agriculture
& rural development

Department:
agriculture
& rural development
PROVINCE OF KWAZULU-NATAL

Programme 2:

AGRICULTURE

CHIEF DIRECTORATE:

Agricultural Research Development & Training Institute

DIRECTORATE:

Agricultural Crop Research Services

DIRECTOR: F.N.P. QWABE

OPERATIONAL PLAN:

2018-2019

1 April 2018 -31 March 2019

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Operational Plans: -

1. Abbreviations page

AOP	Annual Operational Plan
APP	Annual Performance Plan
ARC	Agriculture Research Council
ARC-PPI	Agriculture Research Council – Plant Protection Institute
ARC-VOPI	Agriculture Research Council – Vegetable & Ornamental Plants Institute
ARCX-GCI	Agriculture Research Council – Grain & Crops Institute
BA	Broadacres
DAFF	Department of Agriculture, Forestry & Fisheries
EPMDS	Employee Performance Management Development System
ICFR	Institute for Commercial Forestry Research
INR	Institute for Natural Resources
KZN	KwaZulu-Natal
KZNDARD	KwaZulu-Natal Department of Agriculture & Rural Development
LIMS	Laboratory Information Management System
MOU	Memorandum of Understanding
NGO	Non-Governmental Organization
R&TD	Research and Technology Development
SACNASP	South African Council for Natural Scientific Professions
SANSOR	South African National Seed Organization
SASAS	South Africa Society for Animal Science
SASRI	South Africa Sugar Research Institute
UKZN	University of Kwa-Zulu Natal
UNIZULU	University of Zululand

2. Introduction

The South African Government has identified Agriculture as a major driver of the economy of the country. The main issues covered under Outcome 7 of the Provincial Growth and Development Plan (PGDP) are: (i) Develop and promote agricultural potential of KZN (ii) increasing land productivity and (iii) enhancing sustainable household food security in KZN. South Africa's population will reach close on 60 million by the year 2050. As a result, the country will have to provide for an additional 20% volume in food requirements for its expanded population and diminished productive agricultural land. Climate change could also diminish the potential of agricultural land.

Continuous and substantial investment in a needs-driven research and technology development programme is essential to provide solutions to problems and constraints and offer new and innovative technologies that will ensure sustainable agricultural production in KwaZulu-Natal in future. Research & Technology Development will through its scientific research programme contribute to the KwaZulu-Natal Department of Agriculture and Rural Development Strategic Plan for the period 2015-2020. This five-year strategy presents strategic goals and objectives for an integrated approach to rural development, which will in turn contribute towards addressing food security, job creation and the growth of the provincial economy.

Through its research and technology development programme, the Directorate will provide the necessary scientific backup and support for Department's new programmes in its Agrarian Transformation Strategy. The programmes being the following; Land Reform Support, Inclusive Agri-village Development, River Valley Catalytic and Communal Estates Programmes. As stated in the Department's Strategy, research and technology development play a very important role to be able to establish new technologies in this ever-changing environment. New technologies and theories need to be tested to establish the probability of achieving the predicted results and to form the basis for scientific founded extension. A further part of the responsibility of research is to identify new crops and production systems with future economic potential to the Province.

Research and Technology Development will also focus on the Commodity Approach as laid out in the Strategy of the Department, contributing through research to the improvement of production of commodities not only for import substitution but also to increase exports.

The Research Policy guiding Research & Technology Development in the Province by the KZN Department of Agriculture and Rural Development forms a chapter in the Agricultural Development Policy for KwaZulu-Natal that was signed by Hon. MEC Mr V C Xaba on 5 February 2015.

Three Sub-directorates with respective divisions and are involved in research and technology development:

1. Crop Scientific Research Services (, Agronomy, Horticulture - Juncao Mushrooms and Crop Protection)
2. Analytical Services (Laboratory Analytical Services, Bio-datametrics & Bioinformatics, Biochemistry, Soil Fertility Research)

3. Farming Systems Research

The five pillars of Research and Technology Development are as follows:

i. Agricultural research on-station and off station
ii. Laboratory Services: soil, plant, plant health, water and animal feeds
iii. Maintenance of research infrastructure
iv. Genetic conservation and characterization of indigenous livestock
v. Transfer technology developed.

The customers/clients of research are farmers, advisors & extension officers, industry, NGO's, universities, ARC, companies, commodity organizations, organized agriculture as well as home–gardeners.

Research must respond to the challenges by providing the essential technology needed to improve food security, reduce poverty and promote sustainable economic and environmentally sound agricultural development. However, it must also be mentioned and understood that proper research takes time to generate and produce reliable information.

The Directorate: Agricultural Crop Research Services with 285 staff members performs one of the line functions of the KwaZulu-Natal Department of Agriculture and Rural Development.

The outputs in terms of Agricultural Crop Research Services and transfer as well as support from the Farm Services Sub-directorate as per Key Responsibility Areas are documented in the 2018/19 Annual Operational Plan for the Directorate.

3. Strategic Objectives and Outcomes

Importance of agricultural research and technology development

South Africa's population will reach close on 60 million by the year 2050. As a result, the country will have to provide for an additional 20% volume in food requirements for its expanded population, diminished productive agricultural land. Climate change could also diminish the potential of agricultural land. Literature also indicates that the increasing demand for food is not only caused by rise in population but also a rise in per capita consumption. The rise in population puts natural resources under further pressure. Need to generate productive enhancing technologies and solutions to survive the impact of climate change.

Relevant Medium Term Strategic Framework (MTSF) Outcomes (2014 – 2019) are:
Outcome 7: Comprehensive rural development and food security and
Outcome 10: Protect and enhance our environmental assets and natural resources

4. PGDP interventions address:

Outcome 7:

Develop and promote the agricultural potential of KZN (1)
Increase Land Productivity (2)
Enhance sustainable household food security in KZN (3)

Outcome 10:

Adapt to climate change (4)
Advance alternative energy generation and reduce reliance on fossil fuels (5)

NDP

- (Agricultural Policy Action Plan - APAP) covers issues such as:
- Adequate nutrition – as a core element in NDP (6)
- Technical support to farmers (7)
- Improved food security (8)

Numbers in brackets are used in KRA tables showing the current research programs for the sub-directorates and divisions.

Nature of research:

- Needs-driven with more farmer participation, sensitive to client needs which will promote the uptake of research results

- Involve a network of partners with appropriate and complementary skills
- Adaptive (designed to adjust to the specific needs of a particular set of conditions) or applied (designed to create new technology) research approach
- Meet with relevant stakeholders annually to establish relevancy of trials and to identify new research needs

Responsibilities of Agricultural Crop Research Services Directorate:

- Undertake appropriate research and technology development to advance agricultural crop production with the view to addressing issues surrounding poverty, hunger and food security.
- To undertake technology transfer through technical support, specialist advice and functional training.
- Offer agricultural analytical and diagnostic services in support of agriculture in KwaZulu-Natal.

Sub-Directorates within Directorate:

- Analytical Services (5 Laboratories & Soil Fertility Research, Biochemistry & Biometry)
- Crop Scientific Research (Agronomy, Horticulture, Crop Protection, Juncao Mushrooms)
- Farming Systems Research

Strategic plan of Directorate aspects such as:

1. Focus on conservation agriculture - highlighting water, energy, carbon sequestration and soil health
2. Focus on constraints to agricultural production – soil acidity, compaction, soil quality degradation
3. Identification and assessment of improved cultivars and new crops that can tolerate a wider range of environmental conditions as well to perform within the phenomena of climate change
4. Effect of environmental changes on crop diseases and pests, reducing any food-safety hazard
5. Research to maximum response to soil, water, seeds, lime and fertilizers
6. Conservation and utilization of indigenous genetic resources
7. Develop new and improve of production practices for high value commodities and products that counteract malnutrition & hunger
8. Mushrooms as an alternative nutrient source and improved biological efficiency
9. Expansion of services rendered to clients by Analytical Services – offering extended and improved testing profile (expansion of analytical package options and quicker results)
10. Technology transfer through different means.
11. Working with Farm Services to showcase best practice in Crop Production
12. On Farm Research within the Research stations, and on external client farms.

STRATEGIC OBJECTIVES:

No	Objective	Baseline	Justification	Links
1	Undertake appropriate research and technology development to advance agricultural production with the view to addressing issues surrounding poverty, hunger and food security	Conduct research on– and off station. The following disciplines involved in Crop Production Research services: Analytical Services, Soil Fertility Research, Bio-datametrics, Biochemistry, Juncao Mushrooms, Agronomy, Horticulture Crop Protection, Farming Systems Research. These disciplines are supported by Farm Services (6 Research Farms - Stations)	Best agricultural practices to support food security and other agricultural production in a continuously changing and challenging environment Safeguarding and evaluating indigenous genetic material, especially in response to global climate change	By providing specialist, technical, scientific information and advice to resolve production constraints to enhance food security
2	To undertake technology transfer through technical support, specialist advice and functional training	On demand technological support to Departmental programmes, training and specialist advice	In support of the Departmental outcomes	By providing technical support, specialist scientific advice and appropriate training to households, farmers and advisors
3	Offer agricultural analytical and diagnostic services in support of agriculture in KZN	To provide an accurate and science-based support service to enhance agricultural production	To offer accurate and effective soil fertility recommendations, feed and water quality and plant nutrition and plant health advice	To achieve best agricultural practice and sustainable food production

6. Sub-Directorate: Crop Scientific Research Services

Financial year: 2018-2019

DR SUZETTE R. BEZUIDENHOUT

1. Introduction

The sub-directorate Crop Scientific Research Services (CSRS) comprises of three Divisions namely Agronomy Services, Crop Protection Services and Horticulture Service. The Horticulture Services Division is further divided into Juncao Mushroom Spawn Quality and Viability and Juncao Mushroom Production. Research is undertaken on five research stations, Makhathini, Owen Sithole College of Education (OSCA), Dundee, Cedara and Kokstad.

2. Budget Allocation 2018/2019

The sub-directorate is given a budget allocation from where money is then allocated to the different divisions. However, certain administrative costs are common to each division such as travel agency fees, transport costs and S&T. The budget shown under each division does not include these costs. Below is the budget allocation for CSRS.

Compensation of employees	R 28 823 000
Goods and Services	R 3 237 000
Transfer and Subsidies	R 110 000
Capital Assets	R 894 000
TOTAL	**R 33 064 000**

6.1. Division: Agronomy Services

Financial year: 2018-2019

NOXOLO MTUMTUM

1. Introduction

The Agronomy Services Division conducts research at five of the six Research Farms as well as in various rural districts. Research projects include cultivar evaluations on maize, grain soybeans, dry beans and potatoes, intercropping legumes with maize, groundnut production practices and optimal maize plant populations. The Division is also responsible for disseminating information and various technology transfer events.

2. Customers and socio-economic impact

Clients of the Agronomy Division include Extension Services, Universities, commercial, small-scale and entrant farmers, seed companies, students and the general public. Mr M Naidoo is involved with a potato project involving Potato South Africa and the KwaZulu-Natal Department of Agriculture & Rural Development. Potato production demonstrations are conducted at various sites. These are determined annually in conjunction with Potato South Africa. The technology transferred to the various clients is aimed at improving crop production and increase profitability and household food security, whilst conserving a sustainable environment.

3. The focus of the Section is:

- To conduct research on the major agronomic crops such as maize, dry beans, potatoes, grain soybeans but also on crops such as groundnuts and sorghum
- To transfer technology.

4. Staff component

Refer to attached organogram (According to Staff Structure) Annexure A

5. Research Infrastructure

Cedara Research Station

- 1 x Field lab
- 1 x Potato shed
- 1 x Store room
- 1 x Drier room with two driers
- 1 x Fertilizer shed

Kokstad Research Station

- 1 x Container at “A” lands
- 1 x Cold Room
- 1 x Field Lab

Makhathini Research Station

- 1 x Field lab (electricity, dryers not working)
- 1 x Cold room (to be fixed)
- 1 x Fertilizer store (electricity, flooring)
- 1 x Chemical store room (electricity, painting)

Dundee Research Station

- 1 x Chemical room (fan to be fixed)
- 1 x Cold room
- 1 x Store room
- 1 x Shed (roller door x2 & painting)

6. The aims and the objectives (Key Results Areas) of the Division are:

- Conduct research trials
- Transfer technology
- Personnel training
- Administrative tasks
- Networking and linkage with relevant organizations

7. Budget allocation 2018/19

Goods and Services	R 759 500
Payment for Capital Assets	R 0
TOTAL	**R 759 500**

8. Outcomes

KRA 1: Conduct Research and Demonstration Trials

Linkages with MTSF & PGDP discussed on pages III & VI

Project Number	Researcher	Short Title	Objectives	Start & Finish (year)	Linkages with MTSF & PGDP	Outputs for the year
MAIZE						
AG-LSM 07/02 (ARC)	N.P. Mtumtum	Long-season maize cultivar trial (Kokstad and Dundee)	To evaluate the adaptability and yield of long-season maize cultivars at two localities in KZN	-2020	Increase Land Productivity (2) Enhance sustainable household food security in KZN (3) Adapt to climate change (4) Advance adequate nutrition – as a core element in NDP (6) Technical support to farmers (7) Improved food security (8)	Progress Report
AG-MSIL09/03	N.P. Mtumtum	Maize silage cultivar trial (Kokstad and Cedara)	To evaluate the adaptability and yield of maize cultivars at Kokstad and Cedara.	2009 - 2020	Increase Land Productivity (2) Enhance sustainable household food security in KZN (3) Adapt to climate change (4) Technical support to farmers (7)	Progress Report
AG–2014/01 C,D,K	A J. Arathoon	Maize seeding rate trial	To evaluate maize cultivars at various seeding rate	2014 - 2018	Increase Land Productivity (2) Enhance sustainable household food security in KZN (3) Adapt to climate change (4) Adequate nutrition – as a core element in NDP (6) Technical support to farmers (7) Improved food security (8)	Progress Report

Project Number	Researcher	Short Title	Objectives	Start & Finish (year)	Linkages with MTSF & PGDP	Outputs for the year
AG-2014/02 C	N.P. Mtumtum	Intercropping of maize and soybean	To evaluate the effects of intercropping maize and soybean	2014 - 2018	Increase Land Productivity (2) Enhance sustainable household food security in KZN (3) Adapt to climate change (4) Adequate nutrition – as a core element in NDP (6) Improved food security (8)	Progress Report
AG-2015/01 K	N.P. Mtumtum	Intercropping of maize forage with a legume forage	To evaluate the production potential of maize and cowpea intercropping in terms of maize forage quality and total dry matter	2015 - 2018	Increase Land Productivity (2) Enhance sustainable household food security in KZN (3) Adapt to climate change (4) Adequate nutrition – as a core element in NDP (6) Improved food security (8)	Progress Report
AG-2015/03 D	L.S. Zulu	The effect of added nitrogen through a legume-maize rotation on maize yields	To determine the amount of nitrate left by each legume and the subsequent yields of the rotation crops	2015 - 2020	Increase Land Productivity (2) Enhance sustainable household food security in KZN (3) Adequate nutrition – as a core element in NDP (6) Technical support to farmers (7) Improved food security (8)	Progress Report
AG-2016/02 K	N.P. Mtumtum	Response of wild watermelon to nitrogen (N) treatments	To improve growth and yield of indigenous watermelon through efficient and effective use of manorial and inorganic nitrogen fertilizers	2016 - 2019	Develop and promote the agricultural potential of KZN (1) Increase Land Productivity (2) Enhance sustainable household food security in KZN (3) Adapt to climate change (4) Adequate nutrition – as a core element in NDP (6) Technical support to farmers (7) Improved food security (8)	Progress Report

