful year for the Food Science Department. The year started off with the arrival of a new Lecturer, Dr Diane Rip. She obtained a PhD in Biotechnology (Food Microbiology) from University of the Western Cape (UWC) in 2011. She also lectured at UWC and also worked at Cape Peninsula University of Technology and at the University of Cape Town (Photo 1).

Two long-serving staff members also retired at the end of 2017. Daleen du Preez and Nina Muller had previously been attached to the Department of Consumer Science, but joined Food Science in 2005 and 2007, respectively. Nina Muller established the Sensory Science facility and research group within the Department, which is recognised locally and internationally. She will also be remembered for her hard work, excellent research record and dedication to her students. Daleen du Preez was the Departmental Secretary and worked with three different Departmental Chairs in her time at Food Science. Daleen will be remembered for her eye for detail and commitment to helping students (Photo 2).

Prof Marena Manley has recently received her (National Research Foundation) NRF B-rating. She is nationally and internationally recognised for her expertise in and research on near infrared (NIR) and NIR hyperspectral imaging applied to especially cereal grains, but also other food commodities. Her research nowadays also includes the use of X-ray microcomputed tomography to study micro-structure of cereal grains and other food products. She recently received an NRF grant to the value of almost R8 million to purchase NIR hyperspectral imaging equipment. With this and other already existing equipment, a Central Analytical Facility Vibrational Spectroscopy Unit will be established within the Department of Food Science (Photo 1).

Another highlight in 2017 was the 4th year Product Development presentations held in October. Product Development is a 4th year undergraduate module with the aim being to allow students to gain insight into the entire food product development process. The students, who worked in randomly assigned groups for the entire year, had to integrate all fundamental food science principles and related disciplines in order to research and develop the food products and appropriate packaging. To address the increasing global challenge of food waste, the theme for 2017 was “Profit rather than waste”. Waste streams included, amongst others, grape pomace, bread, various vegetables, spent coffee grounds and banana peels (Photo 5).

ShanghaiRanking’s annual Global Ranking of Academic Subjects (GRAS) 2017 was released earlier this year by the ShanghaiRanking Consultancy. We are proud to announce that Stellenbosch University’s Food Science Department was the only Food Science and Technology department on the African continent to be ranked in the top 100. Stellenbosch is ranked in the 76-100 category with a 46.7 publication count.

The 49 BSc graduates at the December 2017 Graduation were another record for the Department. With at least eight more students to graduate with BSc’s at the March ceremony, it will have been an even bigger record. Between the two graduation ceremonies for studies completed during 2017, there are also 10 MSc’s and five PhD’s being conferred in Food Science – another indication of the strong research focus.

RESEARCH

The Department of Food Science has a strong research culture based on the application of fundamental scientific principles and focuses on expanding our understanding of foods as biomaterials. Cutting-edge research, addressing the needs for today’s global food industry, i.e. food safety, quality and sustainability, attracts significant funding.

FOOD SAFETY

The food safety team conducts research in the multidisciplinary sphere of the food, environmental and public health nexus. Research focuses on the detec-
tion and identification of a diversity of microbial populations present in fruit, fruit juices, vegetables, dairy products, cereals, processed meat, livestock and fermented foods. The occurrence, identity, survival and control of spoilage organisms as well as food-borne pathogens, in the pre- and post-harvest processing environment are investigated. A One Health approach is followed to minimise the effects of food-borne pathogenic organisms on public health (Photo 3).

Cereal quality
The cereal quality research programme aims to develop greater understanding of the underlying factors determining and affecting cereal quality using conventional cereal quality analysis techniques. In addition, non-destructive techniques such as X-ray microcomputed tomography are applied to characterise the microstructure of cereal grains as well as the bubble structure of doughs and baked products. Technology for automated grading of cereals for rapid defect detection is investigated.

Spectroscopy
Conventional near infrared (NIR) spectroscopy as well as NIR hyperspectral imaging in conjunction with chemometrics techniques are used for quantitative, qualitative and authentication studies. Advanced image analyses are applied to study spatially resolved hyperspectral images (chemical maps) of food and agricultural products. The newly established Vibrational Spectroscopy Unit of the Central Analytical Facility of SU is housed in the Department.

Water safety
The link between food safety and irrigation water quality, in commercial and subsistence agriculture, is studied with emphasis on produce that is consumed raw or after minimal processing. The impact of food processing operations on water usage, wastewater characteristics and treatment options is also investigated. This includes the application of anaerobic digestion technology and the use of other pre-treatment techniques to improve the efficiency of wastewater treatment systems (Photo 4).

Sensory science
Sensory science research is often multidisciplinary, correlating chemical, sensory and physical quality of food products. Sensory quality is ascertained using trained panels and standard sensory profiling techniques such as descriptive analysis (DA). Rapid profiling techniques such as projective mapping, free sorting and polarised sensory positioning are validated for industry applications. These methods are extremely flexible and less time-consuming than DA, and are thus ideal for researching industry-related problems.

