Tobacco Research Board

ANNUAL REPORT 2023

Our Mission

To develop and provide elite varieties and innovative agro-based technical services and products to maximise economic value from sustainable tobacco production

Contents

ABOUT THIS REPORT

As we reflect on the past year, we take pride in presenting our annual report for the fiscal year ended on 31 December 2023. This report serves as a testament to our institution's resilience, adaptability, and unwavering dedication to our mission. Despite the challenges posed by the macroeconomic environment and the drought conditions experienced in the last quarter of the year, we have achieved significant milestones and continued to serve our stakeholders with dedication.

This report provides a comprehensive overview of Kutsaga's performance and progress during the fiscal year. It includes financial results, business highlights, strategy, goals, and objectives. The purpose of this report is to offer an honest and transparent account of our achievements and challenges, while also sharing our vision for the future. We have made every effort to ensure that this report is informative, engaging, and accessible to all stakeholders. It contains information that allows stakeholders to assess our performance and the impact we have had during the period under review.

We hope that this report provides a thorough understanding of Kutsaga's performance and progress. It showcases our commitment to transparency and accountability.

REPORTING FRAMEWORK

In developing this report, we were guided by the following reporting requirements:

- The Tobacco Research Act [Chapter 18:21];
- The Public Finance Management Act [Chapter 22:19];
- The Public Entities Corporate Governance Act [Chapter 10:31]; and
- International Financial Reporting Standards ("IFRS");

ASSURANCE

The Financial statements were audited by Baker Tilly (Zimbabwe) in accordance with the International Standards of Auditing (ISAs).

KEY HIGHLIGHTS

Financial Performance

Our financial results indicate stable and prudent management. Despite macroeconomic challenges, we maintained a healthy balance sheet and achieved our financial goals successfully.

Operational Excellence:

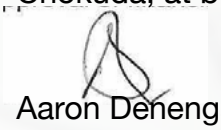
Our teams worked tirelessly to optimize processes and enhance operational efficiency. We focused on streamlining workflows, reducing turnaround times, and improving customer satisfaction. Even in the face of a drought, our production units remained operational, ensuring uninterrupted service delivery.

Innovation and Research:

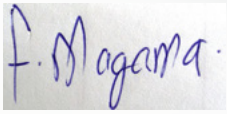
We have made significant investments in cutting-edge research and development initiatives. Our commitment to innovation has led to substantial advancements in product development and process optimization. Our research teams have collaborated with industry experts, universities, and partners to address emerging challenges.

FEEDBACK ON THE REPORT

The Group values opinions and feedback from all stakeholders on how we can improve our operations and reporting. We welcome any suggestions and or inquiries you may have. Kindly share your feedback with the Company Secretary and Information Officer, Batanai Chokuda, at bchokuda@kutsaga.co.zw.



Aaron Denenga
Chairman



Frank Magama
Chief Executive Officer

Our vision

To be self-sustaining centre of excellence in tobacco research and the provision of agro-based products and services by 31 December 2025.

Our mission

To develop and provide elite varieties and innovative agro-based technical services and products to maximise economic value from sustainable tobacco production

Our values

Innovation
Our quest for novelty

Integrity
Our ethical, trustworthy, fair and transparency
approach to business

Accountability
Our responsibility from idea and process to outcome and impact

Commitment
Our dedication to improved livelihoods of tobacco growers

Actualisation
Our accomplishment of business objectives through quality, efficiency, persistence and creativity.

General Information

Country of Incorporation and Domicile
Zimbabwe

Nature of Business and Principal Activities
To conduct research

Registered Address
P. O. Box 1909
Harare
Zimbabwe

Business Address
Kutsaga Research Station
Airport Ring Road,
Harare
Tel: 086 8800 2604

Bankers
Standard Chartered Bank
AFC Commercial Bank
CBZ Bank Limited

Auditors
Baker Tilly

BOARD OF DIRECTORS

Mr A Denenga
(Chairman)

Prof. F Mtambanengwe
(Vice-Chair)

Mr S Mutepfa

Mrs F Miti

AVM I R Chiganze (rtd)

Dr D Kutywayo

Ms C Garise-Nheta

Dr F Magama
(CEO)

KUTSAGA™
For Productivity. For Sustainability

(+263-242) 575 289-94
VOIP:- 0868 800 2604

kutsaga@kutsaga.co.zw

Tobacco Research Board
Kutsaga Research Station
Airport Ring Road, P. O. Box 1909, Harare, Zimbabwe

www.kutsaga.co.zw

Please address all correspondence to the Chief Executive Officer

The Honorable Dr A J Masuka
Minister of Lands, Agriculture, Fisheries, Water and Rural Development
Private Bag 7701
Causeway
HARARE

Dear Sir,

LETTER OF REMITTAL

I have the privilege, on behalf of Kutsaga, to submit for your consideration, the Annual Report covering the research year and the audited financial statements for the year ended 31 December 2023.

Yours sincerely,

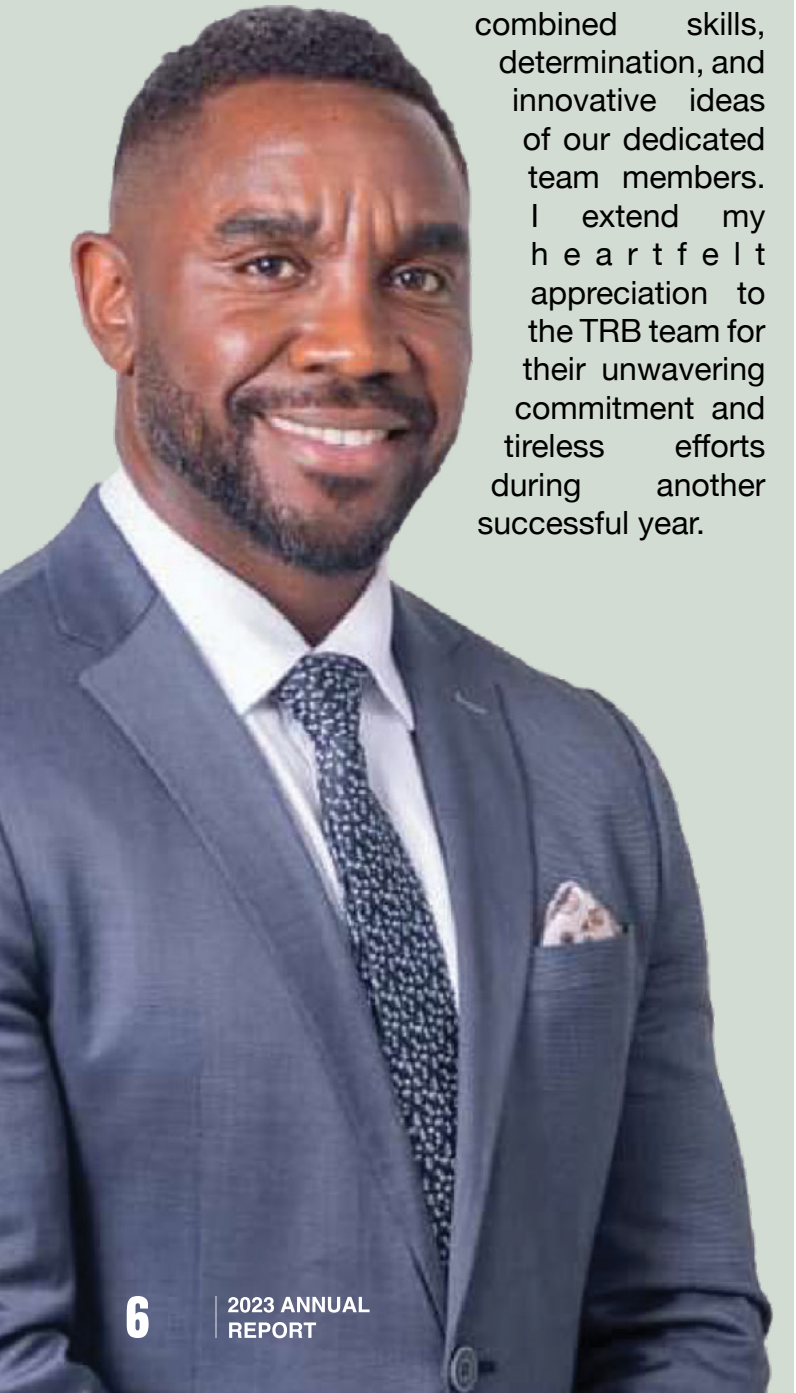
Aaron Denenga
BOARD CHAIRPERSON

Board Members: Mr. A. Denenga (Chairman); Prof. F. Mtambanengwe (Vice Chair); AVM I. R. Chiganze (rtd); Mrs. F. Miti; Mr. S. Mutepfa; Ms. C. Garise-Nheta; Dr. D. Kutywayo; Dr. F. Magama (CEO)

Chairman's Report

Dear Stakeholder

I am pleased to share the much-anticipated 2023 Annual Report of the esteemed Tobacco Research Board (TRB). Despite facing a challenging and dynamic environment, the TRB has demonstrated outstanding performance throughout the year. These exceptional accomplishments are attributed to the combined skills, determination, and innovative ideas of our dedicated team members. I extend my heartfelt appreciation to the TRB team for their unwavering commitment and tireless efforts during another successful year.



OPERATING ENVIRONMENT

Unfortunately, there has been minimal improvement in the overall economic conditions since the previous reporting period. The challenges include ongoing issues with rising inflation, the devaluation of the Zimbabwe dollar, and a scarcity of foreign currency. Throughout the reporting period, the business landscape posed substantial hindrances to production, largely due to fluctuating exchange rates, soaring inflation, expensive production processes, and frequent power interruptions.

The volatile exchange rates were the primary cause of these inflationary pressures. Suppliers aimed to retain value by adjusting ZWL prices in line with foreign currency benchmarks, leading to increased prices for goods and services and negatively affecting disposable incomes.

There was inevitable pressure from staff members for wage increases due to the challenges they faced. We have put in a lot of effort to deal with this issue, considering the limitations of our resources. As a leading agricultural institution, our most valuable resource is our human capital, and our ability to fulfil our mandate relies heavily on our capacity to attract and retain agricultural research scientists. Therefore, staff retention is a crucial pillar for the successful implementation of our Strategic Plan.

Despite the challenging circumstances, we were able to meet our performance targets for the year as per our annual plan for the year under review. We remain fully committed to implementing our Strategic Plan and devoting our utmost efforts to developing and nurturing our capabilities. Our primary goal is to deliver significant value to our stakeholders.

A PURPOSE-DRIVEN STRATEGY

Our organization's long-term goals are laid out in the Strategic Plan (2021-2025), which is designed to align with the National Development Strategy 1 (NDS1). The Tobacco Research Board (TRB) is well-positioned to play a significant role in supporting NDS1 and Vision 2030. Within the framework of NDS1, TRB places particular emphasis on Human Capital Development, Food Security, and Nutrition. Our strategies are informed by various plans within the Agricultural Sector, including the Tobacco Value Chain Transformation Plan (TVCTP), the Agriculture and Food Systems Transformation Strategy (2020-2024), and the Horticulture Recovery and Growth Plan (2020-2025).

Our strategy places great emphasis on achieving economic self-sufficiency. We recognize the importance of financial independence and are committed to reducing our reliance on state funding. To accomplish this, we have initiated several commercial projects, including the commercial production of agricultural products such as tobacco seeds, horticultural seedlings, and seed potatoes. The revenue generated from these activities significantly contributes to funding our research and operations. Our commercial endeavours have been highly successful, with the returns from these activities now playing a substantial role in funding our research and operations.

OUTLOOK

The business is facing a tough operating environment due to exchange rate fluctuations, high inflation, and interest rates. Overheads are increasing because of rising wages and growing expenses in utilities and the service industry. The Board and Management are determined to safeguard the institution from the continuous shocks caused by the volatile economic environment.

It is predicted that the economic growth rate will slow down to about 3.25% in 2024. This is due to factors such as drought affecting agriculture production and a decrease in commodity prices. These factors are also expected to reduce foreign currency inflows, which will hurt the already fragile economy.

The measures implemented by monetary authorities have led to a decrease in inflation in the latter part of the year, indicating a positive market response to these interventions. While we are cautiously optimistic that this trend will continue in 2024, we anticipate that production costs will remain high and the overall business environment will continue to be challenging in the short-to midterm.

Despite these macroeconomic challenges, Kutsaga has shown significant resilience in its operations in demanding environments, largely due to its dedicated and innovative staff. I am confident that TRB will continue to provide value to its stakeholders. Additionally, the improved export performance will help alleviate the challenges associated with the local business environment. Therefore, TRB will redouble its efforts to expand its market share in the region.

ACKNOWLEDGEMENT AND APPRECIATION

I want to express my deep gratitude to Mr. Stanley Mutepfa, my predecessor, for his outstanding and unwavering service to the Board of Directors and Kutsaga as a whole. I am also thankful to our stakeholders for their continuous support. I extend my thanks to my fellow Board Members for their invaluable contributions, guidance, and dedication to the institution. Furthermore, I would like to convey my sincere appreciation to the management team and staff members of TRB for their diligent efforts during the challenging circumstances we faced during the period under review.

Mr Aaron Denenga
Chairman

Chief Executive Officer's Report

Dear Stakeholder,

I am pleased to present Tobacco Research Board 's 2023 Annual Report. This report aims to provide a comprehensive overview of our institution's progress and achievements throughout the year. I am committed to steering our organisation through the ever-changing tobacco industry and capitalising on emerging opportunities.

TRB has undergone significant evolution over the past 73 years to adapt to a changing world. It has become more focused on commercial endeavours, using various projects to fund research on tobacco and its alternatives. Additionally, TRB has embraced the tools of the 4th Industrial Revolution, such as artificial intelligence, predictive data analytics, and precision agriculture, to tackle challenges and seize opportunities. As a result, TRB introduced a new corporate identity on June 30, 2023, and began trading under the name Kutsaga (see image below). This announcement generated substantial publicity and maintained momentum through media coverage and an improved social media presence. Stakeholders have enthusiastically embraced the new branding.

Figure 1: Rebranding ceremony of Tobacco Research Board to trade as Kutsaga 30 June 2023. From Left: Dr. F. Magama (Chief Executive Officer), Honourable D. Marapira, Deputy Minister in the Ministry of Lands, Agriculture, Fisheries, Water & Rural Development and Professor F. Mtambanengwe (Board Vice Chairperson to the Board)

Despite the challenges posed by the macroeconomic environment, Kutsaga has remained steadfast in accomplishing its strategic objectives and delivering value to all our stakeholders. The outstanding performance,

despite challenging circumstances, can be credited to the steadfast dedication of our team members. Their passion, enthusiasm, and innovative mindset have been the driving force behind our accomplishments. Moving forward, we must continue to attract and retain exceptional talent across all areas of our work, ensuring sustained progress and success.

SEASON REVIEW

The rainy season was characterized by a delayed onset, inconsistent rainfall in the middle, and a substantial amount of rain towards the end that persisted until May. Growers experienced relatively dry months in October and November, with only an average of 66.66 mm of rainfall recorded at the TRB stations (Kutsaga 47.47 mm, Banket 49.80 mm, and Oriental 38.70 mm) during this period. After receiving some meaningful rainfall in mid-December, Kutsaga experienced an arid January, followed by abundant rainfall in February. However, March proved to be dry once again. The December rains brought extreme weather conditions, particularly hailstorms, which caused hail damage to crops at Kutsaga station. The low rainfall in January and March resulted in signs of drought stress observed in some field crops. However, April and May saw significant amounts of rainfall, with Kutsaga Station receiving 806 mm, Banket receiving 773 mm, and Oriental Station receiving 638 mm by the end of the season.

PERFORMANCE HIGHLIGHTS

Aligned with the government's focus on performance, the CEO and Board Chairman signed a performance contract approved by the government at the start of 2023. This contract, along with the organization's strategic plan, was then translated into individual performance contracts for management. A government-appointed consultant conducted the 2023 performance appraisal, which resulted in scores of 4.14 for the CEO and 4.46 for the Chairman out of 6. These scores indicate that Kutsaga successfully met all of its performance targets for the year were met. The ratings for senior management ranged from 3.16 to 4.74 on a scale of 6, indicating a commendable performance considering the challenging operating environment.

RESEARCH AND DEVELOPMENT

Kutsaga unveiled four new fast-ripening tobacco hybrid varieties designed to tackle the impact of climate change in traditional growing regions. These varieties are equipped with unique drought-resistant properties, making them well-suited for cultivation in areas with low rainfall and high temperatures. In addition to this, Kutsaga is venturing into exploring alternative crops, such as industrial hemp varieties in Zimbabwe. The company has initiated breeding programmes to develop hemp varieties that are tailored to thrive in the local climatic conditions that can be utilized for various economic uses.

Recognising the importance of food self-sufficiency, the Zimbabwean government has identified potatoes as a national strategic food security crop. Kutsaga is actively involved in efforts to improve the genetics and availability of high-quality seed potatoes within the country. Kutsaga through a seed potato out-grower scheme is contributing substantially to seed supply and availability.

Furthermore, Kutsaga is dedicated to promoting sustainable tobacco production. This includes reducing dependence on synthetic and purple-labeled agrochemicals, as well as promoting energy-efficient curing barns. During the review period, we evaluated 192 products for their effectiveness in combating pests and diseases in tobacco production. Our training and extension division actively advocates for the adoption of energy-efficient curing barns and encourages the increased utilization of bio and organic fertilizers, which are known to enhance soil health.

COMMERCIAL PROJECTS PERFORMANCE

Tobacco Seed Production

During the review period, the total production of tobacco seed reached an impressive 930 kg

in local sales, surpassing the initial target of 650 kg and also achieved 700 kg in seed export sales. Kutsaga, in collaboration with the Kutsaga Seed Association (KSA), is dedicated to supplying tobacco growers in Zimbabwe and beyond with high-quality seed. To ensure top-notch quality, Kutsaga is accredited by the International Seed Testing Association (ISTA) and operates under the regulation of the Seed Services Institute of the Department of Research and Specialist Services (DR&SS). This accreditation and regulation ensure that only premium-grade seed, known for its consistent performance, is produced and used, thereby protecting the interests of growers.

Seed Potato Project

To achieve the goal of self-sufficiency in seed potato production and enhance food security at the household level, the seed potato production project has been steadily expanding its operations. By implementing an out-grower scheme with 118 growers, we have successfully produced seed potatoes of generations 1 to 4, leading to a substantial increase in the availability of G4 seeds. Seed Services Institute has consistently inspected the seed crops throughout the crop cycles.

Commercial Tobacco Crop

In the 2022/23 season, 60 hectares of flue-cured tobacco were cultivated, with 55 hectares irrigated and 5 hectares designated for dryland tobacco. The total production from this area was 190.7 tonnes, which were sold at an average price of $3.55 per kilogram. This production slightly missed the target of 192 tonnes, achieving 99.3% of the set goal.

Gromix Production

There was a notable downward trend in the quantity of compostable bark obtained from the three existing sites over the past four years. Changes in the timber-cutting systems being introduced by our hosts significantly affect the amount of usable and compostable bark obtained from each site. To hedge against potential supply risks associated with these changes, two additional sites namely Cashel Valley in Chimanimani and Erin Estates in Juliasdale are expected to start feeding into the project's supply chain in 2024.

FINANCIAL PERFORMANCE

Revenue increased by 189.22% to ZWL$ 73,904,702,564 compared to the previous period, and the surplus for the year amounted to ZWL$ 34,385,317,573. Kutsaga maintained a strong financial position, with total assets increasing from ZWL$ 33,773,332,728 to ZW$ 85,236,753,643. Current liabilities rose by 196,12% from ZWL$ 8,708,142,589 to ZW$ 25,786,245,930, while current assets surged by an impressive 138,26 % from ZWL$ 30,984,826,660 to ZW$ 73,824,122,347. TRB primarily funded its operations through internal resources and closed the year with a total of ZWL$ 18,552,330,686 in cash and cash equivalents.

RESTRUCTURING

Kutsaga is currently undergoing a restructuring process to enhance operational efficiency. The position of Executive Director - Business Development and Marketing has been dissolved and replaced with an Executive Director - Production and Operations. The Finance and Corporate Services division was reconfigured to the Finance and Administration division and we are in the process of capacitating a fully-fledged Legal and Corporate Services department.

In 2024, our main focus will be on restructuring the Research and Extension sector. This restructuring is necessary to align our research and development projects with the most pressing national priorities. By adopting a streamlined approach, we will be able to maximize our impact and effectively tackle the urgent challenges that our country is currently facing.

Fire Incident

On July 31st, a devastating fire broke out in the executive wing of our administration building at Kutsaga Research Station around midday. Thankfully, all staff members who were present at the time managed to escape unharmed. However, the fire caused significant damage, resulting in the loss of valuable equipment, furniture, and important documents. Our insurers, Bright Insurance Brokers, commissioned fire forensics experts to investigate the incident. According to their findings, the fire was caused by an electrical fault in the ceiling of one of the offices. Fortunately, the building was adequately insured, allowing us to restore the damaged portion. However, due to the extensive damage and the complexity of the restoration work required, the projected completion date for all necessary repairs is set for mid-2024.

Corporate Governance

INTRODUCTION

Corporate governance at Kutsaga is governed by external and internal rules. External rules, such as the Tobacco Research Act [Chapter 18:21] and the Public Entities and Corporate Governance Act [Chapter 10:31], ensure transparency and accountability. Internally, Kutsaga has implemented the Board Charter and Ethics Code to ensure ethical behaviour and compliance with laws.

The strength of Kutsaga's corporate governance framework and adherence to these rules are essential to our institution's success. The Board regularly reviews and evaluates these governance structures to ensure they align with regulatory requirements and best practices. This continuous evaluation process allows us to adapt to changing times and remain compliant with the Public Entities and Corporate Governance Act [Chapter 10:31], the Public Finance Management Act [Chapter 22:19], and ZimCode.

Kutsaga believes that it largely complies with these external governance rules, but we are committed to ongoing improvement and maintaining the highest standards of corporate governance to uphold the trust and confidence of our stakeholders.

THE BOARD OF DIRECTORS

The Board of Directors is responsible for governing, providing strategic direction, managing, and monitoring the performance of the institution on behalf of the Government of Zimbabwe. The was appointed in terms of section 5 of the Tobacco Research Act [Chapter 18:21] and section 11 of the Public Entities Corporate Governance Act [Chapter 10:31]. The Board operates according to a Board Charter established under section 27 of the Public Entities Corporate Governance Act [Chapter 10:31]. The Chief Executive Officer (CEO) is responsible for the daily administration of the institution.