Project Number	Researcher	Short Title	Objectives	Start & Finish (year)	Linkages with MTSF & PGDP	Outputs for the year
SOYBEAN						
AG-SOY07/05 (ARC)	A.J. Arathoon	National soybean cultivar trial (Cedara, Dundee and Kokstad)	To evaluate the adaptability and yield of soybean cultivars.	-2020	Increase Land Productivity (2) Enhance sustainable household food security in KZN (3) Adapt to climate change (4) Advance Adequate nutrition – as a core element in NDP (6) Technical support to farmers (7) Improved food security (8)	Progress Report
DRY BEANS						
AG-DB07/07 (ARC)	T.E. Ntombela	National dry bean cultivar trial (Cedara, Kokstad, Dundee & Makhathini)	To evaluate the adaptability and yield of dry bean cultivars, which have either been sprayed or not been sprayed with fungicides to control diseases	-2020	Increase Land Productivity (2) Enhance sustainable household food security in KZN (3) Adapt to climate change (4) Adequate nutrition – as a core element in NDP (6) Technical support to farmers (7) Improved food security (8)	Progress Report
POTATOES						
AG-EP07/10 (ARC)	M. Naidoo	Elite potato cultivar trial (Cedara)	To evaluate the adaptability and yield of new potato clones against commercially available varieties.	-2020	Develop and promote the agricultural potential of KZN (1) Increase Land Productivity (2) Enhance sustainable household food security in KZN (3) Adapt to climate change (4) Advance adequate nutrition – as a core element in NDP (6) Technical support to farmers (7) Improved food security (8)	Progress Report

Project Number	Researcher	Short Title	Objectives	Start & Finish (year)	Linkages with MTSF & PGDP	Outputs for the year
AG-CP07/08	M. Naidoo	Commercial potato cultivar trial (Cedara)	To evaluate the adaptability and yield of commercially available potato cultivars	-2020	Increase Land Productivity (2) Enhance sustainable household food security in KZN (3) Technical support to farmers (7) Improved food security (8)	Progress Report
AG-PSA09/05 (Potato South Africa)	M. Naidoo	Potato projects on rural sites.	To promote potato production amongst emerging commercial rural farmers in rural districts.	2009-2020	Develop and promote the agricultural potential of KZN (1) Increase Land Productivity (2) Enhance sustainable household food security in KZN (3) Advance adequate nutrition – as a core element in NDP (6) Technical support to farmers (7) Improved food security (8)	Farmers trained & Progress Report
GROUNDNUTS						
AG-2014/03 D	S.B. Radebe	The effect of gypsum and lime application on soil properties and groundnut yields	To determine application rate of gypsum on groundnut yields.	2015 - 2020	Increase Land Productivity (2) Enhance sustainable household food security in KZN (3) Adapt to climate change (4) Adequate nutrition – as a core element in NDP (6) Improved food security (8)	Progress Report
AG-2016/03 D	S.B. Radebe	The effect of earthing - up on groundnuts	To determine the effect of earthing up on groundnut yields	2016 - 2021	Increase Land Productivity (2) Enhance sustainable household food security in KZN (3) Adapt to climate change (4) Adequate nutrition – as a core element in NDP (6) Improved food security (8)	Progress Report

Project Number	Researcher	Short Title	Objectives	Start & Finish (year)	Linkages with MTSF & PGDP	Outputs for the year
SORGHUM						
AG-2014/03 M	S.G. Gumede	The response of three grain sorghum cultivars to chemical, bird netting and control treatments	To measure the efficacy of three bird damage prevention methods on yield of three sorghum cultivars	2015 - 2018	Increase Land Productivity (2) Enhance sustainable household food security in KZN (3) Advance alternative energy generation and reduce reliance Technical support to farmers (7) Improved food security (8)	Progress Report

8.2 Co-operative Research

Person Responsible	Short Title	Objectives	Start & Finish (year)	Linkages with MTSF & PGDP	Outputs for the year

8.3 Suspended Projects

Project Number	Researcher	Short Title	Objectives	Start & Finish (year)	Linkages with MTSF & PGDP	Reasons
AG-2015/01K	N.P. Mtumtum	Evaluation of Quinoa as alternative crop for food security and poverty alleviation in KwaZulu-Natal	To evaluate the agronomic potential and adaptability of quinoa in KwaZulu-Natal	2015-2018	2, 3, 7, 8	Unavailability of seed

8.4 Guest Research

Project Number	Researcher	Short Title	Objective (Hypothesis)	Start & Finish (year)	Linkages with MTSF & PGDP	Outputs for the year

8.5 New Projects for Approval

Researcher	Short Title	Objectives	Start & Finish (year)	Linkages with MTSF & PGDP	Outputs for the year

8.6 Future Research

Short Title	Objectives	Start & Finish (year)	Linkages with MTSF & PGDP	Outputs for the year
Evaluate and document indigenous knowledge on traditional crops grown in rural areas.				

KRA 2: Technology Transfer

Actions	Name	Outputs for the year
Commercial farmer crop production short course	AJ Arathoon and other Agronomy staff	To transfer appropriate technologies on various agronomic crops to commercial farmers and extension staff. Handouts are provided and practical demonstrations conducted.
Farmers' days (Applesbosch, Harding, Bulwer, Elandskop Umzumbe and Port Edward)	M Naidoo	Farmers' days held at some of the potato demonstration trial sites at harvesting time or to present as guests at farmers' days.
Research Symposium (February, 2019)	Relevant Staff	To publicize the activities and research results of the Agronomy Section to fellow researchers and Extension staff..
Research Bulletins	J Arathoon, N Mtumtum, S Radebe , M Naidoo, Zulu, L & Gumede S,	Update cultivar recommendations (maize, soya beans & dry beans) Groundnut production in KZN Update cultivar recommendations for potatoes
Ad hoc advice and documents to clients	N Mtumtum, S Radebe, J Arathoon, M Naidoo, MP Sikhakhane & TE Ntombela	To provide relevant advice to clients either verbally, as handouts or electronically.
Potato SA and DARD project to promote potato production	M Naidoo, T. Magubane	Training and technology transfer to be undertaken at 12 sites
Makhathini Farmers' Day August 2018	Relevant Agronomy Staff	To hold a farmers' day with in-field demonstrations. To transfer crop production technologies to various clients.

KRA 3: Personnel Training

Actions	Name	Outputs for the year
Attend relevant courses	Relevant Agronomy Staff	Some staff will attend certain short courses to increase their knowledge.
Attending congresses, symposia, workshops, farmers days and other technology transfer events	Relevant Agronomy Staff	Staff will attend Farmers' days to improve their knowledge.

KRA 4: Administrative Duties

Actions	Name	Outputs for the year
EPMDS	Mtumtum NP, AJ Arathoon, S Radebe, P Sikhakhane & T Magubane	To complete and submit all the required documents
KZN and Subsidized vehicles	E Ntombela, P Sikhakhane, M Buthelezi, AJ Arathoon, N Mtumtum, S Radebe, M Naidoo, L Zulu & S Gumede	To complete and submit all the required documents and log sheets so that records of the vehicles' usage can be determined and sub-vehicle claims can be made.
Leave	AJ Arathoon, T Zulu, S Radebe, P Sikhakhane, Mtumtum NP & SG Gumede	To complete and submit leave forms.
S&T claims	AJ Arathoon, Mtumtum NP, M Naidoo	Complete and submit the relevant forms.
Operational Plans	Mtumtum NP, AJ Arathoon & Radebe S	Operational Plan submitted
Quarterly Service Delivery Reports (APP Targets)	Mtumtum NP, AJ Arathoon & Radebe S	Quarterly reports submitted

KRA 5: Networking and Linkages

Actions	Name	Outputs for the year
ARC-GCI	N Mtumtum, AJ Arathoon, S Radebe, P Sikhakhane & E Ntombela,	To undertake cultivar evaluation trials on their behalf. To attend their cultivar evaluation meetings in Potchefstroom.
Capstone Seeds	AJ Arathoon	To undertake cultivar evaluations on their behalf.
PANNAR	AJ Arathoon	To attend their farmers' days and communicate with them regarding cultivars. To undertake cultivar evaluations on their behalf.
Link Seeds	AJ Arathoon	To attend their farmers' days and communicate with them regarding cultivars. To undertake cultivar evaluations on their behalf.
Monsanto	AJ Arathoon	To attend their farmers' days and communicate with them regarding cultivars. To undertake cultivar evaluations on their behalf.
Seed Co	AJ Arathoon	To attend their farmers' days and communicate with them regarding cultivars. To undertake cultivar evaluations on their behalf.
Pioneer Seeds	AJ Arathoon	To attend their farmers' days and communicate with them regarding cultivars. To undertake cultivar evaluations on their behalf.
Agrochemical companies	AJ Arathoon, P Sikhakhane, E Ntombela & M Naidoo, T. Magubane, Zulu, L , T.Zulu & S. Gumede	To keep up to date on available chemicals and their prices.
Fertilizer companies	AJ Arathoon	To keep up to date with prices of available fertilizers.
Departmental staff, e.g. FSR, Extension and Universities	N Mtumtum, AJ Arathoon, Radebe S P Sikhakhane, E Ntombela & M Naidoo, G. Sibiya T. Magubane, Zulu, L , T.Zulu & S. Gumede	To liaise with and transfer and obtain information from these institutions & Collaboration & Co-operative work
Potato SA	M Naidoo	To promote small-scale potato farmers towards commercial production.
ARC - VOPRI	M Naidoo	Evaluation of potato cultivars

9. Challenges

9.1 Staff

Vacant post in Sub-directorate summarized below according to the 2015 Approved Departmental Structure:

Total number of posts	Posts filled	No of vacant posts
68	43	25

The following critical posts to be filled this financial year:

Post Title	Salary Level	Nr of vacant posts	Minimum for Service Delivery	On Current Critical List
Specialist Scientist	OSD	1		
Professional Scientist	OSD	5	4	Yes
Scientific Technicians	OSD	0	4	
Auxiliary Officers	4	7	3	No
Farm Aids	2	12	9	Yes

Farm Aides are needed at both Cedara and Dundee Research Station

9.2 Supply Chain Management:

- Delivering of goods timeously and according to the specifications
- Procuring specific goods and capital items needed for experiments

10. Additional needs

10.1 Budget

- Extra funds required for equipment maintenance
- Additional funds required for the following:

Item	Description	2018/2019	2019/2020
Capital			
Trashing machines	Two machines needed to trash soybeans from experiments	R 80 000	
Grain moisture meters	Four grain moisture meters to be upgraded due to unavailability of spares	R 40 000	R 50 000
Infrastructure needs			
Storage facilities	Upgrade of agrochemical storage facilities at all the research stations	R 40 000	R 50 000
Maintenance	Maintenance of offices and storage facilities	R 20 000	R 30 000
Staff facilities	Upgrade the washing and toilet facilities at Cedara	R	R 60 000

6.2. Division: Horticulture Services

Financial year: 2018-2019

ROB OSBORNE

1. Introduction

The production of agronomic and horticultural crops remains one of the most effective means of alleviating poverty and raising the levels of household food security. Both the World Health Organization (WHO) and the UN Food and Agriculture Organization (FAO) have identified low fruit and vegetable intake as one of the top 10 risk factors contributing to mortality, and that sufficient consumption of fruits and vegetables helps prevent many diseases and promotes good health, In addition, horticultural commodities are general of a high value relative to other agricultural produce, and also can form the basis of a value adding industry. Horticultural crops are grown on an intensive scale, and often have high management, input and labour requirements, which have positive implications for sustainable job creation.

2. Customers and socio-economic impact

- Departmental staff (extension technicians, agricultural scientists)
- University of KwaZulu-Natal & UNIZULU
- NGO's
- All producers of horticultural crops, both commercial, emerging as well as subsistence farmers

3. The focus of the Section is:

The focus and aim of the section is to optimize the production of horticultural crops in KwaZulu-Natal by means of applied research and appropriate technology transfer.

4. Staff component

Refer to attached organogram (According to Staff Structure) Annexure **C**

5. Research Infrastructure

Cedara Research Station

- 2 x Tunnels
- 1 x Glass House
- 1 x Open Shed
- 1 x Cold Room

Makhathini Research Station

- 1 x Work room
- 1 x Nursery Facility (not functional)

6. The aims and the objectives (Key Results Areas) are:

- Identify and prioritize research needs and production constraints in the horticultural industry by liaising with role players in the sector & keeping abreast of latest research (reading of journals, attending conferences/symposia)
- Plan, design and conduct scientifically accountable, fruit & vegetable research trials and experiments to find practical solutions and to develop new and diverse products
- Interpret statistical results, formulate conclusions and present research findings at symposia and congresses and publish research findings in scientific and popular journals
- Provide specialist advice on fruit & vegetable production and related crop management issues by transferring appropriate technology e.g. Production guidelines to farmers and advisers, and contribute to other extension and rural development activities
- Perform all administrative and related functions

7. Budget allocation 2017/2018

Goods and Services	R 659 000
Capital Assets	R 0
TOTAL	**R 659 000**

8. Outcomes

KRA 1: Conduct Research and Demonstration Trials

Linkages with MTSF & PGDP discussed on pages iii &VI.