Sensometrics
Sensory science research is complemented by sensometrics, advanced statistical methods to model sensory, chemical, physical, and/or consumer-likeing data. Techniques such as partial least squares (PLS) regression are used to predict sensory bitterness of plant material such as honeybush using its phenolic composition.

SOCIAL IMPACT
All the academic staff are actively involved in community interaction within their research fields, nationally and internationally. Some serve as external moderators of undergraduate and postgraduate modules and programmes for national and African Universities (e.g. University of Namibia, University of Mauritius, University of Pretoria, Cape Peninsula University of Technology, Makerere University).

Most also act as examiners of master’s theses and doctoral dissertations for various national and international Universities. All academic staff regularly review manuscripts for high-impact scientific peer-reviewed journals and project proposals for national (NRF) and international (e.g. Research Foundation Flanders, Belgium) funding bodies. Academic staff members are internationally acknowledged within their fields and regularly serve on scientific and/or organising committees of national and international conferences.
FOREST AND WOOD SCIENCE

FOCUS AREAS
- Precision Forestry
- Wood Quality From Plant To Product
- Green Buildings
- Resilient Sustainable Forests
- Forest Enterprises, Products And Markets

OVERVIEW

The Department focuses on sustainable management and processing of wood-based natural resources. The Department thus services the entire forestry value chain from forest to wood products with a small but dynamic team of researchers. This makes the Department unique internationally, where a fragmentation of forest and forest products is increasingly seen. The Department maintains a close relationship with local industry through a wide array of collaborative research and service delivery in the fields of forest management, forest operations, carbon capture, solid wood processing and development of wood-based composites. During 2017, the Department furthered its international involvement through involvement in several EU COST Actions. After successful completion of the Marie Curie Rise (Climate-Fit Forests) project with Germany, Italy and Switzerland the Department is now collaborating in a much larger consortium of European institutions in a Marie Skłodowska-Curie Action, which highlights the importance of the Department’s role in the international research arena.

Research

Development of phosphate bonded composite products

The developed products were tested for fundamental material properties. This culminated into a graduation of a PhD student, Dr Stephen Amiandamhen (Photo 1 & 2). Some highlights of the project were the presentation of results at two international conferences, SWST 2016 and IUFRO/SWST 2017 held in Brazil and Canada respectively. The results were also presented at two local conferences, ICCBN 2015 and TAPPSA 2016. Thanks to the National Research Foundation (NRF) for the doctoral scholarship award (Grant number 88598).

The results of the study have generated further interest from the South African Paper Manufacturers Association. As such, the project is currently being sponsored to focus on the development of board products using residues specifically from the pulp industry. In the wake of the recent fire incidences in major cities like London and Dubai, and the recurring shack fires in informal dwellings in South Africa, it becomes imperative to upgrade or replace existing building components that are not fire-resistant with novel fire-resistant materials, bearing in mind the economic and environmental implications. The recommendation from the study seeks to investigate the flammability characteristics of the composite products. The key to effectively developing marketable composite products for use as building materials is to identify the market needs and opportunities for such products. Further, a life cycle assessment of the composite product is important for environmental improvement options.

Cellulose Nano Crystals (CNC) from invasive trees (Photo 3 & 4)

In the past two years, we successfully started a new research direction investigating CNCs synthesised from invasive trees, such as Port Jackson, Rooikrans and others. These trees need to be cleared by law and can therefore be regarded as waste material. Any potential use for the extracted wood adds significant value to the clearing operations, but up to date most of this wood is merely used as firewood.

CNCs are small, uniformly sized cellulose blocks that have various desirable characteristics. Their use range from reinforcement materials (bullet-proof materials), medicinal carriers (due to their hydrophilicity) to electronic devices (electrical conductors with a preferred directional property) – for example in LCD screens. The isolation of cellulose and subsequent synthesis of uniformly sized crystals is, however, rather costly, which makes them inappropriate for low value products, such as for example mere filler particles.

We synthesised CNCs from various invasive tree species and compared them to CNCs produced from commercial wood.
cellulose and found that the properties were in all cases comparable, if not superior. The analysed properties included the dimensions, size distribution and crystallinity of the CNCs. The synthesis of CNCs from cleared invasive trees therefore presents a realistic option of high value added end-products.

**Forecasting forests and future fibre**

In South Africa, trees are grown for a minimum of about six, and as long as 30 years, which means that planning requires a long-term view. Predicting the yields from and product quality of a forest in the future can be difficult, and associated with a great deal of uncertainty. Fortunately, the South African forestry industry has access to a sound growth and yield modelling framework which has provided a solid basis for good quality decision-making and production estimation for many years. However, two challenges, not easily handled by existing growth projection systems, are becoming increasingly important. The first is the importance of estimating not only future wood quantity (volume or tonnage) but also wood quality. Differences at rotation end in stand level pulp yield or physical/chemical properties of the wood will have dramatic impacts on downstream processing possibilities and outcomes. The second is the risk and uncertainty associated with changing climate. It is likely that climate in the African sub-continent will be increasingly uncertain in the future, probably with droughts of greater intensity. To address these challenges, a research area has been developed at DFWS in collaboration with several industry partners: to develop a new generation of measurement and modelling approaches which can fully incorporate an up-to-date understanding of how trees grow and form wood into decision making systems required by forest managers. The second concentrates on the cutting edge approaches in remote-sensing that is undoubtedly leading to a revolution in forest measurements. Large amounts of data can potentially be generated for extensive areas with high frequencies of return. These data, in turn, will contribute to better predictions from forecasting models. DFWS currently has six PhD students and two MSc students in this area of work, undertaking research into optimization of image processing algorithms, developing and testing forecast modelling approaches and the characterization of prediction error (Photo 5).