Composition

The board consists of seven non-executive directors and one executive director. It is chaired by a non-executive chairman and meets at least once every quarter. The board is structured to ensure its independence from management and to have the right combination of skills and experience to guide the institution toward success.

Sub-Committees

Towards the end of the reporting period, the Board of Directors reconstituted its sub-committees to comply with Part V of the Public Entities Corporate Governance (General) Regulations, 2018, Statutory Instrument 168 of 2018 (hereinafter referred to as 'S.I 168 of 2018). The Board now has the following sub-committees,

i. The Finance Committee;
ii. The Audit Committee;
iii. Risk Management Committee;
iv. Human Resources Management Committee;
v. Research & Extension and Business Development & Marketing Committee

The board committees' mandates and terms of reference are contained in the Board Charter and Part V of S.I 168 of 2018.

Performance Evaluation

The board's performance is regularly evaluated as required by the Public Entity Corporate Governance Act. The evaluation is conducted annually, and in November 2023, the Tobacco Research Board's Board of Directors carried out a self-assessment exercise. The board used a Performance Evaluation Assessment Framework based on templates developed by the Corporate Governance Unit (CGU) to assess its performance.

The exercise indicated that the Board performed well overall, although certain areas were noted for improvement. Overall, the Board of Directors is robust and in a stable position. It aims to enhance its functionality by considering the outcomes of this performance evaluation, with the ultimate goal of strengthening its governance effectiveness.

Details appear more fully in Table 2 below;

Table 2: Overall Board Evaluation Results

THEMATIC AREA	CRITICA	WEAK	FAIR	SATISFACTORY	STRONG
Board and Strategy Effectiveness					
Board Structure					
Board Meetings & Procedures					
Board & Management Relations					
Succession Planning					
Board Training & Development					
Risk Management					
Transparency and Disclosure					
Peer Review					

Director's Interests

The Directors submitted their annual declaration of assets forms during the period under review as per the requirements of Part IV of the Public Entities Corporate Governance (General) Regulations, 2018 ('Regulations') S.I 168 of 2018.

Director's Attendance of Meetings

The Board of Directors held a total of eight (8) meetings during the period being reviewed. The Finance, Administration, and Human Resources Committee held six (6) meetings, while the Research Extension, Business Development, and Marketing Committee held four (4) meetings. Additionally, the Audit and Risk Committee held five (5) meetings. Please refer to the table below for a summary of individual attendance at both the Board of Directors and Committee meetings.
(From 1 January to 31 December 2023)

Board Meetings

Board Meetings	Total number of meetings held	Number of meetings attended
S Mutepfa	5	3
F Mtambanengwe	5	5
C Garise-Nheta	5	5
F Miti	5	5
A Denenga	5	5
D Kutywayo	5	5
AVM I.R Chiganze(Rtd)	5	5

BOARD SUB-COMMITTEE MEETINGS

Human Resources Committee

Human Resources Committee	Total number of meetings held	Number of meetings attended
I Chiganze	5	5
C Garise-Nheta	5	5
A Denenga	5	5

Research & Extension and Business Development and Marketing Committee

Research & Extension and Business Development and Marketing	Total number of meetings held	Number of meetings attended
F Mtambanengwe	4	4
I Chiganze	4	4
D Kutywayo	4	4

Audit Committee

Audit Committee	Total number of meetings held	Number of meetings attended
C Garise-Nheta	4	4
F Mtambanengwe	4	3
D Kutywayo	4	4

Finance Committee

Finance Committee	Total number of meetings held	Number of meetings attended
A Denenga	5	3
I Chiganze	5	5
F Miti	5	5
S Mutepfa	5	1

Risk Management Committee

Risk Management Committee	Total number of meetings held	Number of meetings attended
F Mtambanengwe	4	4
F Miti	4	4
D Kutywayo	4	3

All Board meetings, except one special Board meeting, were conducted per the Board Meeting Calendar provided by the Company Secretary at the beginning of the year. Board packs were

distributed at least seven (7) days before a meeting, as outlined in our Board charter. Meeting minutes accurately capture the main points of the Board discussions, and the meetings are conducted in a manner that promotes comprehensive, transparent, and vigorous discussions.

COMPLIANCE

TRB, as a public entity, operates in a highly regulated environment characterized by numerous prescriptive laws. Therefore, it is necessary to establish a formal and systematic approach to ensure adherence to these laws that govern our activities as a public institution. To fulfil this objective, Kutsaga established a formal compliance function to monitor and ensure that the institution complies with all relevant laws and regulations. In 2023, we implemented this formal compliance system for the first time. It was observed that the primary area of non-compliance pertained to occupational safety and health (OSH). Consequently, going forward, our primary focus will be on achieving a 100% compliance rate not only with all applicable OSH regulations but across all aspects to attain our goal of complete compliance with all the legislation that governs our activities.

Introducing Our Marketing Mascot

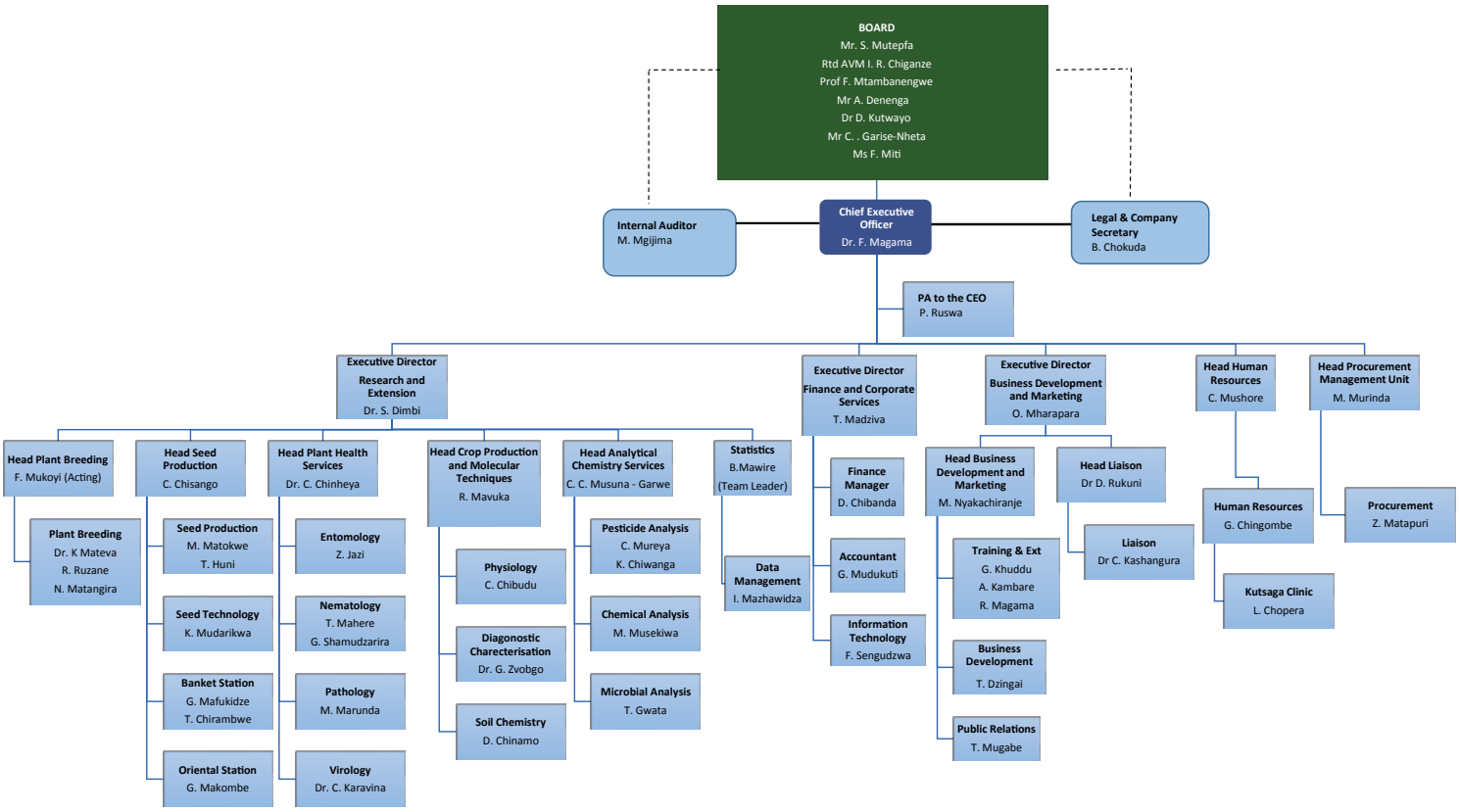
Hello!
My name is Dr Kuts, the mascot for Kutsaga.

Why a rabbit you may ask? Well, Rabbits are considered to be beneficial to the soil. We represent the respect we have for the environment around us. We also show the magic Kutsaga aims to give clients, in the results and multiplying their income.

In some ancient cultures, rabbits were symbols of creativity, fertility and prosperity. In this case, I am a scientist and I represent all the possibilities science opens up and the abundance of the positive outcomes that come from research.

1) My ears are the leaves on the Logo to represent the biology branch of science.
2) The test tube (my torso) is a popular symbol for science and scientists because of its association with experimentation, innovation, and the scientific method. As such, it is a simple and recognizable representation of the scientific process. It also shows that we put a lot into research and thought into our products.

Organogram



EXECUTIVE STAFF LIST

1. Dr. F. Magama
Chief Executive Officer
BSc Crop Science (UZ), MSc (Leeds), PhD (Dundee) MBA (NUST)

2. Dr. S. Dimbi
Executive Director: Research and Extension
BSc, MSc (Zim), PhD (UK).

3. Mrs. T. Madziva
Executive Director: Finance and Corporate Services
BComm (UNISA), MBA NTU, (UK) ACIS, Dip Bus Comp. Prog

4. O. Mharapara
Executive Director: Business Development and Marketing
MSc (Chem) (Czech), MBA (Zim).

5. Ms. P. Ruswa
Executive Assistant to the Chief Executive Officer

6. B. Chokuda
Company Secretary
LLB (Zim), LLM(SA)

7. Ms. D. Chagonda
Executive Assistant to the Executive Director - Research and Extension

8. Ms. M. T. Shonge
Executive Assistant to the Executive Director - Finance and Corporate Services

9. Ms. M. Mpamhanga
Executive Assistant to the Executive Director - Business Development and Marketing

Research and Extension Sector

Dr Susan Dimbi : Executive Director – Research and Extension

It is my pleasure to introduce the Research and Extension (R&E) Sector, which plays a vital role in empowering tobacco growers to optimize their production processes. The sector's primary objective is to promote science-based management practices among growers, ensuring efficient and cost-effective tobacco production.

Through a comprehensive research program, we focus on various aspects of tobacco production, including variety development, best field management practices, and optimal handling and curing techniques. Our goal is to provide growers with evidence-based information and guidance on sustainable methods for producing high-quality crops in an efficient and effective manner.

In addition to productivity, we prioritize sustainability issues such as developing environmentally friendly crop protection agents, designing efficient curing structures, and identifying sustainable curing fuels.

During the period under review, our research efforts were concentrated in eight strategic areas: Plant Breeding, Crop Productivity & Molecular Technologies, Plant Health Services, Agricultural Engineering, Analytical Chemistry Services, Statistical Services, Seed Production, and Field Services. The following sections of this report provide a detailed overview of our accomplishments and progress in these areas

Plant Breeding Division

Our Mission

The overall aim of the breeding program is to produce multi-disease resistant tobacco, Irish potato and hemp varieties, that will meet grower and merchant requirements in a manner that ensures limited use of chemicals; is environmentally friendly, and reduces production costs in the various growing regions of the country and beyond.

Research Thrust

1. Breeding of various strains of tobacco:- Flue cured/Virginia; Cigar wrappers; Burley; Dark fire and Shisha for a robust and diversified industry.

2. Breeding and research into alternative crops to tobacco:-

2.1 Cannabis
   2.1.1 Industrial hemp
   2.1.2 Medicinal cannabis

2.2 Irish potato

Mr. Francis Mukoyi
Acting Head: Pathology
BSc Crop Science, MSc Plant Breeding and Genetics

Dr. Kumbirai I. Mateva
Plant Breeder
BSc in Natural Resources Management and Agriculture, MSc in Crop Science, PhD in Biological Sciences

Mr Ralph Ruzane
Research Officer
BSc Biological Sciences (Zim)
MSc Crop Science

Summary of Research Work

A total of 28 fundamental trials were carried out under the following clusters: agronomic evaluation of advanced breeding lines/varieties (7); Disease breeding and retrofit programs (8); seed production and quality assurance (6); nicotine manipulation projects (2); and alternative crops/uses of tobacco (5)

1.0 EXPERIMENTAL BREEDING

All plant breeding experiments from the fundamental work clusters initiated in the 2023 season were successfully conducted. Sixty-five (65) percent of the experiments were carried out on stations (Kutsaga, Banket and Oriental) while thirty five percent were done at different off station sites that include (Insiza) Matabeleland North, Lower Gweru, Burma Valley and Karoi (Tengwe).

The epic milestone of the Plant Breeding Division in the year was the placement on limited release of four (4) new superior tobacco hybrids. The new experimental hybrids namely T78, 79, T80 and T81 previously termed ETH11/17, ETH10/17, ETH07/17 and ETH12/17 respectively were developed for profitable production in marginal areas such as Masvingo, Midlands, Matabeleland South, Uzumba and Mat South (Fig 1). The varieties designed for climate change mitigation in traditional growing districts have a drought escape mechanism and are also suitable for production in areas characterized by low rainfall, high temperatures, and dry conditions. The varieties are hardy with a medium to fast ripening nurture, multi-disease resistance, root knot nematode resistance (double dose), and an average yield of >2500-3000 kg ha-1 under dry and hot conditions (Fig 1).

The impetus to develop these varieties stemmed from observations of climate change-associated shocks and the recent increases in the tobacco grower base in Zimbabwe that is outside the traditional production areas. Tobacco production has expanded to new areas (Fig 1) with the thrust to increase productivity suitable varieties for these areas

were bred. The new varieties may be cultivated in any environment, but particularly in marginal areas. As stipulated in the TRB Variety Release Protocol varieties placed on limited release requires wider agronomic testing before they can be considered for full open release.

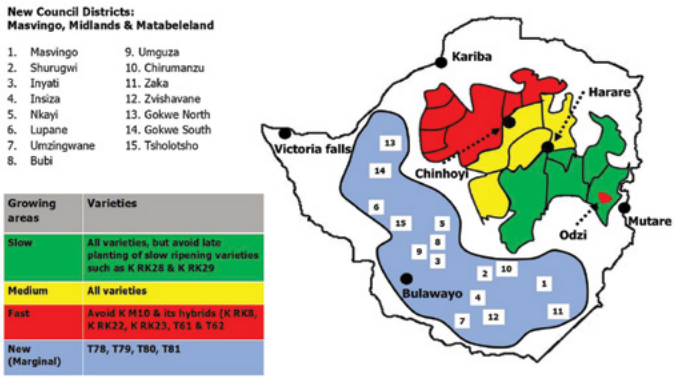


Figure 1: A map illustrating both the established traditional tobacco production regions and the new cultivation areas showing the expanded spatial distribution and expansion of tobacco production areas; the evolving landscape of tobacco production.

Among the trials conducted during the season, the ensuing sections offer noteworthy highlights, shedding light on key findings and significant observations gleaned from the research endeavors.

2.0 Cooperative cultivar trial (CCT) for short season varieties

Climate change has become an everyday phraseology. This project is motivated by the gradual shift of agricultural seasons i.e. late start of the rains resulting in short seasons (Dec-Feb) coupled with expansion of production to areas previously considered marginal for tobacco production. The objective of the work was to evaluate varieties that can fit into the short season and marginal areas framework but still be capable of giving acceptable returns through assessing the performance and stability of the varieties that have been placed on limited release across multiple testing sites in the target population of environments (TPE).

Four experimental test hybrids (ETH 1/18, ETH 4/18, ETH 5/18, and ETH 10/18) selected on good agronomic performance were evaluated alongside three commercial checks (K RK26R, K RK23 and K E1) at Oriental Station (Masvingo: marginal tobacco site), Lower Gweru (Marginal tobacco site), Insiza (Matabeleland North: marginal tobacco site), Tengwe (Oldonyo farm: dry with high temperatures) and Kutsaga Research Station (Harare: ideal growing conditions).

The experimental tobacco hybrids (ETHs) had previously performed well in the preliminary CCT in 2022 (see Annual Report 2022) and are now being evaluated in a full Cooperative Cultivar Trial (CCT) in non-tobacco and very marginal areas. The ETHs performed to the earmarked ideotype in terms of speed to topping, yield and quality. Essentially the new hybrids were faster than the controls.

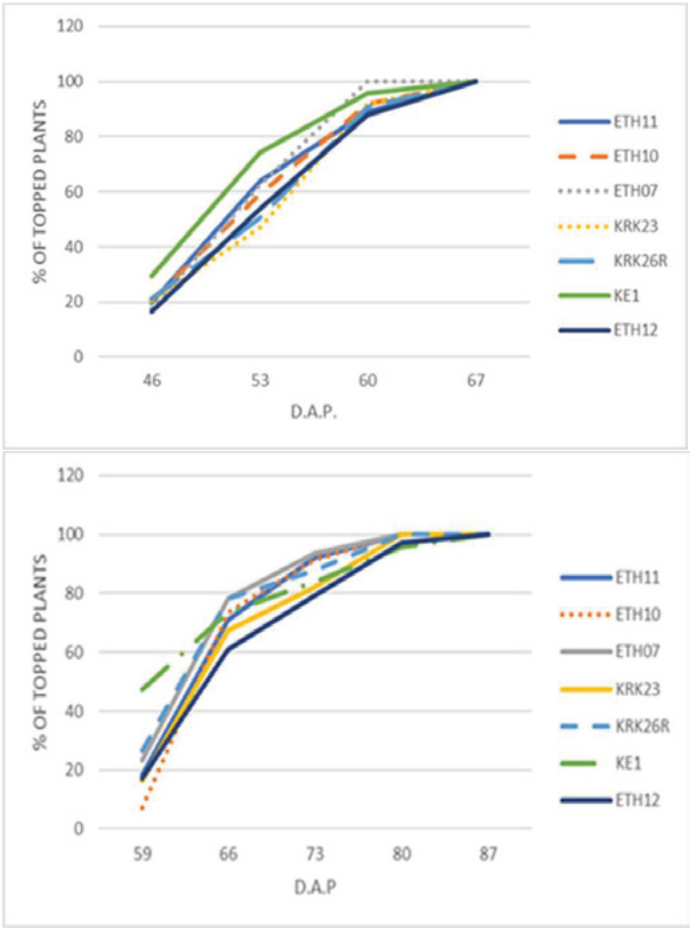


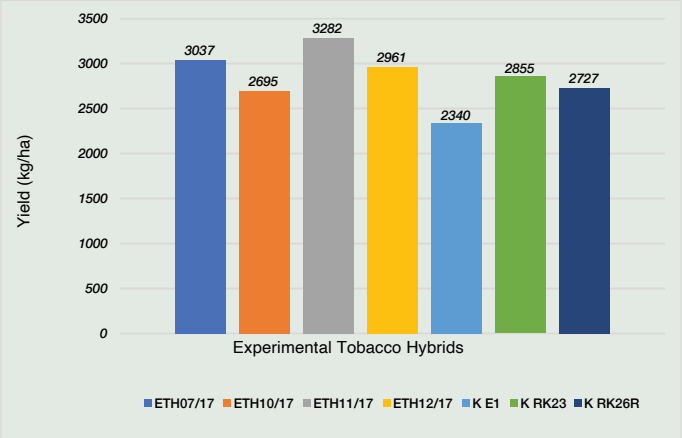
Figure 3: (A) Speed to topping, specifically focusing on marginal conditions, while (B) highlights the same parameter at the optimum site in Harare.

The fast growth and quick takeoff of the varieties in their target production of environments is shown on Fig 3A when compared to an optimum site (Kutsaga) Fig 3B and this bears testimony to the suitability of the varieties in marginal areas. Fifty percent (50%) flowering was attained at 5 weeks in marginal areas with ETH 07/17 being the fastest while 80% was attained at 7-8 weeks after planting. The percentage of early flowering plants was between 0-14% and indistinguishable from the commercial variety (K RK26R) with the exception of the early flowering control variety (KE1) at 34%. Fig 3B shows that ETHs could quickly grow to reach 18-19 reapable leaves before the control cultivar K RK26R, thus, can effectively use the limited resources in a marginal environment to attain an optimal stature upon which leaf weight gain accrues when the rains are finally received while K RK26R continues to grow to topping height at the expense of leaf weight gain resulting in significant yield and quality penalties in marginal and drought areas.

The limited release varieties showed tenacity and outperformed K RK26R (yield control) and K E1 (quality control) on yield and quality across the testing sites. ETH11/17 attained the best yield of 3500kg ha-1 across the test sites followed by ETH 12/17 (3100kg ha-^{1}) and this was 26% higher than K E1 (Fig 4). The average yields obtained by all the genotypes across the testing sites breached the 2500 kg ha-^{1} mark with the exception of K E1 a quality check variety. All the test genotypes performed significantly better than the controls in the marginal areas an indication that growers in the target population of environments will benefit from growing them especially under situations of limited water resources.

Figure 4 (Top right): Overall combined saleable yield data (across sites) from the Cooperative Cultivar Trial (CCT) of short-season tobacco experimental hybrids. This figure provides a detailed overview of the performance of the tested hybrids in terms of saleable yield, showing their potential commercial viability

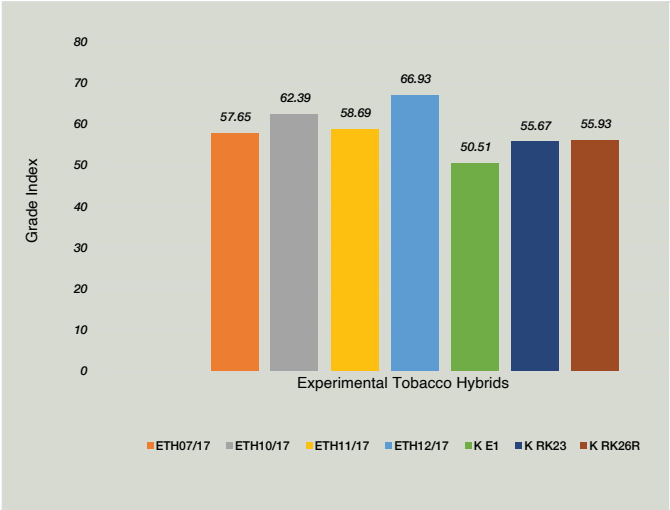
3.0 Genotype stability



while informing future breeding and cultivation strategies.