Project Number	Person Responsible	Short Title	Objectives	Start & Finish (year)	Linkages with MTSF & PGDP	Outputs for the year
VEGETABLE PRODUCTION						
HS-2009/09	R.E Osborne	Sweet potato cultivar evaluation	To determine which cultivars are best suited for production in KZN.	1997-2020	Develop and promote the agricultural potential of KZN (1) Increase Land Productivity (2) Enhance sustainable household food security in KZN (3) Adapt to climate change (4) Advance adequate nutrition – as a core element in NDP (6) Technical support to farmers (7) Improved food security (8)	Progress Report
HS-2014/01 O	V.A.D Gcabashe	Effect of potassium postharvest spoilage on beaureguard sweetpotato tubers	To determine the thickness of the skin and yield of Beauregard sweet potatoes treated with different levels of potassium.	2015-2017	Develop and promote the agricultural potential of KZN (1) Increase Land Productivity (2) Enhance sustainable household food security in KZN (3) Adapt to climate change (4) Advance adequate nutrition – as a core element in NDP (6) Technical support to farmers (7) Improved food security (8)	Final Report

Project Number	Person Responsible	Short Title	Objectives	Start & Finish (year)	Linkages with MTSF & PGDP	Outputs for the year
HS-2016/01 C	S.E. Zulu	Effect of mulch on tomato growth, yield and post-harvest quality	To determine the effect of mulch on weed suppression as well as growth and yield of tomatoes	2016-2019	Develop and promote the agricultural potential of KZN (1) Increase Land Productivity (2) Enhance sustainable household food security in KZN (3) Adapt to climate change (4) Advance adequate nutrition – as a core element in NDP (6) Technical support to farmers (7) Improved food security (8)	Progress report
HS-2015/02C	D. Naicker	Evaluation of indigenous pumpkins for use in sustainable agriculture systems (indigenous crops)	To investigate the performance of indigenous cultivars in comparison with other commercial hybrids	2015-2019	Develop and promote the agricultural potential of KZN (1) Increase Land Productivity (2) Enhance sustainable household food security in KZN (3) Adapt to climate change (4) Advance adequate nutrition – as a core element in NDP (6) Technical support to farmers (7) Improved food security (8)	Progress report
HS-2015/03 Msinga	K.M Mkhathini	Tomato spacing and fertilizer application rated trial	To optimize tomato management practices	2016-2019	Increase Land Productivity (2) Enhance sustainable household food security in KZN (3) Adapt to climate change (4) Advance adequate nutrition – as a core element in NDP (6) Technical support to farmers (7) Improved food security (8)	Progress Report

Project Number	Person Responsible	Short Title	Objectives	Start & Finish (year)	Linkages with MTSF & PGDP	Outputs for the year
HS-2015/04 C	R E. Osborne	Control of downy mildew on brassica seedlings	To find the most effective means of controlling downy mildew in containerized seedlings.	2016-2019	Increase Land Productivity (2) Enhance sustainable household food security in KZN (3) Adapt to climate change (4) Advance adequate nutrition – as a core element in NDP (6) Technical support to farmers (7) Improved food security (8)	Progress Report
FRUIT						
HS-L1997/01 M	C Dlamini	High density Litchi cultivar evaluation	To select cultivars that show good standing ability and high performance under local condition. The evaluation will focus selection of disease resistant cultivars, reliable fruiting and good yield potential as well as commercial suitability.	1997-2020	Increase Land Productivity (2) Enhance sustainable household food security in KZN (3) Adapt to climate change (4) Advance adequate nutrition – as a core element in NDP (6) Technical support to farmers (7) Improved food security (8)	Final Report
HS-M1997/02 M	C Dlamini	Evaluation of mango cultivars under dry - land and irrigation conditions at high density planting	To determine best Mango cultivar suitable for small-scale and commercial farmers in the Makhathini area	1997-2020	Increase Land Productivity (2) Enhance sustainable household food security in KZN (3) Adapt to climate change (4) Advance adequate nutrition – as a core element in NDP (6) Technical support to farmers (7) Improved food security (8)	Final Report

Project Number	Person Responsible	Short Title	Objectives	Start & Finish (year)	Linkages with MTSF & PGDP	Outputs for the year
HS-P2013/01 I	K.M Mkhathini	Value adding to processed peach products at Impendle	To assess the compositional and physical aspects of peach fruits in relation to quality of fresh fruit, the effects of processing conditions and fruit properties on the quality of finished products.	2013-2023	Increase Land Productivity (2) Enhance sustainable household food security in KZN (3) Adapt to climate change (4) Advance adequate nutrition – as a core element in NDP (6) Technical support to farmers (7) Improved food security (8)	Progress Report
MAIZE – BREEDING						
HS-2015/01 M	C Dlamini	Effect of intra row spacing and planting date on green mealies SC701 hybrid	To determine optimum inter row spacing and optimum seeding rate for green mealies as well as suitable planting dates that give the best yield for summer and winter planting	2015-2018	Develop and promote the agricultural potential of KZN (1) Increase Land Productivity (2) Enhance sustainable household food security in KZN (3) Adapt to climate change (4) Advance adequate nutrition – as a core element in NDP (6) Technical support to farmers (7) Improved food security (8)	Progress Report

8.1 Demonstrations

Project Number	Person Responsible	Short Title	Objectives	Start & Finish (year)	Linkages with MTSF & PGDP	Outputs for the year
HS-M1997/04M	C Dlamini &.R.E Osborne	Mango cultivar		1997-2020	Increase Land Productivity (2) Enhance sustainable household food security in KZN (3) Adapt to climate change (4) Advance adequate nutrition – as a core element in NDP (6) Technical support to farmers (7) Improved food security (8)	Progress Report
HS-C1997/05O	V.A.D Gcabashe	Citrus cultivar		1998-2020		Progress Report
HS-M1998/01O	V.A.D Gcabashe	Mango cultivar		1997-2020		Progress Report
HS-SP2004/04 C,M & O	D Naicker ,C Dlamini & V.A.D Gcabashe	Sweet Potato Multiplication		2004-2020		Progress Report
Link with HS/2009/09	D Naicker	Sweet Potato cultivar demonstrations		2012-2020		Progress Report
HS-M-Demo/M	R.E Osborne & C Dlamini	Demonstration of mango grafting and pruning		-2015		Progress Report

8.2 Co-operative Research

Person Responsible	Short Title	Objectives	Start & Finish (year)	Linkages with MTSF & PGDP	Outputs for the year

8.3 Guest Research

Person Responsible	Short Title	Objectives	Start & Finish (year)	Linkages with MTSF & PGDP	Outputs for the year

8.4 Suspended Projects

Project Number	Person Responsible	Short Title	Objectives	Start & Finish (year)	Linkages with MTSF & PGDP	Reasons

8.5 New Projects for Approval

Person Responsible	Short Title	Objectives	Start & Finish (year)	Linkages with MTSF & PGDP	Outputs for the year

8.6 Future Research

Short Title	Objectives	Start & Finish (year)	Linkages with MTSF & PGDP	Outputs for the year
Application of conservation tillage practices in vegetable production				
Improving household food security.				

KRA 2: Technology Transfer

Actions	Name	Outputs for the year
Continue working on wine grape production guidelines	R.E Osborne	Guidelines to be used by commercial farmers.
Update Domestic Food Production Module	R.E Osborne	Module to be used by technicians for training of home gardeners and small-scale vegetable farmers
Propagate & supply sweet potato vines to farmers and extension	D Naicker	Estimate of 40 000 vines supplied to farmers
Provide specialist *ad hoc* advice on horticultural crops	All Staff	Advice provided on request
To provide mentorship to Scientists, Technicians and Interns	Scientists and Technicians	Output as required
Scientific Papers	K.M Mkhathini	Submitted to Journal and reviewers comments corrected
Popular Publications & Agri Updates	R.E Osborne, K.M Mkhathini	Research Bulletins
East Coast Intensive Horticulture Association	R.E Osborne	Assist with the organization of two symposia
Translate key KZN Agri reports	C Dlamini	Translated reports
Technology Transfer at demonstration plots	All relevant staff	Transfer of information and knowledge

KRA 3: Personnel Training

Actions	Name	Outputs for the year
Attend relevant symposia and congresses	R.E Osborne, K.M Mkhathini, D Naicker, C Dlamini and S.E Zulu	Combined Plant Production Congress Seedling Growers Symposium No-till Symposium
Read journals and technical publications	All Technical Staff	Papers read
Attending congresses, symposia, workshops, farmers days and other technology transfer events	All Technical Staff	Courses attended

KRA 4: Administrative Duties

Admin duties	Name	Outputs for the year
Weekly section meetings	All Technical Staff	Provide mentorship and guidance to staff.
EPMDS	All Supervisors	EPMDS reports submitted
Manage finances of section.	R. Osborne & D. Naicker	Compile budgets Monitor spending Manage procurement Manage resources
Submit Horticulture APP Reports	R. Osborne	Quarterly reports submitted
Sign and submit leave forms	All Supervisors	Submitted
Sign and submit log sheets & trip authorities	Supervisory Staff	Submitted
Submit Sub Vehicle claim forms	All relevant staff	Claims submitted
Maintain Asset register	D Naicker	Kept up to date
Attend relevant meetings as required	Relevant Staff	Meetings attended

KRA 5: Networking and Linkages

Networkers and links	Name	Outputs for the year
Extension and Advisory Staff	All Technical Staff	Reciprocal knowledge interchange, practical research and informed extension staff
Universities & Other Academic Institutions	All Technical Staff	
Scientific Congresses/Symposia & Farmers Days	All Technical Staff	
Consultants & relevant commodity groups	All Technical Staff	
ARC & Other Provincial Departments	All Technical Staff	

9. CHALLENGES

9.1 Staff

Total number of posts	Posts filled	No of vacant posts
33	19	14

The table below shows the designations of vacant posts and the minimum required for ongoing service delivery

Post Title	Salary level	Nr of vacant posts	Minimum for Service Delivery	On current critical list
Specialist Scientist	OSD	1		
Professional Scientists	OSD	4	4	
Scientific Technician	OSD	0	4	
Auxiliary Services Officer	4	4	2	
Farm Aid	3	14	11	

- It is essential to advertise the scientist posts for Makhathini Research Station

10. Additional needs

10.1 Budget

- Additional funds required for the following

Item	Description	2018-2019	2019-2020
Capital			
No-till/conservation tillage planter	Planter needed for planting vegetables according to conservation tillage	R 50 000	
Infrastructure needs			
Upgrade of pen shed	Enclosure and upgrade of the existing open shed at Cedara		R 30 000
Staff facilities	Upgrade the washing and toilet facilities at Cedara		R 60 000
Maintenance	Maintenance of offices and storage facilities	R 20 000	R 30 000

6.2.1. Sub-Division: Juncao Mushroom

Financial year: 2018-2019

FIKILE QWABE

1. Introduction

The Isikhowe Juncao Mushroom Centre - Cedara (IJMC) was a flagship project of the KZN Department of Agriculture and Rural Development. The section aims to develop technology to further the use of mushroom production in the province through the provision of training, technology and high-quality spawn (mushroom seed) to alleviate food insecurity and promote the use of mushrooms as an alternative protein source.

2. Customers and socio-economic impact: Rural communities

Customers are rural communities suffering from food insecurity. There is evidence of a growing demand for support in the production of edible and medicinal mushroom. The impact of this section has been to increase rural income especially to rural woman and improve food security in the areas where the section is involved. This improved food security is through higher incomes and by consumption of the mushrooms produced.

3. The focus of the Section is:

To create a sustainable Juncao Mushroom industry throughout KZN province. In this process, job creation and food security initiatives will be enhanced.

4. Section Staff

The IJMC Departmental Structure underwent an in-depth evaluation by Management Advisory Services. The nett result of this evaluation is that the Cedara Mushroom Centre will now concentrate solely on research and training activities and high quality spawn production only. All roll-out activities will now resort under the Districts with mushroom related activities. To this end agricultural advisors have been appointed on a permanent basis and will reside in the respective districts. We still await permanent appointment of staff at the Cedara Mushroom Centre in line with the approved structure.

5. Research Infrastructure:

Cedara Mushroom Centre:

- Budget has been set aside for maintenance of the infrastructure for the 2018/19 financial year.
    - This will be directed towards the following priorities:
        - Maintenance of A/C units in labs & spawn rooms
        - General maintenance of the facility
        - Maintenance of the standby generator
        - Replacement of heater elements in the raw material driers
        - Maintenance and safe operation/legal compliance of autoclaves
        - Maintenance of air purity in labs
        - Maintenance of cold rooms
        - Maintenance of electronic and pack production equipment.

6. The aims and the objectives (Key Results Areas) of the Section are:

- Conduct appropriate research into factors supporting the development of a sustainable Juncao Mushroom Industry throughout KZN province.
- Training and technology transfer with a view to supporting the development of a sustainable Juncao Mushroom Industry
- Produce adequate quantities of viable high-yielding spawn and gene bank maintenance.
- Produce adequate quantities of mushroom packs to service existing FSG sites, until the satellite bases take over this responsibility.

7. Budget allocation 2018/19

Goods and Services	R 380 000
Transfers & Subsides	R 3 302 000
Capital Assets	R 0
TOTAL	**R 3 682 000**

8. Outcomes

KRA 1: Conduct Research and Demonstration Trials

Linkages with MTSF & PGDP discussed on pages iii &VI.

Project Number	Researcher/s	Short Title	Objectives	Start & Finish (year)	Linkages with MTSF & PGDP	Outputs for the year
MUSHROOM						
M-S2013/01C	N van Rij	Effectiveness of six different fungal storage procedures in maintaining the viability of mushroom cultures	The objective of the study will be to evaluate the effects of different culture preservation methods on the viability of mushroom strains	2013-2015		**SUSPENDED** - No personnel to do this research
M-SMS2013/01C	N van Rij	Using spent mushroom substrates (SMS) of Oyster mushroom (Pleurotus ostreatus) to produce vegetables	Recycle spent mushroom substrate (SMS) and develop ways to grow vegetables using (SMS).	2013-2014		**SUSPENDED** - No personnel to do this research

Project Number	Researcher/s	Short Title	Objectives	Start & Finish (year)	Linkages with MTSF & PGDP	Outputs for the year
M.2014/01KZN	N van Rij	On farm trials to research an alternative (lime soak) pasteurization technique to prepare substrates for oyster production	• Demonstrate and test an alternative low-cost, low-input substrate preparation technique. • Train co-operators at three selected sites: Wembezi, Dukuduku and a third site still to be identified on alternative substrate preparation so as to increase the production of oyster mushrooms in the Province. • Improve mushroom yields for small-scale farmers who are limited by the input costs of current substrate preparation methods.	2015-2017		**SUSPENDED** - No personnel to do this research
M.2014/02C	N van Rij	Identification and Management of Factors Affecting Oyster mushroom spawn production	• To develop methods to detect and quantify mushroom culture contaminants in mushroom cultures. • To quantify the effect of bacterial contaminants in final spawn or in cultures on mushroom yield. • To develop economic thresholds to determine and measure spawn quality.	2014-2017		**SUSPENDED** - No personnel to do this research

Overarching Projects to guide research priorities for the 'medium to long term' future.