**Social impact**

**Green Building Initiative**

Buildings are responsible for about 33% of global anthropogenic carbon dioxide emissions. Wood is the only building material available on a large scale in the world that can have a carbon-negative impact on our atmosphere. The DFWS recently started a green building initiative where the use of wood is encouraged for both residential and commercial buildings. One of the focus areas for the initiative is the education of especially architects and engineers on wood use for and in buildings. Workshops were presented in Cape Town and Stellenbosch to mainly architects in cooperation with Vernon Collis from UCT. Further countrywide workshops as well as the development of internet-based short courses are planned for next year.

**Precision Forestry Symposium**

The Department presented the fourth in a series of highly acclaimed International Precision Forestry Symposia during February 2017 in Stellenbosch (Photo 6). Delegates had the opportunity to update their scientific knowledge and gain insight on numerous emerging Precision Forestry initiatives. The high quality and diversity of presentations from delegates from 16 countries contributed to its success and highlighted the all-important role of Precision Forestry to the industry locally and abroad. Thirty-six presentations over three days addressed topics from measurement and modelling of quality and yield data; utilising precision data for efficient forest management and operations; optimised logistics and Operations Research.
The vision of the Department of Genetics is to develop and promote Genetics as a cornerstone of biological science at Stellenbosch University (SU) through quality research, creative teaching, outstanding and responsible service delivery to our community and environment.

A new technical staff member was appointed – Mr Sihle Mthethwa. A total of 38 postgraduate students graduated, including 27 honours, nine MScs and two PhDs.

Stellenbosch University was well represented as students and researchers travelled to places such as Lisbon, Portugal, Tokyo, Japan, Madrid, Spain, Tulln, Austria and Massachusetts, USA to attend conferences as well as to collaborate and share knowledge with various institutions.

International conferences attended included International Federation of Classification Societies (IFCS) (Photo 1), the Hemipteran-Plant Interactions Symposium (Photo 2) and the 22nd International Functional Foods Conference (Photo 3).

Ms Emma Frickel was awarded the Hofmeyr van Schaik medal for the best fourth-year Genetics student in 2017. This award is given annually to the best fourth-year student in Genetics (BSc Honours or BScAgric) by the South African Genetics Society.

RESEARCH

The research focus areas of the Department follow the matrix structure according to which the Department operates. Focus areas within animal, human and plant genetics include studies in the molecular (biotechnology), population and quantitative (breeding) genetic fields.

Animal Genetics

The MBB-group (Molecular Breeding & Biodiversity) has a primary disciplinary foundation in molecular population and quantitative genetics. As such, the group maintains a diverse research portfolio, which aims to investigate various micro and macro-evolutionary processes that influence the distribution of genetic variation in animal populations.

PhD study provides the most comprehensive set of conservation genetic resources for commercially exploited sharks to date.

The research was conducted by Dr Simo Maduna (Photo 5), who received his PhD in Genetics from Stellenbosch University on 4 December 2017.

The species-rich shark genus Mustelus (smoothhounds) is one of the most bio-economically important groups of elasmobranchs (sharks and rays) in the world’s oceans. A multi-disciplinary approach (molecular, morphology and histology) with different methods of analysis on various spatial scales was used in this study to resolve the macro- and micro-evolutionary dispersal patterns of these sharks. In addition, a fisheries forensics identification key guide was successfully developed and sperm storage was reported for the first time. This study provides the most comprehensive set of conservation genetic resources for smoothhound sharks to date that will help inform existing and ongoing management and conservation efforts for these sharks. The study was performed in collaboration with the national Department of Agriculture, Forestry and Fisheries and the South African Shark Conservancy.

Human Genetics

The Pharmacogenetics group focuses predominantly on neuropsychiatric genetics and pharmacogenomics.

In 2017 staff and students of the Human Genetics laboratory presented at several local and international conferences and workshops. Dr Kevin O’Connell, a post-doctoral researcher, was awarded funding under the Early Career Investigator Programme to attend and present research conducted under the Human Genetics umbrella at the XXVth World Congress of Psychiatric Genetics (WCPG) in Orlando, Florida, as well as the preceding Pharmacogenomics Conference in New York.
Psychiatry (PIP) satellite meeting just prior. This research was also presented at the local Biological Psychiatry conference in Cape Town, at which a satellite meeting was held with the chair of the International Society of Psychiatric Genetics (ISPG).

