

# ***CURRICULUM VITAE***

## ***Rouxléne van der Merwe (née Coetzee)***

Home address:

5 Hampshire

NP van Wyk Louw Street

Langenhoven Park

Bloemfontein, 9301

Cell 082-2266474

rouxlenevdmerwe@gmail.com

Work address:

University of the Free State (UFS)

Agricultural building

Plant Breeding

Room 4.109A

Tel. 051-4019672

vandermerwer@ufs.ac.za

ORCID ID: <https://orcid.org/0000-0003-3771-283X>

Scopus *h*-index: 5

Google Scholar *h*-index: 7

## **PERSONAL DETAILS**

---

Nationality	South African Citizen
Identity number	8004150046088
Date of birth	15 April 1980
Gender	Female
Married state	Married
Driver's license	Code – 8
Languages	Afrikaans and English
Sport and hobbies	Hiking, cycling, vegetable gardening, garden design

## **NARRATIVE**

---

I grew up in Bloemfontein, in a family with a history of vegetable gardening. The love for nature, plants and vegetable gardening were always part of my being. I studied Plant Breeding at the University of the Free State (UFS) and worked part-time for a nursery, focussing on propagating garden plants for landscapes. I obtained both my Master's and PhD degree in Plant Breeding at the same institution. During my

postgraduate studies, I work as a research assistant within the Plant Breeding division. With this role, I was in charge of managing glasshouse activities, which involved assistance with other postgraduate students' glasshouse trials, crosses and trial management. I was responsible for keeping our germplasm bank neat and entry records up to date. I also gained experience in teaching as I was responsible for presenting the practical sessions of a third year course. Though my dedication and commitment in providing excellent assistance, I was appointed in the position of Professional Officer at the university. In this role, I continued with all my responsibilities with added responsibilities in training second year students in wheat crossings as part of their second year course. By the time I obtained my PhD degree, a position for a lecturer was open for which I applied and was honoured to be appointed. With my appointment, my research field as a conventional soybean breeder was established.

During my almost eight years in the lecturer's position, I had taught a number of undergraduate modules (second and third year) with the addition of postgraduate modules such as Statistics in Plant Sciences in later years. The progression from undergraduate to postgraduate teaching challenged my knowledge in those subjects, for which I needed to train myself (through reading and attending an international workshop), and as such I grew and gained much experience. This experience came in handy during postgraduate supervision. During those same years, I delivered eight honours, three Master's and two PhD degrees from which four of the students were working on my research field of interest, as well as 12 accredited publications and two book chapters. I had the privilege to attend and present at both national and international conferences, with 17 contributions delivered by me and my students. During my first World Soybean Conference, collaboration with the Edamame Development Program (Dr Michiel Smit) was established, which widely created project funding opportunities, collaborative projects and international collaboration with Prof Qiuying Zhang, which is continuing to date. With my conference visit to Spain, a collaboration was established between me and Prof Antonio De Ron, who is the chief editor of the Science Society of Galicia - MOL. My soybean drought tolerance research and breeding for pod-shattering resistance programmes gained momentum after funding was secured from both the Oilseeds Advisory Committee and the National Research Foundation (NRF) in South Africa. As part of the collaboration between the UFS, the Edamame Development Program and Prof Zhang from the Northeast Institute of Geography and Agroecology in China, international visits were made and invited and public lectures were presented. As lecturer, I engaged in various scholarship activities including internal (six) and external (two) examination of Master's dissertations and four PhD theses internally. I was invited to review a number of articles to be published in mainly accredited journals as well as research projects from the Winter Cereals Trust and the NRF. These engaged scholarship activities not only enhanced my science writing skills and knowledge but also enriched the standard of my supervisory role. I became a member of a national society

(the Southern African Plant Breeders' Association) for which I served on the executive committee for four consecutive years as the treasurer. I had the opportunity to co-organise two conferences and during these years, I became familiar with a number of breeding companies in South Africa and highly valued research connections were established. Being a member of EUCARPIA further contributed to international connections due to international conferences.

I was promoted to senior lecturer during the end of 2018. My perseverance and the accomplishments I achieved in securing project funds, student training, research outputs and establishing myself as an independent researcher all contributed to my promotion. Although I knew that much more will be expected of my performance. I took up the challenge and continued persevering in what I love, my teaching and research. During my three and a half years as senior lecturer, my undergraduate teaching load was reduced although my postgraduate supervision and research gained momentum. During these few years, more students obtained their Honours (two) and Master's (seven) degrees with four PhD students of which three were enrolled under my main supervision. Teaching in mainly postgraduate modules continued with occasional teaching of second and fourth year courses in the absence of the respective lecturers for those modules. In 2020, the transition from hundred percent face-to-face teaching and assessment to an online and blended teaching mode was necessary due to working from home. This was challenging, especially for my Statistics in Plant Sciences course where students did not have the necessary software packages for the practical exercises. Much experience was obtained in using technology and innovative strategies as part of teaching during that year. As a result, I could present my postgraduate course using a blended (face-to-face and online simultaneously) approach to accommodate part-time postgraduate students. In terms of research, I continued with delivering outputs, which included six accredited articles, one book chapter and 12 conference outputs with student participations. NRF funding was secured for two independent vegetable-type soybean research projects of which one has completed and the other one on drought stress breeding is ongoing. My engaged scholarship activities has gained much momentum with additional collaboration and funding that was established with TransfOrmus. With this project I assist in obtaining evidence for new biotransformant products to be registered as bio-fertilisers with the Department of Agriculture, Forestry and Fisheries in South Africa. Further engagement in scholarly activities included internal (one) and external (five) examination of Master's dissertations and two internal, and one external PhD theses respectively. I am also honoured in being invited to externally moderate one undergraduate module for Stellenbosch University and one postgraduate course for the University of KwaZulu-Natal. I was invited to review a few more articles to be published in accredited journals as well as research projects from the NRF. As part of my leadership and administration duties, I became a member of three departmental committees where my

inputs in teaching and learning, research and title registrations of students were required. I currently serve as the chair of the Title and Examiner Registration Committee.

I am honoured that the opportunity came along to apply for promotion to be promoted to Associate Professor at the UFS. This is based upon evidences that comply with the specific requirements for promotion within our Faculty of Natural and Agricultural Sciences. My outputs generated during the 13 years of service at the UFS comply with the requirements of each of the four focus criteria: Teaching and Learning, Research, Engaged Scholarship, and Leadership and Administration. I have delivered the required 20 publications and have an exceptional student supervision track record with 10 MSc and six PhD students who obtained their qualifications under my supervision. I am an independent researcher who is able to secure research funding and generate third stream income. For Teaching and Learning, I have demonstrated excellence in course and materials development, academic development initiatives and obtain excellent student evaluations. I have completed Master's and PhD supervision, and has a track record as external examiner. I am making progression in terms of the scholarship in Teaching and Learning and curriculum innovation with the courses I am attending currently. For Research, I am established researcher who is enjoying considerable international recognition based on my research outputs and professional work. For Engaged Scholarship, I have demonstrated excellence in activities as editor/reviewer of prestigious journals with interactions with industry and professional sectors. I am a specialist advisor to national, and public sector organisations and respected outside the UFS in my field of expertise. I also have engaged scholarship (due to expertise) inside the university. For Leadership and Administration, I am an active member of the Faculty Board and I effectively and efficiently carry out departmental administrative responsibilities. I serve as a departmental leader who effectively chair a departmental committee.

I have shown dedication to work with both undergraduate and postgraduate students, and perseverance to accomplish my work and research goals, but most of all I am blessed to continue what I love, working with plants.

## **TERTIARY EDUCATION**

---

### **UNDERGRADUATE DEGREE:**

**2003: BSc Agriculture, Plant Breeding and Genetics**

University of the Free State, Bloemfontein

## **POSTGRADUATE DEGREES:**

### **2005: MSc Agriculture, Plant Breeding**

University of the Free State, Bloemfontein

Dissertation: Characterization of kenaf (*Hibiscus cannabinus* L.) cultivars in South Africa

Supervisors: Prof M.T. Labuschagne, Prof L. Herselman

### **2011: PhD, Plant Breeding**

University of the Free State, Bloemfontein

Thesis: Genotype by environment interaction for oil quality in high oleic acid sunflower lines.

Promoters: Prof M.T. Labuschagne, Prof L. Herselman, Prof A. Hugo

#### **Abstract:**

This study made a valuable contribution towards high oleic acid sunflower breeding in South Africa, since it was possible to identify high oleic acid hybrids that showed stability and adaptability for the high oleic acid trait in different environments and under different temperature conditions. High heritability estimates, observed from genetic analyses for oleic and linoleic acid contents, will contribute to further development of high oleic sunflower hybrids in heat stress conditions. Additionally, molecular markers linked to the high oleic acid trait have been identified that may possibly be implemented in breeding programmes in order to select more accurately for the high oleic acid trait. High oleic sunflower seed oil proved to have superior oil quality and oxidative stability properties to traditional sunflower oil and the South African hybrids will meet the demands for more healthy and stable sunflower oil.

## **RESEARCH INTERESTS AND SKILLS**

---

- My principle research interest lies in the field of conventional plant breeding, since conventional breeding is and will remain the foundation of any breeding programme.
- In addition, I am interested in combining conventional and molecular breeding because molecular breeding is becoming important in the acceleration of breeding programmes and the private sector began to understand the importance of this strategy.
- I have implemented a soybean breeding programme for new and improved cultivar development. This breeding programme has value in research outputs as well as in student training. Students currently get

more exposure to the practical side of plant breeding as well as gain experience that is necessary for future employment in the field of plant breeding.