Project Number	Person Responsible	Short Title	Objectives	Start (mth,yr)	Finish (year)	Outputs for the year
BP (Best Practice Multi Project)	N van Rij	The dynamics of Oyster mushroom production technology under local conditions and mushroom strains is currently poorly understood.	• To develop technology based on a better understanding of the oyster mushroom • To understand, identify, characterise and document 'best practice' for oyster mushroom production	2012-2020		**SUSPENDED** - No personnel to do this research
S (Spawn optimisation Multi project)	N van Rij	Investigate spawn production and spawn related issues for oyster mushroom production.	• To maintain mushroom cultures and develop a library of suitable stains for KZN. • To produce quality spawn defined by lack of bacterial contaminants, using mother cultures that have been maintained at the optimum vigour (i.e., non-senesced strains). • To develop long term storage methods which ensure vigorous and disease free culture material.	2012-2020		**SUSPENDED** - No personnel to do this research
SMS (Spent mushroom substrate Multi Project)	N van Rij	Investigate uses of spent mushroom substrates uses and recycling	• Investigate alternate uses for SMS • Reduce waste from the mushroom production cycle.	2012-2020		**SUSPENDED** - No personnel to do this research

Project Number	Person Responsible	Short Title	Objectives	Start & Finish (year)	Finish (year)	Outputs for the year
PDC (Pest & disease control multi project)	N van Rij	Pest and contamination control in oyster mushrooms	• To develop technology to control oyster mushroom pests and diseases • To understand the epidemiology of mushroom diseases.	2012- 2020		**SUSPENDED** - No personnel to do this research

8.1. Demonstrations

Project Number	Researcher	Short Title	Objective (Hypothesis)	Start & Finish (year)	Linkages with MTSF & PGDP	Outputs for the year
Demonstration	N van Rij	Demonstration: Wall method of Oyster mushroom production	• Use of mushroom packs generated for "quality control" purposes of mushroom pack and spawn production. • Illustration of methodology involved to produce edible oyster mushrooms.	2013-2025		**SUSPENDED** - No personnel to do this research
Demonstration	N van Rij	Demonstration: Trench method of Oyster mushroom production	• Use of mushroom packs generated for "quality control" purposes of mushroom pack and spawn production. • Illustration of methodology involved to produce edible oyster mushrooms.	2013-2025		**SUSPENDED** - No personnel to do this research

8.2 Co-operative Research

Person Responsible	Short Title	Objectives	Start & Finish (year)	Linkages with MTSF & PGDP	Outputs for the year
N van Rij	On farm trials to research an alternative pasteurization technique to prepare substrates for oyster production	• Demonstrate and test an alternative low-cost, low-input substrate preparation technique. • Train co-operators at three selected sites: Wembezi, Dukuduku and a third site still to be identified on alternative substrate preparation so as to increase the production of oyster mushrooms in the Province. • Improve mushroom yields for small-scale farmers who are limited by the input costs of current substrate preparation methods.	2015-2017		**SUSPENDED** - No personnel to do this research

8.3 Suspended Projects

Project Number	Researcher	Short Title	Objectives	Start & Finish (year)	Linkages with MTSF & PGDP	Reasons
M-BP2013/02C	ND Dladla	Investigation into the use of Pulp waste for Shiitake mushrooms	Establish norms for sawdust mediums	2013- Nov 2014 EXTEND to 2015	1, 2, 3, 4, 6, 7, 8	**SUSPENDED** - No personnel to do this research

8.4 Guest Research

Project Number	Researcher	Short Title	Objective (Hypothesis)	Start & Finish (year)	Linkages with MTSF & PGDP	Outputs for the year
None						

8.5 New Projects for Approval

Researcher	Short Title	Objectives	Start & Finish (year)	Linkages with MTSF & PGDP	Outputs for the year

8.6 Future Research

Short Title	Objectives	Start & Finish (year)	Linkages with MTSF & PGDP	Outputs for the year
The dynamics of Oyster mushroom production technology under local conditions and mushroom strains is currently poorly understood.				
Investigate spawn production and spawn related issues for oyster mushroom production.				
Investigate uses of spent mushroom substrates uses and recycling				
Pest and contamination control in oyster mushrooms				

K**RA 2: Technology Transfer**

Actions	Name	Outputs for the year
Training of prospective mushroom farmers/producers		Training manual drafted and training course initiated - demand driven and 2 events proposed pending re-instatement, Q2 and Q4. APP 5.2.3
Technical support and provision of mushroom production technology to existing Food Security Gardens & Satellite Bases		Demand driven
Training on basic trench management practices for fresh oyster mushroom production		Demand driven
Functional training to newly appointed production staff within the Cedara Mushroom Centre		Staff appropriately trained in practical aspects of mushroom spawn & pack production at Cedara Juncao Mushroom Centre
Outputs workshop		Present relevant research progress reports in Mushroom Science

KRA 3: Personnel Training

Actions	Name	Outputs for the year
After formal orientation to the Department, basic training in the following will be given: Mushroom Pack production; Contamination control in mushroom packs; Spawn production; Contamination control in spawn production; Field Research methodologies, life-skills training in terms of conflict management and computer literacy. In addition to the above – should it be deemed necessary, refresher training will be offered in the topics outlined above. Furthermore, as and when the need and opportunity arises, further, more complex training will be given through the NFT section within the Department.		

Note: Staff have to be identified and permanently appointed

KRA 4: Administrative Duties

Admin duties	Name	Outputs for the year
Maintain discipline in Section		Motivated and productive staff
Budgeting		Financially sound & efficient section to undertake Mushroom Research & spawn production
Produce EPMDS, quarterly & other reports		Efficient section with motivated staff
Meetings (attend Strategic planning workshops, routine section meetings and research symposia/fora)		Motivated staff who understand and accept their respective responsibilities
Procurement of goods & services		Section which operates smoothly & efficiently by receiving goods & service timeously
Asset & Risk management		No loss of State assets through proper asset management and control
Operational plans submitted		Effective planning and execution of research projects and work programs
Routine admin duties (completion & submission of leave forms, vehicle log sheets, S&T claims,		Compliance with approved admin policies and procedures
Stock control and infrastructure maintenance		Control of consumables within section and maintenance of Mushroom Centre APP5.3.2
Ensure compliance as per SOP's		Fully compliant unit

KRA 5: Networking and Linkages

Networkers and links	Name	Outputs for the year
Maintenance of existing links with Extension Service		Reciprocal knowledge interchange, practical research and informed extension staff.
Maintain inter-departmental linkages with research staff for co-operation & improved collaborative research		More versatile research staff compliment operating both within & outside field of direct influence. More effective & improved research outputs from fewer registered research trials.
Forge & maintain linkages with tertiary training institutions and dedicated commodity organizations.		Better informed staff – more efficient solutions to *Ad-hoc* problems.
Create linkages within Mushroom Industry - edible, medicinal & exotic mushrooms		Visit at least 2 Industry stakeholders and provide written report
Create linkages with international mushroom experts, Dr. John Holliday (USA), Prof Lin (China), Dr. Lise Korstens (UNP).		Attend relevant international conferences, symposia and training courses to increase exposure to global mushroom researchers and developments,
University of Zululand UKZN		Collaboration & Co-operative work

9. Challenges

9.1 Staff

Vacant posts in Sub-directorate summarized below according to the Approved Departmental Structure:

Total number of posts	Posts filled	Total no of vacant posts
59	1	58

- Currently no permanent staffs are available within the Mushroom Centre to take over this function.
- A detailed breakdown of filled and vacant posts per component as shown in the table below

Post Title	Salary level	Nr of vacant posts	Minimum for Service Delivery	On current critical list
Professional Scientists	OSD	2	2	Yes
Control Scientific Technician	OSD	1	1	
Scientific Technician	OSD	4	2	
Senior Laboratory Assistant	5	2	1	
Laboratory Assistant	4	8	5	
Auxiliary Services Officer	4	3	1	
General Administrative Clerk Production	5	1	1	
Farm Foreman	5	3	2	
Driver /operator	3	4	2	
Farm Aid	2	30	30	

9.2 Supply Chain Management

- Delivery of materials through Supply Chain Management remains highly problematic, especially with regards to the supply of plastic sleeves and raw materials.

10. Additional needs

10.1 Budget:

- Additional funds required for the following

Item	Description	2018-2019	2019-2020
Capital			
Mushroom -Spawn Lab	CN analyzer	R950 000	
Mushroom -Spawn Lab	Heat block for DNA analysis	R30 000	
Mushroom -Spawn Lab	Centrifuge	R40 000	
Mushroom -Spawn Lab	Bead beater- DNA extraction	R30 000	
Mushroom -Spawn Lab	Microscope and camera		R370 000
Juncao Mushroom	Injection moulds	R220 000	
Juncao Mushroom	Steam pressure cleaner		R50 000
Juncao Mushroom	Rotary grass slasher/mower		R 50 000
Juncao Mushroom	Notebook with docking station	R50 000	
Juncao Mushroom	Desktop computers	R50 000	
Infrastructure needs			
Maintenance	Maintenance of offices and storage facilities	R 20 000	R 30 000

6.3. Division: Crop Protection Services

Financial year: 2018-2019

DR SUZETTE BEZUIDENHOUT

1. Introduction

The Division forms a very important part of crop production. Research conducted by staff are essential for food security. The primary responsibility of the Division is to conduct research into disease, insect and weed control strategies, with the emphasis on integrated control measures and sustainability. Furthermore, assistance with the identification of pests and possible control methods is provided.

2. Customers and socio-economic impact

Customers include small-scale and commercial farmers, extension officers, Universities, agrochemical firms other research institutions and members of the public. By creating awareness of the impact on crop production due to crop interference from diseases, insects and weeds, producers are able to implement counter measures, ensuring food security.

3. The focus of the Section is:

To conduct research in production constraints regarding plant diseases, insects and weeds and to develop innovative and appropriate interventions to ensure the protection of crops and the sustainable use of resources.

4. Staff component

Refer to attached organogram (According to Staff Structure) Annexure B

5. Research Infrastructure

Cedara Research Station

- 3 x Plastic tunnels
- 1 x Field lab/shed
- 2 x Store rooms
- 1 x Cold room
- 1 x Office building

6. The aims and the objectives (Key Results Areas) of the Division are:

- Conduct appropriate industry-led research into major crop pests, diseases and weeds.
- Transfer scientific knowledge and expertise
- Personnel development and training
- Management of Crop Protection, including admin tasks.

7. Budget allocation for Crop Protection 2018/19

Goods and Services	R 355 500
Payment for Capital Assets	R 0
TOTAL	**R 355 500**

8. Outcomes:

KRA 1: Conduct Research and Demonstration Trials

Linkages with MTSF & PGDP discussed on pages iii & vi.

Project Number	Researcher	Short Title	Objectives (hypothesis)	Start & Finish (year)	Linkages with MTSF & PGDP	Outputs for the year
WEEDS						
AG-W11/02 C	S.R. Bezuidenhout	The management of cover-crop residues to reduce weed growth in maize	To evaluate the effect of cover-crop residue management on weed growth	2011 - 2018	Increase Land Productivity (2) Enhance sustainable household food security in KZN (3) Adapt to climate change (4) Technical support to farmers (7) Improved food security (8)	Final report
CP-2015/01 C	S.R. Bezuidenhout	Different weed control methods to reduce *Ipomoea purpurea* (common morning glory) emergence and growth	To determine the effect of different crop rotations and mulches on *I. purpurea* emergence and growth	2016 - 2023	Increase Land Productivity (2) Enhance sustainable household food security in KZN (3) Adapt to climate change (4) Technical support to farmers (7) Improved food security (8)	Progress Report
CP-2016/02 C	N.N. Manyoni	Alternative weed control in indigenous pumpkins	To evaluate if mulching, plant spacing's and intercropping reduce weed growth	2016 – 2019	Increase Land Productivity (2) Enhance sustainable household food security in KZN (3) Adapt to climate change (4) Technical support to farmers (7) Improved food security (8)	Progress report

Project Number	Researcher	Short Title	Objectives (hypothesis)	Start & Finish (year)	Linkages with MTSF & PGDP	Outputs for the year
PLANT PATHOLOGY						
CP-M 09/01 C	A. Nunkumar	Epidemiology and control of *Phaeosphaeria* leaf spot in maize	To elucidate exact causal organism of the disease. Determine potential yield loss. Determine the epidemiology of the disease.	2009 - 2017	Increase Land Productivity (2) Enhance sustainable household food security in KZN (3) Adapt to climate change (4) Technical support to farmers (7) Improved food security (8)	Final Report
CP-M 11/01 C	A. Nunkumar	Epidemiological research into grey leaf spot and northern corn leaf blight in KZN	Determine optimum fungicide application time for disease control on susceptible and resistant cultivars.	2011 - 2018	Increase Land Productivity (2) Enhance sustainable household food security in KZN (3) Adapt to climate change (4) Technical support to farmers (7) Improved food security (8)	Progress Report
CP-2014/03 C	A. Nunkumar	Evaluation of three crop species for tolerance to *Sclerotinia sclertiorum*	To identify different tolerant cultivars of soybean, dry bean and sunflower to different aggressive strains of *Sclerotinia sclerotium*	2014 - 2018	Increase Land Productivity (2) Enhance sustainable household food security in KZN (3) Adapt to climate change (4) Technical support to farmers (7) Improved food security (8)	Progress Report
CP-2015/02 C	A. Nunkumar	Epidemiological research into grey leaf spot on ryegrass	Determine the epidemiology of the disease and evaluate different control measures	2015 - 2021	Increase Land Productivity (2) Enhance sustainable household food security in KZN (3) Adapt to climate change (4) Technical support to farmers (7) Improved food security (8)	Progress Report

Project Number	Researcher	Short Title	Objectives (hypothesis)	Start & Finish (year)	Linkages with MTSF & PGDP	Outputs for the year
CP-2016/03 D	S.R Bezuidenhout	Management of nematodes and scab on potatoes	Evaluating the effect of biofumigation on nematode and scab populations	2016 - 2020	Increase Land Productivity (2) Enhance sustainable household food security in KZN (3) Adapt to climate change (4) Technical support to farmers (7) Improved food security (8)	Progress report
ENTOMOLOGY						
CP–E 06/01	A. Nunkumar	Monitor aphid numbers: potato seed production in collaboration with Potato South Africa.	Increase potato yield Reduce viral load in KZN produced seed potatoes	2006 - 2020	Increase Land Productivity (2) Adapt to climate change (4) Technical support to farmers (7) Improved food security (8)	Incidents of aphids monitored and samples to Potato SA Progress Report
OTHER CROPS						
CP-2016/01 C	K. Mbotho	Maize planting date	To determine the optimum date for maize planting for different growth classes and different seedling rates	2016 - 2020	Increase Land Productivity (2) Enhance sustainable household food security in KZN (3) Adapt to climate change (4) Technical support to farmers (7) Improved food security (8)	Progress report

8.1 Demonstrations

Project Number	Researcher	Short Title	Objective (Hypothesis)	Start & Finish (year)	Linkages with MTSF & PGDP	Outputs for the year

8.2 Co-operative Research

Project Number	Researcher	Short Title	Objective (Hypothesis)	Start & Finish (year)	Linkages with MTSF & PGDP	Outputs for the year
CP-M 09/03 C	A. Nunkumar	Co-operative breeding trials with ACCI-UKZN	To assist in maize breeding trials on Cedara Increase maize disease resistance Increase maize drought tolerance	2006 - 2020	Advance adequate nutrition – as a core element in NDP (6) Improved food security (8)	Progress Report compiled by UKZN