Dr Nathaniel McGregor, a lecturer in the department, was invited to take part in the inaugural Global Initiative for Neuropsychiatric Genetics Education in Research (GINGER) programme of the Broad Institute (Harvard T.H. Chan School of Public Health of Harvard University and MIT). Later in the year, Dr McGregor was invited to present a workshop on neuropsychiatric genetics at the two-week UCT summer school. Considering his role as a member in a number of local and international societies, he was appointed as an executive committee member for the South African Neuroscience Society (SANS) for the 2018 year and will be one of the members representing SANS in preparations for the Conference of Bio-medical and Natural Sciences in Therapeutics (CoBNeST) taking place at the Spier Wine Estate in October 2018.

Plant Genetics

There are currently four research groups involved with plant genetics studies:

- Cereal Genomics
- Molecular Breeding & Biodiversity (MBB)
- Plant Breeding Laboratory (SU-PBL)
- Vitis Laboratory

Research highlights in the Cereal Genomics group include: completing the sequencing and assembly of the Russian wheat aphid genome and that of chromosome 7D of bread wheat, which contain most of the genes conferring resistance against the aphid. These important genomic resources are now freely downloadable from the National Center for Biotechnology Information’s (NCBIs) website. Publications detailing the findings from these studies were published.

The group further found a broad based aphid control agent that will be transferred for application to other crops in future. New pre-breeding germplasm with superior drought tolerant phenotypes had also been released to breeders. Students from the Cereal Genomics group presented their data at two international meetings, namely the International Wheat Genetics Meeting in Tulin, Austria (23-28 April) and the Hemipteran-Plant Interaction Symposium in Madrid, Spain (4-8 June), where their data were well accepted. By invitation, Prof Oberholster presented talks at the NBAgrifood meeting focussing on Food Production for the Future Generating nutritious foods from resilient & sustainable agricultural systems in Durham, UK (11-13 July), as well as at the 3rd World University Network (WUN) Climate Resilient Open Partnership for Food Security (CROP-FS) workshop, Massachusetts, USA (7-8 October).

Institute For Plantbiotechnology

As is the case every year, 2017 at the Institute for Plant Biotechnology (IPB) was busy and productive. One of the core functions of the IPB is to train students. In this regard, a number of students successfully completed their theses and graduated. These included two PhD students, Dr Zheto Pholo and Dr Roya Ndimba; an additional four Masters and six BSc Honours students also graduated. We would like to congratulate all these students on a job well done!

Dr Paul Hills’s term as president of the South African Association of Botanists (SAAB) (photo 6) commenced in 2017. According to the SAAB’s constitution, he serves as president in 2017 and in 2018. Dr Hills delivered his inaugural speech at the SAAB conference held from 9 to 12 January at the University of Pretoria, which was a resounding success.

A new South African Research Chairs Initiative in the field of nutritional biotechnology, spearheaded by Dr Bianke Loedolff (Photo 4), in collaboration with Professor Sharon Prince of the University of Cape Town, also kicked off in 2017. The idea is to fortify leafy greens, such as wild rocket and kale, with good nutrients while they are still growing. Some interesting popular articles were published on this topic in the Natal Mercury (Greens protect body from lifestyle disease; https://www.pressreader.com/south-africa/the-mercury/20171107/281805694202347) and in AgriOrbit (Microgreens: More than just a garnish; https://agriorbit.com/micro-greens-more-than-just-garnish/). A simple method for the bio-fortification of wild rocket micro-greens via manip-
ulation using high light was also published in Functional Foods in Health and Disease (7 [11], 859–872).

SOCIAL IMPACT

Staff members of the Department serve on boards and committees, for example the Advisory Committee on Genetically Modified Organisms. Community-based services include the following: the plant breeding laboratorium’s (PBL’s) marker-assisted selection (MAS) service for wheat breeding programs, forensic DNA analysis of confiscated material related to shark finning and abalone poaching, and a diagnostic service (Vironostix) by Mandi Engelbrecht of the Vitis- group samples for viruses and phytoplasmas test.

During the fires in Knysna, staff members, post-doctoral fellows and postgraduate students of Genetics and IPB, had donated blankets, bottled water and food to the people of Knysna, who were affected by the fires.

With donations collected from IPB staff members, post-doctoral fellows and postgraduate students, the institute could make a donation to Somerset West Primary School for their overseas sports tour.
Leaf blackening is a major post-harvest disorder in certain species, cultivars and varieties of Protea that reduces vase life and quality. Pulsing these stems with sugars (e.g. glucose) shortly after harvest has long been in practice to reduce the severity of leaf blackening, but it varies widely amongst species, cultivars and varieties; making it difficult to execute at the producer level. We thus designed a research project, financed by the Post-Harvest Innovation Programme and CapeFloraSA, to address gaps in our knowledge concerning Protea leaf blackening.