- My future research plans are to release new soybean cultivars that were developed at the UFS, work more closely with the industry in order to improve chances for project funding, increase research outputs through student supervision and publication and establish new techniques such as tissue culture that will aid in the breeding programme.

### **Experimental trials:**

Knowledge on field and glasshouse trial experiments and various types of field trial designs necessary to answer research questions. Knowledge include the following procedures:

- Normal quantitative trial designs as well as factorial designs.
- Drought- and heat stress evaluation in both the field and glasshouse trials.
- Root and shoot evaluation using specialised pots.
- Soybean diallel crossing designs.

### **Laboratory analysis:**

Knowledge on the following laboratory techniques and procedures:

- Seed lipid extraction using the chloroform:methanol procedure (Folch *et al.* 1957), methylation (Slover and Lanza, 1979) and quantification of fatty acids using capillary gas chromatography.
- Plant DNA extraction with CTAB isolation method and concentration determination.
- Generating DNA markers and fingerprinting plant cultivars and lines using the amplified fragment length polymorphism (AFLP) technique.
- Agarose and polyacrylamide gel electrophoresis.
- Silver-staining of polyacrylamide gels.
- Colorimetric analysis of sugar and sucrose in soybean.
- Free proline content extraction and determination using the ninhydrin-based method according to Gibon *et al.* (2000) as modified by Carillo *et al.* (2011).
- Sugar and sucrose concentration determination using the resorcinol hydrochloric acid method described by Huber *et al.* (1982).

### **Data analysis:**

Knowledge and interpretation of various statistical analyses using the computer programs Agrobases and Genstat.

## **EMPLOYMENT HISTORY**

---

<b>December 2018 to date:</b>	Title of Senior Lecturer	- University of the Free State
<b>June 2011-November 2018:</b>	Title of Lecturer	- University of the Free State
<b>2009-May 2011:</b>	Title of Professional Officer	- University of the Free State
<b>2004-2009:</b>	Title of Research Assistant	- University of the Free State

## **FORMAL TEACHING AND LEARNING EXPERIENCE**

---

“I believe the new generation of students need more than just knowledge and should learn through experience. I aim to create experiences in the classroom that are as authentic as possible to mimic real-life application of knowledge. I encourage students to use scientific materials including articles to solve problems. Through scientific inquiry, students do not only learn new information but also how to go about seeking truths through accurate and reliable testing methods. I like to assess students’ practical applications of knowledge rather than simply their written knowledge of information. When students are assessed on their practical skills, they focus on how to put knowledge into action and in that way master the course content. I often use students’ assessment results to reflect upon how I taught the content, what areas of weakness appeared across a cohort, and how to teach to those areas of weakness more effectively in years to come.”

### **UNDERGRADUATE MODULES:**

#### **2011-2014: PLT224 - Introduction to Plant Breeding Techniques**

#### **NQF level 6, 16 credits, 2nd semester module**

This module serves as an introduction to plant breeding. On completion the student will be acquainted with the basic concepts and terminology of plant breeding. The student will have the knowledge to develop self-pollinated, cross-pollinated and vegetatively propagated species. Although the emphasis is on conventional plant breeding, students are exposed to laboratory and biotechnological techniques that may improve breeding efficiency. Differences between qualitative and quantitative characteristics, and how the breeder can select for them, are also addressed.

During 2014 this programme was split into two courses, PLTB2613 and PLTB2623, which were presented from 2015 onwards. I developed the content for both courses, which consisted of 50% original course material and 50% new course material.

**2015: PLTB2613 - Theoretical Principles of Plant Breeding**

**NQF level 6, 12 credits, 1st semester module**

This module deals with the theoretical science of Plant Breeding with the emphasis on genetic principles and concepts. This includes Mendelian and quantitative inheritance, mechanisms and implications of self- and cross-pollination, the study of phenotypic variation and the sources of genetic variability. The Plant Breeding techniques used to manipulate fertility-regulating systems as well as biotechnology methods as tools are being studied.

**2015-2018, 2021: PLTB2623 - Applied Principles of Plant Breeding**

**NQF level 6, 12 credits, 2nd semester module**

This module deals with the practical aspects of plant breeding with the emphasis on conventional breeding techniques and selected breeding objectives. This includes sexual hybridisation as a tool in plant breeding. The classic methods of breeding self- and cross-pollinated species as well as hybrid breeding are being studied.

**2011-2016, 2019: PLT314/PLTB3714 - Selection Methods and Quantitative Genetics in Plant Breeding**

**NQF level 7, 16 credits, 1st semester module**

This module concerns the different selection methods that can be used by the breeder for crop improvement. These methods include selection for qualitative and quantitative characteristics in self-pollinating, cross-pollinating and vegetatively propagated species. Response to selection, the influence of environment on the genotype and the genetic basis of inbreeding and heterosis are emphasised. On completion of the module the student will have the knowledge to decide on the most appropriate selection procedure for a specific breeding aim.

**2016 to date: BLGY1643 - The Interdependence of Plants and Life on Earth**

**NQF level 6, 12 credits, 2nd semester module**

This module contains fundamental knowledge, theories, principles and practices of Plant Sciences, including: the important role plants played during the development of life on earth. A number of topics are addressed during this module, which include the transition from single celled water living algae to terrestrial



plants, the influence of plants on the climate and development of habitats on land, the diversification and domestication of plants as one of the major driving forces in the diversification of animals and humans and the adaptations of plants to different ecological niches that allowed the colonisation. The different topics are presented by various lecturers. I present two, one-hour, lectures as well as a three-hour practical session (which is repeated six to seven times to accommodate  $\pm 300$  students) within this course in order to introduce the basic principles and practises of Plant Breeding to the 1st year students.

**2017 to date: PLTB4854 - Statistics in Plant Sciences**

**NQF level 8, 16 credits, 1st semester module**

After successful completion of this module, you should be able to plan trials and execute them, obtain data from them, analyse the data and make sound conclusions from the output. The student should have a sound knowledge of statistical principles and how it is applied in plant sciences. The student should also have the computer skills to use appropriate software for analysis.

**POSTGRADUATE MODULES:**

**2007-2012: PWS614 - Research Techniques: Greenhouse Management**

**NQF level 8, 16 credits, 1st semester module**

A three hour lecture was given in which the students are familiarised with greenhouse operation and management. Greenhouse structures, management of the greenhouse environment for optimal plant growth as well as sanitation and planting practices are topics that were discussed with students.

**2017 to date: PLTB6854/6874 - Advanced Statistics in Plant Sciences**

**NQF level 8, 16 credits, 1st semester module**

After successful completion of this module, the student should be able to plan trials and execute them, obtain data from them, analyse the data and make sound conclusions from the output. The student should have a sound knowledge of statistical principles and how it is applied in plant sciences. The student should also have the computer skills to use appropriate software for analysis.

**2012 to date: PLT4806/6806 - Seminar in Plant Breeding**

**NQF Level 8, 24 credits, 1st semester module**

This module provides the student with the opportunity of doing research on a particular subject and to present the research in a seminar form. The topic is researched by literature study and other sources. It is expected of the students to do independent research, to make his/her own conclusions and to handle the

material technically correct. It is also seen as a training school for post-graduate study. Assessment is continuous, with no formal examination required. A seminar is presented orally.

**2012 to date: PLTB4808/6808 - Research Basics in Plant Breeding**

**NQF Level 8, 24 credits, 2nd semester module**

The student acquires information on a specified research topic that is related to their research project in plant breeding and assimilates the information in an organized and logical format according to the requirements for scientific publications. Students are not expected to conduct their projects in isolation but will work closely with their respective supervisors. Upon completion of the module students will have had exposure to problem identification, hypothesis formulation, planning, conducting and analysis of experiments as well as the interpretation and communication of results. Assessment is continuous, with no formal examination required. A seminar is presented orally.

**2015 to date: PLTB8900 – Master of Science in Agriculture (MSc) - Plant Breeding**

**NQF Level 9, 180 credits, 2 year programme**

This learning programmes aim at providing the student with the opportunity to present evidence of advanced study and research characterised by intellectual independence and advanced knowledge of a specialisation area in the subject, as well as accurate assessment of his/her own results and that of others by production of a dissertation. This place the student's research in broader context and which is capable of withstanding international intellectual scrutiny. This programme also aims at developing the student in order to demonstrate knowledge and understanding of supervised planning and execution of a research project in the discipline. This project includes hypothesis formulation, collecting appropriate experimental materials, optimising techniques and procedures, data acquisition, analysis and interpretation of results, and writing of a dissertation according to a structured format and related literature.

**2013 to date: PLTB9100 – Doctor of Philosophy (PhD) in Plant Breeding**

**NQF Level 10, 360 credits, 3 year programme**

This learning programme aims to provide the opportunity for students, who have already obtained a NQF Exit Level 9 qualification and have contributed extensive publications of exceptional quality in the specific subject field or discipline over a considerable period of time. The research project includes hypothesis formulation, collecting appropriate experimental materials, developing or optimising techniques and procedures, data acquisition, analysis and interpretation of results, and writing of a thesis according to a structured format and related literature. This enable the student to make an original contribution to the discipline.

