HORTGRO SCIENCE ANNUAL REVIEW

2020

WELGEVALLEN
EXPERIMENTAL FARM,
STELLENBOSCH

CONTACT

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HORTGRO science
Growing Fruit IQ

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CHAIRMAN'S REPORT

STEPHEN RABE

It is once again time to reflect on the past year. Let me get it out of the way in the first sentence: COVID-19 and 2020, what a year! Enough said of the pandemic. It did, however, impact on the activities of Hortgro Science and Hugh will elaborate further on this in his general manager's report.

STEPHEN RABE

If you read my 2019 report, you would have seen that the advisory council, together with management, reviewed the mandate of Hortgro Science and expanded the review to include all the technical aspects within the Hortgro portfolio. Flowing out of this review, Hortgro Technical has been created to coordinate all the technical aspects of the industry. The Hortgro Science advisory committee will remain focussed on the R&D portfolio, recognising this key strategic area of levy investment. Hortgro Technical will also focus on areas pertaining to plant improvement, plant material management and play a role in providing science-based facts to the all-important areas of market access and market retention. The structure and allocation of responsibilities has been decided upon with Hugh Campbell taking on the role of GM Hortgro Technical and Wiehann Steyn taking over the R&D portfolio.

Marno van der Westhuizen was appointed as research implementation manager and started in May.
His main areas of focus will be the following:

- Orchard of the future phase 2
- Nursery tree handling guidelines
- Implementation of research output such as uptake of newly evaluated rootstocks

Hortgro Science will be investing in the Winetech project management system. This data-base project management system, which will ensure continuity of data and the ability to interrogate the various projects over time, will eliminate any possibility of duplication in project investment.

2020 will be a year to remember: change and progress, all part of the year under review, with a number of new projects, appointments and disappointments, international collaboration as well as the opportunity to interact personally with growers and service providers.

I would like to thank management for their passion and commitment to the work they do. You inspire new ways of doing things and are instrumental in the positive changes underway in the industry.

Thanks to all who contribute of their time and expertise in assisting management and the advisory council, ensuring that priority is given to the research needs required by levy payers. We are indebted to you all.

To the advisory council members: your time and inputs are much appreciated. It is an honour and pleasure to form part of this wise counsel

Stay safe.
Stephen Rabe

HORTGRO SCIENCE
ADVISORY COMMITTEE

Stephen Rabe
Chairman

Grant Smuts
Vice Chairman

Charl Stander

Louis von Broembsen

Wesley Hendricks

Linde du Toit

Frikkie Jacobs

Raymond Koopstad

Anton Rabe
Observer

Thembi Xaba
Observer

GENERAL MANAGER'S

REPORT

HUGH CAMPBELL

In light of the happenings during 2020, it would be amiss not to start by reflecting on what the impact of COVID-19 has been on the workings of Hortgro Science (HGS) and the research funded by industry. From the onset, the HGS office and staff were fully operational – initially remotely, then partially remotely and subsequently on site at our office at the Stellenbosch University AGROHUB at Welgevallen Experimental Farm in Stellenbosch.

COVID-19 struck at the tail end of our stone fruit harvest and midway through the pome fruit season. The following actions reflect on how HGS addressed the COVID-19 scenario:

- Regular and intensive contact was maintained with researchers and research organisations resulting in limiting the impact on research projects. It is calculated that 10% of the projects were negatively impacted by lockdown restrictions. Researchers went out of their way to continue with their research. We are indebted to these researchers.

- HGS in conjunction with a team of technical advisors drafted a "Fresh Notes" which provided growers with options to address COVID-19 related impacts on labour and management in order to manage their key operational activities like pruning, thinning etc.

- The research process and review went digital and all review meetings where held online, which proved to be highly productive. The plan is to continue with a hybrid of this process in future.

- All local and international conferences either went on line or were postponed until 2021 and beyond. Webinars effectively replaced symposiums, field days and seminars.

- The research showcase, originally planned for June 2020, was postponed to August 2020 and then was replaced by five minute video presentations that were placed on the HGS website. This enabled the selective viewing of projects and, judging by the number of views, proved a successful alternative to a 'live viewing'.

HUGH CAMPBELL

- HORTGRO developed a "Post-COVID Environment Strategy" to guide the management of the process in the new season and beyond. It also actively participated in the development of a "Post COVID-19 Future of the Western Cape Agriculture and Agri-Processing Sector Project" facilitated and authored by Tanja Hichert and initiated and funded by the Western Cape Department of Agriculture.

As noted in the chairman's report, the structure within the Hortgro camp has been revised to better facilitate focus and coordination by pulling all technical aspects under one newly created structure - Hortgro Technical. Included are the Hortgro Pome and Stone focused activities of R&D and plant material management as well as the activities shared with other grower associations like plant improvement administered through SAPO and the Deciduous Fruit Plant Improvement Association. Wiehann Steyn will head up Hortgro Science while Hugh Campbell will head up Hortgro Technical.

Hortgro Science utilised 18 different university departments and research organisations to conduct its research during 2019/20 with 40% of the total budget being allocated to Stellenbosch University. 50% of the projects provided a platform for post graduate students to continue their training. This, in turn, has enabled industry to ensure that there is a pipeline of graduates flowing into the broader industry. In 2019/20 59 post graduate students were funded to a value of R4,995 million. We are encouraged that 30% of the students are busy with their PhD's and 46% of the students are black students. An interesting shift over time has seen the percentage of female project leader increase from 37% in 2013/14 to 48% in 2019/20 and the percentage of projects lead by black researchers increase from 13% in 2013/14 to 28% in 2019/20.

The funding of research remains the determinant of how much research can be conducted for an industry. Hortgro Science, through grower levies, leveraged additional funding on a 1:1 basis in the years leading up to 2015/16. This reality has changed over the past few years with 75% of the funds coming from levies in 2019/20. The Post-Harvest Innovation (PHI) fund, which is funded through the Department of Science and Innovation, contributed 7% of the total funding. Funds sourced from government agencies have become more difficult to access. The South African government as well as industry's level of funding research needs to grow substantially to be on par with some of our competing nations. This aspect has been recognised by both parties, but needs to be acted on if we are to remain competitive internationally.

Hortgro Science is continually challenged on the question of "are you focusing on the right stuff?" We are guided by over 200 individuals, made up of technical advisors, growers, researchers, industry experts and retired academics who sit on our 30 focus workgroups, peer work groups and technical advisory committees. We are greatly indebted to our small pool of researchers and the larger pool of technical people who assist us in these endeavours.

Marno van der Westhuizen was appointed as our research implementation manager in May 2020. His youthful enthusiasm was teamed up with the young team of Taryn Hodgson (digital expert) and Thea van Zyl (event's organiser) – both from the Hortgro communications department. Webinars, an upgraded website, a stone fruit app and an online research showcase with short five minute video presentations of all our current research projects changed the way we presented information back to our growers. Many lessons were learnt and 'hats off' to our growers, technical fraternity and all for adapting so quickly to the new online technology. We look forward to some personal contact in the future and recognise the need to utilise technology – but to balance it in such a way that we maintain that personal link to people.

2020 has been a year of innovation in terms of communicating with our key client – the grower.

I would like to end off by thanking the Hortgro Science advisory council under the dynamic leadership of Stephen Rabe for their strategic leadership of Hortgro Science. Hortgro Science is a small team that links into a much bigger network that is focused on facilitating and driving technological innovation in the pome and stone fruit industry. It has been a privilege to lead this dedicated team – thank you!

Hugh Campbell

THE HORTGRO SCIENCE TEAM

HUGH CAMPBELL
General Manager

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PROF WIEHANN STEYN
Assistant General Manager & Crop Production and Post-harvest Programme Manager (Extraordinary Associate Professor in the Department of Horticultural Science, Stellenbosch University)

wiehann@hortgro.co.za

MATTHEW ADDISON
Crop Protection Programme Manager

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MARNO VAN DER WESTHUIZEN
Research Implementation Manager (joined May 2020)

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THERESA SONNENBERG
Research Administrator (up to November 2019)

ANITA VAN STADEN
Research Administrator (joined February 2020)

anita@hortgro.co.za

CHAIR IN APPLIED PRE-HARVEST DECIDUOUS FRUIT RESEARCH AT STELLENBOSCH UNIVERSITY

PROF KAREN THERON
Department of Horticultural Science

COMMUNICATIONS SUPPORT BY HORTGRO

ELISE-MARIE STEENKAMP
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Events Coordinator

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TARYN HODGSON
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STAFF SECONDED TO STELLENBOSCH UNIVERSITY

DR XOLANI SIBOZA
Department of Horticultural Science

LAURA ALLDERMAN
Department of Horticultural Science

DR SHELLEY JOHNSON
Department of Conservation Ecology and Entomology (Market Access Appointments)

DR MARELIZE DE VILLIERS
Department of Conservation Ecology and Entomology (Market Access Appointments)