We tested the efficacy of alternate sugars (trehalose and lactulose), osmotic compounds (glycine betaine) as well as senescence inhibitors (nitric oxide), with the hope that they may reduce leaf blackening which is unique to Protea, and also to prolong vase life as has been demonstrated in other cut flowers such as Roses and Lisanthius. Cultivars such as “Sylvia”, “Pink Ice”, “Susara”, “Shar- onet”, and “Brenda” was used.

We found that leaf blackening develops rapidly in some cultivars for example, at day one or two of vase life, whilst in others the onset is slower, developing only after day five. This however is also season dependent, stems harvested between October and March often present with a higher incidence of leaf blackening as well as desiccation of the involucral bracts, compared to those harvested between April and September. Trehalose was effective in significantly reducing leaf blackening in “Sylvia” whereas lactulose reduced blackening but was not more effective than the industry standard, glucose. The application of nitric oxide on “Sylvia”, “Susara”, “Sharonet” and “Brenda” cut stems did not show any positive effect on the lowering of leaf blackening, although both concentrations (25μM and 50μM) had a positive effect on flower quality for the April-harvested “Susara” trial.

Glycine betaine was not effective in controlling leaf blackening in “Brenda”, but when used in combination with glucose, as a pulse, it significantly reduced leaf blackening in “Sylvia” and “Susara”. In conclusion, alternate sugars and osmolytes show promise in reducing leaf blackening in Protea (Photo 2).
Prof Stephanie Midgley, as part of a collaborative research team, continued the research on water use productivity of high performing apple orchards in the winter rainfall area of South Africa (Dzikiti, S, Midgley, SJE, Gush, MB, Volschenk, T, Taylor, NJ, Lötze, E, Zirebwa, FS, Ntshidi, Z and Mobe, N).

Increasing pressure on South Africa’s water resources from rising and competing user demand and climate change threatens the sustainability of the deciduous fruit industry which is totally reliant on irrigation. Furthermore, high yielding (>100 t ha⁻¹) apple orchards have become common, raising the need for detailed information on their water use and water productivity (WP). This study was conducted from 2014-2017 on four productive “Golden Delicious” and four “Cripps Pink” orchards in the two main production regions.

Yields ranged between 11 and 140 t ha⁻¹ in younger to full-bearing orchards. The WP was analysed using detailed quantification of orchard water use using sap flow sensors, eddy covariance evapotranspiration (ET) measurements, ET modelling and yield. WP is the mass (kg) of fruit produced per m³ of water consumed, based on both transpiration and ET. We also calculated the “economic water productivity” (EWP) as gross income per m³ of water consumed, using fruit quality, pack out and price data. The key driver of WP (transpiration-based) was the canopy leaf area. However, lower transpiration from smaller canopies of “Cripps Pink” was compensated by higher evaporation from the orchard floor, resulting in comparable WP (evapotranspiration-based) between the cultivars. WP based on ET increased with increasing yield. Exceptionally high yields resulted in smaller fruit size in “Golden Delicious” orchards which reduced the pack out of export quality fruit and lowered the EWP. The premium prices obtained for “Cripps Pink” compared to ‘Golden Delicious’ drove up the EWP (Photo 3 and 4).

Prof Karen Theron is conducting research to evaluate the effect of shade netting on Japanese plum quality and ways to control the vegetative growth under such nets (Photo 5 and 6).

Several plant growth regulators (PGRs) are evaluated on plum trees grown under shade net to see whether these can control vegetative growth without any detrimental effect on fruit quality. In addition, we evaluated the effect of shade nets on fruit quality at harvest and after cold storage and shelf life compared to fruit grown on trees in full sun. Foliar or soil applications of the PGRs were made either at petal drop (PD), PD plus 4 weeks later or after harvest depending on the product. Effect on fruit set, summer pruning and yield and fruit quality were determined. Fruit quality from untreated trees in full sun was compared to fruit quality from trees grown under shade net, at harvest, after cold storage and after cold storage and subsequent shelflife. Nets did not negatively affect yield per tree or fruit size of netted trees compared to outside trees in “Larry Ann” or “Midnight Gold” plums.

The nets however significantly reduced wind and sunburn damage. In “Larry Ann”, gel breakdown was decreased in fruit from netted trees while the opposite was the case with internal browning. These problems were seen after 6 weeks cold storage at -0.5°C and one week shelf-like simulation at 10°C. No such internal problems occurred in “Midnight Gold”. Foliar PGR applications reduced fruit set and increased fruit size in “Larry Ann” and to a lesser extent in “Midnight Gold”, without a significant effect on vegetative growth. These are preliminary results and further research is needed.