## **SHORT LEARNING PROGRAMMES:**

### **2013-2014: Plant Breeding Lab: Principles of Plant Breeding**

For two consecutive years, I presented one section of a three-day Plant Breeding short course that are were presented to industry on invitation. In 2013, this course was presented at Starke Ayres and in 2014 at SASRI (South African Sugarcane Research Institute).

## **POSTGRADUATE SUPERVISION:**

### **BSc Agric. 4th year literature review and projects supervised:**

<u>Student name</u>	<u>Supervisor/Co-supervisor</u>	<u>Degree obtained</u>
JGR Bornman	Co-supervisor	2018
DE Bubb	Co-supervisor	2020
RD Coertzen	Supervisor	2020
K Hlatshwayo	Supervisor	2020
HJ Basson	Co-supervisor	2021
RP Reyneke	Co-supervisor	2021
JR Vos	Supervisor	2022
JB Fourie	Supervisor	Continuing

### **Honours degree literature review and projects supervised:**

<u>Student name</u>	<u>Supervisor/Co-supervisor</u>	<u>Degree obtained</u>
HTB Bekker	Supervisor	2013
MP Makongwane	Supervisor	2013
NW Mbuma	Supervisor	2015
PS Nzama	Supervisor	2015
CT Basson	Supervisor	2017
T Mishasha	Supervisor	2017
JB van der Merwe	Supervisor	2018
FJ Botha	Co-supervisor	2018
S Zungu	Co-supervisor	2020

CG Omenoba	Supervisor	2020
C Cillié	Supervisor	Continuing

**Master's degrees supervised:**

<u>Student name</u>	<u>Supervisor/Co-supervisor</u>	<u>Degree obtained</u>
NW Mbuma	Supervisor	2017
JH Husselman	Co-supervisor	2018
C Hills (Food Science)	Co-supervisor	2018
RC Marx	Co-supervisor	2019
PS Nzama	Supervisor	2019
T Mishasha	Co-supervisor	2019
JB van der Merwe	Supervisor	2021
F Msani	Co-supervisor	2021
RS Banda	Co-supervisor	2021
JM Hlahla	Co-supervisor	2022
RD Coertzen	Supervisor	Continuing
K Hlatshwayo	Supervisor	Continuing
M Combrinck	Supervisor	Continuing
R Lombaard	Supervisor	Continuing
R Reyneke	Co-supervisor	Continuing
HJ Basson	Co-supervisor	Continuing

**Doctoral degrees supervised:**

<u>Student name</u>	<u>Promotor/Co-promotor</u>	<u>Degree obtained</u>
S Bah	Co- promotor	2015
OJ Mwenye	Promotor	2018
NW Mbuma	Co-promotor	2019
A Smit	Promotor	2019
M Chiipanthenga	Promotor	2020
JF Swanepoel	Promotor	2022
S Sengwayo	Promotor	To submit 30 July 2022
T Mishasha	Co-promotor	Continuing

## RESEARCH EXPERIENCE

---

### PROJECTS:

**2003-2005: My own MSc Study - Kenaf cultivar trials in Winterton (KwaZulu-Natal)**

Project funded by National Research Foundation (NRF)

*Type of work done*

Planting, maintaining, and harvesting of the kenaf field trials on two farms planted in Winterton. The farms planted were selected for dry land and irrigated trials respectively. Nine different cultivars were planted to determine the genotype by environment interaction for yield and the stability of the cultivars across years were also determined. Data collected included plot yield, and for individual plants wet yield, defoliated stem and dry stem yield, stem diameter at the base and middle of the stem, and plant length.

**2003-2004: The influence of environmental factors and agricultural practices on wheat falling number**, by Dr Maryke Craven.

Assisted with cold treatments of plants as part of the PhD wheat project.

**2005: The influence of heat and cold stress on gluten protein and starch in wheat**, by Elago Oskar.

Assisted with the cold and heat treatments of plants as part of the MSc wheat project:

*Type of work done*

Growing and general maintenance (fertilizing, and disease and pest control) of the wheat trials throughout the growing seasons. Assisted in both the high- and cold temperature treatments of the wheat plants in the growth chambers. All plants were individually studied to ensure that the tiller was at the correct stage of development required for the specific treatment. Two treatments were administered when the main tillers were at late milk- and soft dough stage respectively.

**2007-2008: Kenaf research project on the influence of storage time and temperature on kenaf seed viability**

*Type of work done*

Greenhouse trials were planted to multiply and collect fresh seed from nine cultivars. After harvesting the seed were stored for 1, 5 and 10 months at the three different temperatures (room temperature, 4°C and 30°C). After each time frame the seed were sampled and tested for germination percentage and prepared for oil fatty acid analysis. The data collected from the different treatments were prepared for statistical analyses.

**2005-2008: My own PhD Study - High-oleic sunflower variety trials in conjunction with PANNAR (Delmas)**

Project funded by National Research Foundation (NRF) and Oilseeds Advisory Committee

*Type of work done*

Managing the necessary greenhouse and field trials for collection of data as well as seed- and leaf material for laboratory experiments.

Laboratory experiments that were performed during the research project include:

- Seed oil content and fatty acid analysis for determination of genotype by environment interaction and stability across varieties and years.
- Seed oil content and fatty acid analysis for determination of the grain oil composition after exposure to a heat stress period during grain-filling.
- Single kernel oil extraction and fatty acid analysis for the determination of the oil composition of the seed from a F<sub>2</sub> plant population. The data was used to distinguish homozygotes and heterozygotes for the high-oleic acid content trait for molecular marker analysis using the AFLP technique and SSR analysis.
- Seed oil extraction using the Soxhlet system for oil quality and stability determination through testing the iodine values, peroxide values, refraction index, free fatty acids and fatty acid analysis.

**2012-2016: Principal Investigator – 1st project**

**The role of proline in selection and breeding for drought stress tolerance in soybean**

Project in collaboration with Pannar Seed, Greytown; Project funded by UFS Cluster and NRF Thuthuka.

Student and qualification: OJ Mwenye (PhD)

The aims of this study were 1) to examine the response of drought tolerant and drought susceptible soybean breeding lines to drought stress and 2) to determine if proline content can be used as a putative physiological marker to discriminate between drought tolerant and –susceptible soybean genotypes. With this study the mechanisms involved in drought tolerance in soybean were investigated. This project links with the Technologies for Sustainable Crop Industries in Semi-arid regions and the focus area improved resistance of crops to abiotic stress factors. Results from this project will facilitate in the development and release of drought tolerant soybean varieties that are adapted to marginal and semi-arid cropping areas such as the Free State and Northern Cape. This will consequently lead to the expansion of soybean production in South Africa as there is a high demand for soybean products, especially for human nutrition in the rural areas. With this study different soybean phenotypes were analysed for stress physiology and agronomy traits under optimal water and drought stress conditions. With this study, the developmental stages that were most responsive to a given drought stress level was identified. A new technique, using proline as a biochemical marker that will differentiate between genotypes for drought stress tolerance and susceptibility were investigated. This technique was found to be simple, effective and rapid in identifying tolerant soybean genotypes in multi-location trials. This technique will make a valuable contribution towards the breeding of drought tolerant soybean varieties.

**2014-2016: Principal Investigator – 2nd project**

**Soybean cultivar selection for improved yield and yield stability**

Project in collaboration with the Edamame Development Program, the ARC Grain Crops Institute; Project funded by the Oilseeds Advisory Committee.

Students and qualifications: CG Omenoba and C Basson (BSc Agric. Hons); A Smit (PhD)

Yield instability across locations and seasons make it difficult to identify one high yielding soybean cultivar that show good yield potential and stable yields at one specific location or adaptation across various locations. Grain yield is a quantitative trait, which is largely influenced by the environment and management practises (determined by planting location, weather conditions, solar radiation, humidity, temperature, day length, planting date, etc.). In addition, grain yield is a complex trait and in order to estimate yield, various yield components need to be considered. Since yield components are of quantitative nature, in order to successfully select cultivars for stable and high grain yields, it is necessary: 1) to acquire information about the nature and magnitude of genetic variability present in the available cultivars and 2) to know the interrelationships among yield components and their direct effects on yield. An understanding of the relations of the various characters with seed yield is essential so as to find appropriate selection

criteria. This study was conducted to determine the correlation between grain yield and certain yield components as well as the direct and indirect effects of these traits on grain yield in soybean.

**2015-to date Principal Investigator – 3rd project**

**Breeding for resistance to pod dehiscence in vegetable-type soybean**

Project in Collaboration with the Northeast Institute of Geography and Agroecology, Chinese Academy of Sciences; Project funded by the NRF-SA/China Collaborative Project and own entity funds.

Student and qualification: K Hlatshwayo (BSc Agric. 4th year and continuing with MSc Agric.)

The dehiscence of pods (shattering) is an undesirable trait of vegetable-type soybean (Edamame) as it leads to huge yield losses especially when susceptible varieties are grown and harvesting is delayed after maturity. This trait is observed in varieties that are being tested in trials across locations in the Free State, KwaZulu-Natal and the Eastern Cape provinces of South Africa. However, phenotypic variation for pod shattering is observed and the trait is highly regulated by environmental conditions. Shattering resistance is a pre-requisite for adoption of varieties in both commercial production where combine harvesters are used, as well as by the farming communities where shortage of harvesting equipment or labour occurs. There is a need to develop resistant varieties that can stand in the field for longer periods after maturity. Conventional methods for evaluating pod shattering are not convenient for use in a backcross breeding programme since this trait is conditioned by one major and a few minor quantitative trait loci (QTL). However marker-assisted selection (MAS) is a more efficient method. Simple sequence repeat (SSR) markers linked to a major QTL have been reported that could be useful for MAS in a soybean breeding programme. The aim of the project is to introduce non-shattering genes into a large-seeded vegetable-type variety, which has a determinate growth habit, short growth cycle and good yield potential.