Grade index (%) is generally taken as the measure of the usability of the trial leaves, with a higher-grade index value indicating better quality of the variety under consideration. Fig 5 below shows the grade indices (%) obtained across sites and ETH12/17 outperforming all the other test varieties followed by ETH10/17. The leaf quality of the experimental varieties assessed across the test sites is comparable to commercial checks and even better that KE1 which is the quality control.

Figure 5: Grade Index (%) for the Cooperative



Cultivar Trial (CCT) short-season tobacco experimental hybrids.

This is a direct measure of the presence and effect of genotype by environment interactions, which result from the differential performance of a genotype or cultivar across environments. A stable genotype is one which performs with consistence across sites for yield, quality and earliness and such a genotype is more desirable than a high yielding genotype in one environment. Fig 6 shows that ETH11/17 was very stable for yield across the test sites followed by ETH07/17 and ETH10/17. This is shown by the relative distances of the genotypes from principle component line (PC 1); a genotype with the least distance is considered stable. This is an indication of broad and or wide adaptation and these can be grown commercially across a wide range of marginal environments.

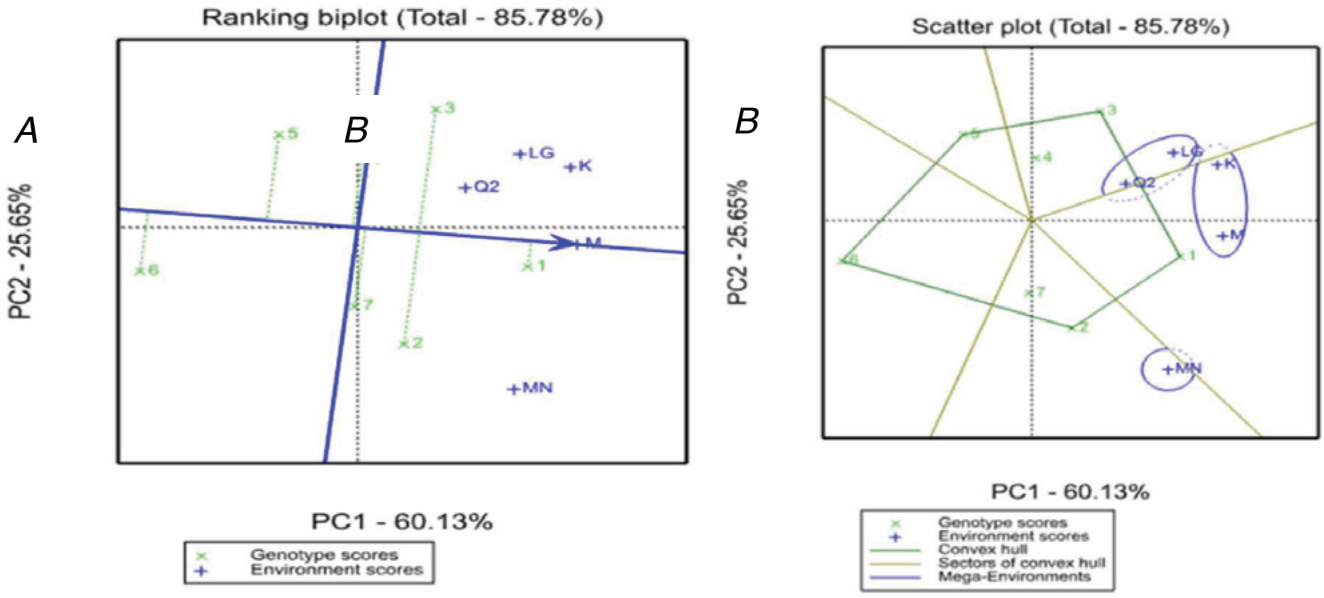


Figure 6: (A) illustrates the assessment of genotypic stability, examining the consistency of performance across multiple environments. Meanwhile, (B) provides insights into the Mega Environment Analysis, elucidating the broader environmental factors influencing genotype performance.

The limited release varieties can however be grown across diverse environments as shown in Fig 6B. Matabeleland North is a distinct environment (Fig 6B) different from all the other sites (Tengwe, Lower Gweru, Masvingo and Kutsaga) which forms another mega environment. ETH11/17, ETH07/17 and ETH10/17 were highly stable across the two mega environments when compared to K RK26R.

4.0 Cooperative Cultivar Trial (CCT) of B RK6 and B RK7 burley varieties.

Burley B RK6 and B RK7 varieties were developed with the aim of expanding the range of burley varieties available for local and regional markets, particularly in Mozambique, Zambia and Malawi. B RK6 was bred primarily with a slow leaf ripening characteristic with above-average resistance to Alternaria, Angular Leaf spot (Race 1), and root-knot nematodes. On the other hand, B RK7 was bred with a fast-growing and ripening nature suitable for stalk cutting, while also exhibiting moderate to high resistance to root-knot nematodes. These two varieties have been on limited release for nearly ten (10) years hence the motivation to move them towards open release. The varieties are gaining popularity and an increased demand in Mozambique, Malawi, and Tanzania. The objective of the trial was to collate agronomic data (yield, disease resistance, maturity, leaf quality and chemical constituents) for the

hybrids in Banket and Burma Valley and compare their performances to standard varieties (B RK4 and DDV7) as checks. Measurements taken included leaf measurements (penultimate and largest leaf), and yield (mass at untying).

Based on the performance data from previous seasons, B RK6 outperformed the controls, B RK4 and DDV7, in terms of yield at Banket Station while B RK7 outperformed the control varieties, B RK4 and DDV7, in terms of yield (see annual report 2022).

4.1 Penultimate leaf geomean

There were no significant differences ($p>0.05$) for the penultimate leaf (Fig 7), despite the check variety, B RK4, exhibited the highest penultimate leaf geomean (49.14 cm), compared to other varieties following by B RK7 (48.5 cm) then DDV7 (47.65 cm) had the lowest.

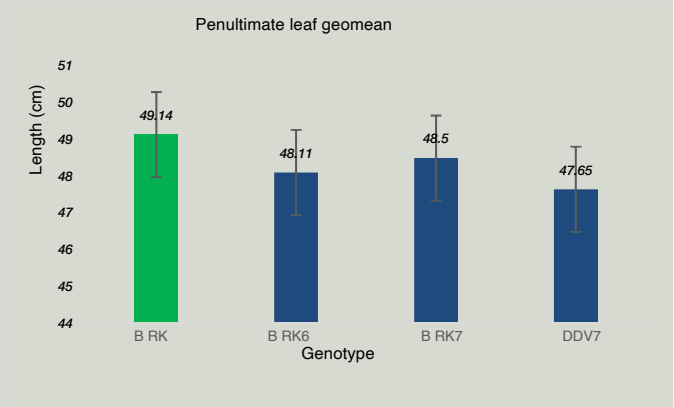


Figure 7: Overall penultimate leaf geomean in CCT burley trial grown in Burma Valley. Green bar indicates the popular burley variety B RK4 used as a yield and quality control and Blue bars are tested varieties. Bars are mean of 60 plants and error bars are standard errors of means.

4.2 Largest leaf geomean

Fig 8, shows the largest leaf geomean at 12 weeks after planting. There were no significant differences ($p>0.05$) among tested varieties. However, B RK6 (50.39 cm) outperformed the control variety B RK4.

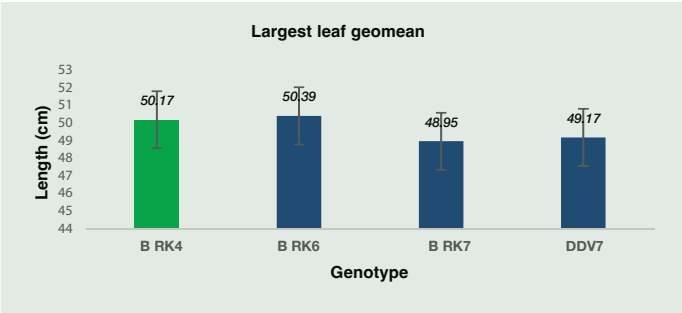


Figure 8: Overall largest leaf geomean in the CCT burley trial grown in Burma Valley. Green bar indicates the popular burley variety B RK4 used as a yield and quality control and Blue bars are tested varieties. Bars are mean of 60 plants and error bars are standard errors of means.

4.3 Mass at untying

There were no significant differences ($p > 0.05$) for mass at untying (Fig 9) among the varieties. However, B RK6 (3299 kg ha-1) and B RK7 (3157 kg ha-1) yielded better than the check varieties with B RK6 having the largest mass at untying.

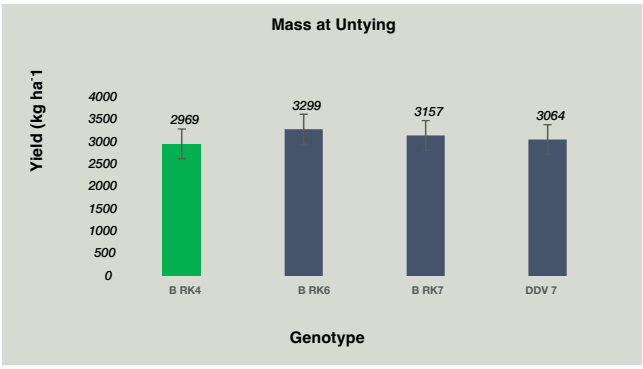


Figure 9: Mass at untying for the CCT burley trial grown in Burma Valley. Green bar indicates the popular burley variety B RK4 used as a yield and quality control and Blue bars are tested varieties. Bars are mean of 60 plants and error bars are standard errors of means.

The results support available data showing that B RK6 and B RK7 varieties are superior in performance. The varieties are expected to be placed on open release in 2025.

5.0 TRB Varieties Global Presence

Superior Kutsaga-bred tobacco varieties are on high demand worldwide and wherever they are grown, an indelible corporate stamp is left. Fig 10 below shows the spatial distribution of our varieties where they are being utilized in research trials, and as a testament to their performance, multiple governments and private companies have successfully commercialized and released some TRB varieties for commercial production.

Figure 10: Global and regional footprints for Kutsaga developed varieties

The varieties are known for their high yield ability, outstanding cured leaf quality, and their resistance to root knot nematodes (TRB annual report, 2022).

5.1 Regional and International Trials

Global variety trials to evaluate the performance of Kutsaga varieties in different countries continued in Italy in 2023. This follows successful trials having been conducted from 2021 – 2023. Trasformatori Tabacco Italia Soc. Coop. Agricola (Italy) a company that produces and distributes agricultural (tobacco) related products conducted these trials. Three varieties (K RK70, K RK1, K RK6) chosen for their fast growth and fast ripening nature were evaluated

among a cohort of nine different varieties from France (3), Brazil (3) and Italy (3). Across all the evaluated parameters (total yield, quality and smoke quality), Kutsaga varieties performed exceptionally well and achieved comparable yields to other global varieties, even when nitrogen units were reduced (Fig 11 and Fig 12 respectively).

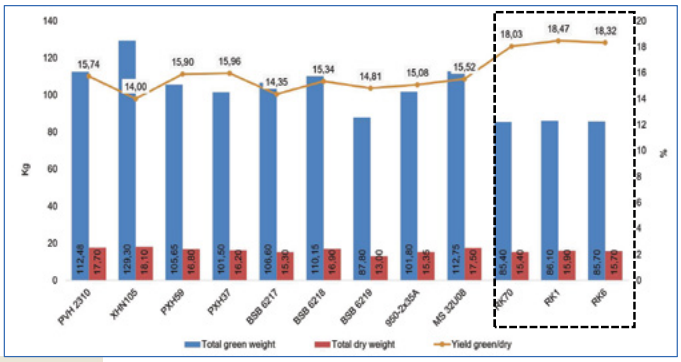


Figure 11: Total yield (green/dry) for all the varieties under evaluation including Kutsaga genetics K RK70, K RK1 and K RK6 had the best total green/dry yield when compared to all the varieties with K RK1 being the best with a yield index of 18.47 compared to 15.74 for PVH2310 (local control). This was despite the varieties receiving 50% of the total nitrogen fertilizers. Kutsaga varieties were given fifty percent (50%) less nitrogen (Fig 12) when compared to all the other varieties yet they performed the best on yield (green/dry) as well as on total green weight and dry weight.

Replication	Plot	Variety	Units N	P_2O_5	K_2O
1	1	PVH 2310	80	94	154
	2	XHN105	80	94	154
	3	PXH59	80	94	154
	4	PXH37	80	94	154
	5	BSB 6217	64	94	154
	6	BSB 6218	64	94	154
	7	BSB 6219	80	94	154
	8	950-2x35A	80	94	154
	9	MS 32U08	64	94	154
	10	RK70	30	64	154
	11	RK1	45	64	154
	12	RK6	45	64	154

Replication	Plot	Variety	Units N	P_2O_5	K_2O
2	1		80	94	154
	2		80	94	154
	3		80	94	154
	4		80	94	154
	5		64	94	154
	6		64	94	154
	7		64	94	154
	8		80	94	154
	9		64	94	154
	10		30	64	154
	11		53	64	154
	12		53	64	154

Figure 12: Fertilizer rates (N units) that was applied during the course of the trial

By requiring less nitrogen fertilizer, growers can effectively reduce the environmental impact associated with nitrogen runoff and pollution. In addition to its environmental benefits, growers can grow a tobacco with less financial inputs

as they use fewer fertilizers to obtain significant yields, growers can significantly reduce their input costs. This not only improves their profitability but also contributes to the overall economic sustainability of the tobacco industry.

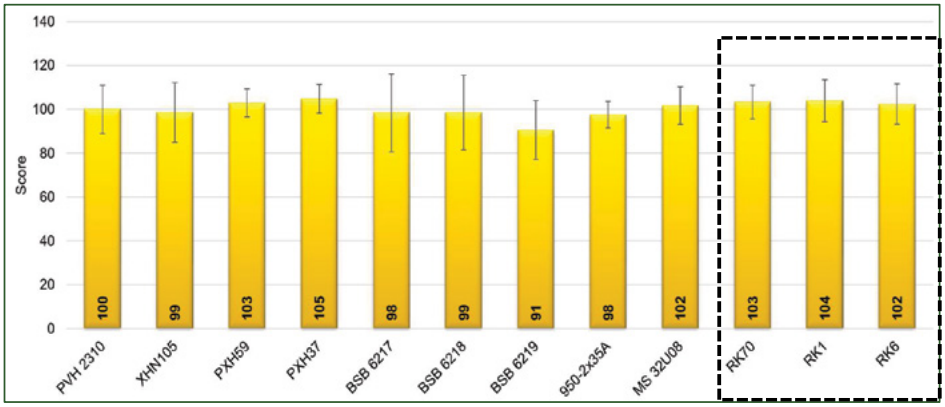


Figure 13: Quality Index (QI): Samples of cured leaves for each variety divided by stalk position were classified giving a score for quality. The overall score calculated on the basis of the QI results per stalk position and weight percentage (%) per stalk position

Furthermore, the leaf quality (Fig13) and smoke index (Fig 14) were exceptional, falling within the range of other test varieties collected from diverse locations and research organizations worldwide.

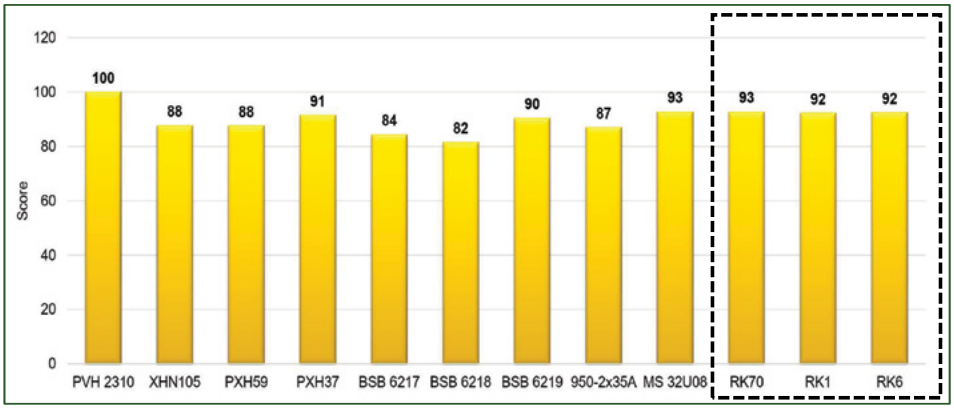


Figure 14: Smoke index: After the removal of the mid-rib, leaf lamina of each variety was used to prepare the cut rags. The test gave scores for flavor, after taste and impact. The overall score was calculated on the basis of the test results per stalk position and weight percentage per stalk position.

In summary, the three evaluated Kutsaga Varieties demonstrated their remarkable performance in terms of yields (both green and dry), even with reduced nitrogen units. These varieties had comparable yields to other test varieties, showcasing their ability to achieve productivity while minimizing nitrogen inputs. This indicates that these Zimbabwe-bred varieties possess the desirable attributes sought after by tobacco manufacturers and consumers ensuring their market competitiveness on a global scale. Hence, the adoption of Zimbabwe-bred tobacco varieties in other countries not only reflects a matter of national scientific pride but also brings economic benefits by earning foreign currency for Zimbabwe.

6.0 Variety Development and Release

Research projects from the disease and retrofit and the agronomic evaluation clusters will culminate in new varieties that can be released to tobacco seed producers and growers. Planned, is to release; Burley varieties (B RK6 & 7) and cigar wrappers varieties in the 2025 season. Table 1 summarizes the variety development and release roadmap.

Table 1: Kutsaga variety release roadmap

Key: CCT – Cooperative Cultivar Trial; PABT – Preliminary Agronomy Breeding Trial; ETH – Experimental Tobacco Hybrid

7.0 CORESTA AP23 conference, Cancun Mexico

F. Mukoyi and R. Ruzane presented papers at the CORESTA AP23 Conference held in Cancun, Mexico from 15th-19th October 2023. Titles of the papers were: "Developing and Deploying Climate-Resilient Tobacco Varieties in Marginal Areas of Zimbabwe: Stability and Adaptability Analysis in New Tobacco Varieties" and "Evaluation of the Performance of Shisha Tobacco under Zimbabwean Growing Conditions". During the conference, the Plant breeders were able to interact with more than 200 fellow researchers from other countries and to get valuable contacts.

8.0 ALTERNATIVES TO TOBACCO AND ALTERNATIVE USES OF TOBACCO

Guided by the WHO-FCTC article 17, which enunciates the need to work on tobacco alternates and alternatives the Plant Breeding division has begun doing work on tobacco alternative crops. As further guided by our expanded mandate the crops include Industrial hemp and Irish potato.

8.1 Industrial hemp (Cannabis sativa L.) trials

Progress has been made in evaluating different varieties of industrial hemp in Zimbabwe. New trial sites have been set up in Masvingo and Banket stations, as shown in Figure 16. Various exotic hemp varieties tested, included Ferimon, Fibror-9, Zenit, Felina, Elleta Campana, Seculleni, Jubilleu, and Isaiah-1.

From the data analysis, it's evident that plants at the Masvingo site consistently grow tallest, particularly the Elleta Campana variety. However, challenges persist, such as difficulties in importing seeds and concerns about how the plants respond to changes in daylight.

To tackle these challenges, a comprehensive breeding program has been launched. This program aims to develop hemp varieties that

are well-suited to Zimbabwe's climate and soil conditions. The goal is to create new local varieties that don't rely on specific daylight conditions to flower (known as auto-flowering) and meet regulations on tetrahydrocannabinol (THC), a compound in hemp. This proactive approach seeks to overcome the unique obstacles faced in growing industrial hemp and medical cannabis in Zimbabwe, such as seed supply and inconsistency in key parameters. By focusing on sustainability and compliance, the aim is to ensure that hemp cultivation practices are both effective and environmentally responsible.

benefits. However, research by Small and Cronquist in 1976 helped differentiate industrial hemp from medicinal cannabis by establishing a THC content threshold of 0.3%, which many countries adopted as the legal definition. Despite arguments against this limit, countries like Zimbabwe, along with Australia, Ecuador, Malawi, Switzerland, and Uruguay, are now raising it to 1%, signaling more lenient regulations.