**SOCIAL IMPACT**

The VII International Conference on Managing Quality in Chains (MQUIC) and the II International Symposium on Ornamentals, was organised by the University of Stellenbosch under the auspices of the International Society for Horticultural Science (ISHS) on 4-7 September, 2017, with Prof Linus Opata and Dr Lynn Hoffman as convenors. A total of 121 participants attended the symposia representing 20 countries.
PLANT PATHOLOGY

FOCUS AREAS
• Pre-harvest Disease Management
• Postharvest Pathology
• Molecular Plant Pathology

OVERVIEW

The Department of Plant Pathology had a very productive 2017. In total, 24 research articles were published, three students obtained their PhD degrees, 12 students their MSc degrees, and seven students their BScHons degrees. Various national and international meetings were also attended. These included the South African Society for Plant Pathology symposium in the Drakensberg, where a total of 26 presentations were made. At the 2nd New Voices Symposium hosted by Cereal Science and Technology of South Africa, MSc student, Asheeqah Cassiem, won best MSc presentation and PhD candidate, Yo-Neal Bless, obtained 3rd place. Ms Bless also received a scholarship to attend a specialist training course on modern breeding techniques of maize, presented by the International Plant Biotechnology Outreach (IPBO-VIB-UGent) at Ghent University in Belgium. Three members of the department also attended the MycoKey meeting in Ghent.

The department hosted various international visitors during the year. These include Dr Emily Bruez, postdoctoral fellow from INRA-Bordeaux in France, who visited the Grapevine Trunk Disease Research Programme of Prof Francois Halleen and Dr Lizel Mostert. The collaboration with Dr Bruez forms part of a South African - France collaboration. Dr Romain Pierron from France also joined the department as postdoctoral fellow in Dr Mostert’s research group (Photo 1).

The curriculum of the Department of Plant Pathology was revised in 2017. In November / December, Prof Bill Fry from Cornell University visited the department to assist with the process.

RESEARCH

A SOILBORNE DISEASE PROGRAMME
Managing avocado root rot with phosphonates
Avocado root rot is caused by the pathogen Phytophthora cinnamomi. The disease occurs worldwide, and is devastating if not controlled. The disease can, however, be managed effectively with phosphonates. Unlike most fungicides that are applied as foliar sprays, phosphonates are injected into the trunk of avocado trees.

Apple replant disease
Apple replant disease is a disorder that occurs in orchards when apple trees are replanted on soil previously planted to apple or related tree species. Research at the department aims to better understand the etiology of the disease for its management. The organisms causing the disease were earlier identified, and molecular methods developed to quantify them. Mr M Nyoni (Photo 2), a recent PhD graduate in the department, investigated novel management strategies to manage the disease. His research demonstrated that a mixture of chemicals can control the disease to the same extend compared to soil fumigation; a method currently widely used to effectively manage the disease. The chemical mixtures can also control replant pathogens present in nurseries, where they contaminate nursery trees. A new MSc project will start in 2018, which will aim to further optimise the chemical mixture used for managing the disease and controlling pathogens on nursery trees.

Fruit and Postharvest Pathology Research Programme

The South African fruit industry contributes significantly to the economy of the country. Still, it is estimated that between 10% and 30% of fruit is lost because of postharvest diseases. To address this obstacle, a Fruit and Postharvest Pathology Research Programme was established in the department in 2008 under the leadership of Dr Cheryl Lennox (Photo 3). The focus of the
Programme is to understand the causes, epidemiology and management of diseases on fruit crops of economic importance to South Africa. Current projects include diseases of apples (apple scab, bull’s eye rot), pears (grey mould), citrus (sour rot, green mould) and pomegranates. These projects have all been highlighted as research priorities by South African fruit industries (Hortgro, CRI, POMASA), and are funded by them.

In July 2017, Dr Lennox was invited by the Brazilian apple industry (ENFRUTE) to present a talk entitled “Management of postharvest diseases of apples using appropriate methods – a South African perspective”. In this talk she highlighted the important phytosanitary implications of postharvest diseases on apples, and the necessary steps needed to manage these diseases. Collaboration with researchers from Brazil has been initiated as a result of this invitation.

**Fusarium Diseases of Agricultural Crops**

Plant pathogens of the fungal species *Fusarium* perpetually contaminate agricultural crops and remain a serious threat to sustainable food production in the world. They cause disease in important staple food crops such as maize, wheat, sorghum, rice and bananas, and in some instances produce mycotoxins that can be harmful and even fatal to humans and animals. Disease management is complex and, therefore, emphasis is placed on disease prevention. This programme focuses on the characterisation and management of *Fusarium* spp. associated with diseases and mycotoxin production (Photo 4).

**Social Impact**

The Plant Disease Clinic (Photo 5) diagnoses all types of fungal, bacterial and virus diseases on various crops, including trees, shrubs, vegetables, fruit and ornamentals. Insect and insect related problems are analysed by the Department of Conservation Ecology and Entomology and virus problems handled by Vironostix at the Department of Genetics. Samples are received from all corners of South Africa, as well as Namibia and Zambia. The Plant Disease Clinic has grown from processing 418 samples in 2007 to a total of 1189 samples in 2017.

Various talks were presented to the industry at technical days and workgroup meetings in 2017, such as the Letaba Avocado Workgroup and the South African Avocado Growers Association in Tzaneen.