**2017-2020: Principal Investigator – 4th project**

**Green pod yield and nutritional content of large-seeded (vegetable-type) soybean**

Project in collaboration with the Edamame Development Program; Project funded by, NRF Thuthuka.

Student and qualifications: JB van der Merwe (Both BSc Agric. Hons and MSc); C Hills (MSc)

Large-seeded (vegetable-type) soybean has been introduced to South Africa as a supplementary high quality protein food source that is eaten as a green vegetable and that is non-genetically modified. The crop is promoted for small-scale farming and community garden projects with emerging farmers currently growing large-seeded soybean under contract. Farmers grow the crop for own use as well as to earn an income from their produce. Varieties are being grown and tested nationally in order to identify top yielding and stable varieties for seed production. However, being a food crop that is harvested in the immature stage, there is



a need to evaluate varieties for green pod yield and nutritional quality. A market for the produce have been established, but quality characterisation is recommended. The aim of this study was to evaluate large-seeded soybean varieties for green pod yield and nutritional characteristics across various growth conditions in order to make available high yielding varieties to the producers and an alternative vegetable food product that is of exceptional quality to the end market.

**2020 to date: Principal Investigator – 5th project**

**Developing a Breeding strategy for vegetable-type soybean (*Glycine max* L.) under abiotic stress conditions**

Project in collaboration with the Edamame Development Program; Project funded by CRF UFS during and the NRF Competitive Support for Unrated Researchers.

Students and qualifications: JR Vos (BSc Agric. 4th year); RD Coertzen (MSc Agric. continuing)

From previous research projects we were able to characterise a group of vegetable-type soybean cultivars in terms of yield potential and stability. From data collected, high yield potential varieties have been identified for production but most of these have shown yield instability across locations and seasons. This is partly attributed to their sensitivity to periods of heat and drought stress conditions that have been occurring during the months of December to February during the past four years. Drought stress during the reproductive stages have shown to reduce grain yield by up to 70% in sensitive vegetable-type soybean varieties. However, there is a need to investigate the effects of heat- and drought stress simultaneously on the yield, yield components and nutritional components of this crop. The aim of this study was to identify vegetable-type soybean varieties that show tolerance to both heat- and drought stress conditions that would give a good mean yield productivity under these stress conditions. This is needed in order to make high yielding varieties available to the producers and to provide an alternative vegetable food product that is of exceptional quality to the end market.

**2021 to date: Principal Investigator – 6th project**

**Evaluating the effect of EnOrmus and Soil Life Combo on plant biomass and yield of vegetable-type soybean and maize cultivars**

Project in collaboration with TransOrmus and the Department of Soil, Crop and Climate Sciences (UFS); Project funded by TransOrmus.

Student and qualification: JB Fourie (BSc Agric. 4th year continuing)

A vast number of different plant growth regulators, biofertilizers and biostimulants are available in South Africa. An alternative product, known as enOrmus, is regarded a biostimulant as its formula combines the benefits of fulvic acid and Ormus into a product which maximizes plant productivity and yield potential. Ormus minerals are concentrated from pristine salts and alchemically transformed into their mono-atomic state, making these essential and rare minerals beneficial for all cellular life. Previous research studies and field trials have indicated that enOrmus radically improved height and trunk growth in citrus trees, yield in wheat, and biomass yield and pod number per plant in vegetable-type soybean. However, in order to register this product as a “group 3 fertilizer” with the Department of Agriculture, Forestry and Fisheries in South Africa, proof must be provided of the efficacy of the product and that the product has no harmful or detrimental effect on the soil or plants. Appropriate trials and investigations need to be conducted that are related to any claims made regarding the efficacy and directions of use of enOrmus. Registration of products used in agriculture is crucial to ensure their practical, safe and legitimate application. The aims of the project are to investigate and statistically evaluate the effect of “enOrmus” and “Soil Life Combo” at variable application rates on above soil plant biomass, yield components and grain yield of vegetable-type soybean and maize cultivars under field conditions and to evaluate possible phyto-toxicity effects on these crops.

**2022: Principal Investigator – 7th project**

**Breeding *Hemerocallis* for pollinators and people**

Project in collaboration with Botany, within the Department of Plant Sciences.

Project funded by own entity.

Student and qualification: C Cillié (BSc Hons. continuing)

Urbanisation has shown to be associated with a change in pollinator community composition, which includes a decrease in insect pollinator species richness and abundance. However, some urban areas have a neutral or even positive effect on the biodiversity of wild bee species. Botanical gardens and residential gardens may be particularly rich in wild bee species. This can be because they contribute both nest sites and forage resources. The diversity of flowering plants in urban gardens have been shown to be positively related to bumblebee and solitary bee diversity. *Hemerocallis* is a possible candidate to be improved through breeding to aid pollinators in urban gardens, since they have a range of colours and produce nectar and pollen that can be used to attract pollinators. By improving these characteristics, it is possible to breed an improved variety to aid and attract more pollinators; however, more research is needed. Until now, most studies and breeding in *Hemerocallis* focussed on improvement of flower colour, shape and size but the amount of pollen and nectar produced were neglected. The aim of this project is to determine if breeding can improve *Hemerocallis* as a food plant for urban pollinators.

## **FUNDING SOURCES:**

### **2012-2016: The role of proline in selection and breeding for drought stress tolerance in soybean**

Project in collaboration with Pannar Seed, Greytown

Project funded by UFS Cluster (2013 - R 55000.00), NRF Thuthuka, Reference: TTK13060318439 (2014-2016 – R468,154.00)

### **2014-2016: Soybean cultivar selection for improved yield and yield stability**

Project in collaboration with the Edamame Development Program, the ARC Grain Crops Institute

Project funded by Oilseeds Advisory Committee (2015-2016 – R92,143.00)

### **2015 to date: Breeding for resistance to pod dehiscence in vegetable type soybean**

Project in Collaboration with the Northeast Institute of Geography and Agroecology, Chinese Academy of Sciences

Project funded by the NRF-SA/China Collaborative Project, Reference: CHN14022465459 (2015-2017 – R179,308.00; own entity funds to date)

### **2016: Evaluation of drought tolerance in soybean using selected morphological and biochemical traits**

Funding source: NRF Knowledge Interchange and Collaboration - International Travel (Conference, Research Visit Abroad, Foreign Research Visitor)

Grand UID 104549 - R25,000.00

Funding was used to present a poster at the 20th Eucarpia General Conference, ETH, Zurich, Switzerland, 29 August to 1 September 2016.

### **2017-2020: Green pod yield and nutritional content of large-seeded (vegetable-type) soybean**

Project in collaboration with the Edamame Development Program

Project funded by, NRF Thuthuka, Reference: TTK160506164249 (2017-2019 – R501,503.00)

### **2020 to date: Developing a Breeding strategy for vegetable-type soybean (*Glycine max* L.) under abiotic stress conditions**

Project in collaboration with the Edamame Development Program

Project funded by CRF UFS during 2020-2021 (R120,000.00)

Project funded by, NRF Competitive Support for Unrated Researchers, Reference: SRUG200309508637 (2021-2022 – R401,059.00)

**2021 to date: Evaluating the effect of EnOrmus and Soil Life Combo on plant biomass and yield of vegetable-type soybean and maize cultivars**

Project in collaboration with TransOrmus and the Department of Soil, Crop and Climate Sciences (UFS);

Project funded by TransOrmus (2022 - R 7,833.64)

**JOURNAL PUBLICATIONS:**

1. **Coetzee, R.**, Herselman, L. and Labuschagne, M.T. 2008. Genetic diversity analysis of kenaf (*Hibiscus cannabinus* L.) using AFLP (amplified fragment length polymorphism) markers. *Plant Genetic Resources: Characterization and Utilization* 7(2): 122–126. – Q4 Journal
2. **Coetzee, R.**, Labuschagne, M.T. and Hugo, A. 2008. Fatty acid and oil variation in seed from kenaf (*Hibiscus cannabinus* L.). *Industrial Crops and Products* 27: 104–109. – Q1 Journal
3. **Van der Merwe, R.**, Labuschagne, M.T., Herselman, L. and Hugo, A. 2013. Stability of seed oil quality traits in high and mid-oleic acid sunflower hybrids. *Euphytica* 193: 157-168. – Q2 Journal
4. **Van der Merwe, R.**, Labuschagne, M.T., Herselman, L. and Hugo, A. 2015. The effect of heat stress on seed yield and oil quality traits in high and mid-oleic sunflower hybrids *South African Journal of Plant and Soil* 32(3): 121–128. – DHET Journal (No quartile)
5. Mwenye, O.J., Van Rensburg, L., Van Biljon, A. and **Van der Merwe, R.** 2016. The role of proline and root traits on selection for drought-stress tolerance in soybeans: a review. *South African Journal of Plant and Soil* 33(4):245-256. – DHET Journal (No quartile)
6. De Wit, M., Hugo, A., Shongwe, N. and **Van der Merwe, R.** 2016. Effect of cultivar, season and locality on lipid content and fatty acid composition of cactus pear seed oil. *South African Journal of Plant and Soil* 33(4):279-288. – DHET Journal (No quartile)
7. Moloi, M.J., Mwenye, O.J. and **Van der Merwe, R.** 2016. Differential involvement of ascorbate and guaiacol peroxidases in soybean drought resistance. *South African Journal of Science* 112:1-4. – Q2 Journal
8. Bah, S., **Van der Merwe, R.** and Labuschagne, M. 2017. Estimation of outcrossing rates in intraspecific (*Oryza sativa*) and interspecific (*Oryza sativa* × *Oryza glaberrima*) rice under field conditions using agro-morphological markers. *Euphytica* (2017) 213:81. DOI: 10.1007/s10681-017-1872-x. – Q2 Journal