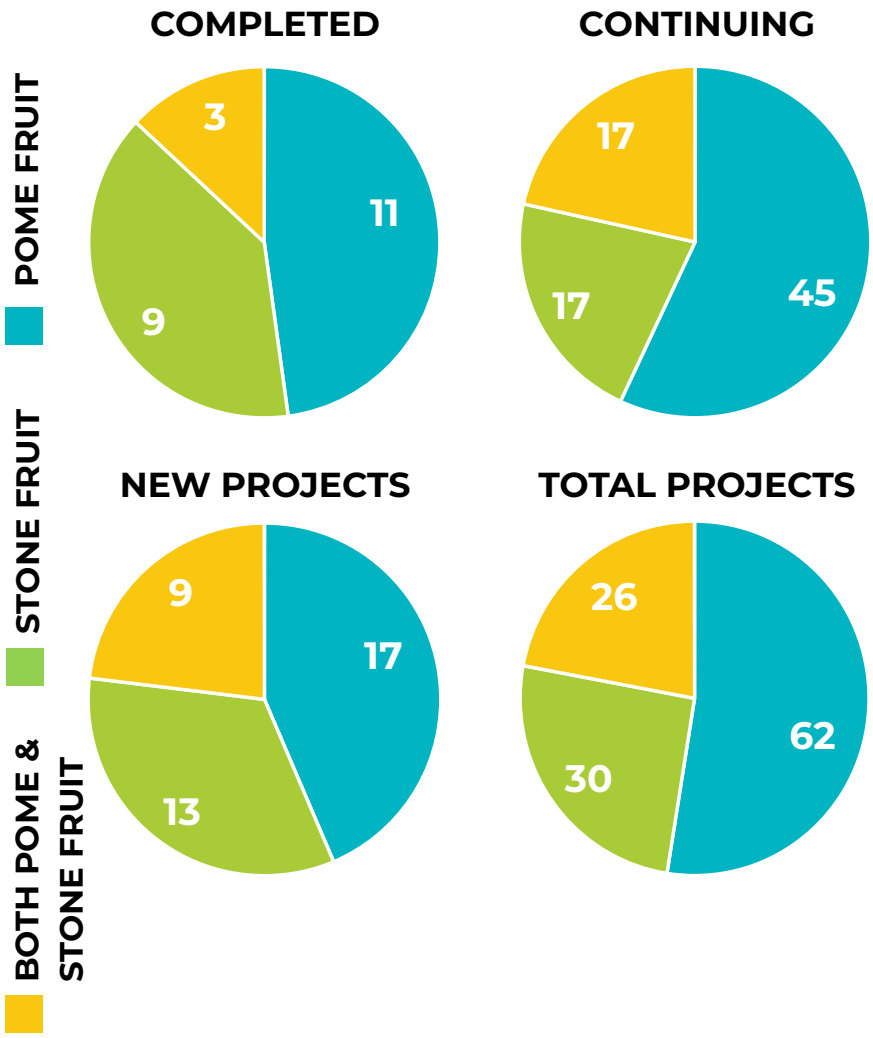
TERENCE ASIA
Department of Conservation Ecology and Entomology (Crop Protection Technical Assistant - Insectary)

YEAR AT A GLANCE

PROJECTS

SUMMARY OF RESEARCH PROJECTS IN 2019/2020

This is a summary of the research projects in 2019/2020 and includes market access projects.



23

PROJECTS COMPLETED IN 2020

79

PROJECTS CONTINUING IN 2019 / 2020

39

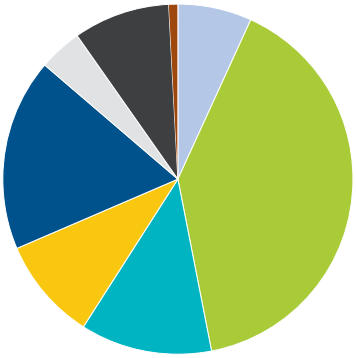
NEW PROJECTS IN 2019 / 2020

118

TOTAL PROJECTS IN 2019 / 2020

FUNDING

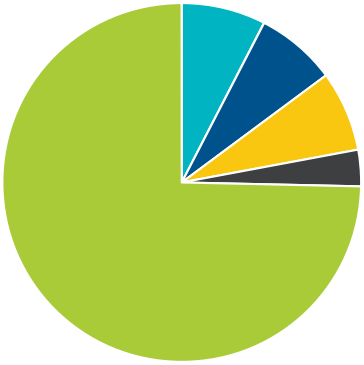
FUNDING ALLOCATIONS 2019 / 2020



This chart illustrates the distribution of the industry's funding for research.

- STELLENBOSCH UNIVERSITY (40%)
- PROG / PROJECT MAN / TECH SERVICES (9%)
- OTHER RESEARCH INSTITUTES (9%)
- ARC (7%)
- RESEARCH POSTS (18%)
- INTERNATIONAL CONGRESS ETC (1%)
- TECH TRANSFER (4%)
- ExperiCo (12%)

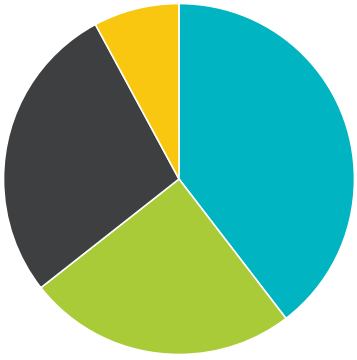
FUNDING LEVERAGED 2019 / 2020



This chart illustrates external funds leveraged as a result of industry project funding for the 2019 / 2020 financial year.

- POME AND STONE LEVY (PROJECTS) (75%)
- PARLIAMENTARY GRANT (ARC) (8%)
- OTHER INDUSTRIES (7%)
- PHI (7%)
- WCDOA (3%)

INVESTMENT PER RESEARCH FOCUS AREA FOR 2019 / 2020



This chart illustrates the investment per research area (pome and stone fruit) for the 2019 / 2020 financial year.

- CROP PROTECTION (40%)
- CROP PRODUCTION (25%)
- POST-HARVEST (28%)
- MARKET ACCESS (8%)

RESEARCH PROJECTS BY RESEARCH INSTITUTION FROM 2012-2020

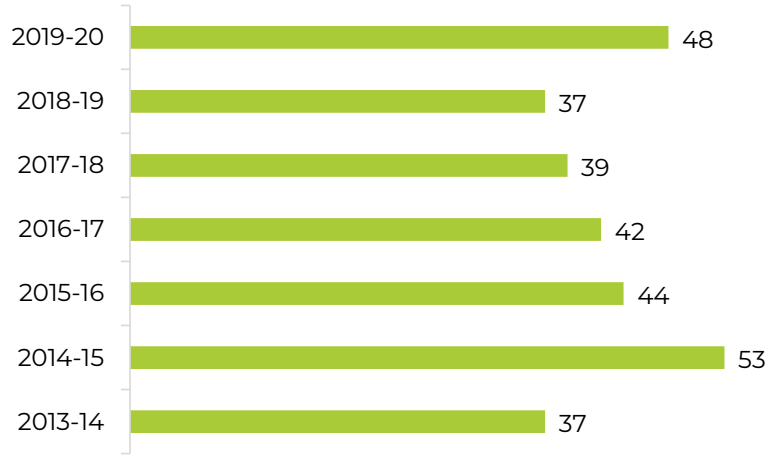
	PROJECTS							
RESEARCH INSTITUTE	**2012-13**	**2013-14**	**2014-15**	**2015-16**	**2016-17**	**2017-18**	**2018-19**	**2019-20**
ARC Infruitec-Nietvoorbij	**36**	**36**	**30**	**29**	**24**	**20**	**6**	**12**
ARC Breeding	21	21	21	20	16	15	0	0
ARC Research Projects	15	15	9	9	8	5	6	12
Stellenbosch University	**38**	**39**	**34**	**33**	**36**	**49**	**48**	**56**
Dept Horticulture	15	16	14	12	12	15	22	23
Dept Pathology	5	5	5	5	7	8	9	7
Dept Entomology	18	18	14	14	16	21	12	17
Dept Engineering			1	1		2	2	2
Dept Soil Science				1	1	1	1	1
Dept Genetics							1	3
CREST						1	1	1
Dept Geography								1
SARChi								1
Hortgro Science Technical Services	**20**	**20**	**15**	**18**	**20**	**4**		**0**
ExperiCo	**15**	**16**	**19**	**18**	**21**	**17**	**22**	**22**
Nemlab	**1**	**1**	**1**	**2**	**2**	**1**		**1**
Blue North	**1**	**1**	**1**	**1**	**1**	**1**	**1**	**1**
University of Kwazulu-Natal							**1**	**1**
Provar					**5**	**12**	**14**	**12**
Procrop								**1**
Consultants			**5**	**4**		**6**	**3**	**4**
C Jarmain			1			1	1	1
P Stassen			3	3	3	3	3	
K Bouwer			1	1				1
SAPO						1	1	
T Ware						1	1	2
	114	**116**	**110**	**109**	**116**	**116**	**96**	**110**

STUDENTS AND TRANSFORMATION

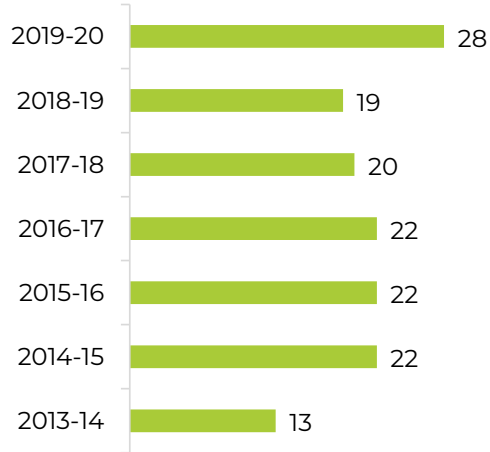
TRANSFORMATION IN RESEARCH FROM 2013 TO 2020

These tables show the percentage of projects with women leader, projects with black leaders, and projects with postgraduate students.