Increasing the legal THC limit to 1% brings several advantages. It expands farmers' options for genetic cultivation, allowing for a wider range of products. Certain genetic combinations

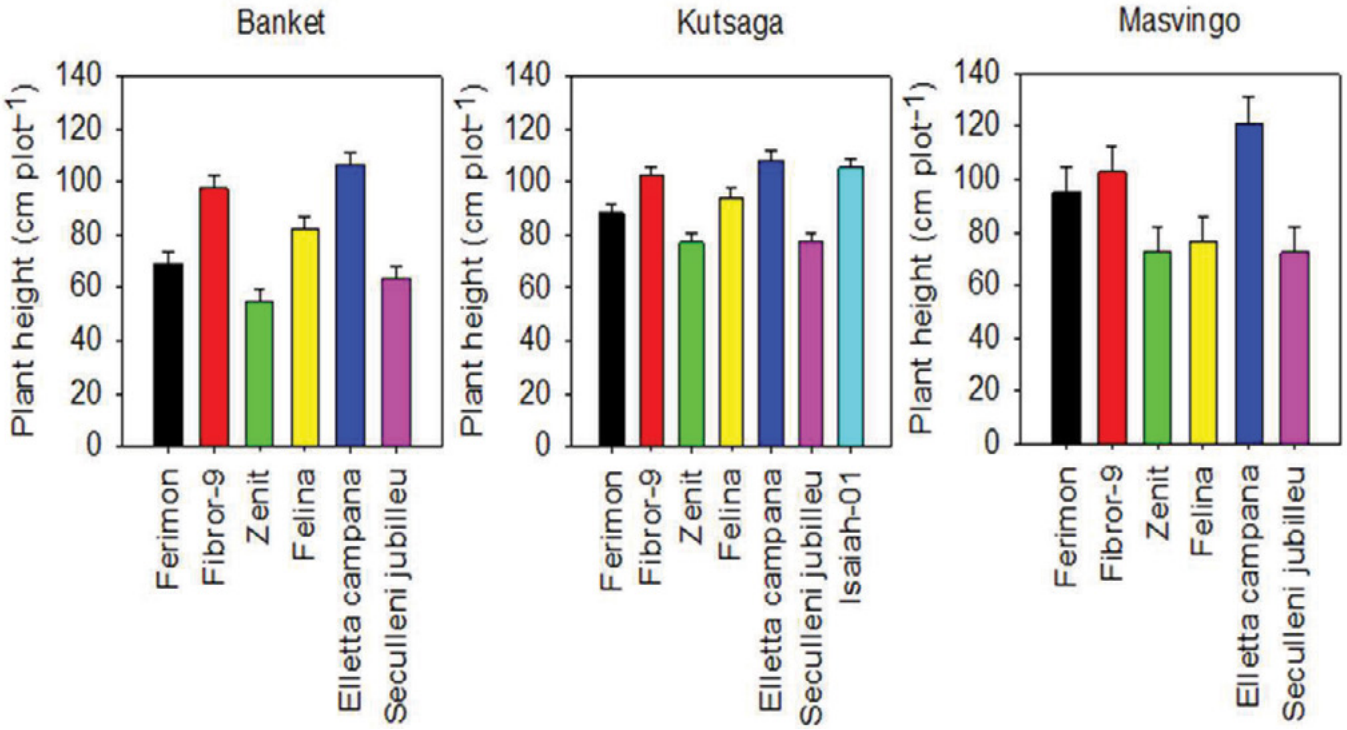


Figure 16: Plant height (cm plot-[1]) evaluation of exotic industrial hemp varieties, namely Ferimon, Fibror-9, Zenit, Felina, Elleta Campana, Seculleni Jubilleu, and Isaiah-1, at Harare, Banket, and Masvingo. The data is mean ± se values (n = 10).

8.2 Zimbabwe Sets Industrial Hemp THC Limit At 1%: Why Does It Matter?

The industrial hemp industry has often faced challenges due to its connection with marijuana, limiting its exploration of potential

of CBD and THC ratios have been found to produce fibers with unique qualities and therapeutic benefits. As Zimbabwe explores new CBD products, there's potential for more effective offerings for consumers locally and internationally, boosting growth in the fiber and CBD industry.

For institutions like Kutsaga, responsible for agricultural research and development, this regulatory change creates new opportunities. Kutsaga has been studying hemp varieties

suitable for Zimbabwe's climate, limited by the previous 0.3% THC threshold. With the potential increase to 1%, Kutsaga can broaden its research, including importing germplasm for improved varieties tailored to local conditions.
Additionally, trials are underway to select hemp varieties resilient to climate change. Recent research at Kutsaga has shown the adaptability of different strains, especially in drought stress conditions (Fig 17). Varieties like MP from Switzerland have demonstrated efficient water use, while local Zimbabwean strains like ZB have shown unique traits for drought tolerance and high intensity sunlight protection. Understanding these characteristics can help Kutsaga develop resilient hemp varieties suited to Zimbabwe's environment and agricultural needs.

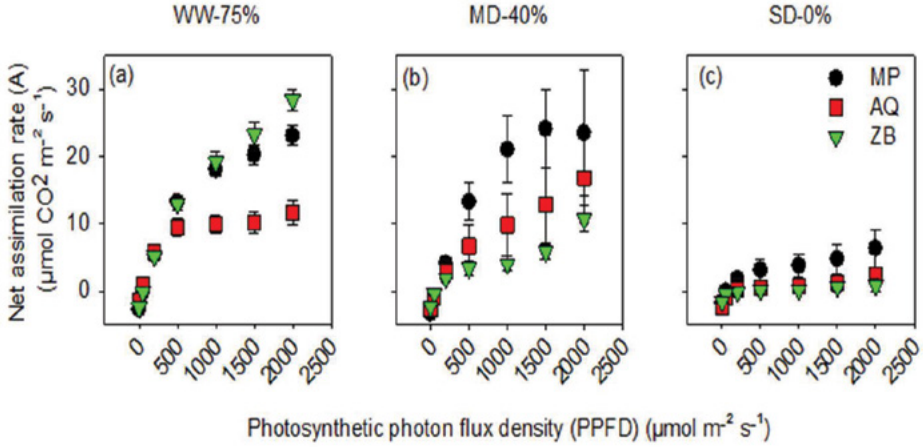


Figure 17: Diurnal curves of leaf stomatal conductance (g^{sw}) and net assimilation rate (A) taken on young fully expanded leaves. Well-watered (WW-75% FC), moderate drought (MD-40% FC), and severe drought (SD-0% FC). Values are presented as mean ± se (n = 5).

9.0 Characterization of Irish potato lines.

Through the government of Zimbabwe, Irish potato was proclaimed a national strategic food security crop (May 17, 2012) to ensure food self-sufficiency. Nevertheless, the government recognizes the importance of research and trials in developing successful strategies for Irish potato cultivation. The aim is to identify best practices and disseminate them to farmers for implementation. In addition to its nutritional significance, potato farmers encounter hurdles such as limited genetic diversity and low yields. To surmount these challenges and enrich genetic reservoirs, twenty-three improved Irish potato lines were procured from the Center of International Potato (CIP) in Peru for comprehensive evaluation. This endeavor is expected to introduce novel genetics and bolster the availability of high-quality seed potatoes in the country, with a specific focus on characterizing the imported lines to furnish breeders with indispensable insights into their traits and attributes.

In upholding the government mantra of *"Food Security: Everywhere. Everyday. Kuguta: Kwese Kwese. Zuva Rega Rega. Inala: Indawo Zonke. Insuku Zonke,"* the endeavor aims to bolster agricultural sustainability across the country. The evaluation process of the imported Irish potato lines will entail assessing their performance alongside two control varieties in single row plots, adhering to standard procedures. Notably, preliminary findings from the 2023/2024 season (Fig 18) reveal diverse characteristics in sprouted tubers, highlighting the potential for genetic variation within the imported lines. This underscores the significance of this research endeavor in enhancing potato cultivation in Zimbabwe, emphasizing its pivotal role in advancing agricultural practices and ensuring food security for the nation.

Figure 18: Irish potato UPOV characterization

Further evaluations will be conducted to assess their overall performance and determine their suitability for future breeding programs. These findings are crucial for planning the next phase of characterization and evaluation of these varieties.

10 Conferences and engagements with stakeholders

The Plant Breeding Division remained steadfast in its commitment to providing valuable insights into tobacco, hemp and cannabis research and production. Welcoming a diverse array of visitors, including international guests, government officials, academics, farmers, and students, the division became a focal point for sharing information in tobacco, industrial hemp and Irish potato production. A total of 914 visitors were welcomed in the division. Additionally, the division actively pursued collaborations with critical institutions (Table 3) detailing the details of collaborations and research scope.

Table 3: Collaborative Research Partners

Collaborating Partner	Collaborative Research Scope
Alliance One International (Brazil)	Agronomic Evaluation of Alliance One International varieties for yield and adaptability in Zimbabwe
Marondera University of Agricultural Science and Technology (MUAST)	PhD student engagement for the Evaluation of Irish Potato varieties in Zimbabwe
University of Zimbabwe (UZ)	PhD student engagement in the Industrial Hemp
Harare Institute of Technology (HIT)	Development of industrial products from Hemp
Cavendish Lloyd Tobacco	Shisha Tobacco Research
Von Eicken Tobacco	Cigar Wrapper Tobacco Research

10.1 Technical exchange visit to the Tshwane University of Technology (TUT) Cannabis Research Hub in Pretoria, South Africa.

Dr. Mateva and Miss. Chiwanga visited South Africa (Fig 19) on a tour organized by the Tshwane University of Technology (TUT)/Council for Scientific and Industrial Research (CSIR) Cannabis Research Hub in Pretoria. The visit which included meetings with key stakeholders in the agricultural industry and analytical chemistry testing services was facilitated by Prof. David Katerere, the co-director of the TUT/CSIR Cannabis Research Hub. The visit to the TUT/CSIR Cannabis Research Hub provided valuable insights into the facilities and capabilities of the hub, inspiring Kutsaga's future research and development in the natural products sector. Investing in the LC-MS/MS and GC-MS/MS is strategic move that would prevent work overload on a single instrument,

decrease downtime, and streamline research operations.

Furthermore, exploring investment opportunities in high-value equipment, such as the Super Critical CO2 Fluid Extractor (SCFE), is recommended (Fig 19). This equipment, capable of extracting oil from various sources like tobacco seed, cannabis floral structures,

and chia seed, presents diverse applications in sectors such as cosmetics and pharmaceuticals, contributing to revenue generation for Kutsaga. The Division continues with dedicated efforts for collaborations and international engagements in advancing research and development in the hemp and cannabis sectors, ensuring its relevance and impact in the evolving landscape of industrial hemp cultivation and utilization.

Figure 19: The Kutsaga team in a technical exchange visit to Tshwane University of Technology /Council for Scientific and Industrial Research (CSIR) Cannabis Research in Pretoria, South Africa.

9.2 Cannabis Policy Workshop in Zimbabwe

The Plant Breeding Division organized the "Cannabis Policy in Zimbabwe: Legal, Policy and Socio-economic Experiences" workshop held on October 24, 2023, at the Holiday Inn in Harare, Zimbabwe (Fig. 20) aimed at delving into the experiences and challenges surrounding cannabis and its policy in Zimbabwe. The project is a collaborative initiative between Kutsaga and the Universities of Bristol and Cape Town. The workshop served as a nexus for exchanging insights and fostering a comprehensive perspective on the evolving dynamics of cannabis policy, contributing to the ongoing discourse shaping the future of the hemp and cannabis industry in the region.

Figure 20: Cannabis Policy in Zimbabwe: Legal, Policy & Socio-economic Experiences workshop held on October 24th, 2023, at the Holiday Inn in Harare, Zimbabwe.

Plant Health Services Division

MISSION

To provide timely, cost-effective, environmentally benign and sustainable integrated plant protection solutions.

PURPOSE

1. To improve yield quality through developing and provision of diagnostic and advisory services.
2. To increase grower profit

OUTPUT

1. Information on pest and disease management
2. Adherence to good agricultural practices in tobacco production
3. Improve management of crops

DIVISIONAL THRUSTS

1. Screening and availing to growers environmentally friendly crop protection agents under the Pesticide Approval Scheme Service (PASS)
2. Monitoring, timeous detection and awareness on emerging or re- emerging pests and diseases for the purposes of grower advisory and consequently adherence to good agricultural practices.
3. Engage in income generating activities to generate funds to support research (Plant Clinic, Kutsaga Gnatbuster® and Kutsaga Trichoderma® production)
4. Prospecting for native biocontrol agents to manage abiotic (drought) and biotic (pests and diseases) factors hindering tobacco production
5. Research on economically viable alternative crops to tobacco that Zimbabwean growers can adopt to address WHO FCTC Article 17 (Economically sustainable alternatives to tobacco growing).
6. Research on cost effective and sustainable integrated pest and disease management systems on tobacco and alternative crops.

YEARLY REVIEW

In the period under review a total of 38 (fundamental, applied and contract) research trials were conducted in the Division (15 in Nematology, 16 in Pathology and seven in Entomology). The main objective of the research programme was to enable Good Agricultural Practices (GAP) through the use of research- based practices in the management of pests and diseases on tobacco by growers. This is in support of NDS1 through the Tobacco Value Chain Transformation Plan`s strategic intervention on sustainable intensification of tobacco productivity and production.

Meet the team

Dr C. C. Chinheya
Head of Division
PHD, MSc, BSc

Dr C. Karavina
Plant Virologist
PhD, MSc, BSc

Mr. T. Mahere
Plant Nematologist
MSc,BSc

Mrs. G. Shamudzarira
Nematologist
MSc, BSc

Mr. M. Marunda
Plant Pathologist
MSc BSc

Miss C. Nyamakura
Entomologist
BSc

1.1 Pesticide Approval Scheme Service (PASS)

Figure 1: (a) Tobacco pesticide application, (b) supplementary nematicide application

The management of pests and diseases in the tobacco production cycle has historically mostly relied on the use of synthetic agrochemicals. However, the Tobacco Research Board has since 1964, advocated for Sustainable Tobacco Production practices through the active search for and selection of less toxic and environmentally benign agrochemicals for use on tobacco. This has become increasingly important in the face of the World Health Organization's Framework Convention of Tobacco Control (WHO-FCTC) (Article 18), which puts emphasis on the "Protection of the Environment and the Health of Persons".

In the period under review 192 products were evaluated in contract research trials for effectiveness against pathogens, insects and root-knot nematodes.

The Entomology Skills Group evaluated 46 insecticides for their efficacy in the control of insect pests. The insecticides were evaluated in aphid, cutworm, leaf-miner, and false wireworm management trials. The 46 products included those that were in the 1st, 2nd and the 3rd and final season of testing. From this lot, 21 active ingredients were recommended for registration, whereas 25 active ingredients were carried forward for testing in the 2nd or 3rd season of evaluation. In the Nematology Skills Group 25 products were evaluated for their effectiveness against root-knot nematodes. Of these, eight were recommended for registration, 11 were moved to the second and third season of testing while six products were deemed ineffective. Figure 2 below shows the performance of green-label nematicides compared with the purple-labelled ones at 5 – 15 weeks after transplanting in a tomato bioassay.

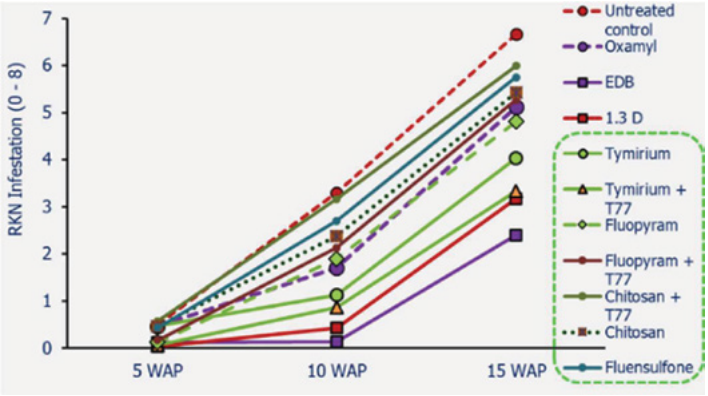


Figure 2: Mean gall ratings of tomato plants assayed with soils from registered nematicide-treated plots scored using the Nusbaum & Dalton scale where 0 denotes a clean root system and 8 denotes a dead root system.

To date there are now four green-label nematicides that are recommended by TRB. These are; fluensulfone, fluopyram, cyclobutrifluram and chitosan and gives growers a wider choice of products to use.

In the Pathology Skills Group, 127 crop protection agents comprising of viricides, bactericides and fungicides were evaluated and of these 12 were recommended for registration, while 99 are being carried forward for testing in the 2rd season, 3 are in their 3rd season and 13 were discontinued due to non-performance.

Bactericides Evaluation

There has been limited options for bactericides, particularly for the management of Angular Leaf Spot as currently only acibenzolar-S-methly is registered for use. Angular leaf spot (ALS) is an economically important disease in the tobacco production both in the seedbed and field. It is a bacterial disease caused by Pseudomonas

syringae pv. tabaci Tox-. If not managed, ALS may cause drastic yield losses of up to 80%. ALS also greatly affects the tobacco leaf quality due to the irregular, necrotic brown lesions that enlarge and coalesce to form large areas of dead tissue (Figure 3).

Figure 3: Angular leaf spot on tobacco

Cool wet weather favours the spread of the disease. Since the early 1990s, the product Acibenzolar-S-methyl (Bion) was solely registered and used for the management of ALS in tobacco fields. This over reliance may spark potential pathogen resistance build-up.

In order to avail more products for growers to use, in the past five seasons 2018-23, field trials were setup in Marondera, Macheke, Headlands and Darwendale to evaluate bactericides for the management of ALS.

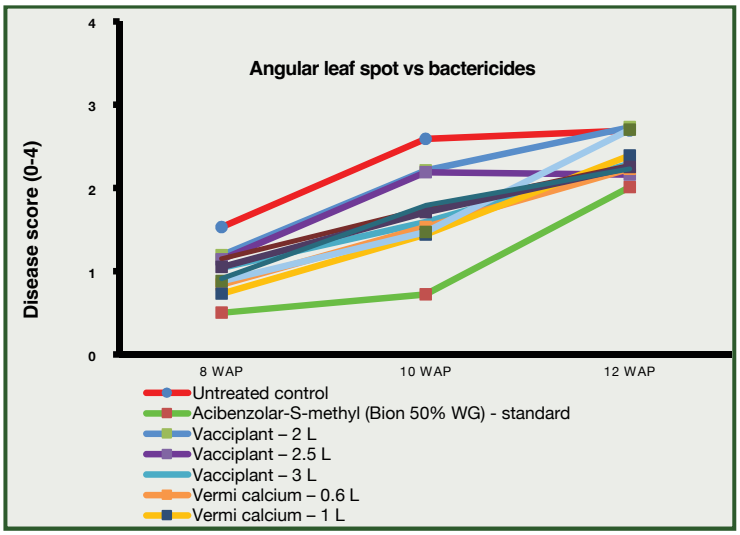


Figure 4: Angular leaf spot vs bactericides in Marondera North.

Several products such as kasugamycin, vacciplant, kasugamycin+vacciplant, vermi-calcium and Rheum officinales+azoxystrobin were evaluated and found to be effective and ultimately registered for the management of ALS on tobacco in the field.

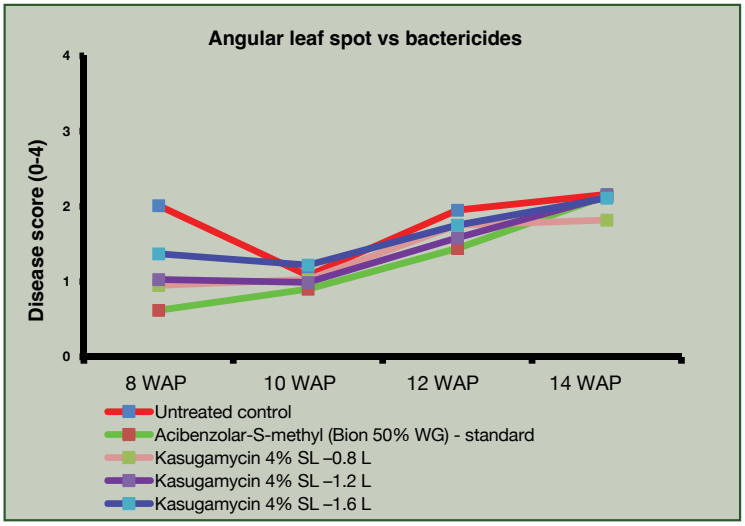


Figure 5: Angular leaf spot vs bactericides in Macheke.

These products which are also green, add to the list of sustainable options that farmers can use against ALS.

1.2 Monitoring and detection of emerging or re-emerging pests and diseases

1.2.1 Fusarium

Fusarium wilt disease (Figure 6), caused by the soil-borne fungus Fusarium spp., is an economically important disease that affects a wide range of solanaceous crops including tobacco, potatoes, tomatoes and peppers. Based on the Kutsaga Plant Clinic statistics, the Fusarium wilt disease has been on the increase in tobacco, potatoes and tomatoes.

Figure 6: Fusarium wilt on tobacco

To establish the potential cause, an investigation into the genetic diversity of Fusarium spp. affecting tobacco and other plant species in Zimbabwe was initiated. In this study, fungal isolates were obtained from solanaceous crops with symptoms of Fusarium wilt disease and then characterized using molecular methods based on targeted sequencing of the Internal Transcribed Spacer region. Forward and reverse sequences were edited using BioEdit to generate consensus sequences. Blast programs were used to find homology of the generated consensus sequences, with already reported sequences present in the nucleotide databases.

The results from this study showed that seven Fusarium spp were detected in solanaceous crops namely *Fusarium fujikuroi, F. foetens, F. nygamai, F. falciforme, F. longifundum, F. persicae* and *F. chlamydosporum* (Figure 7). Most of these fungi were reported in Zimbabwe for the first time on tobacco and potatoes.

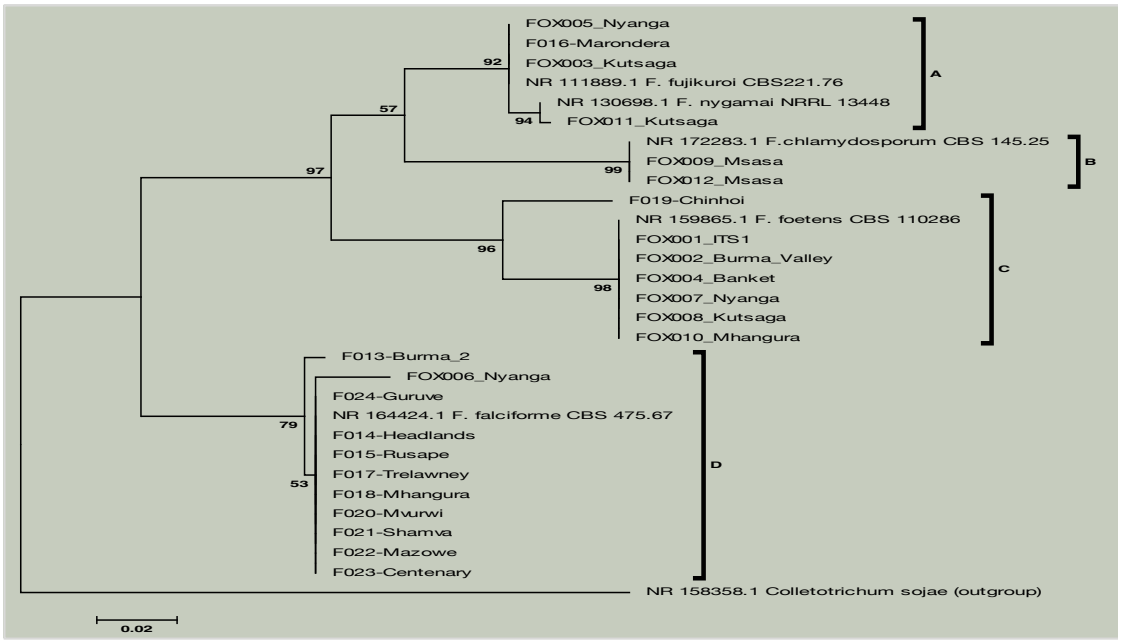


Figure 7: Phylogenetic analysis of partial ITS regions of Fusarium isolates collected from different tobacco and potato producing districts in Zimbabwe. The evolutionary history was inferred using the Maximum Likelihood method based on the Tamura 3-parameter model with 1000 bootstrap replicates in MEGA 6.