9. Mbuma, N.W., Zhou M.M., **Van der Merwe, R.** 2017. Identifying Elite Families and Determining Optimum Family Selection Rates in Sugarcane Breeding. *Crop Science* 57(5): 2525-2537 DOI: 10.2135/cropsci2017.01.0011. – Q1 Journal
10. Bah, S., Labuschagne, M. and **Van der Merwe, R.** 2018. Genetic diversity of improved varieties of intraspecific (*O. sativa* and *O. glaberrima*) and interspecific (*O. sativa* × *O. glaberrima*) rice. *Genetic Resources and Crop Evolution* 65:797–809. DOI: 10.1007/s10722-017-0573-6. – Q3 Journal
11. Mbuma, N.W., Zhou, M.M. and **Van der Merwe, R.** 2019. Comparing family with individual genotype breeding parameters for cane yield in sugarcane populations. *South African Journal of Plant and Soil* 36(1): 11-19. <https://doi.org/10.1080/02571862.2018.1465135> – DHET Journal (No quartile)
12. Mbuma, N.W., Zhou, M.M., **Van der Merwe, R.** 2019. Evaluating parents for cane yield in sugarcane breeding using best linear unbiased prediction analysis of progeny data derived from family plots. *South African Journal of Plant and Soil* 36(1): 21–28. DOI: 10.1080/02571862.2018.1465136. – DHET Journal (No quartile)
13. Mbuma, N.W., Zhou, M.M. and **Van der Merwe, R.** 2020. Family × environment interaction for sugarcane yield and its components in South Africa. *Crop Science* 60(3): 1239-1253. – Q1 Journal
14. Mbuma, N.W., Zhou, M.M., **Van der Merwe, R.** 2020. Estimating breeding values of genotypes for sugarcane yield using data from unselected progeny populations. *Euphytica* (2020) 216: 2. <https://doi.org/10.1007/s10681-019-2540-0>. – Q2 Journal
15. Chiipanthenga, M.K., Labuschagne, M.T., Fandika, I.R. and **Van der Merwe, R.** 2021. Combining ability of soybean (*Glycine max* L.) yield performance and related traits under water-limited stress conditions. *Euphytica* 217: 41 <https://doi.org/10.1007/s10681-021-02780-5>. – Q2 Journal
16. Moloi, M.J. and **Van der Merwe, R.** 2021. Drought tolerance responses in vegetable-type soybean involve a network of biochemical mechanisms at flowering and pod-filling stages. *Plants (Basel)* 10 :1502. <https://doi.org/10.3390/plants10081502>. – Q1 Journal
17. Hlahla, J.M., Mafa, M.S. and **Van der Merwe, R.**, Alexander, O., Duvenhage, M.-M., Kemp, G., Moloi, M.J. 2022. The photosynthetic efficiency and carbohydrates responses of six edamame (*Glycine max*. L. Merrill) cultivars under drought stress. *Plants (Basel)* 2022(11): 394. <https://doi.org/10.3390/plants11030394>. – Q1 Journal

## BOOK CHAPTERS:

1. **Van der Merwe, R.** and Hugo, A. 2013. Sources of oleic acid and their technological and health implications. In: Silva, L.P. (ed), Oleic acid: Dietary Sources, functions and health benefits. Nova Publishers Inc. pp. 105-126.
2. **Van der Merwe, R.** and Labuschagne, M. 2014. Effects of temperature on oleic acid percentage during grain-filling in sunflower and other oil crops. In: Whelan, L. (Ed.), Oleic Acid: Production, Uses and Potential Health Effects. Nova Publishers, Inc. pp. 99-128. ISSN/ISBN: 978-1-63117-576-3.
3. Mwenye ,O.J., Van Rensburg, L., Van Biljon, A. and **Van der Merwe, R.** 2019. Seedling shoot and root growth responses among soybean (*Glycine max*) genotypes to drought stress. In: Kasai M (ed.), Soybean biomass, yield and productivity (2019), INTECHOPEN LIMITED, ISBN 978-1-78985-373-5. London, EC3R 6AF, UK. Pp 59-68.

## POPULAR ARTICLES:

1. SA Graan - **Van der Merwe, R.** 2013. DIE SOJABOON: Die Wonder Goue Boontje. SA Graan/Grain, June 2013, pp 8-9.
2. Oilseeds Focus - **Van der Merwe, R.** 2015. High-oleic sunflower oil – a healthy alternative. Oilseeds Focus volume 1, number 1, April 2015, pp 26-27. ISSN 2410-1206.
3. MOL – Mwenye, O., Van Rensburg, L. and **Van Der Merwe, R.** 2015. Seedling shoot- and root growth responses among soybean genotypes to drought stress. MOL - SOCIEDAD de CIENCIAS de GALICIA, N° 14-15, Octubre - October, 2015, pp 14-21.
4. MOL – **Van Der Merwe, R.** and Smit, A. 2016. Seed yield potential of vegetable type soybean genotypes in South Africa. MOL - SOCIEDAD de CIENCIAS de GALICIA, N° 16, Octubre - October, 2016, pp 7-17.
5. Mbuma, N.W., Zhou M.M. and **Van Der Merwe, R.** 2016. Family versus individual genotype selection for sugarcane yield in Midlands breeding populations of South Africa. Proceedings of the South African Sugar Technologist's Association, (2016) 89:229-233 (Short, Non-Refereed Paper)
6. MOL - **Van der Merwe, R.**, Tyawana, S., Van der Merwe, J. and Mwenye, O. 2018. Evaluation of drought tolerance indices in vegetable-type soybean. MOL - SOCIEDAD de CIENCIAS de GALICIA, N° 18, Noviembre - November, 2018, pp 19-31.

7. MOL - **Van der Merwe, R.** and Coertzen, D. 2020. Soybean genotypic responses in terms of yield and related traits to plant growth regulator treatments. MOL - SOCIEDAD de CIENCIAS de GALICIA, N° 20:5, Diciembre - December, 2020, pp 1-15.
8. MOL - **Van der Merwe, R.**, Van Biljon, A., Hugo, A. and Van der Merwe, J. 2021. Relationships between yield and nutritional components of vegetable-type soybean genotypes using correlations and principal component analysis. MOL – SOCIEDAD de CIENCIAS de GALICIA, N° 21 Diciembre - December, 2021, pp 1-12; ISSN: 1133- 3669.
9. MOL - DE Ron, A.M., Cartea, E. and **Van der Merwe, R.** 2021. The challenges of some horticultural crops in the international year of fruits and vegetables. MOL – SOCIEDAD de CIENCIAS de GALICIA, N° 21, Diciembre - December, 2021, pp 1-10; ISSN: 1133- 3669.

### CONFERENCE AND SYMPOSIUM PRESENTATIONS:

1. **Van der Merwe, R.**, Hugo, A., Herselman, L. and Labuschagne, M. 2012. Physicochemical and oxidative stability characteristics of high- and mid-oleic sunflower seed oil. POSTER: 18th International Sunflower Conference, Mar del Plata and Balcarce, Argentina, 27 February to 1 March 2012.
2. **Van der Merwe, R.**, Van Biljon, A. and Hugo, A. 2013. Current and potential usage of soybean products as food in South Africa. ORAL: 9th World Soybean Research Conference, Durban, South Africa, 17-22 February 2013.
3. Mwenye, O.J., **Van der Merwe, R.**, Van Rensburg, L. and Van Biljon, A. 2014. Review on Selection for Drought Stress Tolerance in Soybeans: The Role of Proline and Root Traits. ORAL: 10th Southern African Plant Breeders' Association Symposium (SAPBA), Black Mountain, 10-12 March 2014.
4. **Van der Merwe, R.** and Smit, A. 2014. Soybean - The golden gift of nature. POSTER: 10th Southern African Plant Breeders' Association Symposium (SAPBA), Black Mountain, 10-12 March 2014.
5. Smit, A., Smit, M., Labuschagne, M.T., **Van der Merwe, R.** 2015. Seed yield potential of vegetable type soybean genotypes in South Africa. ORAL: The Eucarpia International Symposium on Protein Crops, Pontevedra, Spain, 4-7 May 2015.
6. Smit, A., Smit, M., Labuschagne, M.T. and **Van der Merwe, R.** 2016. Seed yield potential of vegetable type soybean genotypes in South Africa. POSTER: 11th Southern African Plant Breeders' Association Symposium, Protea Hotel, Technopark, Stellenbosch, 8-10 March 2016.