8.3 Guest Research

Project Number	Researcher	Short Title	Objective (Hypothesis)	Start & Finish (year)	Linkages with MTSF & PGDP	Outputs for the year

8.4 Suspended Projects

Project Number	Person Responsible	Short Title	Objectives	Start & Finish (year)	Linkages with MTSF & PGDP	Reason
CP-LAB 11/01-C		Development of pest reference database to enhance Entomological Services at Cedara	Develop a pest reference database	2011 - 2030	Increase Land Productivity (2) Adapt to climate change (4) Technical support to farmers (7)	Awaiting appointment of Entomologist

CP-W 2013/01 D	S.R. Bezuidenhout	Influence of cover crops and crop rotations on weed density and *Zea mays* (maize) competitiveness	To quantify the effect of different cultural weed control treatments on weed density and composition and maize competitiveness	2013 - 2024	Increase Land Productivity (2) Enhance sustainable household food security in KZN (3) Adapt to climate change (4) Technical support to farmers (7) Improved food security (8)	Staff capacity problem

8.5 New Projects for Approval

Researcher	Short Title	Objectives	Start & Finish (year)	Linkages with MTSF & PGDP	Outputs for the year

8.6 Future Research Needs/Directions

Short Title	Objectives	Start & Finish (year)	Linkages with MTSF & PGDP	Outputs for the year
Entomology				
Common insect pest and their occurrence in crops	• Develop a database of common insects on common crops			
The occurrence of insects in pastures	• Evaluate the impact of insects on pastures			
Stalkborer resistance in maize	• Evaluate the development of resistance of Bt maize			
Macadamia stink bug IPM monitoring	• Evaluate the occurrence of stinkbugs			

Fall armyworm infestations	• Evaluate the migratory patterns of Fall armyworm and possible integrated pest management startegies			
Plant pathology				
The biology of soil – what are the invisible yield constraints to the traditional staple crops?	• Evaluate nematode populations • Determine the effect of biofumigation			
Determining the effect of water quality on the incidence of plant diseases	• Effect on plant disease severity • Improving water quality through filters, chemical treatments			
The occurrence of mycotoxins on grain	• Determine the impact on grain quality			
Weed science				
Influence of weed numbers on crop growth	• Determining the threshold numbers of weed species for interference with crops			
Effect of teff on oversown pastures	• Determine the potential reduction in growth of over sown pastures in teff residues			

KRA 2: Technology Transfer

Actions	Name	Outputs for the year
Leaflet Series	A. Nunkumar S.R Bezuidenhout N.N Manyoni K. Mbotho S.E. Simelane	Research Bulletins for information dissemination
Farm visits	A. Nunkumar S.R Bezuidenhout N.N Manyoni K. Mbotho S.E. Simelane	On demand – Reports to client
Ad hoc advice	A. Nunkumar S.R Bezuidenhout N.N Manyoni K. Mbotho S.E. Simelane	Transfer of information and knowledge to clients of the Department eg. Farmers

KRA 3: Personnel Training

Actions	Name	Outputs for the year
Attending congresses, symposia, workshops, farmers days and other technology transfer events	A. Nunkumar S.R. Bezuidenhout S.E. Simelane N.N. Manyoni K. Mboto	To gain experience and knowledge with colleagues in relevant fields as well as informal technology transfer. (Networking)

KRA 4: Administrative Duties

Actions	Name	Outputs for the year
Staff supervision	A. Nunkumar, S.R. Bezuidenhout, K. Mbotho,S. E. Simelane, N.N. Manonyoni	Weekly meetings
Budgeting	S.R. Bezuidenhout	To produce realistic budget and not over- or under-spent
EPMDS	A. Nunkumar S.R Bezuidenhout N.N Manyoni K. Mbotho S.E. Simelane	To produce EPMDS, Quarterly Reports and routine requirements
Meetings	A. Nunkumar S.R Bezuidenhout N.N Manyoni K. Mbotho S.E. Simelane	To attend relevant meetings, strategic planning etc
Procurement	A. Nunkumar, K. Mbotho	To source materials, quotes, place orders and receive goods
Risk Management	A. Nunkumar S.R Bezuidenhout N.N Manyoni K. Mbotho S.E. Simelane	Yearly stocktaking, locking of offices, vigilance and monitoring
Operational Plans and APP targets	S.R. Bezuidenhout	Annual submission of operational plans and APP targets
Leave forms	A. Nunkumar	Monitor submission of leave forms, process and send to Leave Section
S&T	K. Mbotho	To check validity of S&T claims and to process them
Logsheets	K. Mbotho	To fill in KZN Transport logsheets and monitor use and roadworthiness

KRA 5: Networking and Linkages

Actions	Name	Outputs for the year
Extension staff & KZNDARD Research	A. Nunkumar S.R Bezuidenhout N.N Manyoni K. Mbotho S.E. Simelane	Networking & Advice
Universities	A. Nunkumar S.R Bezuidenhout N.N Manyoni K. Mbotho S.E. Simelane	Networking
A.R.C.	A. Nunkumar S.R. Bezuidenhout	Networking
Sugar Association	A Nunkumar	Networking
ICFR	A Nunkumar	Networking
Agri-Business firms	A. Nunkumar S.R Bezuidenhout N.N Manyoni K. Mbotho S.E. Simelane	Networking
Scientific Societies	A. Nunkumar S.R Bezuidenhout N.N Manyoni K. Mbotho S.E. Simelane	Attend congress & networking
International experts	A. Nunkumar	Networking

9. Challenges

9.1 Staff

Vacant post in Sub-directorate summarized below according to the approved Departmental Structure:

Total number of posts	Posts filled	No of vacant posts
20	7	13

- The table below shows the designations of vacant posts and the minimum required for ongoing service delivery.

Post Title	Salary Level	Nr of vacant posts	Minimum for Service Delivery	On Current Critical List
Specialist Scientist	OSD	1		
Professional Scientist	OSD	1	2	
Scientific Technicians	OSD	3	2	
Auxiliary Officers	4	2	2	
Farm Aids	2	7	9	Yes

9.2 **Supply Chain Management:**

- Delivering of goods timeously and according to the specifications
- Procuring specific goods needed for experiments.

10. Additional needs

10.1 Budget

- Extra funds required for equipment maintenance
- Additional funds required for the following:

Infrastructure	Description	2018/19	2019/20
Capital			
Infrastructure needs			
Storage facilities	Storage facilities for agrochemicals, fertilizer and seed are required at Dundee Research Station	50 000	60 000
Enclose field lab/shed	The current shed at the Field lab must be enclosed to prevent rainwater from seeping into the cold room	100 000	150 000
Plastic tunnels	The plastic of the tunnels need to be replaced after being damaged by hail. The structure needs to be repainted.	100 000	200 000

7.Sub-Directorate: Analytical Services

Financial year: 2018-2019

LES THURTELL

1. Introduction

The Directorate: Agricultural Crop Production Scientific Research Services: Sub-directorate; Analytical Services of KwaZulu-Natal Department of Agriculture & Rural Development is addressing the following strategic goals and strategic objectives of the Department respectively:

- Outcomes 7 and 10 according to the Medium Term Strategic Framework (2014-2019) (MTSF) and PGDP interventions:
  - Undertake appropriate agricultural research, technology development and transfer to advance optimum and sustainable agriculture production.
  - Provide agricultural analytical, recommendation and diagnostic services in support of agriculture in the Province.

Within the Sub-Directorate the following divisions render services to clients of the Department:

- Analytical Services
- Biometrical Services
- Biochemistry Research
- Soil Fertility Research

Analytical services

This is a support service comprised of five routine laboratories;

- ❖ Soil Fertility Laboratory
- ❖ Plant Nutrition Laboratory
- ❖ Feed and Forage Quality Laboratory
- ❖ Salinity and Water Laboratory
- ❖ Plant Health Diagnostics Laboratory

Additional three research laboratories also operate within Analytical Services;

- ❖ Biochemistry Laboratory
- ❖ Soil Physics laboratory
- ❖ Tissue Culture Laboratory

The laboratories are housed in sophisticated technical facilities and offer cost effective, valuable scientific data which impacts directly onto agricultural production.

The Soil Fertility Laboratory adds value with respect to: correction of soil-related problems before planting; efficient use of fertilizers and lime; cost-efficient use of limited capital inputs. This enables farmers to apply up-to-date research information to optimize agricultural production.

The Feed and Forage Laboratory analyzes for nutrient and feed quality of raw materials and then the finished feeds to optimize lowest cost feed without compromising the quality thereof. Additionally this laboratory analyzes for quality parameters of pastures used in the supplementation of feed for livestock herds.

The Plant Laboratory's nutritional analysis is a good management tool to monitor the nutrient status of plants as well as to assist with the diagnosis of certain toxicities and deficiencies present in the crop.

Salinity Laboratory analyzes for soil salinity, soil texture, lime and water quality samples from diverse sources within KZN.

The Plant Health Diagnostics Laboratory offers a service, diagnosing plant diseases and identifying water pathogens and thus offering advice on solutions on how to treat the crop, thereby remedying the cause of the problem and improving production.

The laboratory services rendered to clients includes quality, accuracy and a good turn-around time for samples submitted. The vision of Analytical Services is to transfer the available science-based information and technologies in the best possible way. It is also very important to improve the technologies to meet the requirements and exceed the expectations of farmers and other clients.

Biometrical Services

This is a vital service which assists with the planning and design of experimental trials and then conducts the statistical analysis of research results; the outcome of which assists with highlighting the impact of projects. Additionally the design and the analysis of surveys form an important part of this service.

The Bioinformatics Specialist post that is new on the structure will be used to conduct modelling for future environmental conditions pertaining to crop production as well as linking in to Natural Resource information such as Bioclimatic information, farm plans, crop suitability. Crop models and agricultural production modelling are important tools which allow farmers and advisers to consider different options. This is crucial for improved adaption to climate change and changing economic conditions.

The limitations to this section is that all the posts are currently vacant and there is no movement to replace the post vacated by Mrs Nixon (Stevens) at the end of October 2016, due to restructuring of the Department and the matching and placing processes.

Biochemistry Research

There is a great need for diversification in the agricultural field. The production of essential oils crops is a way that fills this need but can also be used as a great opportunity for the engagement of small farmers in agriculture.

South Africa in general and KwaZulu-Natal in particular has the climatic diversity which enables it to produce a great diversity of essential oils producing plants. However, the amount of information available on the successful production of essential oils and their optimal oil quantity and quality, is limited. Wrong quality oil is one of the major constraints to profitability. Therefore, it is of primary importance to have facilities where scientific advice can be given on the different aspects of the essential oils industry. In line with this, the Biochemistry section is going to offer a quality analysis on essential oil package on plant samples, pending approval from the Revenue Office from the 1st April 2017.

Currently Mrs. Sherrylyn Naidoo has undertaken a Master's Thesis and is about to submit her thesis on the use of essential oils to control agricultural pathogens with the Free State University.

The vacant post of Professional Scientist in Biochemistry has been replaced with that of a Specialist Scientist in the Structure approved in July 2015 by MEC Xaba and when approved, will be advertised and filled by Human Resource Process, with the focus on Biochemistry with regard to the nutrient content of crops as well as molecular research and Microbiology for soil health.

The focus of research in Crop Production has shifted to include the nutritional status of crops. So instead of focusing just on the production parameters (inputs and yields) and the factors that

influence these, research must also include the nutritional quality and quantity of vegetables to include minerals, trace elements, vitamins and other components such as sugars and heavy metals. In order to be able to conduct research into these components within plants, additional staff and instrumentation will need to be considered so as to allow this trend to occur. Lack of budget, insufficient staff capacity and SCM cooperation for procurement of equipment are all risks to hinder this potential research.

Soil Fertility Research

Poor soil fertility is the major agronomic constraint to profitable crop and fodder production in KwaZulu-Natal. The vision of Soil Fertility Research is to eliminate poor soil fertility as a constraint in the most cost-efficient way. Fertilizers, lime and organic sources of nutrients are crucial, and often costly, inputs necessary for most agricultural enterprises in KwaZulu-Natal. Soil Fertility Research aims to improve the profitability of these enterprises by enabling the cost-efficient use of these inputs, whilst conserving natural resources. Research is always needed to explore new avenues, or build on existing knowledge, to improve or maintain our soils and water for sustainable agricultural production.

Soil Fertility researchers perceive the use of soil testing together with the use of conservation agriculture technologies (no-till, minimum tillage, cover cropping and crop rotation) as critical tools in the realization of this vision. Soil Fertility Research, therefore, also focuses on improving the recommendations made by the Analytical Services, and on developing conservation agriculture technologies which promote the rehabilitation and maintenance of soil structure and health for commercial, emerging and subsistence farmers.

The outputs of the research conducted is transferred to extension officers, agricultural advisers, farmers, and researchers working in the fields of Agronomy, Horticulture and Forage Production.

Continued research into the Province's soil fertility is ongoing and many of the trials have been running for a number of years and are providing valuable information with regard to acidification as well as the use of alternative sources of N such as cover cropping.

The component has commenced with research into the micro-biological aspects of soil fertility and their interaction with management practices.

The impact of soil compaction is a constraint that needs to be researched especially in conservation agriculture. Should the division be granted an extra professional scientist, this scientist will embark on soil physics research into compaction problems in soils where conservation tillage is practiced.

Additionally as the research need expands, especially in terms of the nutritional quality of crops, appointment of suitably qualified staff to carry out this function must be permitted and fast tracked.

2. Customers and socio-economic impact

Clients of the Sub-Directorate include resource-poor communal farmers through to internationally competitive commercial farmers, seed companies, Departmental Extension Services, Universities, NGO's, training institutions, fertilizer consultants, feed nutritionists, research colleagues, advisers and the general public.

The outcome and impact of the service delivered by the Sub-directorate will significantly contribute to food security; by improving crop production, the nutrition quality of the crops and increasing profitability thereby addressing hunger and household food security, whilst conserving a sustainable environment and contributing to unlocking the agricultural potential of the Province. It is vital that Senior Management support and promote Analytical Services, authorizing the procurement of technical inputs, both in equipment and supplies required to ensure success of the service provided.

3. Strategy

3.1 Soil Fertility Research

The point of departure in strategizing the activities of the Soil Fertility Research is the sound identification of research priorities. Inputs from the following form the basis for prioritizing research requirements:

- The need to unleash agricultural potential, increase land productivity and food security in rural communities.
- Information needs identified in the implementation of Departmental projects.
- The needs of farmers.
- Requirements for sustainable agricultural production in terms of yield and nutritional content.
- Soil conservation and health.