1.2.2 Black shank

Black shank disease caused by the oomycete *Phytophthora nicotianae* is a serious threat to tobacco production in many tropical and subtropical countries (Figure 8). In the past few seasons, there have been sporadic incidences of this disease in several districts. The 2023-24 season was characterized by a surge in the incidence of this disease, with more than half of the plant health cases brought to the Plant Clinic in November and December 2023 positive for this disease. Interestingly, a black shank-fusarium wilt disease complex was confirmed in most of samples brought to the Plant Clinic.

Figure 8: Blank shank on tobacco stems

Research is underway to determine the race structure of P. nicotianae in the country. Genetic diversity and pathogenicity studies are also underway to understand factors that might be contributing to increased disease incidence and severity.

1.2.3 False wireworm

Figure 9: False wireworms and their damage

False wireworms were not common pests on tobacco in historic seasons, however, in September 2023 there were sporadic reports of false wireworm on tobacco. False wireworm damage on tobacco could potentially lower yields given there are no curative active ingredients that are registered to effectively control the pest in tobacco fields. In response to the false wireworm outbreak, greenhouse trials were set up to evaluate different insecticide formulations of registered active ingredients for their efficacy in management of false wireworm damage on tobacco. Results from the greenhouse trial showed that Imidacloprid 200 SL, Imidacloprid 70 WP, Imidacloprid + Lambda-cyhalothrin and Fipronil were effective in the management of false wireworms especially when applied as preventative insecticides in the planting hole. These results confirm that these already registered products were effective although growers were applying them for managing other insects.

1.2.4 Aphids monitoring

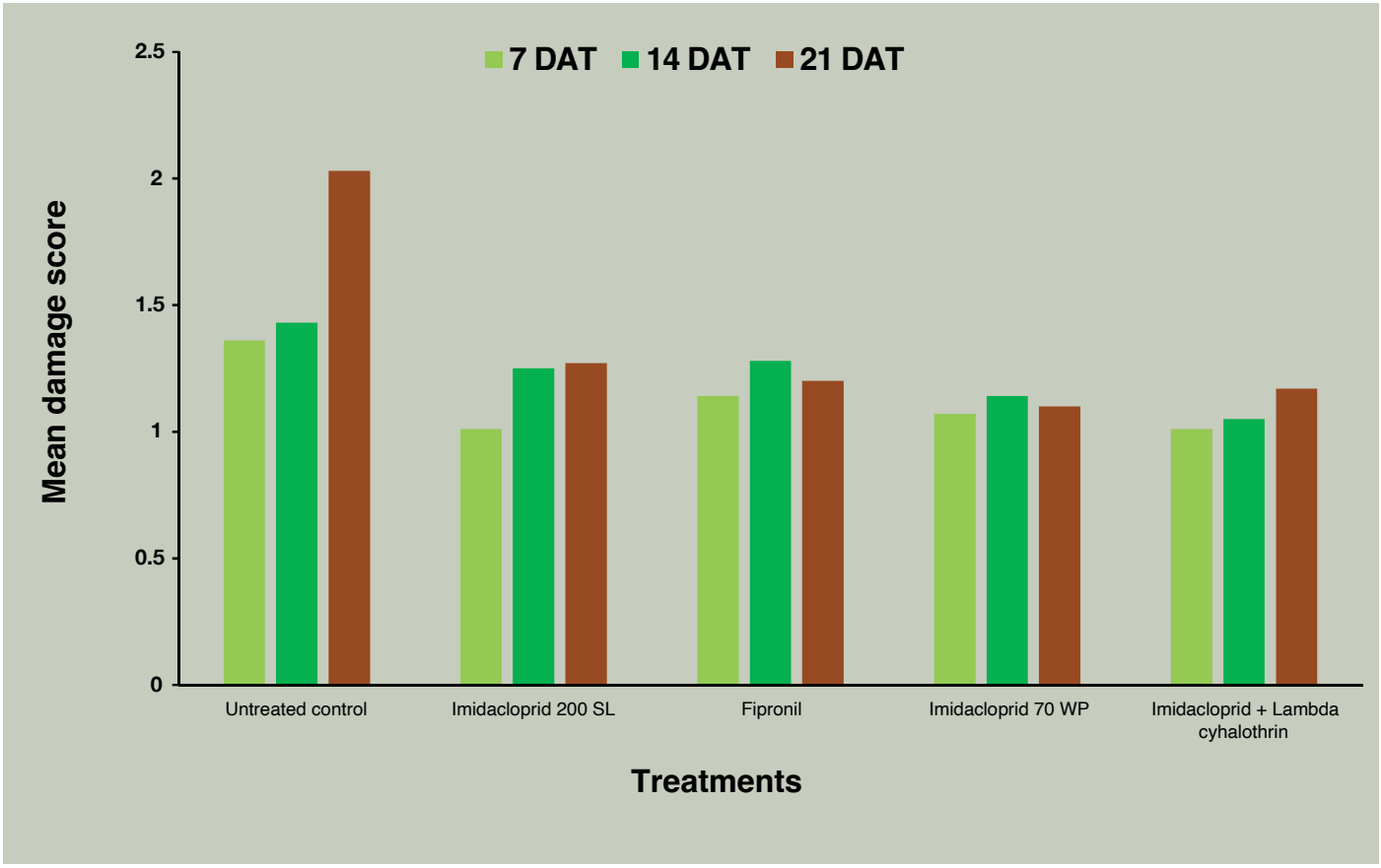


Figure 10: Mean damage scores plotted against treatments for false wireworm control

The surveillance of aphid populations is a key component of virus management in tobacco as aphids serve as vectors of virus disease. Potato Virus Y outbreaks have previously been related to high aphid populations, yellow water pan traps were used as a management tool to monitor winged aphid populations.

Figure 11: Aphid and PVY on tobacco

Historically, aphid populations were generally lower during the period June to December and sharply peak between end of December to March as seen in the data from
the 1960 and early 2000s (Fig. 12).

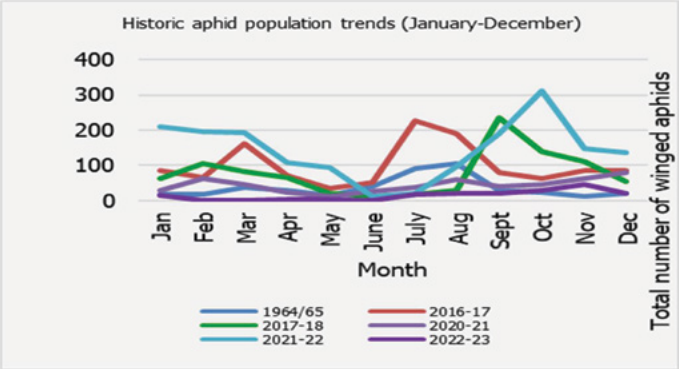


Figure 12: Historic aphid population trend from the period January to December

This period is associated with most crop Fig establishments which support population build-up of aphids. Contrary to this known trend, the total number of migrating winged aphids recorded from the yellow water pan traps for the 2022-23 season was lower than the total number of winged aphids recorded in historic seasons between January and September 2023 (Figure 12). This was attributed to the prevailing wet conditions during the season. However, with the advent of El Niño phenomena in the 2023-4 season it is expected that insect populations, especially aphids, will be on the increase. Good agricultural practices are encouraged to maintain aphid populations below economic threshold each season.

2. Cost effective and sustainable integrated pest and disease management systems on tobacco and alternative crops.

TRB's main push in the Tobacco Value Chain Transformation Plan (TVCTP) lies in promoting sustainable intensification of tobacco production as well as researching and facilitating the production of alternative crops to diversify farmer revenue.

2.1 Evaluation of Trichoderma-treated crops in short tobacco rotations

Rotation crops notably sunnhemp (Crotalaria juncea) and Katambora grass (Chloris gayana) have been recommended for the control of plant parasitic nematodes. However, sunnhemp is susceptible to other soil borne pathogens hence there was need to control these pathogens notably Fusarium and Rhizoctonia spp as well. A wide range of biological control agents derived from Trichoderma species have been developed and commercialized for the management of such pathogens on various crops. However, not much work has been done in Zimbabwe to assess the potential of suitable rotation crops in combination with Trichoderma spp for the control of root knot nematode and disease complexes in tobacco. Disease assessments of this trial showed that tobacco seed-treated with T77 (a native Trichoderma harzianum strain) had markedly lower disease than those from disease control plots with merit noted when T77 was applied at transplanting (Figure 13). Additionally, the higher soreshin score noted in tobacco relayed with sunnhemp not seed-treated shows the danger of doing relay cropping without seed treatment using a biocontrol agent like T77 as the carryover of soilborne pathogens is exacerbated.

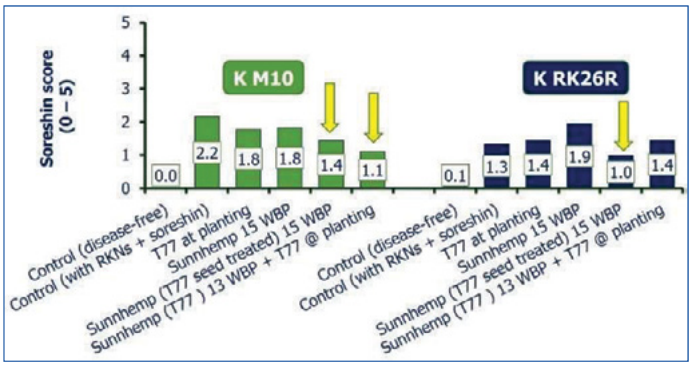


Figure 13: Soreshin assessments of tobacco relayed with sunnhemp.

Results in the three seasons of this trial, which evaluated sunnhemp seed-treated with T77 as a relay crop indicated that seed treatment coupled with the application of T77 at planting

significantly reduced rootknot nematode (RKN) infestations and galling in plots planted with highly susceptible K M10 (Figure 14). Gene expression studies are ongoing in ascertaining the mechanisms involved in inducing disease resistance by the plant when T77 is applied. These results, therefore, confirm that T77 alone and in combination with sunnhemp may be used for the control of root-knot nematodes and soreshin on tobacco.

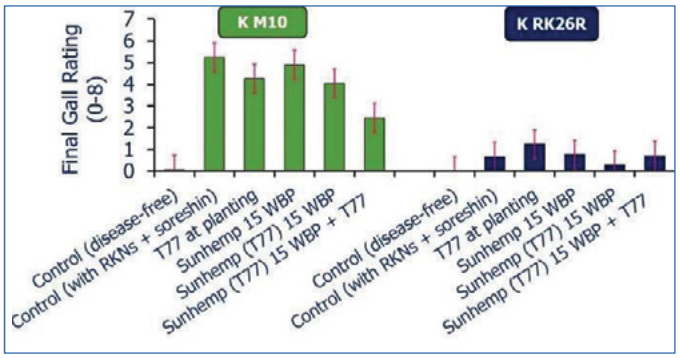


Figure 14: Final Root knot nematode galling

2.2 Evaluation of Root-knot nematode suppression potential of Mustard (Brassica juncea)

Whilst crops such as sunnhemp and Katambora, have been recommended for rotation, it has become necessary search for more ideal rotation crops particularly for smallholder tobacco farmers. Research in other cropping systems has shown mustard (Tsunga) to be effective for both nematode and disease suppression. The crop has to be established as a winter cover crop before tobacco is planted in summer for effective nematode management. Trials were, therefore, set up to investigate the potential of mustard as a relay crop with tobacco. In addition, a mustard-Trichoderma treatment was included in the investigation.

Gall assessments of this trial from tomato plants assayed with soils from the different treatments showed that tobacco planted in plots that had mustard treated with Trichoderma T77 and mustard in combination with fluopyram before planting, had gall ratings that were comparable with the standard nematicide, fluopyram (Fig. 15). Both treatments were found to have significantly lower gall rating as compared to the untreated control. The use of mustard as a relay crop in an Integrated Pest Management (IPM) setting provides an effective RKN management option for the Zimbabwean tobacco grower, especially the small-scale farmer.

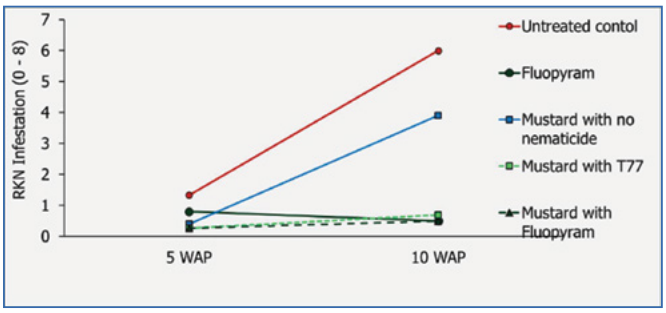


Figure 15: Mean gall ratings of tomato plants assayed with soils from different treatments scored using the Nusbaum & Dalton scale where 0 denotes a clean root system and 8 denotes a dead root system.

2.3 Application of Infrared Spectroscopy for The Detection of Root-Knot Nematode Infestation in Tobacco

Visual symptoms of a plant predisposed to root-knot nematode damage are similar to those produced by water or nutrient stress or secondary infective microorganisms, and so the nematode problem is frequently misdiagnosed. Currently, the usual way to detect RKNs is by collection of root or soil samples, and laboratory analysis by qualified specialists. The whole process is time- and effort-consuming, and generally costly. Additionally, the use of galling as a measure of nematode damage is becoming outdated and there is need to use methods that confirm the presence of RKNs without counting galls. As the majority of plant-parasitic nematode (PPN) diagnosis is done by visual examination, including microscope observations, efforts to automate and improve this diagnosis are currently being made. This trial was established to evaluate a method for detecting RKN infections by measuring spectral changes in tobacco plants and improving the

detection parameters for diagnosis of plant nematode damage.

Some of the improvements in PPN and plant pathogen diagnosis or monitoring include the analysis of infrared (IR) spectral data from crops. Fourier Transform Infrared (FTIR) Spectroscopy is used as a tool for plant taxonomy, assessing abiotic effects such as drought stress, and the detection of plant pathogens such as Fusarium in maize. Kutsaga has an FTIR-ATR Spectrophotometer in the Analytical Chemistry Services (ACS) Division. Tobacco leaf samples from uninoculated plots and those inoculated with nematodes were processed for eight weeks per experimental run. Results in the second trial run showed that ATR-FTIR spectra of tobacco plants with and without nematode infestation differed from each other as early as the first week after nematode inoculation. Moreover, in the susceptible K M10 samples that were taken from nematode infestation in comparison with K M10 samples from non-infested plots, high values of maximum absorbance in the IR region between 1500 and cm–1 1700 cm-1, were observed, when this region was compared with the other analysed IR region in control samples (Fig. 16).

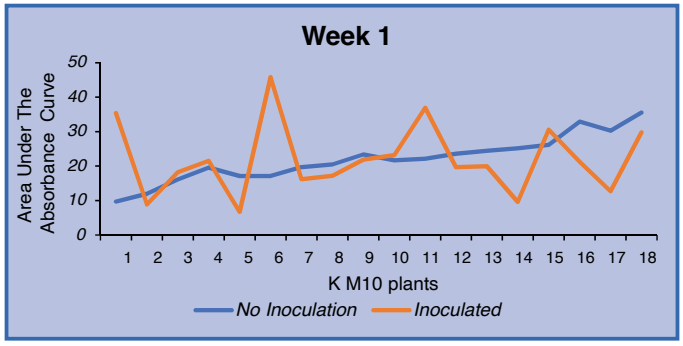


Figure 16: Leaf spectral data of susceptible K M10 tobacco leaves at 1 week after nematode inoculation.

Visible differences were only picked at 3 weeks after inoculation between the resistant K RK75 plants from infested plots and those from non-infested plots (Fig. 17). The highest RKN galling was noted in K M10 pots inoculated with the 10,000 RKNs at 3 weeks after inoculation. This technology will aid more timeous disease identification in the future. More trial runs are required to train the model so that it becomes more accurate.

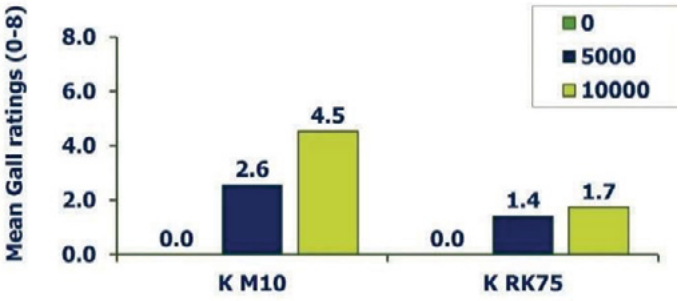


Figure 17. Mean nematode galling in tobacco plants noted 3 weeks after inoculation of 0-10000 RKNs.

The plants were scored using the Nusbaum & Dalton scale where 0 denotes a clean root system and 8 denotes a dead root system.

3.0 Research on economically viable alternative crops (Cannabis spp.)

Industrial hemp (Cannabis sativa) is a plant belonging to the family Cannabaceae that is cultivated for its bast fibre or its edible seeds. It originated in Central Asia but is now grown in several countries worldwide. Hemp is a relatively new crop in Zimbabwe, with varietal screening trials underway at the Tobacco Research Board. Hemp is being promoted as an alternative crop to tobacco whose production is under threat from the impending WHO ban.

Like other crops, hemp is susceptible to infection by several diseases caused by fungi, bacteria and viruses. Studies were instituted to diagnose infected plants, document the causal pathogens and ultimately avail this information to farmers, researchers, agronomists and other stakeholders for this relatively new crop.

In the period under review, some sixty samples of industrial hemp leaves exhibiting disease symptoms were collected from fields in Shamva and at Kutsaga Research Station in

order to establish the causal agent. Symptoms on affected plants included concentric ring patterns with a white spot in the center, wilting, yellowing, browning of the leaf tips, and powdery patches. In the laboratory, twenty-one pathogens resembling mostly Alternaria and Bipolaris species were isolated from sick tissues. Amongst the isolates, 2 representative isolates were sequenced and sequencing comparisons using BLAST analysis showed that one of the isolates was identical to Alternaria tenuissima strain GYUN-10732 with a 99.5% sequence homology (98% query cover) which represented 11 of the isolates and the other sequence had a sequence homology of 89.69% (90% query cover) to Kalmusi italica which represented nine of the isolates.

In order to avail chemical disease management options, a greenhouse trial to test the efficacy of strobilurins and Trichoderma isolates on the two diseases. A treatment combination of Trichoderma T77 + Azoxystrobin + Tebuconazole was shown to have the highest efficacy on Alternaria tenuissima as compared to the other treatments ($p < 0.05$). Trichoderma T77 + Azoxystrobin + Tebuconazole and Chlorothalonil had the highest efficacy on Kalmusi italica ($p < 0.05$) and were compatible. To our knowledge, this is the first report of A. tenuissima and K. italica causing a leaf spot on industrial hemp in Zimbabwe.

In 2023 work was also carried out to characterise plant parasistic nematodes associated with industrial and medicinal hemp grown in Zimbabwe. The investigation was carried out on five farms in four locations namely Darwendale, Harare, Bulawayo and Trelawney. The results from these investigations showed that root knot nematode (Meloidogyne spp.) and spiral nematodes (Helicotylenchus spp. And Scutellonema spp.) were found to infect both industrial hemp and the medicinal cannabis. Investigations on damage thresholds, prevalence, incidence and possible resistance of Cannabis lines to PPNs is planned for future studies.

4.0 Afforestation and Agroforestry

Figure 18: Gum tree seedlings

The Tobacco Research Board has a total ownership of 1103 Ha of land between its three stations (Kutsaga, Banket and Makoholi Stations). Of this only 34% is arable land while the remainder is divided between buildings, forests, plantations, water and vlei. The Board cultivates a commercial tobacco crop (commercial and experimental) on approximately 70 Ha which currently requires coal for curing.

It is envisioned that tobacco production will be anchored on sustainable production practices with most 'blue chip' contractors requiring that

all tobacco curing facilities use wood by 2025. As such the Board's indigenous woodlands and exotic forests will play a critical role in sustaining tobacco production. However, it is projected that in 2025 there will be a critical shortage of fuelwood along with logistical constrains to transport the available fuelwood. At all three stations, particularly at Kutsaga, drastic changes in the forest cover have taken place in the recent past due to wood poaching and arson related forest fires.

A project was therefore, established to counter this anticipated constraint by establishing and managing of fuelwood plantations for the Board (afforestation). In addition, the project seeks to utilize all dormant land (not arable) for the financial benefit of the Board by establishing agroforests.

The Board reserved dedicated plots for the cultivation of hass avocado, acacia, eucalyptus and citrus trees. In the period under review a total of 251 hass avocado, 100 acacia trees, 24 citrus and 27 744 eucalyptus trees were established and maintained.

5.0 Kutsaga Plant Clinic

A correct diagnosis is critical for the effective management of pest and disease problems to reduce economic losses, and increase grower returns.

A total number of 247 samples were received in the Kutsaga Pathology Plant Clinic in the period under review. Tobacco samples constituted 32.4% (80) and non-tobacco samples 67.6% (167). Potatoes made up the majority of the non-tobacco samples. The major diseases in potatoes were dry rots followed by wet rots and bacterial wilts. The major plant health challenge in tobacco was the black shank and Fusarium wilt disease complex. Other notable challenges included angular leaf spot, Alternaria and Frogeye. Potato Virus Y (PVY) and powdery mildew incidences were sporadically reported.

A total number of 660 samples were received in the Kutsaga Nematology Plant Clinic from January to December 2023. Tobacco samples constituted 84.4% (557 samples) and non-tobacco samples 15.6% (103). The majority of non-tobacco samples consisted of potatoes and horticultural crops. Generally, there has been an increase in samples submitted to the Nematology Plant Clinic in recent seasons. The Kutsaga Plant Clinic is an active service available on call and Kutsaga social media platforms.