7. Mwenye, O., Van Rensburg, L., and **Van der Merwe, R.** 2016. Association of grain yield, proline and stress tolerance indexes in selection for drought stress tolerance in soybean [*Glycine max* (L.) Merrill]. POSTER: 11th Southern African Plant Breeders' Association Symposium, Protea Hotel, Technopark, Stellenbosch, 8-10 March 2016.
8. Mwenye, O., Van Rensburg, L. and **Van der Merwe, R.** 2016. Association of grain yield, drought tolerance indices and proline accumulation in selection for drought stress tolerance in soybean. POSTER: 20th Eucarpia General Conference, ETH, Zurich, Switzerland, 29 August to 1 September 2016.
9. **Van der Merwe, R.**, Smit, A., Smit, M. and Labuschagne, M.T. 2016. Grain yield potential and stability of large-seeded vegetable type soybean genotypes. ORAL: 20th Eucarpia General Conference, ETH, Zurich, Switzerland, 29 August to 1 September 2016.
10. Pienaar, R.C., Jansen van Rensburg, W.S., **Van der Merwe, R.** and Van Biljon, A. 2017. Genetic Diversity of *Cleome gynandra*. POSTER: Indigenous Plant Use Forum, 20th Annual Conference 2017, Batter Boys Village in Montana, Pretoria, 9-12 July 2017.
11. Mbuma, N.W., Zhou, MM. and **Van der Merwe, R.** 2017. Identifying elite families for the Midlands sugarcane breeding programmes in South Africa. ORAL: THE 90th Annual Congress of SASTA (South African Sugar Technologist's Association): ICC (International Convention Centre), Durban, 15 -17 August 2017. Published: Proceedings of the South African Sugar Technologist's Association, (2017) 90:147-150.
12. Smit, A., Labuschagne, M.T. and **Van der Merwe, R.** 2018. Stability of edamame (*Glycine max*) in South African production conditions. ORAL: 12th Southern African Plant Breeding Symposium, Gateway Hotel, Umhlanga Ridge, Durban, KwaZulu-Natal, 11-15 March 2018.
13. Van der Merwe, J.B. and **Van der Merwe, R.** 2018. Green yield potential and quality of vegetable-type soybean. ORAL: 12th Southern African Plant Breeding Symposium, Gateway Hotel, Umhlanga Ridge, Durban, KwaZulu-Natal, 11-15 March 2018.
14. Mishasha, T., Zhou, M.M. and **Van der Merwe, R.** 2018. Using quantitative genetic parameters to determine sample size for sucrose content in sugarcane breeding. ORAL: 12th Southern African Plant Breeding Symposium, Gateway Hotel, Umhlanga Ridge, Durban, KwaZulu-Natal, 11-15 March 2018.
15. Mbuma, N.W., Zhou, M.M. and **Van der Merwe, R.** 2018. Estimating breeding values for sugarcane yield of parental genotypes using best linear unbiased prediction (BLUP). ORAL: 12th Southern African Plant Breeding Symposium, Gateway Hotel, Umhlanga Ridge, Durban, KwaZulu-Natal, 11-15 March 2018.



16. Mishasha, T., Zhou, M.M. and **Van der Merwe, R.** 2018. Phenotypic correlations among cane quality traits measured from unselected sugarcane breeding family plots. ORAL: 91st Annual Congress of SASTA (South African Sugar Technologist's Association): 14-16 August 2018, ICC Durban.
17. Mbuma, N.W., Zhou, M.M. and **Van der Merwe, R.** 2018. Evaluating breeding values of genotypes in sugarcane breeding using Best Linear Unbiased Prediction (BLUP). ORAL: 91st Annual Congress of SASTA (South African Sugar Technologist's Association): 14-16 August 2018, ICC Durban.
18. Mbuma, N.W., Zhou, M.M. and **Van der Merwe, R.** 2019. Determining the breeding values of parental genotypes of sugarcane for biomass yield. ORAL: 41st Annual Conference, Australian Society of Sugar Cane Technologists, Clive Berghofer Recreation Centre (CBRC), University of Southern Queensland (USQ), 30 April to 3 May 2019.
19. Mbuma, N.W., Zhou, M.M. and **Van der Merwe, R.** 2019. Family by environment interactions for sugarcane yield in South Africa. The 92nd SASTA Congress, 20-22 August 2019, ICC, Durban
20. Mishasha, T., Zhou, M.M. and **Van der Merwe, R.** 2019. Using quantitative genetic parameters to determine sample size for sucrose content in sugarcane breeding. The 92nd SASTA Congress, 20-22 August 2019, ICC, Durban.
21. Hills, C., Bothma, C. and **Van der Merwe, R.** and Hugo, A. 2019. Yebo-mame: its' a soybean! Pangborn Sensory Science Symposium, 28 Jul - 01 Aug 2019, Edinburgh International Conference Centre (EICC), Edinburgh, UK.
22. **Van der Merwe, R.** 2021. Drought tolerance indices and their correlation with seed yield in vegetable-type soybean. Meeting of the Working Group Seed Science and Certification (GPZ/GPW) & Section IV Seeds (VDLUFA). Topic of the Scientific Seed Symposium: "Seed Production in Times of Climate Change", 10 March 2021, Online Symposium. [https://www.ipk-gatersleben.de/fileadmin/content-ipk/content-ipk-institut/Veranstaltungen/210222\\_Seed\\_Symposium\\_Abtracts.pdf](https://www.ipk-gatersleben.de/fileadmin/content-ipk/content-ipk-institut/Veranstaltungen/210222_Seed_Symposium_Abtracts.pdf)
23. Coertzen, R.D., Van Biljon, A. and **Van der Merwe, R.** 2021. Evaluering van opbrengs-verwante eienskappe in groente-soja onderworpe aan geïnduseerde droogtestremming. Die 20ste Studentesimposium in die Natuurwetenskappe deur die Suid-Afrikaanse Akademie vir Wetenskap en Kuns (SAAWK), Noordwes Universiteit, SAAWK Studentesimposium, 28-29 Oktober 2021.
24. Vos, J., **Van der Merwe, R.** and Moloï, M. 2021. The impact of heat stress during flowering on the physiological and yield traits of vegetable-type soybean. UJ Virtual Postgraduate Symposium, University of Johannesburg, 9-12 November 2021.

25. Hlahla, J., Mafa, M.S, **Van der Merwe, R.**, Moloi, M.J. 2021. The photosynthetic efficiency and carbohydrates responses of six edamame (*Glycine max.* L. Merrill) cultivars under drought stress. UJ Virtual Postgraduate Symposium, University of Johannesburg, 9-12 November 2021.
26. **Van der Merwe, R.**, Van der Merwe, J.B. and Van Biljon, A. 2022. Combining ability of nutritional components in vegetable-type soybean. Oral presented at the 14th Southern African Plant Breeding Symposium, Protea Hotel by Marriott Stellenbosch, Western Cape, 6-9 March 2022.
27. Coertzen, R.D., Van Biljon, A. and **Van der Merwe, R.** 2022. Physiological and biochemical responses associated with water-limited-induced-stress tolerance in vegetable type soybean. Oral presented at the 14th Southern African Plant Breeding Symposium, Protea Hotel by Marriott Stellenbosch, Western Cape, 6-9 March 2022.
28. Basson, H.J., Maré, A., **Van der Merwe, R.** and Minnaar-Ontong, A. 2022. Fusarium sudden death syndrome: A pre-breeding approach for resistance in South African soybeans. Poster presented at the 14th Southern African Plant Breeding Symposium, Protea Hotel by Marriott Stellenbosch, Western Cape, 6-9 March 2022.
29. Mishasha, T., Zhou, M. and **Van der Merwe, R.** 2022. Family by environment interactions for brix content in sugarcane breeding. Poster presented at the 14th Southern African Plant Breeding Symposium, Protea Hotel by Marriott Stellenbosch, Western Cape, 6-9 March 2022.

## CONFERENCE AND SYMPOSIUM PROCEEDING PUBLICATIONS:

1. **Van der Merwe, R.**, Hugo, A., Herselman, L. and Labuschagne, M. 2012. Physicochemical and oxidative stability characteristics of high- and mid-oleic sunflower seed oil. In: Proceedings of the 18th International Sunflower Conference, Mar del Plata and Balcarce, Argentina. 08-VC-12, pp. 955-960. 27 February to 1 March 2012.
2. Smit, A., Smit, M., Labuschagne, M.T. and **Van der Merwe, R.** 2015. Seed yield potential of vegetable type soybean genotypes in South Africa. In: Proceedings of the Eucarpia International Symposium on Protein Crops, Pontevedra, Spain. Actas AEL 6 2nd edition pp. 199-201. 4-7 May 2015.
3. Mbuma, NW, Zhou, M.M. and **Van der Merwe, R.** 2017. Identifying elite families for the Midlands sugarcane breeding programmes in South Africa. In: Proceedings of the South African Sugar Technologist's Association, (2017) 90:147-150. THE 90th Annual Congress of SASTA (South African Sugar Technologist's Association): 15-17 AUGUST 2017, ICC (International Convention Centre), Durban.

4. Mbuma, N.W., Zhou, M.M. and **Van der Merwe, R.** 2019. Determining the breeding values of parental genotypes of sugarcane for biomass yield. In: Proceedings of the Australian Society of Sugar Cane Technologists, 41: 74–78. 41st Annual Conference, Australian Society of Sugar Cane Technologists, 30 April to 3 May 2019, Clive Berghofer Recreation Centre (CBRC), University of Southern Queensland (USQ).