In 2017 Prof Viljoen continued his international involvement in mitigating the banana Fusarium wilt fungus *Foc TR4*. He was an invited participant and panel member in two meetings in Maputo, Mozambique, to discuss a National Strategy for the containment of banana Fusarium wilt, and later to discuss the impact of invasive species in agriculture in Mozambique. He continued his role as advisor of banana farms in northern Mozambique affected with *Foc TR4*. In addition, Prof Viljoen reviewed activities in Australia on the containment of *Foc TR4* in northern Queensland, and participated as panel member in meetings of the World Banana Forum on the global spread of *Foc TR4*. In South Africa, he was involved in efforts to contain the banana bunchy top virus, which was discovered in southern KwaZulu-Natal in 2016, and in consultation with banana growers and DAFF to develop policies on the importation of banana fruit into South Africa.
Four PhD students (L Wiese, G Louw, J Atkinson and K Barichievy) are currently working on various aspects of soil-geomorphology relations combining the digital terrain analysis with soil information to improve farm planning tools, carbon accounting procedure. The above research is conducted with departments of Geography and Forestry, the Water Institute, SU; department of Agriculture, KZN and Agroecology group at the Coventry University, UK.

The department of Soil Science conducted rooibos tea research for the past five years. A recent research project by Drs A Hardie and JE Hoffman in the Clanwilliam area (Photo 2) and funded by Rooibos Ltd. has been successfully completed in 2017. The project consisted of two MSc studies: (1) the effect of soil depth on the soil water balance and physiology of young rooibos, and (2) the effect of NPK fertilization on young rooibos and nutrient leaching.

The research showed that rooibos plants are able to grow in extremely dry soils, and that initially plants performed better on shallow soils which changed during the dry summer period. It was also interesting that the rooibos cluster roots were concentrated in the cooler and wetter 10-20 cm soil layers. The research found that young plants responded best to moderate applications of K, and low amounts of N fertilizer.

As can be expected in the water-scarce Western Cape, research on irrigation and water relations of economically important crops is one of the focal areas of the soil science department. Three projects were conducted on this topic, namely on rooibos, apples and wine grapes respectively.

The main aim is to investigate how different vine cultivar scions and rootstocks affect leaf water potential. This information would help to adapt published plant water potential thresholds for more accurate irrigation scheduling and accumulated water constraints in grapevines to produce wines of good quality and the effect on fruit and wine quality.
A substantial amount of water could be saved by longer irrigation cycles compared to higher irrigation frequencies. Three irrigation treatments, T1 (irrigation every four days), T2 (irrigation every seven days) and T3 (irrigation every 12 days) received 426mm, 370 mm and 327 mm respectively. The longer irrigation cycles had significantly higher rooting densities, the roots grew to deeper soil layers at a greater distance from the tree (Photo 3).

Soil Amendments
The department of Soil Science has conducted numerous research projects on biochar amendment of soils and waste waters since 2010. Recently an MSc project on the composting and quantification of biochar was completed by Mr Ockert Botha. He also received the Soil Science Society of South Africa for best paper presented by a researcher younger than 30 years at the Combined Congress 2017 in Bela Bela.

A PhD study investigating the effect of local biochars on mineral nitrogen availability in sandy soil was recently completed by Ms Makhosazana Aghoghovwia (néé Sika).

It was found that selected plant biochars can enhance ammonium nitrate fertilizer retention in sandy soils by up to 157%.

The MSc project completed by Mr S Gobodzi focused on compost applications in the small-holder farming units, analyzing the nutritional and economic value of various plant nutrition options in small-holder setting.

SOCIAL IMPACT
Dr JE Hoffman is involved in monitoring the water level in seeps of the Table mountain group aquifer. The city of Cape Town planned to use the water of the Aquifer to supplement the City’s water supply to help reduce the critical shortage of water due to the drought.

Dr C Clarke actively participated in the activities of the South African soil classification working group and was instrumental to the revision of the SA soil classification system updated for the first time since 1991. She also organized the activities of the soil discussion group in the Western Cape focusing on the burning problems and solutions of soil research.

Dr AG Hardie is leading the farm-based research with small-scale farmers (Photo 4) and engages commercial rooibos producers in active research (Photo 5) through field days and community interaction.

The recent research achievements were presented to the public and peer researchers at: the 72nd international conference of the Soil and water conservation society in Madison, Wisconsin, USA (Dr JE Hoffman); The World Soil day in Moscow, Russia (Dr A Rozanov) and at the Combined Congress in Bela-Bela (A Hardie and A Rozanov).

The post-graduate students also had an opportunity to present their research at the Combined Congress (O Botha, D Osborne, M Esmeralso).

Drs C Clarke and A. Rozanov attended the digital soil mapping course at the International Soil Reference and Information Center (ISRIC), The Netherlands, where it was shown that machine learning algorithms in soil mapping are starting to prevail over geostatistical techniques widely used in the recent past.