6.0 Training

Staff from the Division trained both internal and external clients, university students and various delegates from different agrochemical companies, regional and international communities on various aspects of Plant Health including seedbed management, microscopy, sprayer calibration, correct pesticide application and use of registered crop protection agents (CPAs) for pests and diseases control in tobacco seedbeds and fields. Several discussion groups, Agricultural broadcast shows (fig 19) and farm visits were attended and approximately over 900 farmers and extension officers were trained.

Figure 19: Wadzanai Manyore with the PHS team on training growers through TV channels and training on use of the newly acquired Biolog disease identification platform.

Publications

1. Peer Reviewed Journal: "Evaluation of the potentials of Bacillus and Trichoderma isolates as biocontrol agents against Meloidogyne javanica and Phytophthora infestans and plant growth promoters in potatoes (Solanum tuberosum)" – September 2023.
2. Peer Reviewed Journal: "Genetic diversity of Fusarium isolates infecting potato (Solanum tuberosum) and tobacco (Nicotiana tabacum) in Zimbabwe" – September 2023.

Conferences and workshops attended

1. "Seed Potato Workshop on Pest and Disease Identification" at Kutsaga – March 2023.
2. "ZTA discussion on the Tobacco Industry Status" in Trelawney – May 2023.
3. "ZPMA Seed Potato Grading" at Kutsaga – June 2023.
4. "Biolog training" at Kutsaga – August 2023.
5. "Sprayer calibration and pesticide application training" in Marondera North – September 2023.
6. "Diversity of Fusarium isolates infecting tobacco in Zimbabwe" CORESTA Mexico Cancun – 15 – 19 October 2023.
7. "Evaluation of sunnhemp seed-treated with Trichoderma in short tobacco rotations for the control of root-knot nematode (Meloidogyne javanica) and disease complexes" CORESTA Mexico Cancun – 15 – 19 October 2023.

Crop Production & Molecular Technologies
CPMT

CROP PRODUCTION & MOLECULAR TECHNOLOGIES

Division

Agronomy, Soil Chemistry,
Horticulture, Crop Physiology,
Plant Tissue Culture,
Molecular Biology

MISSION

The Crop Production and Molecular Technologies (CPMT) division comprises the Crop Production, Molecular Biology and Tissue Culture sections. The goal of the CPMT division is to deliver efficient, effective and sustainable crop best management practices and to provide accurate and rapid molecular diagnostic and characterisation services for pests, disease and plant genotypes. In addition, the division offers commercial micropropagation, horticulure seedling production and lime and fertiliser recommendations to stakeholders in the agriculutre and horticulture sectors.

Crop Production Division

- **Agronomy**
- **Horticulture**
- **Soil Chemistry**
- **Crop Physiology**

Mission

To develop and disseminate effective, efficient environmentally sustainable tobacco best management practices.

Goals

Continuous search and evaluat-lon of crop protection agent from a variety of sources giving the Zimbabwean tobacco grower a wider range of products to choose from for use in tobacco production

Research Work

A total of **thirty-five (35)** fundamental and applied research trials were established In the Crop production Section, which comprises of **twelve (12)** Agronomy, **fifteen (15)** in Soll Chemistry and eight (8) In Physiology. In the period under review. **forty-two** (42) PASS products were evaluated which includes bio-fertillzers, organic fertilizers, suckercides. herbicides and soil conditioners.

Soil Chemistry

The research focused on soil rehabilitation, improving soil fertility by evaluating soil conditioners, growth enhancers, bio-fertilizers for optimized tobacco production. The section had a demonstration trial on four (4) bio-fertilizers which were approved in tobacco production, that growers can use to improve crop yields and improve soil fertility and structure. Research on alternative relay crops i.e. velvet beans, silverleaf disodium continued during the period under review, and these have a potential in improving soil fertility and reducing nematode pressure in the soil.

Physiology

Research endeavors to enhance productivity and sustainability in tobacco production, focusing on current problems faced by farmers such as climate change. Bio-stimulants, osmo-protectants and organic fertilizers were evaluated during the period under review. Research on the effects of fertilizer rates on productivity of Industrial Hemp continued during the season under review.

Agronomy

Agronomy research focuses on best weed management practices, effective sucker control and soilless seedling growth medium enhancement. Research on parasitic weed -*Striga gesneriodes* control in tobacco production continued focusing alternative methods such as Biochar and *Mycorrhiza* fungi. Additionally, the skills group continued with Kutsaga Gromix quality assurance.

Meet the team

RHODA MAVUKA

Head of Division

BSc (Hons) Biological sciences, MPhil (Zim), Postgrad. Dip. Pesticide Risk Management (UCT)

Ms D Chinamo
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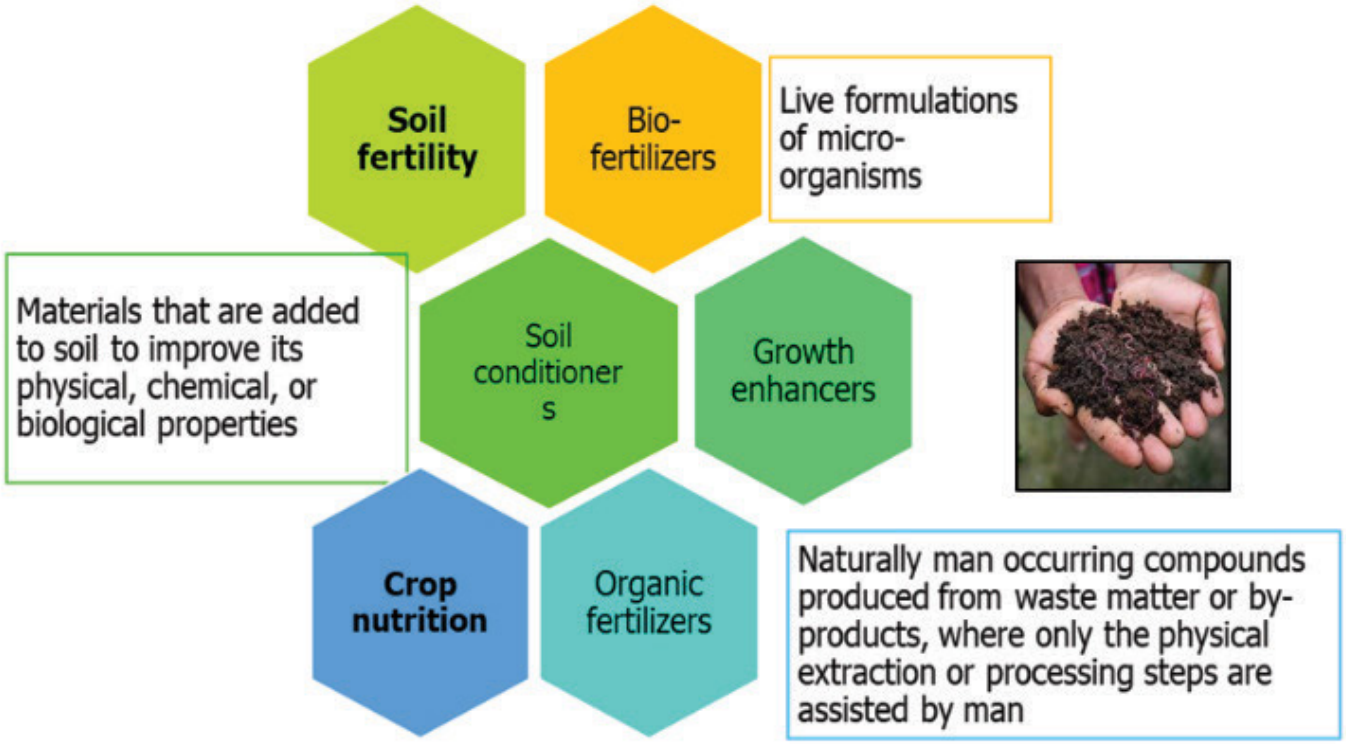
BSc Agric (Zim), MSc (Zim)

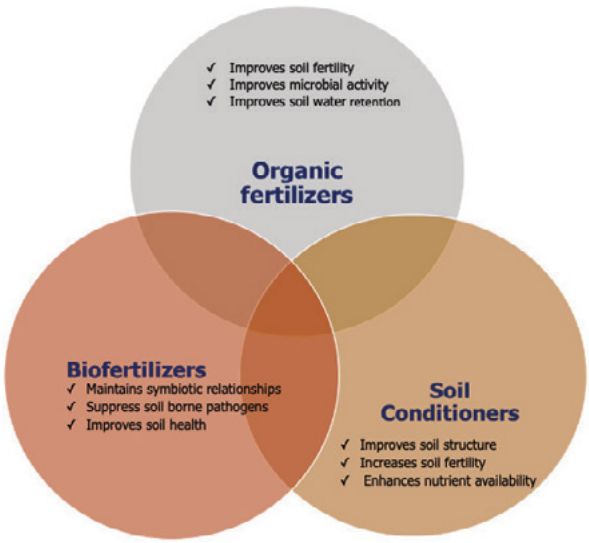
Ms F Zinyandu
Research Officer
MSc Plant Production Designs and Agronomy. BSc Agronomy

Mrs T Hove
Research Officer
MSc Crop Science-(MSU) BSc Crop Science-(UZ)

CROP NUTRITION: SOIL REHABILITATION RESEARCH



Tobacco production relies on inorganic fertilisers to provide the crop with the required macro and micronutrients for optimum plant growth and the maintenance of soil fertility. However, chemical fertiliser overuse can contribute to soil acidification and soil crust, thereby reducing the content of organic matter, beneficial species, altering the soil pH and even leading to the release of greenhouse gases. These effects led to a quest for sustainable production practices which have a greater resource use efficiency. Bio-fertilizers, soil conditioners and organic fertilizers improve soil health through the increase of beneficial soil microbe's population, maintain symbiotic relationships and improving soil fertility. Research was carried out and results of several of these are shown below.



1. Effect of Organic grow + and Carboamin+ on tobacco growth, yield

Focus & Objective

- Grow+ and CarboAmin+ are liquid organic fertilisers which contains 72% humic acids, 65-70% organic matter, 28% fulvic acid, 7-8% Nitrogen, 0.1% P, 12% K, 35% carbon, enzymes, phytohormones, amino acids, natural chelates, trace elements Zn, B, Mn, Fe, Cu, Mo
- These organic fertilizers are compatible with soil microbes and therefore, can increase soil microbial activity, thus improving soil fertility.
- Objective: To determine the effects of Grow+ and CarboAmin+ on tobacco growth, yield and quality.

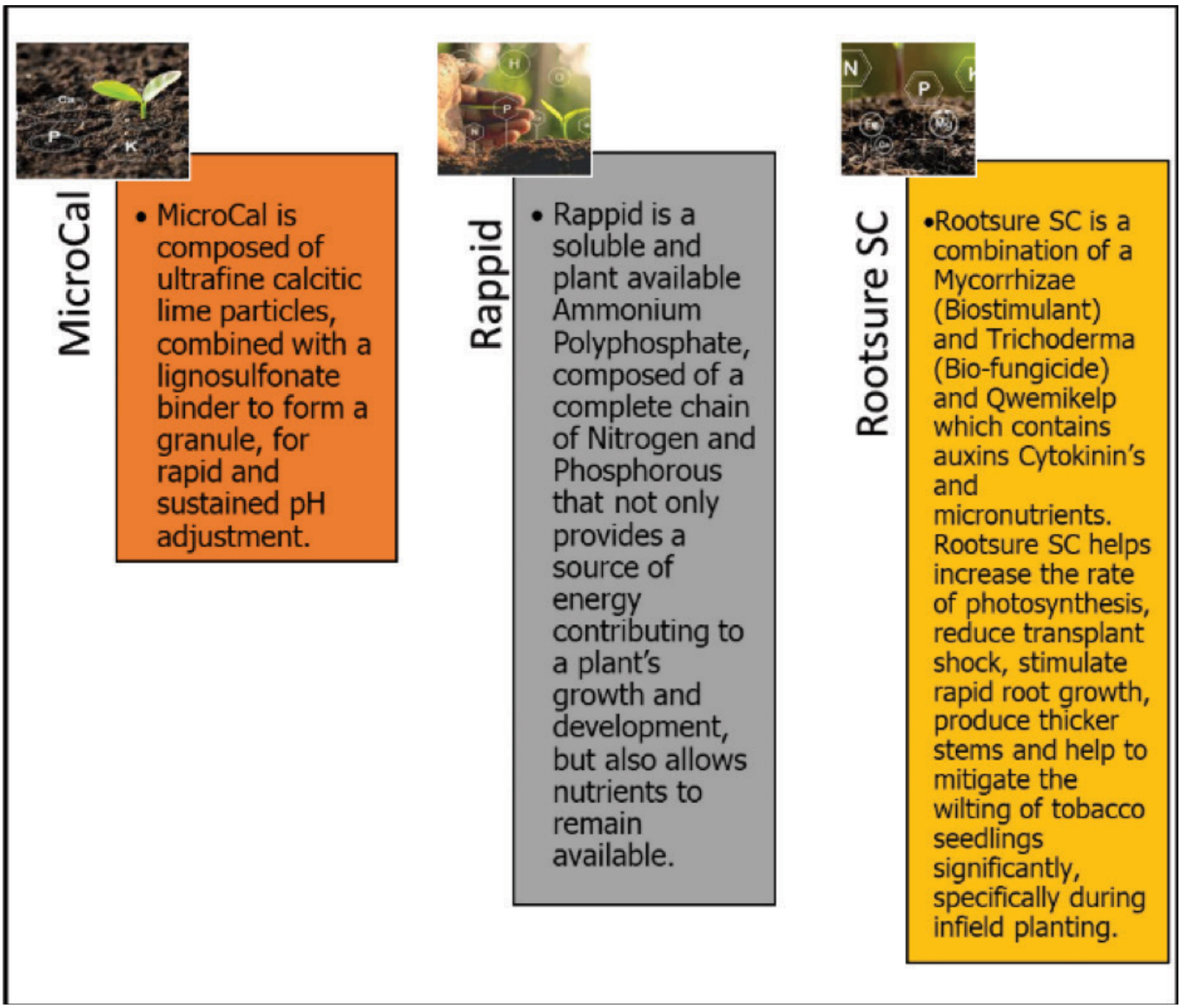
Procedure

- CarboAmin+ and Grow+ were tested in combination with 100% standard fertiliser and at reduced rates of the chemical standard fertilizer at 50% or 75% or as a sole application; the standard fertilizer and a no fertilizer treatment were included as the positive and negative control treatments. CarboAmin+ was applied in the planting hole and Grow+ was foliar sprayed at 3, 5, & 7 weeks after planting
- Data collected included; Leaf expansion, yield and quality, soil nutrient compostion.

Findings

- The use of CarboAmin+ and Grow+ as sole fertilisers gave significantly low yield and quality compared to the standard fertilizer showing that it cannot be used without other nutrient sources. However, when used in combination with the standard fertilizer at 50% or 75%, yield and quality was comparable to the 100% standard fertiliser.
- Results are similar to those obtained in the previous season. Therefore, the product was recommended for temporary registration at (50% CarboAmin+ and Grow+ and 50% standard fertilizer) whilst awaiting third season's results.

2. Evaluation of the different stages of the Sureway program in tobacco production.



A trial was established to evaluate a Sureway program in tobacco production which consists of MicroCal, Rappid and RootsureSC against a standard fertilizer program and a no fertilizer treatment. The data collected included; Root and shoot dry matter, fresh and dry leaf weight (top four upper leaves); leaf expansion, yield and quality. Micropal enhanced blend resulted in a significantly higher saleable yield than the standard fertiliser program (Table 1) whilst the addition of MAP Tech and Rappid to the standard fertiliser program produced similar yields to the standard program. As expected, the no fertiliser treatment resulted in a significantly lower saleable yield. The MicroCal enhanced blend was found to be effective in significantly increasing saleable yield and thus is a potential alternative to the tobacco standard basal fertilisers. The second season trial was established for validation of results and was being maintained at the time of reporting.

TABLE 1: SALEABLE YIELD, (kg/ha)

TREATMENT	Reaping group			
	1	2	3	All groups
Control (No Fertiliser)	453.67	323.00a	342.67a	1119.33a
Standard Program	463.67	801.33c	601.33abc	1866.33c
Damara Enhanced Blend (9% MicroCal)	415.00	802.33c	874.67c	2092.00d
Standard Program + MAP Tech	379.00	862.67c	750.00bc	1991.67cd
Standard Program + Rappid	530.00	757.33c	620.00abc	1907.33cd
Standard Program + Rootsure SC	430.67	572.67b	511.00ab	1514.33b
F-Value	0.87	<.001	0.065	<.001
S.E.D.	114.00	65.60	150.70	96.10
L.S.D.	254.00	146.30	335.70	214.10
CV%	31.30	11.70	29.90	6.70

3. Investigation of Organic S and Gwamis+ on growth and development of tobacco seedlings in conventional seedbeds.

A trial was set-up to investigate the performance of Organic S, a basal fertilizer and Gwamis+, an organic top-dressing fertilizer with a nutrient composition of 12% N; on conventional seedlings.

TREATMENTS

TREATMENTS

1. Standard fertiliser (Compound S and Ammonium nitrate (AN)
2. 100 % Organic S +Organic (Gwamis^{+})
3. 100 % Organic S +AN (Inorganic)
4. 75% Organic S+ AN (Inorganic)
5. 50% Organic S + 50% Organic (Gwamis^{+})

RESULTS

- It is interesting to note that in the first year of test the Organic S and Gwamis plus were comparable to the standard fertilizer with regard to seedling length and diameter, germination as well as root and shoot dry mass, even at a lower rate.
- The organic fertilizers will be evaluated for the second season to validate results.

4. Polyhalite product evaluation trial for rainfed tobacco production

Polyhalite is an organic mineral fertilizer comprising of Sulphur, Magnesium and Calcium and Potassium (Fig 1A). This fertiliser is derived from a naturally occurring mineral polyhalite, thereby negating the need for chemical processing. In this way, it has the lowest carbon footprint compared to other fertiliser products used being processed for crop production. Polyhalite is processed non-chemically (Fig 1B) which is sustainable to the environment.

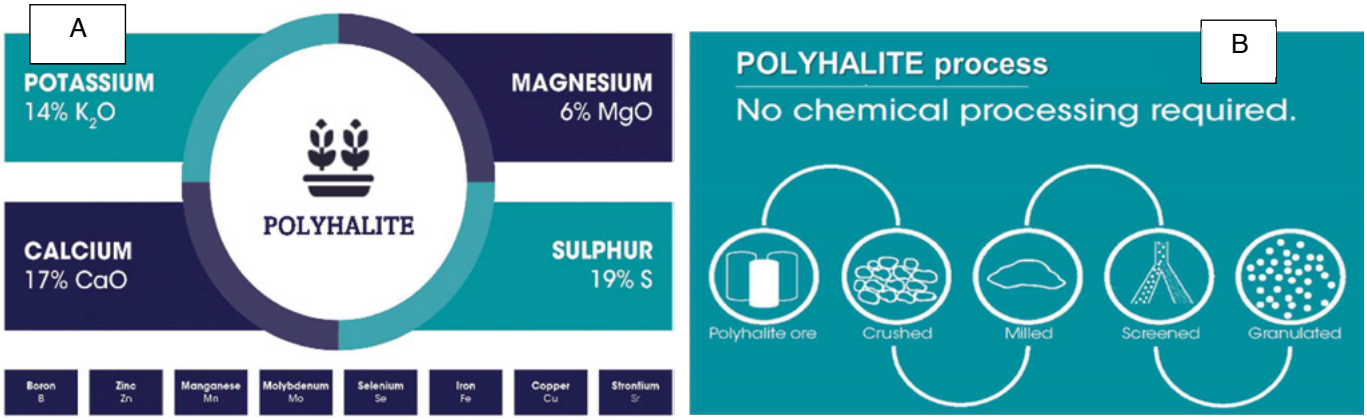
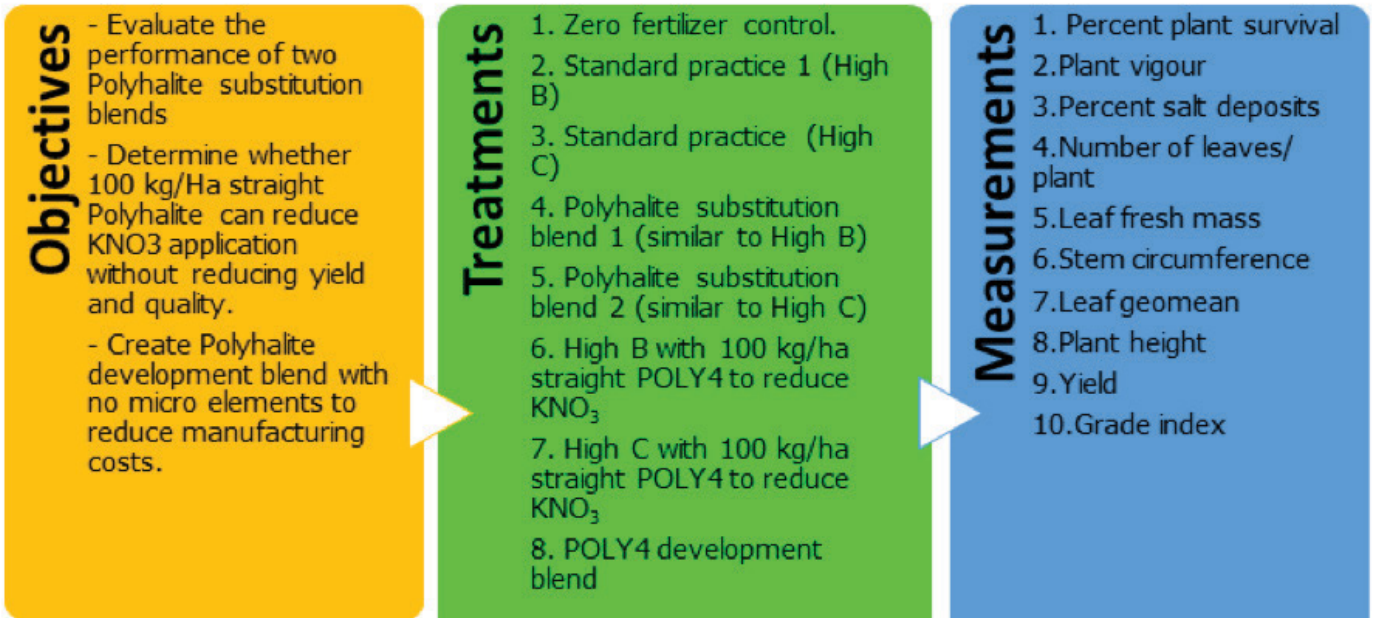
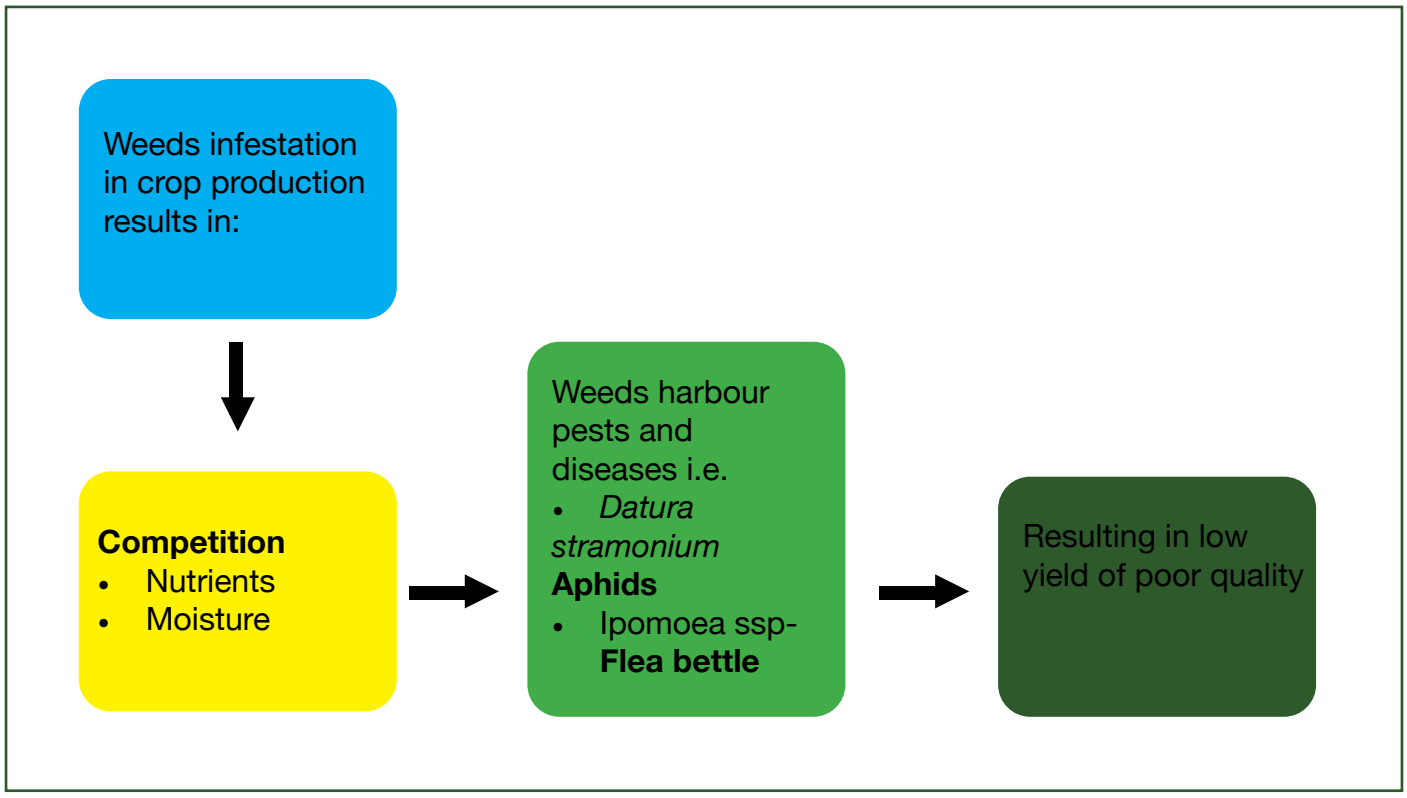