## **ENGAGED SCHOLARSHIP**

---

### **PUBLIC ENGAGEMENT:**

#### **Invited lectures**

- 2015:** **Van der Merwe, R.** Soybean research at the University of the Free State - South Africa. Lecture presented at: Joint SA-China Research Cooperation Programme Workshop, Northeast Institute of Geography and Agroecology, Chinese Academy of Sciences, Harbin, 15 July 2015.
- 2017:** **Van der Merwe, R.** Edamame research carried out at UFS. Lecture presented at: The Edamame Development Program’s Farmer’s Open Day, Moses Mabhida Stadium, 24 March 2017.
- 2022:** **Van der Merwe, R.** and Van Biljon A. Pre-breeding of legume crops for climate change. Online lecture to be presented at: SANSOR in collaboration with The South African Society of Crop Production (SASCP) and the South African Plant Breeders’ Association (SAPBA) webinar on Breeding for Climate Change, 21 July 2022.

#### **Panellist discussion invitation**

- 2021:** I served on a panel discussion session for and online webinar section, titled: “Investigations of water deficit interactions with heat and elevated carbon dioxide in wheat (*Triticum aestivum*)”, that was held by the University of Fort Hare as part of their Research Week of Excellence, held from 15-18 November 2021.

## **COLLABORATION:**

### **National**

#### **2013 to date: Edamame Development Program, Mariannhill, Durban, KwaZulu-Natal**

National collaboration has been established in 2013 with the Edamame Development Program (EDP). The EDP is managed by Newlands Mashu Community Development Centre (Newlands Mashu) a Durban based Section 21 Co. (not for profit) and registered Public Benefit Organisation (PBO). The EDP is based on the Monastery Farm (20 ha) in Mariannhill, Pinetown. The project engages and supports selected emerging and developing farmers who have been targeted to commercially grow Edamame for markets currently in KZN. The program partners include large-scale commercial growers and national and international academic research institutions. UFS collaboration with the EDP includes germplasm maintenance of introduced varieties, base seed multiplication, research and training of students, pre-breeding and new cultivar development for SA growing conditions.

#### **2015 to date: SASRI (South African Sugar Research Institute), Umhlanga, Durban, KwaZulu-Natal**

UFS collaboration with SASRI involves postgraduate training and supervision. SASRI assist with bursaries for both undergraduate and postgraduate students.

#### **2020 to date: TransfOrmus**

National collaboration has been established in 2021 with TransfOrmus. TransfOrmus was established in 2017, following many years of research and product development in South Africa and Australia. With this collaboration, new biostimulant products are being evaluated for their impact on plant biomass and yield of both maize and vegetable-type soybean. Results from field and glasshouse trials will assist with the registration of these products with the Department of Agriculture Forestry and Fisheries. Funding obtained is used to support both a final year BSc Agric project and an MSc project.

#### **2021 to date: Internal Collaboration with The Department for Sustainable Food Systems and Development**

I provide expertise and support to the UFS Community Garden Project – (Food tunnels). The main purpose of the project is to turn the garden project into a vegetable production and training programme for students. I assist this project in terms of planning the planting season, crop rotation, irrigation, fertilization, harvesting

and end-use of the crops planted. I am in the process of developing a manual for students on vegetable gardening and seed saving. This manual will further assist with training of students.

## **International**

### **2014-2018: Stoller Africa**

UFS collaboration with Stoller involved the execution of soybean field trials, which are scientifically sound to determine the influence of Stoller Stimulate on soybean growth and grain yield. This was a successive trial that was planted, based on recommendations made during the preliminary trial, which was planted the previous season. The project aimed to determine the effect of Stoller Stimulate on soybean plant growth, photosynthesis capacity and grain yield potential of three diverse soybean cultivars.

### **2019-2020: Lithovit (New Zealand)**

UFS collaboration with Lithovit involved the execution of soybean field trials, which are scientifically sound to determine if the Lithovit product has a positive impact on seed yield of soybean and to determine what type of treatment (seed and/or foliar applied at various growth stages) can be recommended to farmers.

### **2014 to date: Northeast Institute of Geography and Agroecology, Chinese Academy of Sciences**

International collaboration has been established with Prof Qiuying Zhang from the Northeast Institute of Geography and Agroecology, Chinese Academy of Sciences in 2013 when I received NRF-RISA funds for the IRG-China/South Africa Cooperation Programme for the period 2015-2017. Project title: Breeding for resistance to pod shattering resistance in vegetable-type soybean. Prof Zhang is an expert in “edamame” breeding and her inputs are highly valued in the local research projects. Prof Zhang’s collaboration is continuing as she is co-supervising students and serve as an external examiner for students.

## **Collaborative research reports**

1. Van der Merwe, R. 2018. University of the Free State - Soybean trial (2017/2018) – Stoller Africa
2. Van der Merwe, R. 2020. Lithovit soybean trial (2019/2020) - Lithovit
3. Smit, A. and Van der Merwe, R. 2020. Evaluation of three commercially available soybean inoculants for use on Edamame production in South Africa. - EDP

## **EXAMINATION OF POSTGRADUATE DISSERTATIONS AND THESES:**

### **MSc internal (UFS):**

2015 C Craig  
2015 T Van Rooyen  
2015 I Ngobese  
2016 H Musopole  
2017 NT Dhlamini  
2017 NT Mishamba  
2019 HM Katondo

### **MSc external:**

2017 NE Chiuta – University of Forth Hare (Supervisor: Charles Mutengwa)  
2018 W Ngcamphalala – University of Stellenbosch (Supervisor: Willem C Botes)  
2020 NSS Shinga – University of KwaZulu Natal (Supervisors: Julia Sibiyi, Marvellous Zhou)  
2020 JD Slabbert – University of Stellenbosch (Supervisor: Willem C Botes)  
2021 P Mavindidze – University of Forth Hare (Supervisor: Charles Mutengwa)

### **PhD internal (UFS):**

2012 S Ramburan  
2014 M Booyse  
2014 B Masuka  
2017 D Santchurn  
2019 OF Ndoro

### **PhD external:**

2022 John Lobulu – University of Kwa-Zulu Natal (Supervisor: H Shimelis)

## **EXTERNAL MODERATION:**

**2019 to date:** Stellenbosch University - Genetika 414 (Lecturer: W Botes)

**2021 to date:** University of KwaZulu-Natal – Advanced Plant Breeding, AGPS730 (Lecturer: S Hussein)

## **EDITORIAL DUTY:**

**2015 to date:** Serve as co-editor for Sociedad de Ciencias de Galicia / Science Society of Galicia.

## **ARTICLES REVIEWED:**

### South African Journal of Plant and Soil (No Quartile)

- 2012: PG 1749 - Title: 'TUFA' – A new South African drought-tolerant, intermediate-oleic groundnut (*Arachis hypogaea* L.) cultivar.
- 2013: TJPS-2013-0055 - Morphological variability for qualitative and quantitative traits in finger millet (*Eleusine coracana* L. Gaertn).
- 2014: TJPS-2014-0031 - Phenotypic characterization of 54 sweetpotato genotypes grown in East and Central Africa.
- 2014: TJPS-2014-0088 - Symbiotic Effectiveness of Inoculation with *Bradyrhizobium* Isolates on Soybean [*Glycine max* (L.) Merrill] Genotypes Having Different Maturity Time.
- 2015: TJPS-2015-0019.R1 - Family versus individual plant selection for stem borer (*Eldana saccharina*) resistance in early stages of sugarcane breeding in South Africa.
- 2016: TJPS-2016-0040 - Evaluation of Seed and Germination Traits in Cowpea [*Vigna unguiculata* (L.) Walp.] Genotypes.
- 2017: TJPS-2017-0120 - Yield stability and adaptation analysis of South African common bean cultivars.
- 2018: TJPS-2018-0112 - Genotype-by-environment interaction analysis on grain yield of selected drought and heat tolerant dryland wheat (*Triticum aestivum* L.) genotypes.
- 2020: TJPS-2020-0050 - Genetic diversity among Tanzanian pigeonpea germplasm based on agromorphological traits.
- 2022: TJPS-2022-0030 - Response of derivatives of sorghum variety Macia developed through gamma-radiation for grain yield and drought tolerance.

### Frontiers in Plant Science (Q1-Journal)

- 2014: ID: 127590 - Effects of agricultural practices on soybean seed protein, oil, fatty acids, sugars, and minerals in the Midsouth USA.

Grasas y Aceitas (No Quartile)

2014: 0457141 - Quality characteristics of high-oleic sunflower oil extracted from some hybrids cultivated under Egyptian conditions.

African Journal of Biotechnology (No Quartile)

2013: AJB-22.01.13-12055 - Genotypic Stability and Correlation among Quantitative Characters in Ten Genotypes of Aromatic Pepper Grown over Years.

2014: AJB-28.11.13-13514 - Effect of PEG 6000 on germination and seedling growth of pearl millet (*Pennisetum glaucum* (L.) R. Br. and LD50 for in vitro screening for drought tolerance.

Industrial Crops and Products (Q1-Journal)

2014: INDCRO-D-14-01222 - Ultrasound-assisted enzymatic extraction (UAEE) of phytochemical compounds from mulberry (*Morus nigra*) must and optimization study using response surface methodology.

2021: INDCRO-D-21-00558 - Simulation Modelling for Sugarcane Yield Estimation Using DSSAT-CANEGRO Model.

2022: INDCRO-D-22-00489 - Adaptability and phenotypic stability in midway and advanced sugarcane breeding clones.

Euphytica (Q2 Journal)

2012: EUPH-D-12-00247 - Advanced cycle pedigree breeding in sunflower: i. testcross hybrid performance, variability and phenotypic correlations for seed yield and other agronomic traits.