The strategy adopted is as follows:

- Field trials are conducted in communities, on Departmental Research Stations and on commercial farms.
- Demonstration plots are maintained and included as part of the trials.
- Participation in farmers' days. On these occasions, information on research findings and optimal agronomic practices is relayed to farmers, extension officers, regional scientists, school teachers and pupils. Feedback from clients at these days is an important source of information regarding their research needs.
- Relevant findings from research trials, as well as information from the literature are incorporated into the Departmental Computerized Fertilizer Advisory Service. In this way, recommendations accompanying every soil sample submitted to the Advisory Service reflect the latest and most up-to-date technology available; furthermore, all farmers – both commercial and small-scale – benefit from research activities.
- Technology is documented in the form of scientific & semi-scientific publications, popular articles, information packs, guidelines and reports.
- The latest and best technologies are included in presentations made at Departmental Short Courses as well as information days.
- Research project results with an impact and message are invited to be presented at the Annual Research Symposium, but this will be in the first quarter of 2019.

3.2 Analytical and Biometrical Services

The strategy of the Analytical and Biometrical Services is to support all activities arising from the following:

- Food security in rural communities.
- Information needs, identified in the implementation of Departmental Projects.
- The needs of emerging-commercial farmers.
- Requirements for sustainable agricultural production (efficient use of inputs, developing production systems that are less affected by temporary drought spells, minimizing dependence on costly external inputs).

- The nutritional content of crops for the benefit of health.

The strategy adopted is as follows:

- Promotion of the Analytical and Biometrical Services to schools, communities, emerging and commercial farmers.
- Promote the use of soil testing.
- Continually work in collaboration with researchers to improve the recommendations that accompany soil test results to reflect the latest and most up-to-date technology available.
- Liaison with customers i.e. farmers, extension staff, researchers, consultants and general public to address their concerns.
- Liaison and network with other laboratories who analyze samples for the betterment of the analytical services in the Province.
- Training of farmers, consultants and extension staff, to understand and correctly interpret results in order to use them properly. This is done through Departmental short courses and site visits.
- Training of researchers and extension staff in research methodologies.
- Use of the latest statistical techniques and software.
- Upgrade the laboratory network with a Laboratory Integrated Management system (LIMS) which has the effect of improving the laboratory services and thereby paving the way to ISO 17025 accreditation. LIMS went live in the 4th quarter of 2016/17.
- Continually improve analytical skills and method developments.

3.3 Biochemistry Research

The essence of the essential oils research strategy is how to utilize agricultural potential and environmental stability as key vehicles in building a prosperous community.

The analysis of farmer essential oil samples was offered from the 1st April 2017 thus assisting clients with the management of their crops and validation of the quality of their oils.

The completion of the research into essential oil has resulted in a strategy to be adopted by the Biochemistry section is to do microbiological research to indicate indices of soil health.

4. The Focus of the Section is:

- To provide an ongoing analytical service to the Department's clients that will encourage the use of the Laboratory services to enhance agricultural production.
- To carry out research that will promote sustainable agricultural production for both rural and commercial farmers.

5. Staff component

Refer to attached organogram (According to Departmental Structure) Annexure F

6. Research Infrastructure

The Sub-Directorate Analytical Services is housed in a sophisticated Laboratory Complex that has 8 laboratories, (Feed Lab, Plant Lab, Soil Research Lab, Soil Fertility Lab, Salinity Lab, Plant Health Diagnostic Lab, the Biochemistry Lab and the Tissue Culture Lab), a reception area, a conference room, a training room, ablution blocks, offices, a sample archive basement, chemical stores, fertilizer stores, garages, infrastructure support rooms and a staff kitchen.

Additional offices and laboratories are required to meet the additional staff and work that will be generated from the new staff once the new structure is in place.

7. The aims and the objectives of the Sub-directorate are:

7.1 Soil Fertility Research

Objectives

- To improve the database of useful soil fertility knowledge available to agriculturalists in KwaZulu-Natal.
- To improve farmers' access to soil fertility technology and thereby enhance the profitability of their enterprises.
- To conduct relevant research and assessments and to develop new soil fertility and microbiology technologies aimed at improving sustainable farming (improving and optimising crop production).
- The new knowledge will then be disseminated to the relevant people (farmers, scientists, extension officers and other stakeholders) by means of presentations, publications and training.
- To link with rural communities. The Regional Liaison Officer, Bright Mashiyana, visits farming districts and offers training concerning the correct soil sampling procedures, the interpretation of results for improved use of inputs, and the promotion of Conservation Agriculture (CA).

Outputs

- Demonstration value of trials.
- Document and verbally communicate information that can assist farmers improve their soil fertility.
- Improved analytical techniques.
- Improved information accompanying the results of soil and plant tissue testing.
- Improved soil fertility guidelines for targeted commodities.
- Documents and presentations on soil and plant sampling, fertilization and conservation agriculture technologies.
- More efficient use of soil fertility inputs and improved profitability and sustainability of enterprises using soil fertility information.
- Information on the Department's Website
- The use of video material for technology transfer.

7.2 Analytical and Biometrical Services

Objectives

- To provide an efficient, accurate and-up-to date Analytical and Biometrical Services for use by Departmental clients.
- To improve the use of the Analytical and Biometrical Services by agriculturalists and consultants in KwaZulu-Natal.
- Keep abreast of and implement relevant new technologies and analytical methodologies.

Outputs

- Accurate Soil Fertility results and their corresponding lime and fertilizer recommendations.
- Plant nutritional status which assists with management of crop production as well as the diagnosis of toxicities or deficiencies.
- Quality parameters of feeds, raw materials and pastures.
- Soil salinity, soil texture and water quality.

- A plant disease diagnostic service which can recommend solutions to plant health problems.
- A tissue culture laboratory to be used to cultivate virus free sweet potato vines.
- Increased usage of analytical results for soil, plant tissue, water and feed.
- Improved communications with all role players.
- Informed and reliable use of fertilizers and lime.
- Farmers' concerns addressed through the use of research and survey data.
- Achievement of higher yields, better nutrition, food security, increased profits and sustainable enterprises through using the Analytical and Biometrical Services
- Scientifically planned research trials and/or surveys and analyzed data for the compilation of reports, for scientific publications and information to be used in technology transfer events
- Refer queries of information to relevant experts in their field.

7.3 Biochemistry Research

Objectives

- To analyse essential oils for quality purposes.
- To transfer the information obtained from research to the agricultural community enabling them to increase crop production.

Outputs

- The production of an Essential Oil Manual to assist with production of essential oil crops and to ensure that good oil quality is obtained.
- The extension of Analytical Services by offering the quality of essential oils as analyzed on a Gas Chromatograph.

8. Budget

8.1 Budget allocation 2017/18:

Compensation of Employees:	**R18 216 000**
Goods and Services:	**R5 758 000**
Transfers:	**R112 000**
Capital	**R1 929 000**
TOTAL:	**R26 015 000**

9. Outcomes

KRA 1: Conduct Research and Demonstration Trials
(Research programme followed by Section - register)

Project Number	Person Responsible	Short Title	Objectives	Start & Finish (year)	Linkages with MTSF & PGDP	Outputs for the year
SOIL FERTILITY						
F-2015/01C Cedara	N Findlay	Cultivar effects on yield response of selected staple agronomic crops to soil acidity and P deficiency	• To determine the yield response (reflected as a response curve) of selected staple dryland agronomic crops to varying levels of soil acidity and soil P. • To create a response matrix for those crops, which indicates the tolerance levels to increasing levels of soil acidity and decreasing soil P. To be able to make recommendations on both agronomic crop and variety when faced with a situation of limited resources in terms of lime and P. To gain a better idea of the nutritional values of these crops when grown under stressed (high acidity, low P) conditions.	2016 – 2016	Increase land productivity Outcome 10	Information Pack Possible Publication

Project Number	Person Responsible	Short Title	Objectives	Start & Finish (year)	Linkages with MTSF & PGDP	Outputs for the year
SF-M 10/27 Cedara	A.D. Manson	Cover crops for maize silage	Determine the effects of winter cover crops on maize silage production	2010-2020	Increase land productivity, Outcome 10 & APAP – Conservation Agriculture (CA) pg 58	Progress report Review
US 21 At Loskop	G.R.Thibaud	Tillage effects on organic matter break down and its effect on Nitrogen requirement of maize	Compare different tillage regimes in their effect on maize response to N Evaluated tillage effects on carbon sequestration Evaluate the efficiency of different N sources on maize production	2004-2020	Increase land productivity Outcome 10 APAP – Conservation Agriculture (CA) pg 58	Progress report Relevant information to be transferred at technology transfer events
SF-M 99/19C Trial and Demo Broadacres : Cedara	Charmaine Mchunu	The improvement of FERTREC nitrogen recommendations	To secure information on the measurement of nitrogen (N) in soils for use in extending advice to farmers To monitor nitrogen and carbon dynamics after implementation of conservation agriculture	1999-2019	Increase land productivity Outcome 10 APAP – Conservation Agriculture (CA) pg 58	Progress report Relevant information to be transferred at technology transfer events

Project Number	Person Responsible	Short Title	Objectives	Start & Finish (year)	Linkages with MTSF & PGDP	Outputs for the year
SF-2014/02C	CN Mchunu	Impact of Land Management on microbial functional diversity	To study the impact of land management on microbial functional diversity and N Mineralization rates	2015-2020	Increase land productivity Outcome 10 APAP – Conservation Agriculture (CA) pg 58	Progress report Relevant information to be transferred at technology transfer events
SF/V11/25 D Dundee	Douglas Gordon and Elise de Jager	Soil P requirement of vegetables	To determine the P requirements of vegetable crops especially sweet potatoes	2011-2017	Increase land productivity Outcome 10 APAP – Conservation Agriculture (CA) pg 58	Progress report Relevant information to be transferred at technology transfer events
BIOCHEMISTRY						

Project Number	Person Responsible	Short Title	Objectives	Start & Finish (year)	Linkages with MTSF & PGDP	Outputs for the year
	SC Naidoo	Ammonia oxidising bacteria as good microbial indicators of the nitrogen cycle when monitoring soil status	Objectives of the project: To quantify the ammonia oxidising archaea (AOA) and ammonia oxidising bacteria (AOB) present in soils of varying acidity levels by quantifying the abundance of genes (*amo*A from each microbial group) encoding for enzymes key to nitrogen loss from the soil. To compare the abundance of the AOA community with the AOB community abundance to assess the relationship between differences in abundance to particular soil conditions/ agricultural practices. To provide an independent estimate of the abundance of ammonia oxidising bacteria by calculating the potential nitrification rates and to explore whether these factors correlate with the abundance of either AOA or AOB.	2018-2024	Increase land productivity Outcome 10 APAP – Conservation Agriculture (CA) pg 58	Progress report Relevant information to be transferred at technology transfer events
DIESEASE VARIETY OF PLANT SPECIES						

Project Number	Person Responsible	Short Title	Objectives	Start & Finish (year)	Linkages with MTSF & PGDP	Outputs for the year
HS/2009/5 Cedara	MD Relihan	Research into diseases associated with Lagena Species	To conduct in-depth research on diseases associated with infection by Lagena sp. On pepper and other crops	2009	Increase land productivity. Unleash agricultural Potential	Progress report Relevant information to be transferred at technology transfer events

9.1. Demonstrations

Project Number	Researcher	Short Title	Objectives	Start & Finish (year)	Linkages with MTSF & PGDP	Outputs for the year
SF-M 99/19C Trial and Demo Broadacres: Cedara	Charmaine Mchunu	The improvement of FERTREC nitrogen recommendations	To secure information on the measurement of nitrogen (N) in soils for use in extending advice to farmers To monitor nitrogen and carbon dynamics after implementation of conservation agriculture	1999-2019	Increase land productivity Outcome 10 APAP – Conservation Agriculture (CA) pg 58	Progress report Relevant information to be transferred at technology transfer events
BC-EO-07 Cedara	S Naidoo	Establishment and maintenance of an essential oil trial for demonstration purposes	To establish and maintain a trial where several essential oils producing plants are grown for the purpose of demonstration to first time essential oil growers.	2007-ongoing	Increase land productivity Unleash agricultural Potential	Annual progress report Relevant information to be transferred at technology transfer events/ visit requests.

Drakensville	G Thibaud	Establishment of a cover crop demonstration site at Drakensville near Bergville	To establish and maintain a demonstration trial of winter and summer cover crops.	2017 - ongoing	Increase land productivity Outcome 10 APAP – Conservation Agriculture (CA) pg 58	Presentation at Project Approval Committee Annual progress report Relevant information to be transferred at technology transfer events/ visit requests.

9.2. Co-operative Research

Person Responsible	Short Title	Objectives	Start & Finish (year)	Linkages with MTSF & PGDP	Outputs for the year

9.3. Guest Research

Person Responsible	Short Title	Objectives	Start & Finish (year)	Linkages with MTSF & PGDP	Outputs for the year

9.4. Suspended Projects

Project Number	Researcher	Short Title	Objectives	Start & Finish (year)	Linkages with MTSF & PGDP	Reasons
SF-V2013/01C Cedara	Dr Alan Manson	Nitrogen use Efficiency for Vegetables	Establish 6 treatments on which a vegetable rotation will be implemented. Determine NUE for each treatment.	**2013-2016**		**SUSPENDED DUE TO ACCIDENTAL PLOUGHING UP OF TRIAL AND THUS MIXING UP OF THE TREATMENTS**

US 14 Karkloof	G.R.Thibaud	Lime x Nitrogen interactions for No-Till	Determine the efficacy of surface lime applications Measure the effect of N source and rate on maize production	2001 - 2020	Increase land productivity Outcome 10 APAP – Conservation Agriculture (CA) pg 58	**SUSPENDED DUE TO TRANSFER OF LAND OWNERSHIP AND THE UNWILLINGNESS OF THE NEW OWNER TO ALOW RESEARCH TRIALS ON HIS PROPERTY**

9.5 New Projects for Approval

Person Responsible	Short Title	Objectives	Start – end (mth,yr)	Linkages with MTSF & PGDP	Outputs for the year
Alan Manson	The successful application of science in a small scale / subsistence scenario	To bridge the gap between research and communities	2018-2023	APAP – Conservation Agriculture (CA) pg 58	Literature review

9.6 Future Research

Soil Fertility Research:

Short Title	Objectives	Linkages with MTSF & PGDP	Outputs for the year
Improve lime, fertilizer and soil health recommendations.	Improvement of Analytical Services output in terms of optimizing inputs for crop production	Increase land productivity Unleash agricultural potential. APAP – Conservation Agriculture (CA) pg 58	1 review written up (Alan Manson / Nicky Findlay)
Improved Nitrogen Recommendations	Evaluate the efficiency of different N sources on maize production and optimal Nitrogen inputs for maximum yield.	Increase land productivity Unleash agricultural potential APAP – Conservation Agriculture (CA) pg 58	1 progress report 1 Updated Fertrec