Figure 1 – Polyhalite composition and processing. A: Nutrient composition B: con-chemical processing



Results indicated that the two Polyhalite substitution blends performed similarly to the standard fertilisers High B and High C. There was no significant reduction in yield and quality when KNO3 was reduced and 100 kg/ha of straight Polyhalite added to either High B or High C. The performance of Polyhalite development blend, which supplies macro nutrients but omits micro elements, was comparable to the standard High B and High C treatments. There is need for a second season trial for recommendations to be made and to closely keep an eye on soil nutrient levels.

5. Weed management research



Weeds are rated one of the major pests of all crops, resulting in more than 50% of the combined losses incurred from insect pests. Weeds greatly slow down the crop's growth and development, therefore it is essential to remove weeds early and keep a weed free crop during critical development stages. In the year under review, weed management research continued with the aim of providing growers with effective herbicides to use in tobacco production. Some five (5) pre-emergence herbicides (Clomazone, Sulfentrazone, S- Metolachlor), one(1) pre-emergence new herbicide active ingredient (Metobromuron) and four (4) post- emergence herbicides (Halosulfuron, Clethodim, Fluazifop-p-butyl) from new sources were evaluated and weed counts and identification, weed fresh and dry weight measurements data was collected. The tested herbicides controlled their target weeds i.e. Halosulfuron controlled sedge weeds, whilst Clethodim controlled grass weeds and can be recommended for use in tobacco production.

One of the pre-emergence herbicides established during the period under review, focused on evaluating Metobromuron a new active ingredient for annual broad-leaved weeds control, the trial was established for the third season. Metobromuron is a phenyl-urea herbicide, whose mode of action is through the inhibition of the photosynthetic electron transfer at photosystem II, thus inhibiting photosynthesis. Four rates of the herbicide were evaluated either as a sole application (1.7L/ha, 2L/ha, 2.3L/ha and 4.6L/ha) or in combination with S- Metolachlor 960 EC (1.5L/ha). Efficacy of Metobromuron on broad-leaved weeds and compatibility of the active ingredient with other herbicides was evaluated.

Low weed counts were observed in treatments with Metobromuron at 2L and 2.3L/ha compared to the standard herbicides such as Clomazone, showing that the herbicide can control broad-leaved leaves solely. It was also observed that the highest rate (4.6L/ha) of the pre-emergence herbicide Metobromuron had the lowest

broad-leaved weed counts, although high phytotoxicityeffects on tobacco were recorded in this treatment. There was increased weed control in plots applied the combination of Metobromuron (2L and 2.3L/ha) and S-metolachlor 960 EC. The results obtained showed that Metobromuron can be recommended to be used for broad-leaved weeds control at 2.3L/ha and it can be used in combination with S-Metolachlor 960EC for increased weed control.

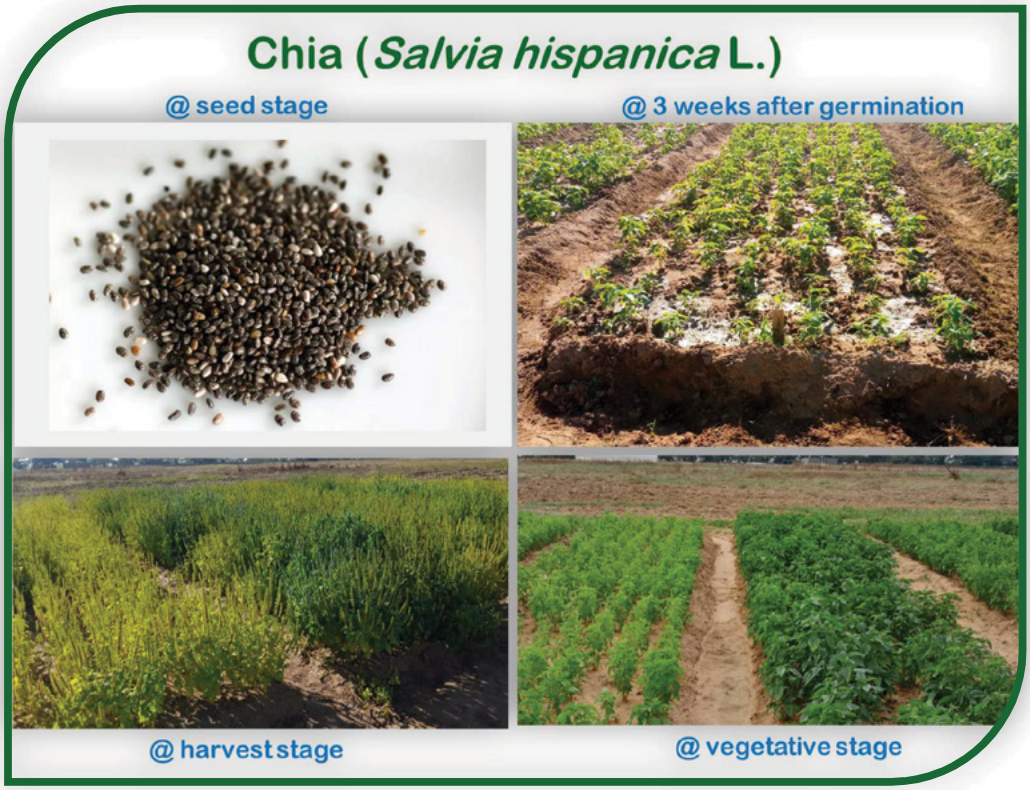


Figure 6. Stages of the Chia (Salvia hispanica L.) in the field

6. Chia (*Salvia hispanica L.*) as an alternative to tobacco

As part of the Tobacco Value Chain Transformation Plan, particularly focusing on the third objective of diversifying and increasing alternative crop production, research has been carried out to assess the viability of Chia (*Salvia hispanica L.)* as an alternative to tobacco. Chia is a plant native to Mexico and Guatemala, known for its tiny black or white seeds that are rich in omega-3 fatty acids, fiber, and various micronutrients. While Chia seeds have gained popularity as a nutritious food ingredient, there is limited scientific research exploring it as an alternative to tobacco.

Ongoing trials seek to establish optimum fertilization rates as well as determination of the most effective and user-friendly fertilizer application method. Preliminary results are biased towards the use of inorganic fertiliser banded after germination as opposed to the use of compost. The agronomic assessment of Chia is currently ongoing, entering its third season, with the aim of generating comprehensive recommendations.

LIME AND FERTILIZER RECOMMENDATIONS

Growers are recommended to follow the 4 'Rs' when using fertilisers which stipulate the use the **right** fertilizer, using the **right** rate at the **right** time and **right** placement, to increase production and this can be achieved by soil sampling and analysis so as to get correct lime and fertilizer recommendations. Recommendations are important to the grower because the grower uses the correct amount of fertilizer thus, reducing cost of purchasing excess fertilizer and also the grower use the correct recommended fertilizer required for a specific crop.

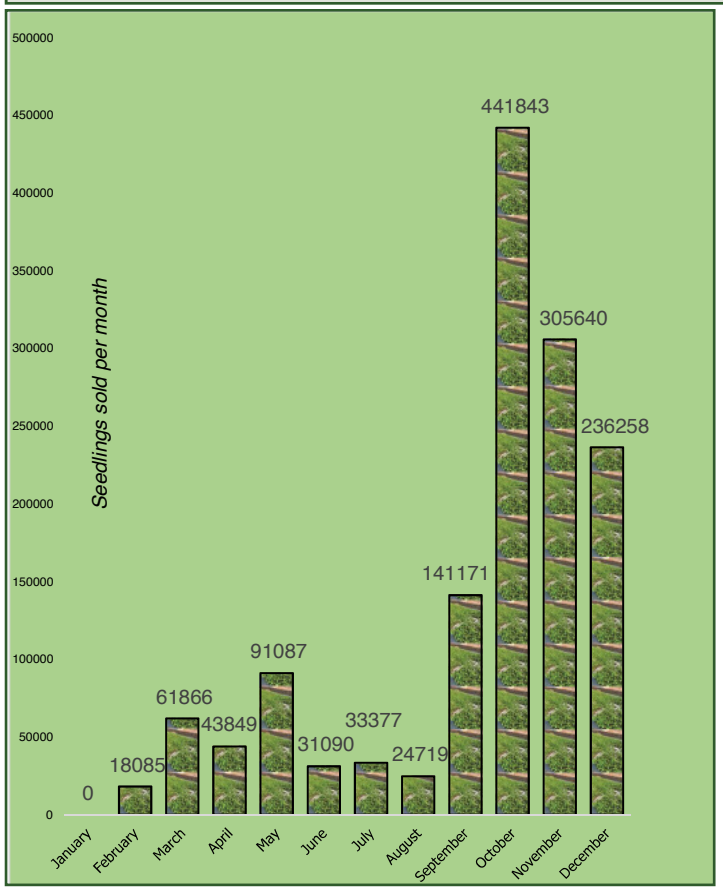
In the period under review, a total of 534 lime and fertilizer recommendations against a target of 1 500 were done (Table 2). Of the 534 recommendations processed 241 were for tobacco whilst 293 were for non-tobacco crops such as tomatoes, pepper, maize, soybeans, potato. The achieved 35.6% of target is a 30%

decrease from the same period in the previous year. This may be attributed to the general low submission of soil samples by farmers. In 2024, it is recommended to raise awareness to farmers through advertisements and articles.

Table 2: Lime and fertilizer recommendations

Year	Cumulative Jan-June	Target	Target %
2022	763	1 500	50.8
2023	534	1500	35.6

Figure 3: Tobacco and Non-tobacco lime and fertilizer recommendations done in 2023



HORTICULTURE SEEDLING PRODUCTION PROJECT

In order to achieve the NDS1 vision of being an upper-middle-income economy by 2030, Kutsaga has vastly contributed to the Horticulture Recovery and Growth Plan by supplying a total of 1 429 985 different vegetable seedlings to farmers all over Zimbabwe. In the year under review the main vegetable seedlings produced include tomato, cabbages, cherry peppers, rape and onions. Pawpaw's have also been added to this range and some 14 500 seedlings were supplied to a client. New crops propagated during the year also include Siratro (legume) *(Macroptilium atropurpureum)* and Arborvitae *(Thuja occidentalis).* Seedling demand increased during the period under review due to aggressive marketing carried out during the season

Figure 4: Horticulture seedlings produced in 2023

Molecular Technology

MISSION

The Molecular Technologies section seeks to leverage cutting-edge molecular biology techniques for Genetic Analysis, Precision testing, and innovative Solutions in agriculture and Biotechnology. The aim is to contribute to the global scientific community by conducting research, internationally accredited testing services, and developing molecular tools that empower stakeholders in the agricultural industry.

GOALS

Testing and Quality Assurance: provide accurate and reliable GMO testing viral indexing. DNA sequencing and DNA fingerprinting, services to ensure product safety, quality and compliance with regulatory standards.

Research Excellence: Conduct high-impact research to deepen our understanding of molecular biology and its applications in agriculture and biotechnology.

Innovation and Development: Foster innovation by developing novel molecular tools, technologies, and methodologies that address industry challenges and drive sustainable solutions.

Collaboration and partnerships: Foster collaborations and partnerships with industry stakeholder, academic institutions, and research organizations to foster knowledge exchange, leverage expertise, and accelerate scientific advancement.

Education and Outreach: Contribute to the dissemination of scientific knowledge by organizing training programs and educational initiatives to enhance understanding and promote best practices in molecular biology.

OBJECTIVES

Conduct groundbreaking research projects that address key scientific questions and contribute to advancements in agriculture and biotechnology.

Develop and optimize molecular tools and techniques for efficient GMO testing, viral indexing, DNA fingerprinting, biopharming, and molecular marker development

Deliver timely and accurate testing services to clients, ensuring compliance with regulatory requirements and industry standards.

ROLE IN THE PARENT ORGANISATION

To address the mandate of the organization of establishing, enhancing and harness technologies for industrial application, inclusive of biopharming.

To support the plant breeding division in developing and optimizing molecular tools, such as DNA fingerprinting or marker-assisted selection, to assist in the breeding of improved tobacco varieties.

To support the Plant pathology division in proving molecular diagnostic services and expertise to identify and monitor disease outbreaks helping to mitigate their impact on tobacco crop.

Meet The Team

The section comprises of 3 molecular Biologists and one technical officer.

Key Activities in the year

Commercial Services

The section performs screening of genetic modification (GM) in all plants, seed, feed, grain and all plant derived material. The service is key in supporting regulations in import and consumption of GM food in the nations. The samples received in 2023 were almost at par with those received in 2022 (201). Continuous marketing and service improvement is key to the success in the following year. A drop in the number of samples in viral indexing was however experienced and this may have been due to low numbers in samples for PVY incidences which we had in the previous seasons.

Table 1: Commercial service carried in the section with the output achieved in 2023.

Service	Context	Progress in 2023
GMO Testing	The service is driven by the nations non-tolerance to GM food. GMO testing service is not limited to tobacco only, but also to any plant food, feed, seed and plant derived material destined for import or export. The method is ISO 17025;2017 accredited which guarantees internationally accepted results.	193 Samples analysed [3 tested positive for GM]. (97 % achievement)
Plant Viral Indexing	Molecular biology-based techniques offer early detection of viral infection infections well before the symptoms emerge phenotypically providing farmers quicker responses that can save their crops from total destruction.	58 Samples analysed (29% achievement)

**GMO- Genetically Modified Organism*

Quality Management System

The section adheres to the strict procedures of ISO 17025:2017, a specific standard that focuses on the competence and quality management system (QMS) requirements for testing and calibration laboratories. QMS is a set of policies, processes, and procedures implemented by an organization to ensure that its products or services consistently meet or exceed customer requirements and expectations.

Table 2: Quality Management System Activities carried in 2023.

Activity	Description	2023 Progress
Proficiency testing	The laboratory participates in external assessments to evaluate its performance in conducting specific tests. The Service is provided by USDA/ GIPSA	April – 100% October – 75%
Standard Operating Procedure (SOP) review	Procedure of maintaining a robust QMS and ensuring operational efficiency.	Procedure for 2023 done, all the SOPs were reviewed.

Activity	Description	2023 Progress
Internal Audit	A systematic and independent examination process conducted within the section to assess the effectiveness of its internal controls	Done and three observations were noted that need corrective actions.
External Audit	Is an examination of the section`s related records conducted by an independent external auditor.	Not done, Scheduled for 2024
Equipment calibration	The process of comparing the measurements or outputs of a piece of equipment or instrument to a known reference or standard to ensure its accuracy and reliability.	All equipment was calibrated and is within the stipulated operational ranges.

MOLECULAR TECHNOLOGIES

2023

RESEARCH THRUST

1 BIOPHARMING

The production of pharmaceuticals, therapeutic proteins, and other valuable compounds using genetically modified plants or animals as bioreactors.

2 VARIETY IMPROVEMENT

The process of developing new or improved varieties of plants with desirable traits and characteristics. Variety Improvement can be done via convectional plant breeding or utilising New Breeding techniques.

3 MARKER DEVELOPMENT

Molecular markers are tools used to identify and track specific regions of DNA within an organism's genome. involves the identification, characterization, and utilization of these markers to understand genetic variation.

In the period under review, the research was hinged on the three clusters namely; Biopharming research, Tobacco variety improvement and Molecular Marker Development. The clusters are described below:

1. BIOPHARMING RESEARCH

Under the auspices of the National Development Strategy, the Tobacco Research Board, Kutsaga was mandated, among other things, to establish, enhance and harness technologies for industrial applications, inclusive of biopharming. Three biopharming projects were planned to be undertaken in the period under review. The projects were:

1.1 Production of a Bacillus Calmete-Guerin (BCG) virus-like protein (VLP) in tobacco.

Tuberculosis (TB) remains one of the most economically and socially important disease in Zimbabwe. Tuberculosis is highly infectious and is caused by *Mycobacterium tuberculosis* a bacterium in the Mycobacteriaceae family. The World Health Organization reports that an estimated 28,000 individuals become ill with TB and close to 4,000 die everyday and in Zimbabwe, 90% of recorded cases are coinfections with Human Immunodeficiency Virus infections. In 2019 alone, close to 29,000 people fell ill to TB and an estimated 6,900 died of the disease. Although through government's efforts TB treatment has been made free, 80% of those ill with TB cannot, however, access treatment and care owing to transport costs and healthy food. In addition, a number of individuals succumb to the disease owing to multidrug resistant TB cases. Case detection rates and other TRB-related data can be found on the Zimbabwe's Dashboard at hub.tbdiah.org/dashboards/countries/Zimbabwe.

Since TB is a potentially fatal disease, a vaccine has been developed to protect individuals against it. The Bacillus Calmette-Guérin (BCG) vaccine has been dependably used to protect against TB and is administered mainly to babies and young children who are higher risks of TB contraction. In a bid to improve availability and access of this life-saving vaccine, research into production of a concept BCG vaccine was conducted during the year. This protein-based vaccine was constructed from one of *M. tuberculosis* Antigen 85 fibronectin binding proteins called *fbpA*. The gene was introgressed into a plant expression vector and this was used to transform N. tabacum through *Agrobacterium*-mediated transfer.

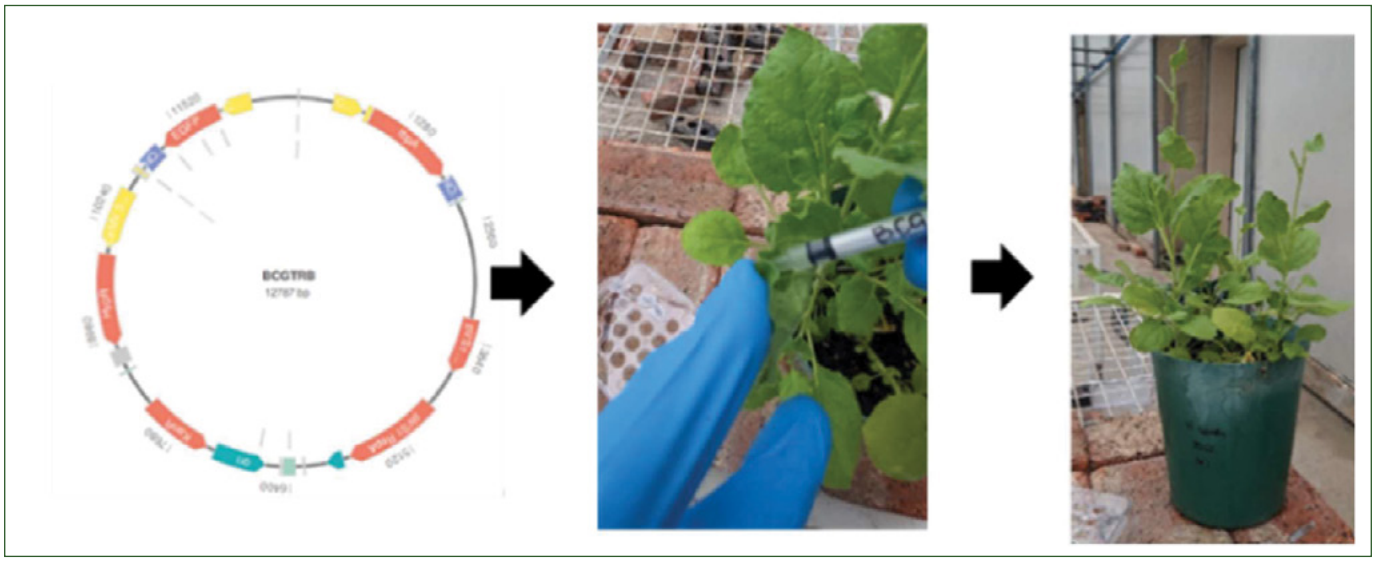


Figure 1. A generalized depiction of the production of biologics in tobacco. The construct was designed (left), then introduced into Agrobacterium before introducing into N. tabacum (middle and right).