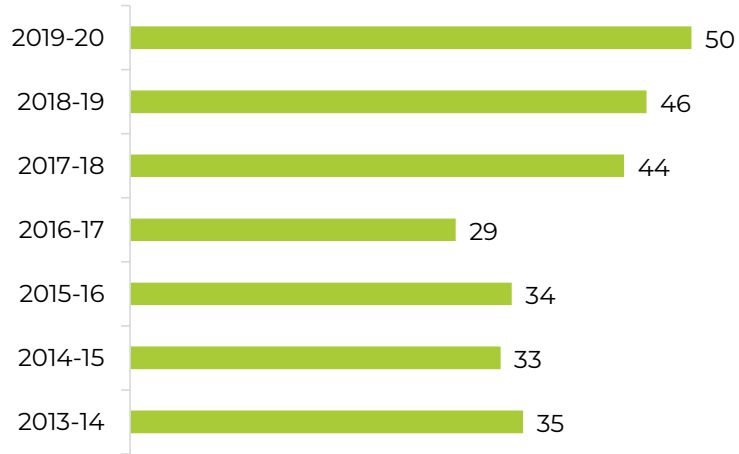
% Projects with a female project leader



% Projects with a black project leader



% Projects with a postgraduate student



PROFILE OF STUDENTS WORKING ON HORTGRO POME AND HORTGRO STONE FUNDED PROJECTS

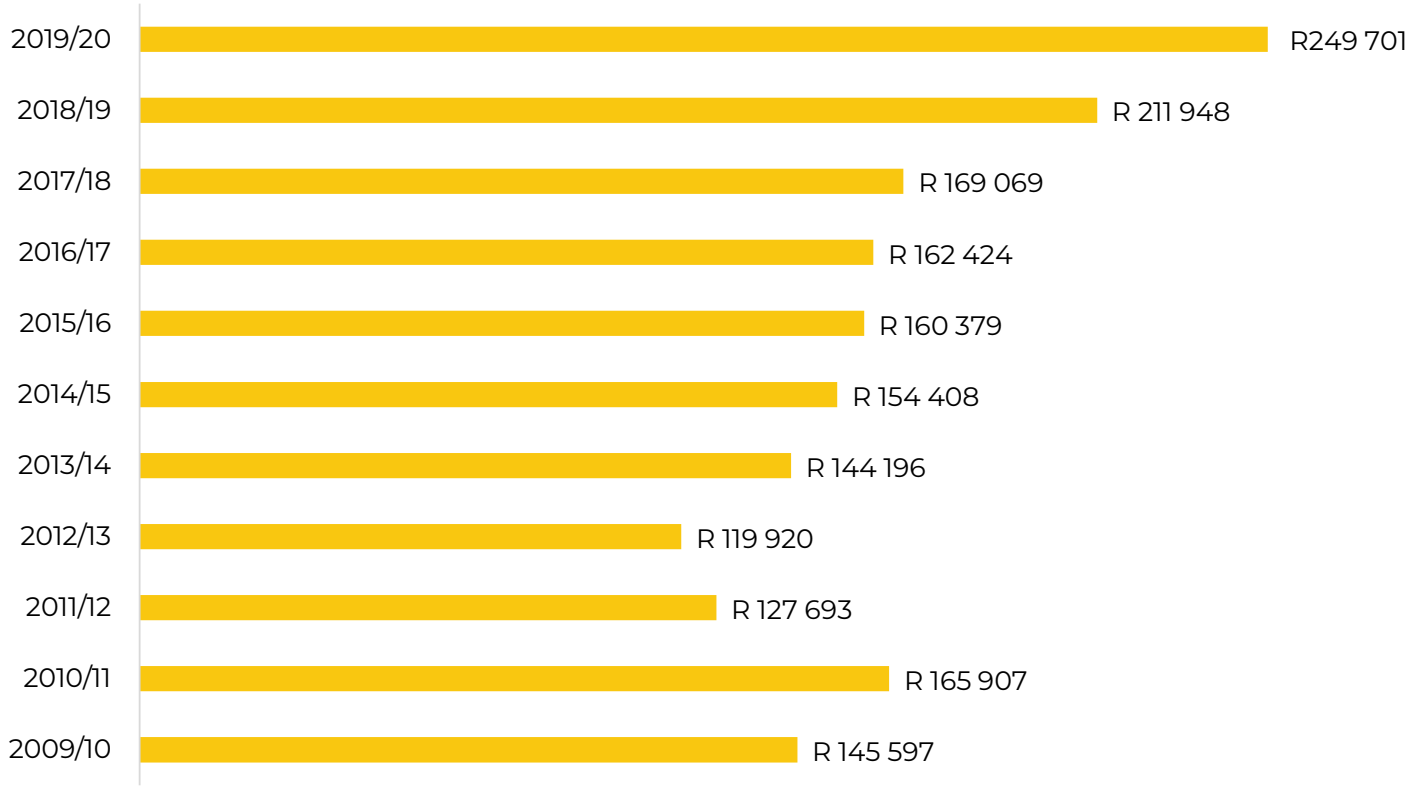
This table depicts the profile of the 59 postgraduate students working on projects funded by Hortgro Pome and Hortgro Stone.

Bursary costs total R 4 955 000

DEGREE	BLACK MALE	BLACK FEMALE	WHITE MALE	WHITE FEMALE	TOTAL
Hons	3	5	1	5	**14**
MSc	4	3	6	8	**21**
PhD	6	5	2	5	**18**
Postdoc	1	0	2	3	**6**
TOTAL	**14**	**13**	**11**	**21**	**59**

AVERAGE COST PER PROJECT

This graph illustrates the average cost per project per year, including inflation, over the past few years.
The average cost is influenced by the nature of the research, as well as other factors such as external funding and student bursaries.



CROP PRODUCTION RESEARCH PROGRAMME

Research within the crop production programme addresses current problems experienced by fruit growers, but is also future-directed – research has a long lead time and it is important to start building the capacity and conduct the research for the solutions that we will need in the future. In this sense, the crop production research strategy is directed and aligned with the requirements and key risks to the orchard of the future. Hence, increasing orchard productivity and efficiency as well as improving fruit quality are the main drivers of the crop production programme while climate change, extreme weather, plant material quality and water availability and quality are key risks that are addressed.

The crop production research programme is structured into six themes, namely dormancy, farming technology, irrigation and nutrition, rootstocks and nursery tree quality, growing season climate, and reproductive biology. The research strategy for each theme is determined by a workgroup (a workgroup per theme) consisting of fruit growers, technical advisors and researchers. When considering research strategy, the workgroups always keep in mind the changes we need to make to our orchards to remain internationally competitive as well as profitable. They also consider the major future risks, as identified within the overarching research strategy, which may jeopardise our profitability.

DORMANCY

READ PROJECT ABSTRACTS HERE

Research in this theme is aimed at understanding the progression of dormancy under mild winter conditions. We also study dormancy release in order to potentially identify new, safer rest breaking chemicals – Dr Xolani Siboza is currently busy with field evaluation of potential new rest breaking programmes that were based on laboratory work by Dr Esmé Louw and Laura Allderman.

It is becoming increasingly evident to the dormancy workgroup that the induction of dormancy under mild, local conditions requires further study. It is nearly impossible to apply chill models to our climatic data if we cannot determine when trees went dormant.

Hence, the induction of dormancy will be a key focus of future research. In terms of new projects, we are very excited about the early results obtained in the so-called adaptability project. This project consists of 10 genotypes each of apple, plum and cherry (the latter not currently funded by Hortgro) varying in chill (and heat) requirement planted at three climatically contrasting sites. The project allows the researchers to tease apart the effect of chill and heat requirements on the adaptability of cultivars to local conditions.

EXPERTISE

Dormancy Workgroup

RESEARCH TEAM

Prof Wiehann Steyn - Crop Production Programme Leader

Researchers

Dr Esmé Louw

Dr Xolani Siboza

Ms Laura Allderman

Dr Iwan Labuschagne

Mr Werner Truter

Students:

Mr Andrew van Lingen – MSc student

Ms Micheline Inamahoro – PhD student

Mr Tristan Dorfling – MSc student

Ms Anika Kock – MSc student

Dr Leandra Möller – Postdoctoral research fellow

Mr Dian Craven – MSc student

NEW PROJECTS

- Investigating the significance of temperature on flowering phenology by establishing a South African apple and plum phenophase-temperature database. (E Louw & I Labuschagne)

CURRENT PROJECTS

- Quantifying the impact of insufficient winter chill on apple fruit quality. (E Louw and A van Lingen)

- Investigating the effect of different autumn/winter/spring scenarios on budbreak in apple trees. (E Louw and L Allderman)

- Validation of the shoot assay as a proxy to determine progression of dormancy in intact apple trees. (E Louw and L Allderman)

- Evaluation of alternative rest breaking agents for apples. (X Siboza, K Theron and D Craven)

- Adaptability indexing of new pome (apple) and stone fruit (plum) cultivars in diverse South African growing areas. (I Labuschagne, E Louw, A Kock and T Dorfling) – see *Growing season climate*

- Scientific and practical guide to climate change and pome/stone fruit production in South Africa. (S Midgley) – see *Growing season climate* and also *Irrigation and nutrition*

- Leaf defoliation of Cripps' Pink and Granny Smith apples in the EGVV – effect on vegetative and reproductive development. (X Siboza, K Theron and D Craven) – see *Reproductive biology*

COMPLETED PROJECTS

- Physiological dynamics of dormancy in apple buds grown in areas with insufficient cold. (E Louw, L Möller and M Inamahoro)

- Investigating the effects of different autumn temperatures on endodormancy progression. (E Louw and L Allderman)

PUBLICATIONS

- Fresh Quarterly Dec 2019: Mouton, A. *Looking to the future.*

- Fresh Quarterly Jun 2020: Mouton, A. *Comparing apples with apples.*

EVENTS

- Langkloof seminar and orchard walk (28 November 2019)

ROOTSTOCKS AND NURSERY TREE QUALITY

READ PROJECT ABSTRACTS HERE

Finding more precocious and productive rootstocks adapted to South African conditions is integral to our orchard of the future vision. For this reason, various pome and stone fruit rootstocks are evaluated in an increasing number of industry trials in commercial orchards.