New opportunities are now opening up for quality soil information processing.
FOCUS AREAS
- Grapevine Sciences (viz. Viticulture, grapevine molecular biology and biotechnology)
- Wine Sciences (viz. Oenology, wine chemistry, wine microbiology and molecular biology, wine sensory evaluation)

OVERVIEW
The Department of Viticulture and Oenology is the only grape and wine science environment at a South African University and focuses on training high-level professional graduates and postgraduates who make major contributions, not only to the wine industry, but also several other sectors. It includes the Institute for Wine Biotechnology (IWBT) and the Institute for Grape and Wine Sciences (IGWS). While the former is a multidisciplinary research institute, the latter focuses on building capacity and infrastructure in support of research and training, and on knowledge and innovation transfer.

Achievements: 2017 was a very productive year in terms of research outputs with 36 scientific articles published and six HonsBSc, 8 MSc/MScAgric and six PhD students graduating. Mr Riaan Wasing won the awards at the Veritas 2017 competition for Die Laan wines: Cabernet Sauvignon, Gold, Shiraz Silver, Viognier Bronze and Pinotage – Bronze.

STAFF NEWS
Highlights of the year include the appointment of Prof Benoit Divol as Head of the Department in April 2017. He was also promoted to Associate Professor. Dr Hélène Nieuwoudt was promoted to Senior Researcher. Dr Evodia Setati and Dr Debra Rossouw obtained a C3 rating from the National Research Foundation. Ms Marianne McKay received the prestigious award of Distinguished Teacher from the University. Finally, a new departmental manager, Ms Somi Radasi, was appointed in August 2017.

Interesting fact: Brand new curricula were finalised for our undergraduates and Honours students. They are kicking off in January 2018. The new curriculum incorporates the most recent knowledge in grapevine and wine sciences as well as new teaching techniques. It will allow the students to better integrate the critical knowledge in the different fields and practical application.

Program renewal for viticulture and oenology was on the agenda for 2017 and first year changes will be implemented in 2018.

RESEARCH
Research in teaching and learning
Teaching and Learning (T&L): Marianne McKay continues to carry out research in innovative teaching methods in Oenology, and has been recognized this year for her efforts with awards at the Scholarship of Teaching and Learning Conference, and through being made a Distinguished Teacher within SU (Photo 3).

Ms McKay has a strong focus on engaged T&L, improving graduate attributes, critical citizenship and employability of our undergraduates.

Wine Ecology
The South African Research Chair (SARChI) in Integrated Wine Science, held by Prof Florian Bauer, was renewed in 2017 for a new funding cycle of five years starting 2018. The NRF panel indicated that the chair had opened new links between the traditional wine science and newly emerging fields in data analysis and ecology. The research projects that are directly funded through the SARChI grants will continue to strengthen transdisciplinary research initiatives within the DVO/IWBT and South African and international collaborators.

Precision Viticulture and climate change research group
Dr Carlos Poblete-Echeverria (Photo 4) was recruited as a Senior Lecturer in Viticulture in December 2016 and he is working on the development of the Precision Viticulture and Climate change research group. The main objective of this group is “To develop research and innovation in precision agriculture with a focus on modern technologies for improving field management practices and implementing mitigation strategies..."
for climate change impact” (Photo 2). In this sense, one of the most important effects of the climate change in South Africa is the water scarcity, which is an increasingly frequent and wide-spread phenomenon and the major limitation for viticulture productivity. Therefore, in this research group, the application of water management techniques using novel technological tools will be a priority topic.

To achieve the objectives of this new research group, several activities were developed by Dr Poblete-Echeverría during 2017. These include: The presentation of six research projects, the supervised postgraduate thesis (one PhD and three MSc), four presentations in the 20th GiESCO International Viticulture Meeting, two presentations at national level (SASEV) and four ISI publications in the areas of Postharvest, Satellite remote sensing, Phenotyping and Precision Viticulture (PV) (Photo1). Unmanned Aerial Vehicles (UAVs) are an emerging technology in PV, however, its use is limited by the image processing. Cameras on board UAVs acquire finer resolution images than satellite or aerial aircraft systems, therefore, in commercial vineyards, the images present problems associated with the misclassification of the plant, soil and shadow. In this regard, in Poblete-Echeverría et al. (2017) presented the development of an automatic algorithm to detect and segment the vine canopy using RGB images. Additionally, as a part of initial activities of this research group Dr Poblete-Echeverría visited Argentina (INTA and U Nacional de Cuyo), Chile (U Católica de Valparaíso), and China (Northwest A&F University) to establish collaboration programs.

SOCIAL IMPACT
Pinotage Youth Development Academy (PYDA): the DVO interaction with the Pinotage Youth Development Academy (PYDA) continued with another successful year of Oenology- winemaking related course (Photo 6). The Social Impact of our interaction (and the broader impact of the Pinotage Youth Development Academy (PYDA) on the Winelands communities in which they live) was monitored independently this year, and feedback was very positive.

Food4City: Dr ME Setati (DVO-IWBT) together with Mr B Joffin (Welgevallen garden), (Photo 5) Dr M Le Roux (Agronomy) and Mr H Stander (Animal Sciences) oversaw the training of community gardeners from Masiphile Peace Food4City: Project (Khayelitsha) and Inkwenkwezi Community Project (Philippi East) on various farming practices including compost preparation, seedling development and nursery management, as well as aquaponics.