2013: EUPH-D-13-00456 - Assessing the Agronomic Potential of Linseed Genotypes by Multivariate Analyses and Association Mapping of Agronomic Traits.

2015: EUPH-D-15-00308 - Identification of QTL influencing seed oil content, fatty acid profile and days to flowering in *Brassica napus* L.

2020: EUPH-D-20-00342 - Variability in the nutritional value of cowpea genotypes for crop improvement.

2021: EUPH-D-21-00038 - Governing crop genetics in post-Soviet countries: Lessons from the biodiversity hotspot Armenia.

Annual Research & Review in Biology (No Quartile)

2018: Ms\_ARRB\_38989 - Assessment of Genetic diversity for the properties related to the quality of hexaploid bread wheat (SeriM82 / Babax) under drought stress.



2019: Ms\_ARRB\_50975 - Study of Genetic Variability in Some Bread Wheat Accessions (*Triticum aestivum* L.) in Gurage zone, Ethiopia.

The Crop Journal (Q1-Journal)

2018: CJ-D-18-00001 - History, current status and prospects of soybean production and research in Sub-Saharan Africa.

Journal of Crop Improvement (No Quartile)

2019: WCIM-2019-0206 - Inheritance of seed yield and its attributes in sunflower.

Acta Agriculturae Scandinavica, Section B - Plant Soil Science (Q3-Journal)

2021: SAGB-2021-0272 - Selection of Soybeans for adaptation under different levels of water, temperature and photoperiod at seedling stage.

Agronomy Research (No Quartile)

2021: AR-2021-196/R1 RESUBMISSION - Evaluation of the combining ability of CMS lines in crosses with samples of grain sorghum and Sudan grass.

Field Crops Research (Q1-Journal)

2021: FIELD-D-21-01679R1 - Selection for yield shifted the proportion of oil and protein in favor of low-energy seed fractions in soybean.

BioMed Research International (Q3-Journal)

2022: 1532987 - Estimating genetic analysis using half diallel cross underlying kenaf (*Hibiscus cannabinus* L.) fibre yield in tropical climates.

Forests (MDPI) (Q1-Journal)

2022: forests-1770833 - Dynamics of non-structural carbohydrates in different types of bamboos in response to their phenological variations: Implications for managing bamboo plantations.

## **PROJECTS REVIEWED:**

### Winter Cereal Trust

2016: 2016\_2: RMS Yield - Marker identification and implementation (including MAS) - WC Botes – Stellenbosch University

### NRF

2017 and 2018: NRF - Support for Unrated, Rated and Y-rated Research

CSR170419227837 - Mr Willem Jansen van Rensburg - Agricultural Research Council (South Africa), Vegetable and Ornamental Plant Institute

2017 and 2018: NRF - Support for Unrated, Rated and Y-rated Research

CSR170522231783 - Dr Charles Mutengwa - University of Fort Hare

2021: NRF – Thuthuka

TTK210302588526 - Mr Vusi Mshayisa - Cape Peninsula University of Technology

2021: NRF – Thuthuka

TTK210318590373 - Ms Talitha Laetitia Venter - Stellenbosch University

## **WORKSHOPS AND TRAINING**

---

### **INTERNATIONAL:**

#### **2013: USDA - Day conference and workshop**

Diversifying the southern African food basket. Developing the regional market with us food and ingredient suppliers, Radisson Blue Gautrain Hotel, Sandton, Johannesburg, South Africa, 18 April 2013. During this visit presentations on the status of legume research to address food nutrition and food security in southern Africa were addressed. After the lectures, demonstrations on how second generation soy-based food products are prepared were done by the Vaal University of Technology.

Funded by: Own research funds.

**2015: Bilateral workshop and training**

China (Northeast Institute of Geography and Agroecology, Chinese Academy of Sciences) during 13-18 July 2015. During this visit presentations on the status of soybean research being conducted at the University of the Free State (UFS) as well as the status of Edamame production in South Africa were made. Soybean field trials were visited, and training in the technique of cross-pollinations in soybean was received. The work plan of the Bilateral Project was discussed.

Funded by: NRF-SA/China Collaborative Project (2015-2017)

**2016: Course attended**

“Advancements in plant breeding, trial design and analysis”, hosted by the Institute of Field and Vegetable Crops in cooperation with University of California Davis Plant Breeding Academy, Novisad, Serbia (27-29 September). This workshop created an opportunity for breeders to expand their knowledge on new strategies and technologies that are applied in breeding programmes, as well as R software and its use in plant breeding. The course further covered seed production and intellectual property protection.

Funded by: Own research funds

**2017: Bilateral workshop and training**

China (Northeast Institute of Geography and Agroecology, Chinese Academy of Sciences) during 15-21 July 2017.

The work plan of the new Bilateral Project was discussed. Soybean field trials were visited, and Training in colorimetric analysis of sugar and sucrose content in soybean was received.

Funded by: NRF Thuthuka (2017-2019)

**NATIONAL:**

**2020: Blackboard training workshops**

University of the Free State

A number of Blackboard training workshops were attended. These were necessary to transition from a complete face-to-face teaching mode to an online and blended mode of teaching and assessment.

**2022: Teaching Portfolio workshop**

University of the Free State during 20 to 21 July 2022.

As part of the review criteria for academic promotion, academics need to be required to submit a Portfolio of Learning and Teaching. This will help to facilitate the development of scholarly teaching across the institution and enhance the Scholarship of Teaching and Learning for academics specialising in the teaching of their discipline.

**2022: Curriculum Renewal Programme**

University of the Free State during 22 July to 19 August 2022.

The purpose of this programme is to provide lecturers with an opportunity to redesign a module by considering its purpose, their students, and the UFS context through good curriculum design principles. With this programme the Statistics in Plant Sciences module will be redesigned and the teaching strategies adapted in order to accommodate the modern learning environment.

## **LEADERSHIP AND ADMINISTRATION**

---

### **MEMBER OF SOCIETIES:**

#### **Local**

**2011 to date:** Member of the Southern African Plant Breeders' Association.

**2014-2018:** Served as treasurer on the Southern African Plant Breeders' Association committee.

#### **International**

**2015 to date:** Member of the European Society of Breeding Research (EUCARPIA).

#### **Conferences co-organised**

**2016:** Southern African Plant Breeders' Association

11th SAPBA Symposium, 8 to 10 March 2016, the Protea Hotel Technopark, Stellenbosch.

**2018:** Southern African Plant Breeders' Association

12th Southern African Plant Breeding Symposium 11 to 15 March 2018, Gateway Hotel, Umhlanga Ridge, Durban.

### **Committee involvement**

#### ***Within the Department of Plant Sciences***

2019 to date: Title and Examiner Registration Committee

I currently serve as the Chair for this committee. Duties include organising monthly meetings, collecting titles and examiners from supervisors within the department that need to be scrutinised during meetings and giving feedback to supervisors.

2019 to date: Academic Committee

Duties include co-organising postgraduate seminars, which include Hons seminars, MSc and PhD project proposal and progress report sessions as well as flash fact presentations. I am also responsible for keeping the database of student degrees within the department. I am responsible for organising all modules within the division of Plant Breeding during Departmental audit.

2019 to date: Research Committee

Duties include CRF project proposal and progress reviews as well as NRF reviews of postgraduate scholarship applications. Decision-making on strategies to strengthen a research and publication culture in the department.

#### ***Within the Faculty of Natural and Agricultural Sciences***

I am a member of the Faculty Board meetings and participate in meetings.

## **AWARDS RECEIVED**

---

**2003:** Best Plant Breeding student (undergraduate) in 2003

**2005:** Merit award for obtaining MSc degree with distinction

**2013:** Best article published in SA Grain Magazine for the June 2013 issue

## REFERENCES

---

### NATIONAL:

*Prof Charles Mutengwa*

Faculty of Science and Agriculture, Department of Agronomy

University of Fort Hare

Tel. +27 (0)40 602 2468

CMutengwa@ufh.ac.za

*Mr Walter Coughlan*

Edamame Development Program & The Fair Food Foundation

Cell no. 0836568417

Walter@thefairfoodco.com

*Prof Shimelis Hussein*

School of Agricultural, Earth and Environmental Sciences

University of KwaZulu-Natal

Pietermaritzburg Campus

Tel. +27 332606474

Cell no. +27 722264729

shimelish@ukzn.ac.za

*Prof Arno Hugo*

Faculty of Natural and Agricultural Sciences

Department of Microbial Biochemical and Food Biotechnology (Food Science)

University of the Free State

Tel. +27-(0)51 401 2729

hugoa@ufs.ac.za

*Mr Willem C Botes*

Faculty of AgriSciences

Genetics Department

Stellenbosch University  
Tel. +27(0)21 808 2627  
WCB@sun.ac.za

## **INTERNATIONAL:**

*Prof Antonio M. De Ron*

Misión Biológica de Galicia (MBG)

Spanish National Research Council (Consejo Superior de Investigaciones Científicas - CSIC). Pontevedra,  
Spain

Tel. +34 986854800

Cell no. +34 669423454

amderon@mbg.csic.es

*Prof Qiuying Zhang*

Northeast Institute of Geography and Agroecology, Chinese Academy of Sciences.

138 Haping Road, Nangang District, Harbin, 150081, PR China

Tel. 86-451-86601320

Cell no. 86-13895783713

zhangqiuying@iga.ac.cn

*Prof Martin M. Williams*

USDA Agricultural Research Service

University of Illinois

Urbana, IL 61801

Tel. 217-244-5476

martin.williams@ars.usda.gov