Hortgro Science has appointed Provar to run new rootstock trials under the management of Dr Xolani Siboza and with input from Dr Piet Stassen and the rootstock evaluation committee. Together with the new funding strategy of rootstock evaluation, which involves co-funding by IP owners and licensees, this increases the number of trials that are conducted. More trials mean better data and hopefully earlier and more confident recommendations regarding new rootstocks.

Completed research indicates that G.778 is a potential replacement for MM.109 while comprehensive stone fruit rootstocks trials have also identified some clear winners. Other rootstock research is aimed at characterising new rootstocks in terms of adaptation and disease and pest tolerance. In addition to new apple and stone fruit rootstock evaluation trials, a new project was initiated to assess the performance of apple trees derived from tissue culture compared to layer beds.

EXPERTISE

Rootstock and nursery tree quality workgroup
Rootstock evaluation committee

RESEARCH TEAM

Prof Wiehann Steyn - Crop Production Programme Leader

Researchers:
Dr Xolani Siboza
Dr Iwan Labuschagne
Dr Piet Stassen
Prof Stephanie Midgley
Ms Louisa Blomerus
Mr Carl Hörstmann
Mr Werner Truter
Prof Adele McLeod

Students:
Ms Lindsay Muchena – PhD student
Mr Solomon Zirebwa – PhD student
Ms Buhle Ngidi

NEW PROJECTS

- Performance of apple trees derived from tissue culture compared to those from layer beds. (L Blomerus)

- Apple rootstock influence on Granny Smith scion growth, productivity and fruit green colour. (X Siboza)

- Rootstock effect on growth synchronisation of apples planted in low chill areas. (X Siboza)

- Testing stone fruit rootstocks for salt tolerance in controlled conditions and in situ plantings. (W Truter)

- Evaluation of new plum rootstocks for South African fruit industry. (C Hörstmann)

- Growth synchronisation of stone fruit rootstocks and scions with different chilling requirements. (C Hörstmann)

- Evaluation of new peach rootstocks for South African fruit industry. (C Hörstmann)

CURRENT PROJECTS

- Evaluation of pear rootstocks for the South African industry. Packham's Triumph in Grabouw. (X Siboza and I Labuschagne)

- Evaluation of pear rootstocks for the South African industry. Forelle in Wolseley (Mostertshoek). (X Siboza and I Labuschagne)

- Evaluation of pear rootstocks for the South African industry. Cape Rose in Wolseley (Mostertshoek). (X Siboza and I Labuschagne)

- Evaluation of peach rootstocks for the South African fruit industry at Vaalwater, Limpopo. (P Stassen and C Hörstmann)

- Evaluation of peach rootstocks for South African fruit industry: Rawsonville planting (Slanghoek). (P Stassen and C Hörstmann)

- Evaluation of plum rootstocks for the South African industry at Simondium (Keunenberg). (P Stassen and C Hörstmann)

- Evaluation of plum rootstocks for South African fruit Industry: Robertson planting (Roodehoogte). (P Stassen and C Hörstmann)

- Evaluation of new apple rootstocks and interstem combinations in Grabouw (Oak Valley). (X Siboza and B Ngidi)

- Evaluation of new apple rootstocks and interstem combinations in Grabouw (Breëvlei). (X Siboza and B Ngidi)

- Evaluation of new apple rootstocks and interstem combinations in the Langkloof (Helderwater). (X Siboza and B Ngidi)

- Evaluation of new apple rootstocks representing two vigour classes in two growing areas (Bokveldskloof and Molteno). (X Siboza)

- Evaluation of new apple rootstocks representing three vigour classes at Môrester and Oak Valley. (X Siboza)

- Sensitivity of various apple rootstocks to water stress. (S Midgley and L Muchena)

- Establishing quantitative relationships between water relations, growth, yield and quality of high performing commercial apple orchards. (S Midgley and S Zirebwa) – see *Irrigation and nutrition*

- Evaluation of apple rootstocks tolerance against specific apple replant disease (SARD). (I Labuschagne, A McLeod and X Siboza) – see *Plant pathology*

PUBLICATIONS

- Fresh Quarterly Jun 2020: Mouton, A. *Getting to the root of salt tolerance*.

- SAFJ June/July 2020: Midgley, S., Muchena, L. and Dzikiti, S. Measuring tree sap flow - Why and how: p. 80.

EVENTS

- Langkloof seminar and orchard walk (28 November 2019)

GROWING SEASON CLIMATE

READ PROJECT ABSTRACTS HERE

Of the "serious" pome fruit producers, South Africa, together with Brazil, has the production areas closest to the equator. This means higher summer temperatures and generally altogether more plant stress and more fruit downgraded for processing compared to our major competitors.

The great inefficiency of caring for fruit that ultimately ends up in a juice bin would have seriously endangered deciduous fruit production in South Africa if not for the (currently) favourable exchange rate. It should not be surprising that research under this theme is predominantly aimed at decreasing sunburn and internal fruit quality defects brought about by climatic stress.

In terms of new projects, Hortgro bought into the final year of a four-year Winetech-funded project aimed at developing a climate and terrain tool for the EGVV production area. The output of this project can be accessed at https://www.terraclim.co.za/.

EXPERTISE

Growing season climate workgroup

RESEARCH TEAM

Prof Wiehann Steyn - Crop Production Programme Leader

Researchers:

Prof Karen Theron
Dr Elke Crouch
Dr Tara Southey
Prof Stephanie Midgley
Dr Esmé Louw
Dr Iwan Labuschagne

Students

Ms Nasreen van Rensburg – MSc student
Mr Brian Makeredza – PhD student
Ms Liza-Marie Dippenaar – MSc student
Dr Letitia Schoeman – Postdoctoral research fellow
Ms Anika Kock – MSc student
Mr Tristan Dorfling – MSc student

NEW PROJECTS

- Climate and terrain tool for the Elgin-Grabouw-Vyeboom-Villiersdorp production area specific to pome fruit. (T Southey) – see *Farming technology*

CURRENT PROJECTS

- Scientific and practical guide to climate change and pome/stone fruit production in South Africa. (S Midgley) – see *Dormancy* and also *Irrigation and nutrition*

- Adaptability indexing of new pome (apple) and stone fruit (plum) cultivars in diverse South African growing areas. (I Labuschagne, E Louw, A Kock and T Dorfling) – see *Dormancy*

- Effect of nets on growth, yield and fruit quality as well economic feasibility in plums. (K Theron and N van Rensburg)

COMPLETED PROJECTS

- Determining 'Forelle' pre-harvest mealiness / cavity development stage, due to environmental factors and exploring prevention of mealiness developing after storage and ripening. (E Crouch, L Schoeman and L-M Dippenaar) – see *Physiological defects*

PUBLICATIONS

- Fresh Quarterly Dec 2019: Mouton, A. *Looking to the future*.

- Fresh Quarterly March 2020: Mouton, A. *Sunburn*.

- Fresh Quarterly March 2020: Mouton, A. *Sunburn Research Summarized*.

- Fresh Quarterly March 2020: Mouton, A. *Net essentials*.

- Fresh Quarterly Sept 2020: Mouton, A. *Hot and Bothered*.

- Fresh Quarterly Sept 2020: Mouton, A. *Forewarned is forearmed*.

- Fresh Notes 169 – 10 January 2020: *Heat damage plums*.

REPRODUCTIVE BIOLOGY

READ PROJECT ABSTRACTS HERE

Research in this field is aimed at obtaining regular high yields of good quality fruit. Hence, projects tend to investigate flower initiation, fruit set, fruit thinning and alternate bearing.

The research is mostly applied and in recent years provided the stone fruit industry with a mechanical thinning option and a new chemical thinning agent that will soon be registered for use on plums, peaches and nectarines.

Prof Theron studied the use of plant growth regulators to increase stem lengths of various apple cultivars. She is also evaluating the use of new plant growth regulators for thinning and fruit set. Philagro South Africa is covering the cost of these projects while Hortgro contributes to Prof Theron's salary.