The effect of soil management on greenhouse-gas emissions and carbon storage. (be aware of what is going on) Synergies with soil health monitoring and improvement	Awareness of environmental factors. Enhanced interaction and support with external role players Measurement of soil carbon stocks Increased understanding of soil health.	Increase land productivity Unleash agricultural potential APAP – Conservation Agriculture (CA) Outcome 10 pg 58	Updated knowledge Where necessary a review could be written
Investigate soil fertility and plant nutrition practices in small-scale agriculture in KZN and document problems and possible solutions.	Sample irrigation scheme and soil sample from plots on small scale farmers lands – look at fertility variability. Demonstrate to extension value of individual sampling and not just generic. – collaborate with extension scientists – would regard mentoring Put in place an over arching document trail of crop production processes.	Increase land productivity Unleash agricultural potential	Overarching document with multiple research bulletins in place.
Improved recommendations for Sulphur, Copper and Boron fertilization. Correlation between soil copper and leaf copper. Leaf test for Boron and correlate and advice based on leaf results only because the Boron soil test – difficult.	Updated and relevant Laboratory Service New laboratory methods researched and implemented	Increase land productivity Unleash agricultural potential	New lab protocols and SOPS in place.
Study the impact of P mineralization, to improve soil fertility from a Microbiology perspective.	Improvement of soil P recommendations and knowledge gathered on a Microbiological perspective	Increase land productivity Unleash agricultural potential	Review Possible new trial
Study of compaction in conservation agriculture • Infiltration rate test • Guidelines for irrigation – calibrate MIR for soil colour	Minimization of compaction and improvement in guidelines	Increase land productivity Outcome 10 APAP – Conservation Agriculture (CA) pg 58	Reports Reviews Research Bulletins

Laboratory Research: Soil test indicating potential for urea ammonia volatilization from urea.	Understanding of amount of volatilization occurring Enhanced lab services.	APAP – Conservation Agriculture (CA) pg 58	Reports Reviews Research Bulletins
Quick tests for spatial variability – supplement wet chemistry to improve map. – MIR, pH meter, buffer method. Desktop – correlations.	Good baseline for your whole field To show where spot liming is necessary	Increase land productivity Outcome 10 APAP – Conservation Agriculture (CA) pg 58	Reports Reviews Research Bulletins
Quick tests for soil health eg Solvita, Key indices: Aggregate stability see correlation with MIR.	CO2 evelation – Monitor soil conservation Monitor potential soil erosion	Increase land productivity Outcome 10 APAP – Conservation Agriculture (CA) pg 58	Reports Reviews Research Bulletins
Check production guidelines	Updated and relevant documents	Increase land productivity Outcome 10	Updated production guidelines
Double stranded RNA methods for detection and identification of plant viruses. Soil borne diseases:- Out source sequencing. Charmaine and Lyn will dove tail, for nitrogen work and the isolation of soil pathogens. How does a farmer handle soil borne diseases: -	Enable molecularly identify soil borne pathogens and viruses. develop management guidelines	Increase land productivity Outcome 10 APAP – Conservation Agriculture (CA) pg 58	Reports Reviews Research Bulletins Trial
Publish Fertrec Database for open access based on District Locality. Impact of Agric on water quality. Soil fertility of different land use using GPS co-ordinates. Consult with Natural Resources.	Establish an app relevant to Fertrec with regard to crop codes.	Increase land productivity Unleash agricultural potential APAP – Conservation Agriculture (CA) pg 58	Lead to data modelling Possible trial – desk top research.

There is scope for many more projects in the Soil Fertility Research Section, but it must be borne in mind that staff capacity and budget are limiting factors. This has been addressed in the new structure but in the meantime the component is encouraged to work alongside the other Sub-Directorates in Research who can assist with trials in terms of staff capacity.

It is recognized that no-till research (and conservation tillage) has priority over conventional till. This is a mitigating factor with regard to climate change and other environmental challenges such as soil erosion. With the last 2 years of severe drought in the Province, the results of the research emanating

from conventional vs conservation tillage have shown that with dryer conditions, the yields and inputs clearly favour No-Till.
Conservation tillage research is ongoing and this will yield positive results for resource poor farmers as well as having the “green environmental” affect by reducing carbon emission and limiting soil erosion.

Research on soil fertility with regard to the benefits of cover crops is ongoing. Additionally the production of cover crop seeds for small scale farmers is being investigated.
Future research directions must be based on problems and constraints faced by Farmers. Discussion in this regard with Farmers, Extension and Advisory personnel must be ongoing.

Biochemistry:

New disciplines to be considered with the appointment of a Specialist Scientist (pending implementation of the new structure still to be approved and implemented) as the research leader must occur.

This leader would be required to have majors in Soil Physics, or Biochemistry and Soil Microbiology.

Soil Physics- looking into compaction of the soil
Soil Micro-biology-soil health
Soil Biochemistry- soil bio-life and its effect on crop production
Technologies to support these would be the existing Analytical services, Biochemistry equipment such as GC and GC MS and the use of DNA sequencing.

Equipment required to enable DNA work will be required, but with the Department’s very cumbersome Supply Chain Management, clear specifications will be required to buy the correct equipment from the correct service provider.

Analysis carried out with DNA sequencing will benefit both Crop Production and Animal Production research as the methodology can be used for both disciplines. The technicians appointed in Biochemistry will need to be trained in this field.

Equipment such as HPLC and a new ICP for nutritional content of crops

Future Research: (This is providing a suitable Specialist Scientist is appointed)

Short Title	**Objectives**	**Linkages with MTSF & PGDP**	**Outputs for the year**
Investigation into soil compaction and its effect on production in No Till Systems	To mitigate against compaction by animals and machinery.	Increase land productivity Unleash agricultural potential	Progress report Research bulletin

To procure, install DNA sequencing and conduct training on the use of DNA sequencing in relation to older methods used.	Up to date technologies and therefore improved research and laboratory services.	Unleash agricultural potential	Progress report

The following table lists some of the outputs that can be considered if the Professional Scientist is appointed.

Short Title	**Objectives**	**Linkages with MTSF & PGDP**	**Outputs for the year**
Development of MIR methodology for analysis of organic C, clay, oxalate-Al (P fixation), N mineralization, and microbial activity index.	For use in Fertrec Recommendations on a routine basis.	Increase land productivity Unleash agricultural potential	Progress report Addition to result report for Soil Fertility Analysis
Improve and update NIR calibrations for the rapid analysis of Protein, Fibre, Starch and Total Non-Structural Carbohydrates in pasture samples and maize silage.	Enhancement of Analytical Services Quality Analyses for feeds and forages.	Unleash agricultural potential	Research bulletin Additional rapid low cost analytical package
Improved Quality control of: exchangeable acidity, pH, Calcium, Magnesium, total cations, acid saturation, and other parameters in soil samples	Improvement of laboratory service delivery.	Unleash agricultural potential	Additional information pertaining to quality control to comply with ISO17025
Improved method of P analysis in soil samples (need for field calibration makes this difficult)	Improvement of laboratory service delivery.	Unleash agricultural potential	Research bulletins Possible trial
PCR diagnostic tests to be introduced as a service to the Plant diagnostic clinic	Enhancement and improvement of Analytical Services	Increase land productivity Unleash agricultural potential	Addition to results delivered from plant health diagnostic laboratory

KRA 2: Render Analytical Services

Analytical Services:

Ongoing investigation into new technologies must continue to enable the laboratories to procure new instruments which will support these technologies and enhance the services delivered. Although critical, the procurement of new laboratory instrumentation has been highly problematic as Supply Chain Management shy away from procuring highly technical equipment and are reticent to proceed with tender procedures despite clear specifications.

LIMS went live during the February 2017. There are however teething troubles with LIMS, and once sorted out, ISO 17025 accreditation will commence which will enhance the reputation of the Laboratory services of the Department housed at Cedara. The appointment of a Professional Scientist to continually evaluate and monitor existing laboratory methodology and do research into new methodology is critical. A vacant post exists in the Feed Laboratory for this purpose. A motivation to appoint a suitably qualified scientist has been submitted to senior management for approval.

Project Number	Person Responsible	Short Title	Objectives	Start & Finish (year)	Linkages with MTSF & PGDP	Outputs for the year
Feed Laboratory	Vincent Zuma (Control Scientific Technician) Sherene Naicker (Scientific Laboratory Technician supervisor)	3250 (demand driven)	Up to 27 different tests are conducted per sample	2017-2018	Unleash agricultural Potential	Quarterly: • Copies of incoming register • Sample numbers collated • Updated equipment maintenance logs • Updated chemical log books • AgriLasa Results presented at Sub Directorate meetings
Plant Laboratory	Vincent Zuma (Control Scientific Technician) Lucky Sithole (Acting Scientific Laboratory Technician supervisor	4000 (demand driven)	Up to 15 different tests are conducted per sample	2017-2018	Unleash agricultural Potential	Quarterly: • Copies of incoming register • Sample numbers collated • Updated equipment maintenance logs

						• Updated chemical log books • AgriLasa Results presented at Sub Directorate meetings
Plant Health Diagnostic Centre	Michael Relihan	250 (demand driven)	Up to 40 different tests are conducted per sample	2017-2018	Unleash agricultural Potential	Quarterly: • Copies of incoming register • Sample numbers collated Annually: Progress report
Salinity Laboratory	Vincent Zuma (Control Scientific Technician)	1500 (demand driven)	Up to 20 different tests are conducted per sample	2017-2018	Unleash agricultural Potential	Quarterly: • Copies of incoming register • Sample numbers collated • Updated equipment maintenance logs • Updated chemical log books • AgriLasa Results presented at Sub Directorate meetings
Soil Fertility Laboratory	Vincent Zuma (Control Scientific Technician) Rani Noel (Scientific Laboratory Technician supervisor)	21 000 (demand driven)	Up to 18 different tests are conducted per sample	2017-2018	Unleash agricultural Potential	Quarterly: • Copies of incoming register • Sample numbers collated • Updated equipment maintenance logs • Updated chemical log books

						• AgriLasa Results presented at Sub Directorate meetings

KRA 3: Technology Transfer

Actions	Name	Outputs for the year
Presentations to be given at Advanced Soil Fertility Course	Guy Thibaud, Alan Manson, Charmaine Mchunu, Sherrylyn Naidoo, Les Thurtell, Bright Mashiyana, Thoko Makhathini, Elise de Jager, Patrick Madladla	To be given in June 2017
Disseminate information at the Research Symposium	All Senior Staff	Talk/poster by invitation
Student/school groups visiting the laboratories	Analytical staff	Demand driven- Analytical services promoted and informed
School children mentored for 5 days	Laboratory Scientific Technicians (supervisors)	School children exposed to working laboratory conditions by working in the laboratories for 5 days
Mentor and train interns	All Senior Staff	Supervision of interns for period of internship
Career day at Vula Program at Hilton College	Thoko Makhathini	Inform career options based on science
Presentations at farmers days	All research staff	Demand driven – copy of programme
Provide ad hoc advice to farmers, extension and Consultants	All staff	Demand driven – record of communication
Laboratory in House training	Vincent Zuma	1 per quarter
Farmers day – Fertrec extension	Bright Mashiyana	2 per annum
Analytical Services Open day	Les Thurtell	For advisers and consultants – November 2018
Progress report-back	All researchers	September 2018
Research Methodology Course	Les Thurtell Nicky Findlay Bright Mashiyana Suzette Bezuidenhout James Arathoon Derryn Nash Joanne Mann Archana Nunkumar	If required, this will be held and Planning sessions/meeting for the course/ develop training material September 2018
Provide advice in office/telephonic/electronic	All senior staff	Reported quarterly

Actions	Name	Outputs for the year
Annual Research Symposium	All Researchers	To present research with a message to interested staff, tertiary students and other interested parties

Publications

Name	Type of Publication	Title	Due
Les Thurtell	Information Pack	Analytical Services tariff update	Fourth Quarter
Charmaine Mchunu	Scientific Paper	Soil Health	Fourth Quarter
Michael Relihan	Scientific Paper	Lagena disease in plants	Fourth Quarter
Les Thurtell	Popular Publication	An Overview of Analytical Services	Second Quarter

KRA 4: Capital Development and Training

Actions	Name	Outputs for the year
Attend seminars, symposia, congresses and workshops and farmers days	All staff	To build knowledge base, networking and is required by SACNASP as a criteria for further registration.
LIMS Congress	Les Thurtell, Vincent Zuma	Date to be Confirmed, networking and gaining insight and knowledge
Combined Congress- soils, horticulture, crops,	Relevant staff	To build knowledge base, networking and required by SACNASP as a criteria for further registration.
Attend honours seminars at UKZN	G.R.Thibaud	Mentoring students -November 2018
No-Till Congress	Les Thurtell, Alan Manson, Bright Mashiyana, Sherrylyn Naidoo, Michael Relihan, Charmaine Mchunu, Vincent Zuma Elise de Jager Sherene Naicker Rani Noel Thoko Makhathini	Attend September 2018 Set up Departmental information stall

KRA 5: Administrative Duties

Admin duties	Name	Outputs for the year
Ongoing Budget planning and control	Les Thurtell	Sub Directorate's MTEF planned annually
AOP and APP planning and reporting	Les Thurtell	1 updated AOP, APP Quarterly Reports with supporting POE's
Admin meeting	Les Thurtell	Budget, procurement, staffing, leave, revenue, Fertrec, LIMS reporting. Quarterly- minutes and log books
Contracts and Tenders	Les Thurtell	Look into contract / terms of reference with regard to GAS and chemicals. Redo Tender documents for auto-titrator, CNS, ICP and HPLC Tender documents for molecular equipment
Bi-Monthly Sub Directorate Meetings	Les Thurtell	Every second month- minutes taken
Weekly meetings with Director	Les Thurtell	Weekly Itinerary presented

Monthly Lab Manager Meeting	Vincent Zuma/ Control Technician	Once a month- minutes taken and logbooks
Timeous execution of staff related administration (eg. EPMDS, Staff advertisements, interviews, etc.)	Les Thurtell	EPMDS (twice a year)/ when needs arises Staff Structure and Establishment maintained and acted on where necessary.
Submission of requested motivations	Les Thurtell	On demand
Submission of leave and S&T documents	All supervisors and researchers	When required
LIMS Administration	Les Thurtell, Vincent Zuma	Ongoing throughout the year

KRA 6: Networking and Linkages

Networkers and links	**Name**	**Outputs for the year**
Omnia	Vossie	Laboratory co-operation: possible visit to Omnia Laboratory
SASRI	Neil Miles	Laboratory co-operation: possible visit to SASRI Laboratory
Memorandum of understanding with ARC and UKZN	Les Thurtell	Peruse and ensure compliance
Potato Growers	Mike Relihan	Secretary for Potato SA working group with rural farmers.
Peruse and familiarize contents of APAP, MTEF,	Les Thurtell	Ensure that all outputs are aligned.
Linkages with Extension	Bright Mashiyana	Meet once a quarter to ensure that agricultural problems and constraints are voiced and that then gives future research impetus.
University of UNIZULU	Sub-directorate	Collaboration & Co-operative work
UKZN	Sub-directorate	MOU
ARC	Sub-directorate	MOU
National Agriculture Task Force (NCATF)	Bright Mashiyana	Four meetings per year (1 hosting)

11. Challenges

11.1 Staff

The appointment of staff needs to be fast-tracked. This is a risk for the Sub-directorate as it takes months and sometimes years to fill posts. The filling of these will have challenges with regard to office space to house the incumbents.