EXPERTISE

Reproductive biology workgroup

RESEARCH TEAM

Prof Wiehann Steyn - Crop Production Programme Leader

Researchers:

Dr Nicky Taylor
Prof Karen Theron
Dr Xolani Siboza

Students:

Ms Suzann Oosthuizen – MSc student
Mr Dian Craven – MSc student

CURRENT PROJECTS

- Leaf defoliation of Cripps' Pink and Granny Smith apples in the EGVV – effect on vegetative and reproductive development. (X Siboza, K Theron and D Craven) – see *Dormancy*

- Carbon partitioning in low chill peach cultivars: the impact on yield in summer rainfall areas of South Africa. (N Taylor and S Oosthuizen)

PUBLICATIONS

- Fresh Quarterly Sept 2020: Mouton, A. *The fundamentals of fruit set.*

- Fresh Quarterly Sept 2020: Mouton, A. *Hot and bothered.*

- Fresh Quarterly Sept 2020: Mouton, A. *Five factors affecting fruit set.*

FARMING TECHNOLOGY

READ PROJECT ABSTRACTS HERE

Research in this theme focuses on orchard mechanization and technology drivers such as big data, remote sensing, robotics, and GIS that will all contribute to changing the way we produce our fruit in our orchards of the future.

A new study was initiated in collaboration with CRI and KaapAgri to identify specific netting structure considerations that should be taken into account when erecting a netting structure in an orchard. A best practice guideline was developed to improve design integrity and risk mitigation in the industry.

Final reports were completed for each of the four orchards participating in the Hortgro orchard of the future programme. The four orchards of the future focused sharply on future industry needs and have been setting the crop production research agenda. It was evident from the financial data that intensive, high-density farming makes financial sense if onset of cropping is advanced and higher fruit quality is achieved.

EXPERTISE

Farming technology workgroup

RESEARCH TEAM

Prof Wiehann Steyn – Crop Production Programme leader

Mr Marno van der Westhuizen – Research Implementation Manager in charge of the orchard of the future programme

Researchers:

Mr Koos Bouwer
Dr Tara Southey

NEW PROJECTS

- Development of a best practice guideline for the construction of agricultural netting structures (K Bouwer)

- Climate and terrain tool for the Elgin-Grabouw-Vyeboom-Villiersdorp production area specific to pome fruit. (T Southey) – see *Growing season climate*

COMPLETED PROJECTS

- Orchard of the Future – Paardekloof (Du Toit Agri) (M van der Westhuizen)

- Orchard of the Future – Graymead (Fruitways) (M van der Westhuizen)

- Orchard of the Future – Oak Valley (TAD) (M van der Westhuizen)

- Orchard of the Future – Bokveldskloof (ZZ2) (M van der Westhuizen)

IRRIGATION AND NUTRITION

READ PROJECT ABSTRACTS HERE

Water availability was identified as one of the top five risks facing our industry in the future. The Western and Eastern Cape provinces are water scarce; climate change is driving a drying trend and competition for water is increasing.

The crop production water strategy involves:

1) determining how much water highly productive apple trees use;

2) funding permitting expanding this research to include stone fruit;

3) conducting research on various water saving technologies and

4) conducting research to show growers the negative effects of over-irrigation on production and quality.

A Water Research Commission co-funded project on water saving under fixed and draped nets commenced in 2018. A new project was initiated to assess the tolerance of various stone fruit rootstocks to salinity stress.

EXPERTISE

Irrigation and nutrition workgroup

RESEARCH TEAM

Prof Wiehann Steyn - Crop Production Programme Leader

Researchers:

Prof Stephanie Midgley
Dr Eduard Hoffman
Dr Johan van Zyl
Dr Caren Jarmain
Dr Nicky Taylor
Prof Adriaan van Niekerk
Dr Sebinasi Dzikiti
Dr Elmi Lötze
Mr Stephan Daiber

Students:

Ms Aline Stofberg – PhD student
Mr Solomon Zirebwa – PhD student
Ms Ncamsile Shongwe – MSc student
Mr Edward Lulane – PhD student
Mr Stephen Jordaan – MSc student

CURRENT PROJECTS

- Establishing quantitative relationships between water relations, growth, yield and quality of high performing commercial apple orchards. (S Midgley and S Zirebwa) – see *Rootstocks and nursery tree quality*

- Investigating the potential of fixed and draped netting technology for increasing water productivity and water savings in full bearing apple orchards under micro-irrigation. (S Midgley, E Lulane and S Jordaan)

- The effect of a water deficit on fruit tree phenology, fruit production, fruit quality and storability of Fuji and Cripps' Pink apples. (S Midgley and S Daiber) – See *Quality management*

- Scientific and practical guide to climate change and pome/stone fruit production in South Africa. (S Midgley) – see *Dormancy* and also *Growing season climate*

COMPLETED PROJECTS

- The effect of irrigation on the performance of young apple trees in newly established orchards. (E Hoffman, J van Zyl and A Stofberg)

- Water use of pome and stone fruit: knowledge status, relevance and gap analysis. (C Jarmain, N Taylor, A van Niekerk and N Shongwe)

PUBLICATIONS

- Fresh Quarterly Sept 2020: Mouton, A. *The fundamentals of fruit set.*

- Fresh Quarterly Sept 2020: Mouton, A. *Hot and bothered.*

CROP PROTECTION RESEARCH PROGRAMME

The crop protection programme is multidisciplinary in nature and it includes both applied and basic research on nematology, entomology and plant pathology. The crop protection technical advisory committee assesses research outputs and research priorities. In addition, the entomology and pathology peer workgroups assess proposed and current research projects and provide guidance to the researchers involved in the programme. Various workgroups also aid in identifying research needs and prioritizing research projects.

Ensuring the sustainability of the fruit production process is a critical aspect in crop protection research and emphasis is placed on biological control, orchard ecology, phytosanitary issues and precision agriculture.

Crop protection research during this season has been challenging with Covid complicating and delaying a number of projects. However, a number of important projects were completed and a wide variety of new projects approved.

PHYTOSANITARY AND MARKET ACCESS

READ PROJECT ABSTRACTS HERE

The threat posed by phytosanitary issues to market access is significant and ongoing. The current spread of the invasive oriental fruit fly and the concerns regarding false codling moth are relevant examples. The current research projects address a number of relevant issues including applied research on fumigation using novel materials. The research programme is aimed at ensuring effective management of phytosanitary pests and diseases and ensuring access to markets.

EXPERTISE

Phytosanitary and biosecurity workgroup

Integrated pest management group

RESEARCH TEAM

Matthew Addison - Crop Protection Programme Leader

Researchers:

Dr Shelley Johnson

Dr Pia Addison

Dr Tony Ware

Ms Anél Blignaut

Mr Handré Viljoen

Technical Assistance:

Mr Terence Asia

Students:

Dr Renate Smit – Postdoctoral research fellow
Dr Leigh Steyn – Postdotoral research fellow

NEW PROJECTS

- Academic support for the development of a pest diagnostic company. (P Addison)

- Updating the quick identification guide for phytosanitary pests of South African deciduous fruit. (S Johnson)

CURRENT PROJECTS

- Comparison of cold disinfestation treatments of Thaumatotibia leucotreta (Lepidoptera: Tortricidae) in peaches, plums (Prunus spp.) and media. (T Ware)

- Disinfestation of Bactrocera dorsalis fruit fly-infested apples, pears, nectarines and plums using cold treatment. (T Ware)

- Upscale and customise ethyl formate fumigation from shipping container to cold room capacity for the control of key phytosanitary pests. (S Johnson & R Smit)

- Effect of irradiation as a mitigation treatment on storage quality of early peaches and nectarines for airfreight consignments. (H Viljoen) – see *Quality management*.

- Confronting climate change initiative. (A Blignaut)

PUBLICATIONS

- Fresh Quarterly Sept 2020: Bestbier, G. *The six-legged hitchhiker*.

- Fresh Quarterly Sept 2020: Bestbier, G. *Fumigation to combat phytosanitary pests*.

EVENTS

- Langkloof seminar and orchard walk (28 November 2019)

NEMATOLOGY

READ PROJECT ABSTRACTS HERE

The research programme on nematodes continues to be highly productive. Past and current research has allowed for the development of a number of potential biological control agents.

Both plant parasitic and entomopathogenic nematodes are being researched. Entomopathogenic fungi are also being integrated into the research programme. The research on plant parasitic nematodes and the host status of various cover crop species by Dr Rinus Knoetze is now complete and is highly relevant to industry.

EXPERTISE

Integrated pest management group
Soil health workgroup

RESEARCH TEAM

Matthew Addison - Crop Protection Programme Leader

Researchers:

Prof Antoinette Malan
Dr Nomakholwe Stokwe
Dr Rinus Knoetze
Ms Lené van der Walt
Mr T Platt

Students:

Ms Letodi Mathulwe – MSc student
Mr Murray Dunn – PhD student

NEW PROJECTS

- Biological control agents currently available for plant parasitic nematode control. (L van der Walt)
- Mass culture and formulation of entomopathogenic nematodes for improved field application against key insect pests. (A Malan and M Dunn)
- Evaluating the ability of entomopathogenic nematodes (EPNs) for their ability to control populations of the obscure mealybug (Pseudococcus viburni) on apple foliage in field conditions. (T Platt)
- Identification and characterisation of naturally suppressive soils specific to ring nematodes (Criconemoides xenoplax). (R Knoetze)
- Ring nematode (Criconemoides xenoplax) resistance of South African bred rootstock selections in potted plant trials and high pH soils. (S Booi)

CURRENT PROJECTS

- Control of the mealybug, Pseudococcus viburni, using entomopathogenic fungi in deciduous fruit orchards. (N Stokwe and L Mathulwe)
- Screening of apple rootstocks for resistance against the most prevalent Pratylenchus species affecting orchards in South Africa. (R Knoetze)

COMPLETED PROJECTS

- Host status of certain cover crops for the root lesion nematode, a major pest of economic importance in apples. (R Knoetze)

PUBLICATIONS

- Fresh Quarterly June 2020: Mouton, A. *Future-proofing pest management.*

EVENTS

- Hortgro Science Research Showcase videos, Crop Protection Projects in September 2020

SOIL HEALTH

READ PROJECT ABSTRACTS HERE

Research on soil health and orchard floor ecology is an emerging theme in agriculture as it is an important component of sustainability. Current research is focused on cover crops and their effects on soils, soil biota and fruit production. New research is focused on the role of collembola (small primitive insects living on and below soils) in orchard soil ecology and the effect of plant diversity in planted cover crops.