Total number of posts	Posts filled	Vacant posts
77	44	33

- A detailed breakdown of filled and vacant posts per component as shown in the attached organogram. (Annexure A).
- The table below shows the designations of vacant posts and the minimum required for ongoing service delivery.

Post Title	Salary level	No of posts	Minimum for Service Delivery	On current critical list
Specialist Scientists	OSD	3	1	0
Professional Scientists	(OSD			
Feed Laboratory	Grade	1	1	
Biometry	A/B)	4	2	2
Scientific Technicians:	(OSD			
Soil Fertility Research (Control)	Grade	1	1	
Salinity		1	1	
Soil Fertility Laboratory		4	3	
Plant Health Centre		1	1	
Feed Laboratory		2	1	
Plant Laboratory		2	1	
Research Assistant (ASO):				
Soil Fertility Research	4	2	2	
Administrative Support				
Senior Admin Clerk	7	1	1	
Admin Assistant	5	1	1	
Laboratory Aides:	3			
Salinity Lab		1	1	
Soil Fertility Lab		1	1	
Feed Laboratory		1	1	
Farm Aides	3			
Biochemistry		1		
Soil Fertility Research		2	2	

11.1.2 There are many challenges pertaining to food security that need to be addressed. As can be seen from the future research that could be initiated, there are many projects that can address food security and the quality (nutritional) of crops that need to be investigated. However if we cannot fill the vacant posts on our structure, there is no use continuing to work on these projects.

11.2 Supply Chain Management:

The procurement of technical items such as specific laboratory instrumentation and chemicals is a risk in terms of planning as there is a resistance by SCM to procure these items due to the deviation from the policy of obtaining 5 quotes. This is often impossible when procuring technical inputs and a solution will need to found to ensure that a way forward can be achieved.

Additionally the timeous approval to allow procurement of technical laboratory equipment needs to be speeded up to enable the laboratories to replace instrumentation and advance with technology and thus enhance service delivery and accuracy.

12.1 Budget

Additional budget for new posts in the approved new structure is required. Additional operational budget is required for maintenance and repair, Laboratory Supplies, gas, chemicals and replacement Laboratory equipment.

12.2 Equipment & Machinery

Tender documents for the procurement of the Carbon, Nitrogen, Sulphur instrument were put in place for the 16/17 and 17/18 financial year. Unfortunately the Bid Evaluation Committee did sit as members invited did not arrive for the meeting and thus the required quorum could not be formed to move the tender process along.
Currently only 2 of the Laboratory Instruments in the Analytical Services are fully operational.. The balance though operational are defunct (cannot source spares due to age of instrument) and there is an urgent need for additional funding and smooth tender processes to start replacing these instruments.

Component	Equipment	2017/18	2018/19	2019/20
Plant Lab	CNS ICP	1,400,000	 1,700,000	
Soil Research Lab	CNS			1,500,000
Biochemistry	DNA Sequencer GC GC MS HPLC		1,200,000 1,500,000	 2,000,000
Soil Fertility Lab	ICP CNS Auto Titrator Atomic Absorption	 450,000 800,000	1,700,000 1,400,000	
Feed Laboratory	UV/Vis Spectrometer Auto Analyzer		1,200,000	750 000
Salinity Laboratory	Atomic Absorption			450 000

12.3 Infrastructure

As per infrastructure maintenance plan for Directorate

The following infrastructure needs with the budget implication is attached in the table below:

Infrastructure	Description	**2018/19**	**2019/20**	**2020/21**
Additional offices for Research Staff	Construct additional offices and work stations for soil fertility research staff, either by erecting a floor above N Block or new offices running behind N Block. (Soil Fertility Lab)			25,000,000
Analytical Services complex fenced	Fenced area around Analytical Services with biometric access for after hours	250,000	250,000	
Car Park	Install new shade awnings		1,000,000	

13 General

All staff to be ready to assist in crisis such as, but not limited to, fire or flood. An OHS team is in place with specific tasks to handle evacuation processes in the event of an emergency. This is to ensure that the Sub-directorate works together in such situations to safeguard lives and property.

Sub-Directorate:
Farming Systems Research

Financial year: 2018-2019

THAMI MPANZA

1. Introduction

The Farming Systems Research Sub-directorate (FSR) specializes in studying the farming systems of the small-scale farmers in order to guide on-farm research as a tool needed to contribute to the accomplishment of the mandate of the Department.

The strength of the on-farm research approach lies in the bottom-up rather than the top-down approach, which is people centred. The bottom-up approach implies farmer-driven research that focuses on farmer's needs and constraints, hence the immediate application of the knowledge and technology. This approach is effective because it is based on farmer's own needs and is sustainable as it uses farmer knowledge and available, affordable resources in an economical and environmentally friendly way.

The very close link between researchers and extension staff will ensure impact of technologies through wider dissemination of knowledge to other communities. Additionally, numerous people will benefit from the increased production and potential surpluses resulting from the new technology.

2. Customers and socio-economic impact

Small-scale farmers are the main customers of FSR's activities. This approach requires the participation of the on-station researchers and Extension staff. The target areas for conducting on-farm research are identified by the FSR staff in consultation with Extension staff. It is therefore critically important that Extension staff from the relevant Districts participate fully in this programme to enable them to take technology and also the approach followed to different wards. The outcome of this approach and research programme will lead to food security; it will unlock the agricultural potential in communal areas and will ensure effective, sustainable utilization and protection of the environment in partnership with Extension and the small-scale farmers.

3. The focus of the Farming Systems Research Sub-directorate

To study and understand the farming systems of the small-scale farmers in order to solve agricultural constraints identified by small-scale farmers in communal areas of KwaZulu-Natal. To convey research needs such that on-station research meets the requirements of a demand-driven, client-orientated research programme.

Research conducted by FSR is demand-driven and requested by the farmers. Discussions in the workshop are around the general FSA approach and linkages between FSR, on-station research and Extension; indicators of success; farmers' involvement; layout and design of trials and objectives of the research programme.

The specific features of FSA to research and development (Matata *et al*., 2001) are:

- Research thrusts are derived from the users, i.e., from the farmers, through diagnostic activities;
- The technology is tested under farmers' own environments before the recommendations are being made;
- The systems interaction is given explicit consideration in identifying problems, technical interventions, as well as in the evaluation of technologies; and

- The evaluation criteria used are consistent with the ones used by farmers.

2. Staff component

Refer to attached organogram (According to Departmental Structure) Annexure E

5. Research Infrastructure

Cedara

- 2 x Stores Rooms

The aims and the objectives (Key Results Areas) of the Sub-directorate are:

- The surveying of farming systems practised by small-scale farmers and identification of constraints experienced by and opportunities for farmers
- To provide possible solutions to constraints and problems under actual on-farm conditions in rural communities through demand-driven on-farm research (technology development)
- Technology transfer (production of authoritative production guidelines, small-scale farmer-friendly documents, fact sheets, demonstrations, training, farmers' days, *ad hoc* advice, and other documents)
- Development of staff expertise

7. Budget allocation 2018/19

Compensation of Employees:	**R 4 305 000**
Goods and Services:	**R 622 000**
Capital Asset:	**R 446 000**
TOTAL	**R 5 373 000**

8. Outcomes:

Currently on farm research conducted by the directorate is in the following districts: ILembe & uThukela

KRA 1: Develop and implement methodologies, policies, systems and procedures with particular reference to agricultural research

Linkages with MTSF & PGDP discussed on pages iii & VI.

Project Number	Researcher	Short Title	Objectives	Start & Finish (year)	Linkages with MTSF & PGDP	Outputs for the year
LIVESTOCK						
FSR 2.12	S Gcumisa	Feeds and feeding for rural pigs – An alternative strategy	• To find alternative cheaper feeds for rural pigs • To enhance growth performance of rural pigs • To increase pig numbers through use of home grown feeds.	2014-2018	2, 3, 4, 7	Progress Report
	ST Gcumisa CSZ Qwabe	Improving ruminants' production in KZN through supplementing winter nutrition.	• To eradicate poor performance of ruminants due to poor winter nutrition.	2016-2018	1, 2, 3, 7	Final Report
AGRONOMIC CROPS						
FSR	SB Madiba	Equipment availability for small scale farmers in KZN	• To determine equipment available for small scale farmers • To identify the appropriate equipment for small scale farmers	2015-2018	2, 3, 4, 7	Survey report & Final Report

Project Number	Researcher	Short Title	Objectives	Start & Finish (year)	Linkages with MTSF & PGDP	Outputs for the year
FSR 2.17	SB Madiba	Maize production in rural small scale areas	• To address identified constraints, demonstrate production practices and opportunities for maize production. • To mitigate the soil pathogen incidences in maize production	2010-2018	2, 3, 7	Final Report
HORTICULTURAL CROPS						
FSR-2014/01 Uthukela	FZ Khubone	An overview of cucurbits production in UMnambIthi and Indaka local municipalities	• To test the performance of butternut in communal areas	2014-2018	2, 3, 6, 7	Survey report & Final Report
FSR-2014/02C	TP Mpanza	Sweet potatoes production in a maize based farming system.	• To promote crop diversification • To identify the best combination of maize and sweet potato in an intercropping system • To identify the best inter-row spacing of maize and sweet potato in an intercropping system	2014-2018	1, 2, 3, 6, 7	Progress Report

FSR-2016/02 Bergville	S Ngcobo	The effects of Nitrogen levels and cutting length on the yield and taste of two sweet potato cultivars (A40 & 199062.1)	• To compare the effect of two different methods of preparing planting materials on the yield of two sweet potato cultivars. • To investigate the response of two cultivars under four levels of Nitrogen • To investigate the effects of Nitrogen on the taste of the two sweet potato cultivars	2016-2019	1, 2, 3, 6, 7	Progress Report

8.1. Demonstrations

Project Number	Researcher	Short Title	Objectives	Start & Finish (year)	Linkages with MTSF & PGDP	Outputs for the year

8.2. Co-operative Research

Person Responsible	Short Title	Objectives	Start & Finish (year)	Linkages with MTSF & PGDP	Outputs for the year

8.3. Guest Research

Person Responsible	Short Title	Objectives	Start & Finish (year)	Linkages with MTSF & PGDP	Outputs for the year

8.4. Suspended Projects

Project Number	Researcher	Short Title	Objectives	Start & Finish (year)	Linkages with MTSF & PGDP	Reasons

8.5 New Projects

8.6 Future Research

Research conducted by the Farming Systems Research Sub-directorate is demand driven. Request from districts will be investigated and the FSR will continue to conduct diagnostic studies in order to assess research opportunities in different districts.

Short Title	Objectives	Start & Finish (year)	Linkages with MTSF & PGDP	Outputs for the year
Peach production in rural communal areas (uThukela)	Better utilization of peach trees in the communities			
Dry beans in Ugu				
Production potential of cattle and goats in communal areas				
Study and document the small scale faming systems in the Province				

KRA 2: Technology Transfer

Actions	Name	Outputs for the year
Lecture at short courses (Goats & Pigs) (As per Short Course Programme)	S Gcumisa S Gumede	To transfer appropriate technologies on various topics to farmers, extension staff and students
Farmers' days	All FSR Staff	Presentations at Farmers' days
Research Symposium 2018	Relevant FSR Staff	Presentations on research outputs
Ad hoc advice and documents to clients	All FSR Staff	To provide relevant advice to clients either verbally, as handouts or electronically.
Farm visits	All FSR Technical Staff	Report to the farmer
Popular articles	FSR Staff	Popular articles
Technical transfer events	FSR staff	Technical transfer events
Lecture at Extension Course (As per Short Course Programme)	T Mpanza	
Assist in FET Training	S Gcumisa S Gumede	Disseminate information and training
Technology Transfer events conducted	All FSR Staff	On site visits by farmers and extension as well as group training
Training farmers and Community Health worker in collaboration with Heifer & Mdukatshani	Relevant Staff	

KRA 3: Personnel Development

Actions	Name	Outputs for the year
Further education and training	All relevant FSR Staff	Attend relevant congresses
Attend relevant courses	Relevant FSR Staff	Attend relevant courses
Farmers' days	Relevant FSR Staff	Attend relevant farmers days
Attending congresses, symposia, workshops, farmers days and other technology transfer events	All Technical Staff	Courses attended

KRA 4: Administrative Duties

Administrative Duties Actions	Name	Outputs for the year
Procurement & Budget Management	T Mpanza	To procure the necessary equipment, inputs and other goods necessary for the Section.
EPMDS	All Supervisors	To complete and submit all the required documents
KZN and Subsidized vehicles	All Supervisors	To complete and submit all the required documents and log sheets so that records of the vehicles' usage can be determined and sub-vehicle claims can be made.
Leave	All Supervisors	To complete and submit leave forms.
S&T claims	All Supervisors	Complete and submit the relevant forms.
Operational Plans	T Mpanza	Operational Plan submitted
Quarterly Service Delivery Reports (APP Targets)	T Mpanza	Quarterly reports submitted

KRA 5: Networking and Linkages

Actions	Name	Outputs for the year
KZNDAE Extension Staff	All FSR Technical Staff	Reciprocal knowledge interchange, practical research and informed extension staff
UKZN, UNIZULU & Institute for Natural Resources	All FSR Technical Staff	
LIMA	All FSR Technical Staff	
Mdukatshani Rural Development Trust	S Gcumisa & S Gumede	
Scientific Societies	All FSR Technical Staff	
Organized Agriculture	All FSR Technical Staff	

9. Challenges

9.1 Staff

Vacant post in Sub-directorate summarized below according to the approved Departmental Structure:

Total number of posts	Posts filled	No of vacant posts
21	8	13

The following critical posts to be filled during this financial year are the following:

- Scientific Manager
- Professional Scientists (2 Animal Scientist, Agronomist & Horticulturalist)
- Research Assistants
- Administrative Clerk

- Refer to a detailed breakdown of filled and vacant posts per Sub-directorate before the attached organograms.

9.2 Supply Chain Management:

- We will request a meeting between supply chain management staff and research staff the importance and the needs and requirements of the Directorate: Research & Technology Development.

10. Additional needs

10.1 Budget

- Goods and Services
- Compensation of employees

10.2 Equipment & Machinery

- Upgrading IT equipment
- Small compact tractor, trailer and implements

10.3 Infrastructure

As per infrastructure maintenance plan for Directorate

- The entire Sub-directorate is in urgent need for office space/partitioning of the currently used open space in the second floor of the Mushroom base.