EXPERTISE

Soil health workgroup
Integrated pest management group

RESEARCH TEAM

Matthew Addison - Crop Protection Programme Leader

Researchers:

Dr Charlene Janion-Scheepers
Mr Matthew Addison

Students:

Ms Ansuli Theron – MSc student
Mr Abdul Jacobs – MSc student

NEW PROJECTS

- Soil health in orchards: the role of collembola as key indicators (C Janion-Scheepers and A Jacobs)

CURRENT PROJECTS

- Orchard floor management and soil health in deciduous fruit orchards. (M Addison and A Theron)

PUBLICATIONS

- Fresh Quarterly March 2020: Mouton, A. *Back to earth.*

EVENTS

- Hortgro Science Research Showcase videos, Crop Protection Projects in September 2020

PLANT PATHOLOGY

READ PROJECT ABSTRACTS HERE

The plant pathology research programme addresses a number of important industry issues. On-going research on the incidence and distribution of fungal pathogens in young trees is highly relevant, as is the integrated management of apple scab. Apple replant disease and various aspects of post-harvest pathology, including the development of alternative fungicides, are also receiving attention.

EXPERTISE

Pre- and postharvest pathology workgroup
Integrated pest management group

PRE-HARVEST PATHOLOGY

RESEARCH TEAM

Matthew Addison - Crop Protection Programme Leader

Researchers:

Prof Lizél Mostert
Prof Adele McLeod
Dr Pieter Louw
Dr Iwan Labuschagne
Dr Xolani Siboza
Mr Werner Truter
Prof Hano Maree
Dr Rachelle Bester
Dr Yolanda Petersen

Students:

Mr Vernon Jacobs – MSc student
Ms Reshika Kallideen – PhD student
Ms Doré de Villiers – MSc student
Ms Elzane Froneman – MSc student
Ms Rochelle Janse van Rensburg – PhD student

NEW PROJECTS

- Determining the risk of mulches in the spread of canker pathogens in apple orchards. (L Mostert, V Jacobs and R Kallideen)

- Investigating the relationship of pathogens, particularly Alternaria, in causing fruit spot symptoms/lenticel damage on apples. (P Louw)

- Bacterial disease survey of major pome fruit production areas in South Africa. (Y Petersen)

- Determine the occurrence of fungicide resistance against pyrimethanil and fludioxinol in Monolinia laxa and Botrytis cinerea populations from stone fruit orchards. (P Louw)

- Development of a hybridisation-based detection assay for PVdI. (H Maree and R Bester)

- Evaluation of PVdI transmission through top working infected trees. (H Maree and R Bester)

CURRENT PROJECTS

- The influence of climatically different seasons on the reproductive strategy of Venturia inequalis and the RIMpro disease forecasting model. (A McLeod and E Froneman)

- The effect of organic amendments on the severity of apple replant diseases in subsequent apple orchard replantings. (A McLeod and R Janse van Rensburg)

- Evaluation of apple rootstocks tolerance against specific apple replant disease (SARD). (I Labuschagne, A McLeod, X Siboza and W Truter)

- Evaluation of pruning wound protectants on nursery apple trees. (L Mostert)

- Alternatives for the management of apple replant disease. (A McLeod and D de Villiers)

COMPLETED PROJECTS

- Survey of stem canker pathogens on stone fruit propagation material and young stone fruit trees. (L Mostert and V Jacobs)

- Determine fungicide efficacy using qRT-PCR for detection and quantification of Botrytis cinerea inoculum and viability on pear leaves as a substrate, before and after fungicide application. (P Louw)

PUBLICATIONS

- SAFJ April/May 2020: Havenga, M., Gatsi, G., Halleen, F., Spies, C.F.J., van der Merwe, R. and Mostert, L. *Canker and wood rot pathogens in young apple trees and propagation material*: p. 50

- Fresh Notes 170 – 5 February 2020: *Plum marbling*

- Fresh Notes 173 – 13 March 2020: *Plum marbling update*

- Fresh Notes 178 – 16 July 2020: *Plum marbling update*

EVENTS

- Hortgro Science Research Showcase videos, Crop Protection Projects in September 2020

- Hortgro Science Plum Marbling Days, 4 and 5 March 2020

POST-HARVEST PATHOLOGY

RESEARCH TEAM

Matthew Addison - Crop Protection Programme Leader

Researchers:

Dr Cheryl Lennox
Dr Julia Meitz-Hopkins
Dr Robbie Pott
Dr Oluwafemi Caleb
Dr Olaniyi Fawole
Dr Pieter Louw

Students:

Dr Zinash Belay – Postdoctoral research fellow
Ms Nandi Nyamende – MSc student
Ms Christi Kriek – Honours student
Ms Janis von Johannides – MEng student
Dr George Teke – Postdoctoral research fellow
Ms Sinovujo Magwebu – MSc student
Mr Andre Russouw – MSc student

CURRENT PROJECTS

- Thermal and non-thermal treatments of stone and pome fruit: Towards efficient phytosanitary measures. (O Caleb, Z Belay and N Nyamende) – see *Quality management*

- Bioreactor and process development for the production of antimicrobial lipopeptides produced by Bacillus spp. for biological control of postharvest phytopathogens in the perishable fruit industry. (R Pott, C Kriek, J von Johannides and G Teke)

- Pursuit of sanitiser products for potential use in the apple and pear industry. (P Louw)

- Lipopeptides Fengycin and Iturin A as postharvest fungicide on pome fruit. (C Lennox, J Meitz-Hopkins and S Magwebu)

COMPLETED PROJECTS

- Develop a storage protocol for plums harvested from week 5 onwards for 6 weeks in bins - decay control using alternative gas regimes of CO2 and O2 manipulation, UV treatment of air supply and a GRAS product drench. (P Louw)

- Purification of antimicrobial lipopeptides produced by Bacillus spp. for biological control of postharvest phytopathogens in the perishable fruit industry. (R Pott, J von Johannides and G Teke)

- The development of an integrated management strategy for Bulls Eye rot of apples. (C Lennox, J Meitz-Hopkins and A Russouw)

EVENTS

- Hortgro Science Research Showcase videos, Crop Protection Projects in September 2020

INTEGRATED PEST MANAGEMENT

READ PROJECT ABSTRACTS HERE

The IPM research programme deals with a wide variety crop protection issues. The research is aimed at allowing for the more efficient and sustainable control of pests and diseases. Invasive insects and phytosanitary concerns have influenced the research programme. Research on false codling moth has yielded significant results, as has research on biological control.

EXPERTISE

Integrated pest management workgroup

RESEARCH TEAM

Matthew Addison – Crop Protection Programme leader

Researchers:

Dr Pia Addison
Prof John Terblanche
Dr Ruan Veldtman
Mr Mike Allsopp
Mr Thomas Platt
Prof Francois Roets

Technical Assistant:

Mr Terence Asia

Students:

Dr Minette Karsten – Postdoctoral research fellow
Dr Francois Bekker - Postdoctoral research fellow
Mr Francois du Preez– PhD student
Ms Erika Huisamen – PhD student
Ms Mignon de Jager – MSc student
Mr Steffan Hansen – MSc student
Ms Bianca Stead – MSc student
Ms Erica Huisamen – PhD student

NEW PROJECTS

- Assessing the threat of the Polyphagous Shot Hole Borer beetle (PSHB, Euwallacea whitfordiodendrus) and its symbiotic fungus (Fusarium euwallaceae) to deciduous fruit trees in the Western Cape Province of South Africa. (F Roets and M de Jager)

- Phlyctinus callosus taxonomy and field management. (P Addison and S Hansen)

- Trophic ecology of predaceous mites in apple and pear orchards. (J Terblanche and M Karsten)

CURRENT PROJECTS

- Implementation of biological control options against false codling moth in laboratory and field trials. (P Addison and F du Preez)

- Assessment of management methods against pome fruit mites. (T Platt and P Addison)

- Sequencing the genome and transcriptome of false codling moth, Thaumatotibia leucotreta, for pest management. (J Terblanche and M Karsten)

- False codling moth population genetics: gene flow in agricultural environments. (J Terblanche, M Karsten and E Huisamen)

- Maintaining and rearing of insect cultures. (M Addison and T Asia)

COMPLETED PROJECTS

- Determining the contribution of wild honey bees (pollination ecosystem service) to commercial deciduous fruit production. (R Veldtman and M Allsopp)

- Pest and disease monitoring in orchards under shade net. (M Addison)

- Exploration of orchard sanitation and the potential of parasitic wasps for the biological control of fruit flies in South Africa. (P Addison and B Stead)

PUBLICATIONS

- Fresh Quarterly Dec 2019: Mouton, A. *False codling moth.*

- Fresh Quarterly Dec 2019: Mouton, A. *Waging war on moth malefactors.*

- Fresh Quarterly Dec 2019: Mouton, A. *The false codling moth genome sequence.*

- Fresh Quarterly March 2020: Bestbier, G. *A tale of two flies.*

- Fresh Quarterly March 2020: Bestbier, G. *Going the distance.*

- Fresh Quarterly Jun 2020: Mouton, A. *The secret life of weevils.*

- Fresh Quarterly Jun 2020: Mouton, A. *Polyphagous shot-hole borer.*

- SAFJ December 2019/ January 2020: Steenkamp, E. *The polyphagous shot hole borer: p. 53*

EVENTS

- Hortgro Science Research Showcase videos, Crop Protection Projects in September 2020

PRECISION AGRICULTURE

READ PROJECT ABSTRACTS HERE

The application of new technology in integrated pest management and the industry in general is critical. The development of more efficient spray application and evaluation methods is central to pest and disease control. Coupled to this is the use of predictive models and various decision support methods that allow for the accurate application of management methods. Current research addresses a number of these issues.

EXPERTISE

Spray application workgroup
Integrated pest management group

RESEARCH TEAM

Matthew Addison - Crop Protection Programme Leader

Researchers:

Dr Pia Addison
Dr Gideon van Zyl
Dr Francois Bekker

Students:

Mr Quintus Deacon – MSc student

CURRENT PROJECTS

- Evaluation of spray application techniques on pome and stone fruit trees for improved spray deposition parameters for the control of late season red spider mite. (G van Zyl)

- Artificial intelligence for managing economic fruit pest efficiently. (P Addison, F Bekker and Q Deacon)

PUBLICATIONS

- Fresh Quarterly Sept 2020: Mouton, A. *Protect your crops with effective spray application*.

- Fresh Quarterly Sept 2020: Mouton, A. *Time is money*.

- Fresh Quarterly Sept 2020: Mouton, A. *How are dosages determined?*

EVENTS

- Hortgro Science Research Showcase videos, Crop Protection Projects in September 2020

POST-HARVEST RESEARCH PROGRAMME

Post-harvest supports and enhances the processes throughout the supply-chain critical to ensuring that intrinsic product integrity is maintained and that a quality product is available to the end-consumer in local and distant global markets. Post-harvest covers producers, packhouses, marketing co-ordination, logistics and shipping, receivers/wholesalers and end-consumers. The post-harvest research programme is structured into four themes, namely quality management, physiological defects, storage techniques and packaging and logistics. Research strategy for each theme is determined by a workgroup (a workgroup per theme) consisting of exporters, pre- and post-harvest technical specialists, industry consultants and researchers. Additional workgroups are formed as and when needed.

WHEN CONSIDERING RESEARCH STRATEGY, THE WORKGROUPS ALWAYS KEEP IN MIND THE OBJECTIVES OF THE POST-HARVEST RESEARCH PROGRAMME, WHICH ARE THE FOLLOWING:

- **To increase the marketable tons of fruit delivered per ton of fruit loaded;**
- **To present clients all along the post-harvest value chain extending up to the consumer with a safe product of reliable, good quality;**
- **To reduce wastage and losses from defects and pathogens (see the crop protection programme for post-harvest pathology research);**
- **To increase efficiencies throughout the post-harvest value chain;**
- **To increase the sustainability of post-harvest practices;**
- **To reduce risk within the post-harvest value chain.**

Research needs relating to pre-harvest factors that affect post-harvest quality and storability are addressed within the crop production programme. The post-harvest and crop production programmes share a programme manager with the effect that research is very well integrated over the two programmes.

QUALITY MANAGEMENT

READ PROJECT ABSTRACTS HERE

Quality management refers to maintaining quality throughout the logistical chain to the end-consumer. With reference to stone fruit, shrivel due to moisture loss, is the main post-harvest defect and therefore the key research focus area. Prof Olaniyi Fawole has been conducting very interesting research on the use of edible coatings to prevent moisture loss and maintain fruit keeping quality. Moisture loss in pears is also receiving attention. Pome fruit projects are aimed at optimising the Forelle Early Market Access (FEMA) programme in terms of release criteria and marketing protocol.

EXPERTISE

Quality management workgroup

RESEARCH TEAM

Prof Wiehann Steyn - Post-Harvest Programme Leader

Researchers:

Ms Anél Botes
Mr Daniël Viljoen
Mr Stephan Daiber
Mr Handré Viljoen
Dr Olaniyi Fawole
Dr Oluwafemi Caleb
Prof Stephanie Midgley
Dr Elke Crouch
Ms Heleen Tayler

Students:

Ms Shannon Riva – MSc student
Ms Taongashe Majoni – MSc student
Ms Nicole Jenneker – MSc student
Ms Nandi Nyamende –MSc student
Ms Makiwe Nkohla – MEng student
Dr Zinash Belay – Postdoctoral research fellow
Mr Tsepo Kholoane – Honours student
Mr Kenias Chigwaya – PhD student
Ms Asanele Same – MSc student

PUBLICATIONS

- SAFJ February/March 2020: Viljoen, H.W. *Impact of carton liners*: p. 46.
- SAFJ April/May 2020: Viljoen, H.W. *Packaging and humidity control impact on shrivel*: p. 42.
- Fresh Notes 172 – 28 February 2020: FEMA.

EVENTS

- Langkloof seminar and orchard walk (28 November 2019)

POME FRUIT PROJECTS

NEW PROJECTS

- Assessment of malic acid equivalents of Forelle pears on the storability and taste thereof. (D Viljoen)

CURRENT PROJECTS

- Thermal and non-thermal treatments of stone and pome fruit: Towards efficient

phytosanitary measures. (O Caleb, Z Belay and N Nyamende) - see *Pre- and post-harvest pathology*

- The effect of a water deficit on fruit tree phenology, fruit production, fruit quality and storability of Fuji and Cripps' Pink apples. (S Midgley and S Daiber) - see Irrigation and nutrition

- Moisture loss studies in pears. (A Botes, E Crouch and A Same)

- Revision of FEMA release standards when fruit do not make FEMA firmness or sugar criteria. (D Viljoen)

- To develop marketing protocols for FEMA designated orchards that are harvested two to three weeks after normal release but do not qualify for FEMA release. (D Viljoen)

- Integrated post-harvest ethylene management along the value chain: From the farm to the consumer. (O Caleb, Z Belay and M Nkohla)

- The use of HarvistaTM (pre-harvest 1-MCP) application to prevent green colour loss and reduce blush of Granny Smith apples. (D Viljoen)

COMPLETED PROJECTS

- Fuji browning types explored via X-Ray CT in collaboration with existing trial. (E Crouch & K Chigwaya)

- To investigate different step down cooling regimes, utilised in conjunction with SmartFreshSM, to reduce the risk of internal browning of Cripps' Pink apples and provide year round supply of good quality fruit. (H Tayler, D Viljoen, E Crouch and T Kholoane) – see *Storage techniques*

STONE FRUIT PROJECTS

NEW PROJECTS

- Technology testing for the ability to control shrivel in cold-stored plums and nectarines. (H Viljoen)

CURRENT PROJECTS

- Thermal and non-thermal treatments of stone and pome fruit: Towards efficient phytosanitary measures. (O Caleb, Z Belay and N Nyamende) - see *Pre- and post-harvest pathology*

- Effect of irradiation as a mitigation treatment on storage quality of early peaches and nectarines for airfreight consignments. (H Viljoen) – see *Phytosanitary and market access*

- Evaluation of the 8 mm penetrometer plunger to determine harvest maturity on plums. (H Viljoen)

- Application of postharvest bioactive edible coatings and natural antimicrobial peptides as a green solution to alleviate shrivel and extend storage life of plums. (O Fawole and N Jenneker)

- Application of post-harvest edible coatings to alleviate shrivel in plums and nectarines. (O Fawole and S Riva)

- Profiling sugar metabolism in plums as related to maturity, cultivar difference and post-harvest storage regimes. (O Fawole and T Majoni)

COMPLETED PROJECTS

- Develop a six week storage protocol for plums harvested from week 5 onwards. (H Viljoen)

PHYSIOLOGICAL DEFECTS

READ PROJECT ABSTRACTS HERE

The main internal quality defects receiving research attention are lenticel breakdown, mealiness, superficial scald and internal browning. Research is aimed at understanding the underlying causative factors (both pre- and post-harvest) and biochemistry of these defects so to allow the development of technology to limit or prevent their occurrence. Other aims are to generate best practice guidelines for handling of fruit both pre- and post-harvest and to develop indicators to predict the risk of the various defects in a given season. Mealiness in 'Forelle' pears, once a major defect, is today circumvented through either cold storing fruit for a minimum of 12 weeks or through the Forelle Early Market Access (FEMA) programme. These solutions were developed on the basis of considerable research over many years. The latest projects on mealiness broadened our understanding of the link between fruit anatomy, most notably flesh porosity, and the development of mealiness, but potentially also a range of other disorders such as internal browning. We have also learned how fruit position in the canopy through exposure to light affects flesh porosity and thereby mealiness development.

EXPERTISE

Physiological defects workgroup

RESEARCH TEAM

Prof Wiehann Steyn - Post-Harvest Programme Leader

Researchers:

Dr Elke Crouch

Dr Elmi Lötze

Dr Ian Crouch

Dr Ashwil Klein

Ms Anél Botes

Mr Daniël Viljoen

Mr Handré Viljoen

Students:

Mr Kenias Chigwaya – PhD student

Dr Letitia Schoeman – Postdoctoral research fellow

Ms Liza-Marie Dippenaar – MSc student

Ms Nolubabalo Mzizi -MSc student

Mr Alone Hlungwani – PhD student

Ms Monja Gerber – PhD student

Dr Thirupathi Pandian - Postdoctoral research fellow

Mr Rudolph Cronjé – MSc student

Dr Walter Fourie – Postdoctoral research fellow

Dr Tavagwisa Muzuri – Postdoctoral research fellow

CURRENT PROJECTS

- Compilation of a database of high quality images of pome fruit disorders from South African growing and storage conditions to contribute to the further development of software-based determination (APP) for the detection and reduction of bearing damage in fruit (Frudistor) in an international context. (I Crouch)

- Quantifying the role of vapour pressure deficit in the development of lenticel breakdown in Braeburn apples. (E Lötze, D Viljoen and N Mzizi)

- Superficial scald on Granny Smith - understanding the mechanisms and limitations of the storage protocols used by industry and assess risk indicators in storage for scald development. (E Crouch, A Botes, A Klein, D Viljoen, T Pandian, M Gerber and A Hlungwani)

- Detection of internal heat damage and identification of techniques to prevent the expression of the disorder in plums. (H Viljoen) – also *Storage techniques*

- Determining 'Forelle' pre-harvest mealiness / cavity development stage, due to environmental factors and exploring prevention of mealiness developing after storage and ripening. (E Crouch, L Schoeman and L-M Dippenaar) – see *Growing season climate*

COMPLETED PROJECTS

- Fuji browning types explored via x-ray CT in collaboration with existing trial. (E Crouch and K Chigwaya)

- Post-harvest 'Forelle' mealiness development, detected at harvest by CT X- ray scanning and semi-commercial colour pre-sorting influenced by canopy position at harvest as well as pollination. (E Crouch, W Fourie, T Muziri, L Schoeman and R Cronjé)

PUBLICATIONS

- Fresh Quarterly March 2020: Mouton, A. *Internal Browning in Cripps Pink.*

- Fresh Quarterly March 2020: Mouton, A. *Keep your apples in the pink.*

- Fresh Quarterly March 2020: Store-it Group. *Best post-harvest practices.*

- Fresh Quarterly Jun 2020: Bestbier, G. *Solutions for superficial scald.*

- Fresh Quarterly Jun 2020: Bestbier, G. *Putting it in pictures.*

- Fresh Notes 169 – 10 January 2020: *Heat damage plums.*

STORAGE TECHNIQUES

READ PROJECT ABSTRACTS HERE

Non-chemical scald control and prevention of internal browning are major focusses of the evaluation of storage technologies and protocols. On the browning front, Heleen Taylor and Dr Elke Crouch showed that harvesting at optimum maturity combined with step down cooling and 1-MCP treatment significantly decreases the risk of internal browning development in Pink Lady™ during long term storage. These findings have major practical application and have been included in the updated best practice guidelines for cold storage of Pink Lady™. A major outcome of research in this theme is the development of protocols to prevent or reduce the incidence of disorders and to maintain fruit quality.

EXPERTISE

Controlled atmosphere storage group

RESEARCH TEAM

Prof Wiehann Steyn – Post-Harvest Programme leader

Researchers:
Ms Anél Botes
Dr Elke Crouch
Mr Daniël Viljoen
Dr Asanda Mditshwa
Mr Handré Viljoen
Dr Pieter Louw
Ms Heleen Tayler
Dr Ian Crouch

Students:

Mr Tsepo Kholoane – Honours student
Mr Braam Mouton – MSc student
Ms Zinhle Shezi – Honours student
Mr Jason Ladegourdie – MSc student
Ms Monja Gerber – PhD student
Ms Anmari Kriegler – MSc student

NEW PROJECTS

- Investigate the effect of step wise cooling on superficial scald and internal browning in apples. (A Botes , E Crouch and A Kriegler)

- Soft scald development and management in apples. (A Botes , E Crouch and J Ladegourdie)

- Survey of commercial stone fruit cold room relative humidity and temperature to ascertain possible impact on moisture management. (H Viljoen)

CURRENT PROJECTS

- Detection of internal heat damage and identification of techniques to prevent the expression of the disorder in plums. (H Viljoen) – see P hysiological defects

- Performance evaluation of three controlled atmosphere storage equipment / techniques on Granny Smith apples. (E Crouch, I Crouch, A Botes, M Gerber and B Mouton)

- Studies on the effect of ozone on postharvest quality of apples. (A Mditshwa and Z Shezi)

- The effect of OTFLOW system on temperature distribution in containers specifically for cold steri protocols. (H Viljoen)

- Develop a storage protocol for plums stored for 6 weeks in bins prior to packing - decay control using alternative gas regimes of CO2 and O2 manipulation, fungicides and GRAS products by drenching and Ozone treatment. (P Louw) – see *Pre- and post-harvest pathology*

- Determine optimum storage conditions for Abate Fetel pears. (A Botes)

COMPLETED PROJECTS

- To investigate different step down cooling regimes, utilised in conjunction with SmartFreshSM, to reduce the risk of internal browning of Cripps' Pink apples and provide year round supply of good quality fruit. (H Tayler, D Viljoen, E Crouch and T Kholoane)

PUBLICATIONS

- Fresh Quarterly March 2020: Store-it Group. Best post-harvest practices.

EVENTS

- Langkloof seminar and orchard walk

(28 November 2019)

PACKAGING / LOGISTICS

READ PROJECT ABSTRACTS HERE

Logistics projects focus on the optimisation of shipping container space utilisation while packaging projects are aimed at reducing plastic packaging or finding alternatives to non-recyclable, single use plastics without jeopardising fruit quality or the structural integrity of the packaging. The plastic workgroup of the packhouse action group provides direction in terms of where industry needs to go with regard to plastic packaging. Going forward, Hortgro will be initiating projects on the needs identified by the plastic workgroup. The research of Dr Olaniyi Fawole on edible coatings (also see the quality management theme) is delivering very promising results. Dr Fawole found that some edible coatings have the potential to prevent shrivel and extend the storage life of plums and nectarines while potentially precluding the need for plastic packaging to prevent excessive moisture loss. A new project was initiated by Heleen Tayler and Handré Viljoen to develop a knowledge base on plastic use in the South African stone and pome fruit industries. The project will also assess plastic usage of other southern hemisphere deciduous fruit industries and the alternatives being considered by other commodity industries for the local and export markets. Pome and stone cultivars will be grouped according to their specific packaging requirements, i.e. no plastic required, plastic definitely required etc. Relevant industry bodies, local and international supermarkets, exporters, packhouses, plastics manufacturers, manufacturers of alternative products or materials and local polymer scientists will be interviewed.

EXPERTISE

Packhouse action group
Plastics workgroup

RESEARCH TEAM

Prof Wiehann Steyn - Post-Harvest Programme Leader

Researchers:
Dr Tarl Berry
Dr Alemayehu Tsige
Ms Heleen Tayler
Mr Handré Viljoen
Ms Anél Botes
Mr Daniël Viljoen

Students:
Mr Adewale Nuryan Tiamiyu – MSc student

NEW PROJECTS

- Evaluation of logistic alternatives in container transport of apples and pears. (A Tsige)

- Development of knowledge to react to possible banning of single-use petroleum based plastics that impact on post-harvest management of stone and pome fruit quality knowledge. (H Tayler & H Viljoen)

- Evaluating the effects of different plastic liners and pallet shrouds on internal and external quality on pome fruit. (A Botes & D Viljoen)

CURRENT PROJECTS

- Implementation of next-generation packaging systems in high cube refrigerated containers for efficient cooling and improved volume usage. (T Berry and A Tiamiyu)

PUBLICATIONS

- Fresh Quarterly Dec 2019: Bestbier, G. *What's next for plastics?*

- Fresh Quarterly Dec 2019: Bestbier, G. *Sustainable plastic manufacturing.*

- Fresh Quarterly Dec 2019: Bestbier, G. *Join the circular economy.*

- Fresh Quarterly Jun 2020: Bestbier, G. *Drawing the line on plastic use.*

COMPLETED PROJECTS

- Determining the contribution of wild honey bees (pollination ecosystem service) to commercial deciduous fruit production. (R Veldtman and M Allsopp)

- Pest and disease monitoring in orchards under shade net. (M Addison)

- Exploration of orchard sanitation and the potential of parasitic wasps for the biological control of fruit flies in South Africa. (P Addison and B Stead)

PUBLICATIONS

- Fresh Quarterly Dec 2019: Mouton, A. *False codling moth*.

- Fresh Quarterly Dec 2019: Mouton, A. *Waging war on moth malefactors*.

- Fresh Quarterly Dec 2019: Mouton, A. *The false codling moth genome sequence*.

- Fresh Quarterly March 2020: Bestbier, G. *A tale of two flies*.

- Fresh Quarterly March 2020: Bestbier, G. *Going the distance*.

- Fresh Quarterly Jun 2020: Mouton, A. *The secret life of weevils*.

- Fresh Quarterly Jun 2020: Mouton, A. *Polyphagous shot-hole borer*.

- SAFJ December 2019/ January 2020: Steenkamp, E. *The polyphagous shot hole borer*: p. 53.

EVENTS

- Hortgro Science Research Showcase videos, Crop Protection Projects in September 2020

INSPIRING INCLUSIVE GROWTH