1.2 Production of FMD virus-like protein (VLP) based vaccine in tobacco.

Foot and mouth disease (FMD) is a highly infectious viral disease of both wild and domestic ungulates. FMD is a viral panzootic disease caused by the foot-and-mouth disease virus in the Piconoviridae family. The virus has different serotypes, including serotype O, A, C, SAT-1, SAT-2, SAT-3 and Asia-1. It is usually characterized by a fever, and formation of blisters in the mouth, teats and feet of the infected animal leading to hunger, lameness and eventually death of the animal. In Zimbabwe, FMD is endemic and since 1931, disease outbreaks have been recurring in the country. This has meant that farmers have lost the ability to export beef to lucrative markets such as the EU and the battle against the disease has been severely frustrating and financially burdening.

Control of FMD requires restriction of movement, mandatory zoning, quarantine of infected animals and vaccination of exposed animals. Conventional FMD vaccines have used some form of inactivation of the virus and modern vaccine production incorporates use of peptide vaccines. This project aimed at producing a viral protein-based vaccine economically in tobacco and was accomplished by constructing an expression vector of the virus' major capsid protein (VP1). After introgression, the construct was used to transform tobacco plants (as depicted in Fig 1). The project is ongoing, and the growth of transformed plants is currently being monitored.

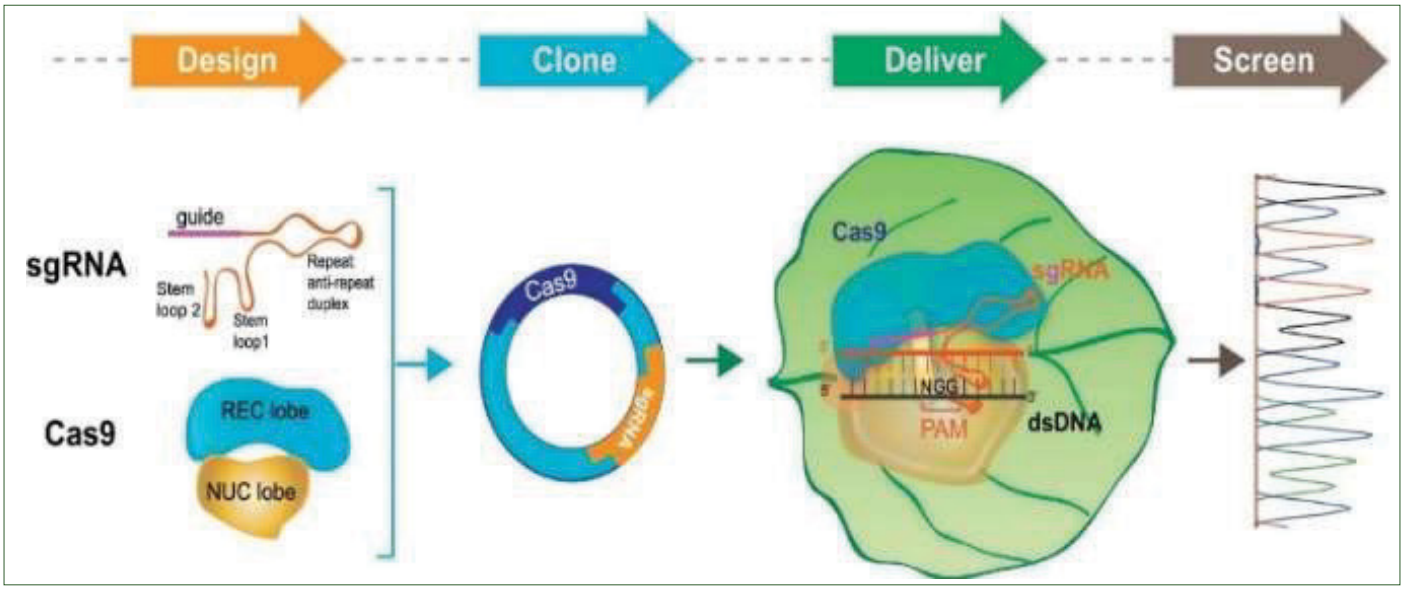
1.3 Biopharming of insulin in tobacco

In Zimbabwe, the overall diabetes prevalence before 1980 was 0.44% and after 1980, the prevalence rose to 5.7% (Mutowo et al, 2015). In 2018 alone, the Ministry of Health reported that around 137,000 people were recorded to have diabetes. This shows that the prevalence of diabetes has steadily increased over the past three decades with a global estimation of 10 in every 100 people suffering from diabetes as of December 2022. In 2021, in Zimbabwe, the total diabetes-related expenditure was USD84.6 million and is projected to rise to USD104.6 million by 2030. Diabetes control demands an individual to be restricted to certain diets and in hyperglycaemic conditions, an individual need to inject themselves with insulin. Recombinant insulin has been in production throughout the world since 1978 and this protein has been produced in bacteria yeast and plant platforms. In this project, the aim was to produce and isolate insulin in tobacco using the procedure depicted in Fig 1. The project is ongoing, and the growth of transformed plants is currently being monitored (Fig 2)

Figure 2. Growth of the transformed plants in the greenhouse under controlled conditions.

2. VARIETY IMPROVEMENT

2.1 Eukaryotic translation factor (eIF4) targeted sequence analysis of PVY tolerant Kutsaga accession to determine nucleotide responsible for PVY resistance and CRISPR/Cas9 mutagenesis of a Kutsaga line for PVY resistance.



(Belhaj et al., 2015)

Tobacco variety improvement has been done utilizing CRIPSPR-Cas 9 technology. CRISPR (Clustered Regularly Interspaced Short Palindromic Repeats) is a revolutionary gene-editing technology that has transformed the field of plant genetics and biotechnology. It allows scientists to make precise changes to the DNA of plants by targeting specific genes, enabling the development of improved crop varieties with desirable traits.

In this on-going study we aimed at utilizing CRISPR-Cas9 technology to induce *PVY* tolerance by targeting the eIF4 gene. In the previous year we managed to induce a single base pair deletion mutation on the ONC tobacco variety. We further performed pathogenicity studies on the ONC wild-type and the mutated ones. T0 seeds of the transformed ONC and the wild-type were sown in the greenhouse and after 60 days of planting, *PVY* was mechanically inoculated on the plants. *PVY* infestation assessments were done 2 and 4 weeks after inoculation.

Growth patterns in this initial study were not empirically measured but observations of the growth pattern showed that the ONC transformed plants had a slow growth compared to the wild-type (Fig 3). The observed phenotypic change could be due to the effects of the deletion that we observed in our previous studies. Further analysis, including whole genome sequencing could be employed in order to understand the genetic implications of the eIf4 deletion

Figure 3. Pathogenicity studies comparing the growth pattern and PVY infestation between A. ONC wild-type and B. ONC transformed after weeks on inoculation.

PVY disease infestation were noted assessing the necrotic, mosaic and clean plants (with no *PVY* symptoms) (Fig 4). At four weeks after inoculation ONC wild-type contained all the plants with mosaic *PVY* symptoms with no clean plants, while 40% of the transformed ONC plants were clean plants and 60% showed mosaic symptoms. Pathogenicity studies are still being carried out on different seedlings under screen protected cages so as to ensure no further *PVY* inoculation from other vectors.

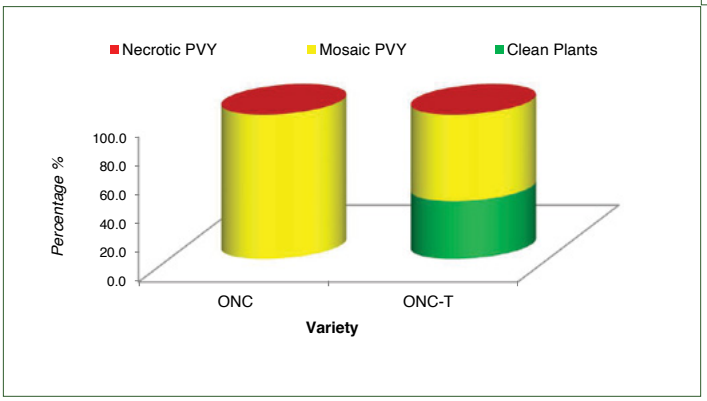


Fig 4. PVY disease infestation studies on ONC wild-type and ONC-T (transformed) at four weeks after inoculation.

2.2 CRISPR-Cas9 gene mutagenesis of Kutsaga parental lines for the production of a drought resistant tobacco lines.

Climate change has exacerbated the need for drought proof tobacco plants. In this on-going project we aimed at utilizing CRISPR-Cas9 to independent induce a mutation on two genes responsible for conferring drought tolerance; DREB and WRKY transcription factor. These genes have been shown to induce drought tolerance in plants according to previous studies. The project aimed at inducing the mutation on a Kutsaga parental line which will be subsequently used in Plant breeding upon relevant approvals.

Two gRNA`s were designed and synthesized, thereafter, were cloned into a binary plasmid (Fig 5). The plasmids were transformed into chemically competent E.coli cells and selected using antimicrobial resistance genes. Colony PCR was performed in order to ascertain correct integration of the gRNA into the vector.

Figure 5. gRNA integration into the binary vector containing the promoter (T7) and the gRNA scaffold.

Thereafter the gRNA component was transferred into the Cas9 containing vector (Fig 6) and transformed into *Agrobacterium tumefaciens.*

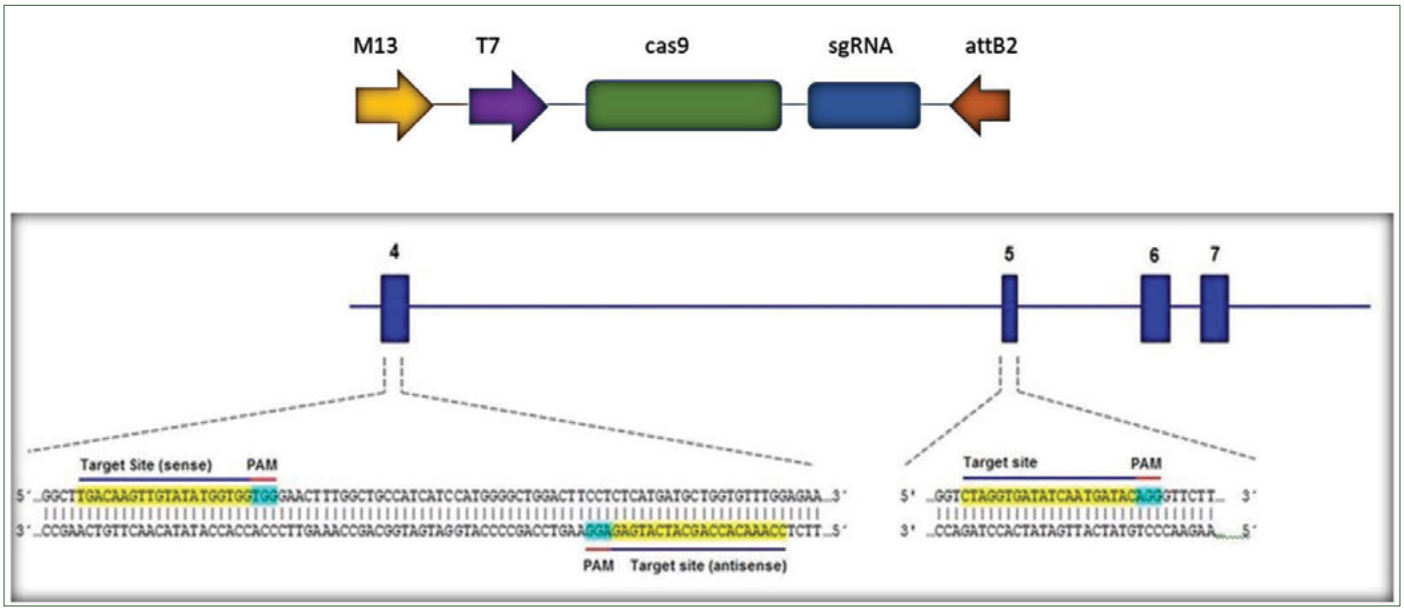


Figure 6. gRNA integration into the binary vector containing the promoter (T7) and the gRNA scaffold.

Tissue culture trials of the transformed plants is currently underway. Upon propagation of the plants, screening will be done in order to identify the transformed plants and the nature of the mutation.

3. MOLECULAR MARKER DEVELOPMENT

3.1 Genetic Diversity of Potato Lines and Varieties Using SSR Markers

Potatoes (Solanum tuberosum) are an important food source globally and in Zimbabwe. Increasing local seed potato production and yield has a tremendous impact in regards to providing import substitution with about 55% of seed potato being used by Zimbabwean potato growers coming from South Africa while 36% and 9% are from the local informal and formal markets, respectively. Also, out of the 35 000-ha set aside as a national target each year for potato production, only about 12 500 ha representing 36% land use have been under potato production in each given year due to seed shortages prior 2018. Additionally, a 2018 estimate placed potato production in the local market at 50% capacity (https://www.herald.co.zw/demand-for-potatoes-goes-up/, accessed 08 May 2018). Catapulting Zimbabwe into a self-sufficiency situation for seed, table and processing potatoes is critical and requires increased seed potato production and development of better potato genetics.

Development of higher yielding potato genetics requires proper identification of germplasm and determination of the genetic relationships for commercial applications and breeding. This has become increasingly important due to phenotypic plasticity encountered by the effect of the environment on the genotype. Thus, this study sought to elucidate the genetic relationships amongst 35 Kutsaga potato germplasm comprising lines and commercial varieties to establish an authoritative genetic reference point using 32 simple sequence repeat (SSR) markers as shown in Table 1.

Table 1: Simple sequence repeat primers used to amplify sections of DNA of 32 Kutsaga potato lines and commercial varieties using PCR

Primer Code	Sequence 5′ – 3′
UBC 811	GAGAGAGAGAGAGAGAC
UBC 812	GAGAGAGAGAGAGAGAA
UBC 813	CTCTCTCTCTCTCTCTT
UBC 814	CTCTCTCTCTCTCTCTA
UBC 815	CTCTCTCTCTCTCTCTG
UBC 816	CACACACACACACACAT
UBC 817	CACACACACACACACAA
UBC 823	TCTCTCTCTCTCTCTCC
UBC 824	TCTCTCTCTCTCTCTCG
UBC 825	ACACACACACACACACT
UBC 826	ACACACACACACACACC
UBC 873	GACAGACAGACAGACA
URP1F	ATCCAAGGTCCGAGACAACC
URP2F	GTGTGCGATCAGTTGCTGGG
URP2R	CCCAGCAACTGATCGCACAC
URP4R	AGGACTCGATAACAGGCTCC
URP6R	GGCAAGCTGGTGGGAGGTAC
URP9F	ATGTGTGCGATCAGTTGCTG
URP13R	TACATCGCAAGTGACACAGG
URP17R	AATGTGGGCAAGCTGGTGGT
URP25F	GATGTGTTCTTGGAGCCTGT
URP30F	GGACAAGAAGAGGATGTGGA
URP32F	TACACGTCTCGATCTACAGG
URP38F	AAGAGGCATTCTACCACCAC
ISSR 1	CACACACACACACACAG
ISSR 6	GTGTGTGTGTGTCC
ISSR 8	GACACGACACGACACGACAC
ISSR 10	GAGAGAGAGAGAGAGACG
ISSR 15	ACGACACACACACACAC
ISSR 18	AGAGAGAGAGAGAGAG
ISSR 19	GAGCAACAACAACAACAA
ISSR 20	AGAGAGAGAGAGAGAGGC

The UBC markers exhibited the highest level of polymorphic bands (see Fig. 7), while the URP and ISSR markers had lower polymorphic bands. The UBC 824 marker enabled distinguishing the popular Diamond and Hermes potato varieties from the rest of the potato lines and varieties based on the banding pattern exhibited (see Fig. 1). UBC 824 is recommended for use as a variety proving marker to identify Diamond and Hermes from the rest of the potato lines and varieties. A combination of URP13R and URP9F revealed a distinct banding pattern (see Fig. 8) for variety Jasper and is recommended for hybrid proving of Jasper from the rest of the potato lines and varieties.

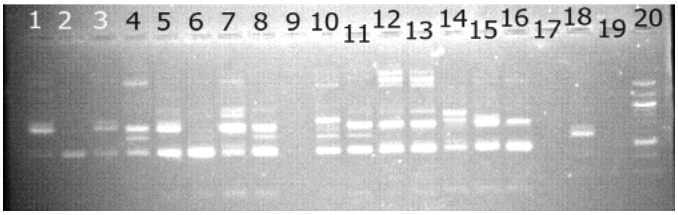


Figure 7. DNA banding profile using UBC 824 exhibiting the distinct banding pattern for Diamond (Lane 12) and Hermes (Lane 13) in comparison to the rest of the potato lines and varieties (CIP lines in Lanes 1 to 11; Jasper in Lane 14; Garnet in Lane 15; BP1 in Lane 16; Makey in Lane 17; PCR positive control in Lane 18; PCR negative control in Lane 19 and 100 bp DNA Ladder in Lane 20).

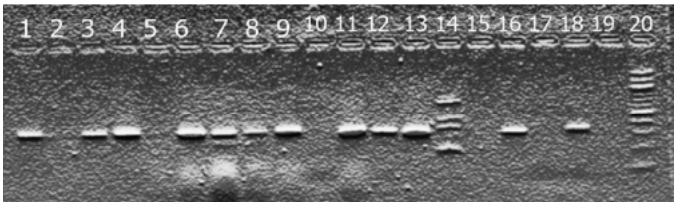


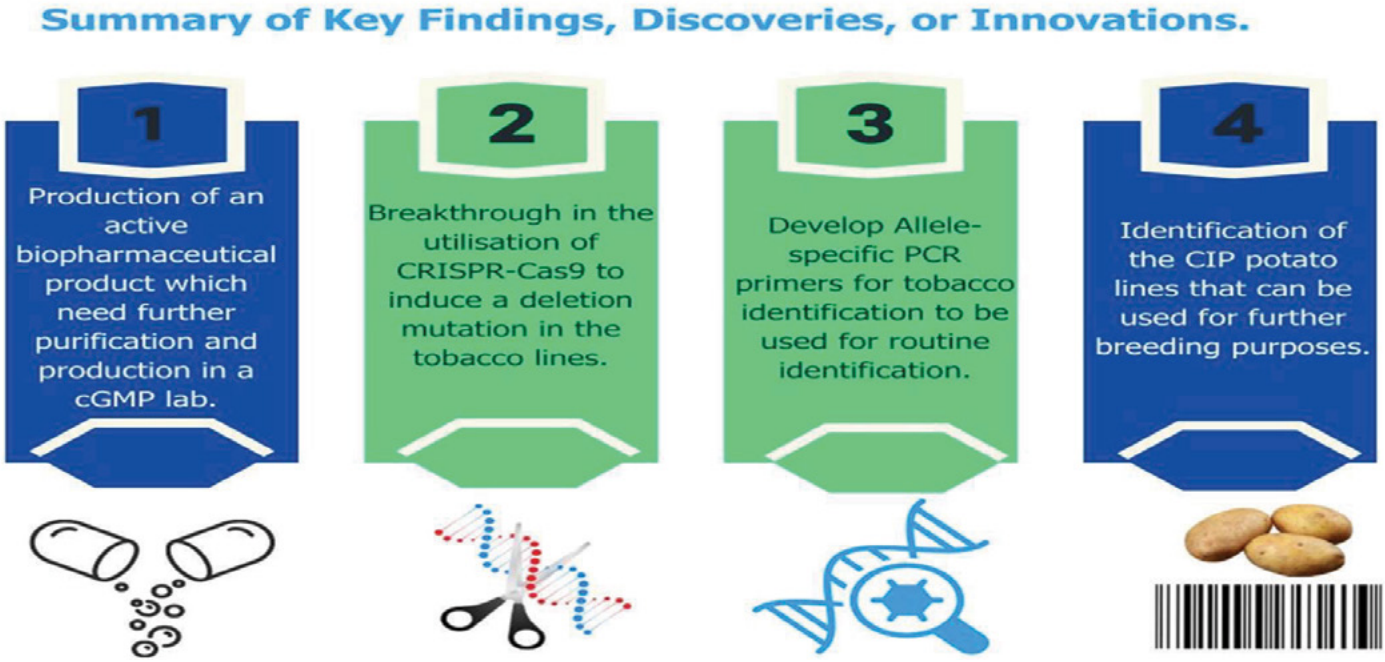
Fig 8. DNA banding profile using URP13R and URP9F exhibiting the distinct banding pattern for variety Jasper (Lane 14) which can be used for hybrid proving. CIP lines are in Lanes 1 to 11; Garnet in Lane 15; BP1 in Lane 16; Makey in Lane 17; PCR positive control in Lane 18; PCR negative control in Lane 19 and 100 bp DNA Ladder in Lane 20). Analysis software was used for better visualisation of the bands.

A phylogenetic tree (Fig. 3) generated using all the polymorphic banding information from the 32 SSR markers (Table 1) revealed 3 major clusters. Cluster 1 included CIP lines, Makey and Garnet; Cluster 2 included only CIP lines, while Cluster 3 included the bulk of the varieties (Diamond, Hermes, BP1 and Jasper) and CIP lines 23, 21, 25, 27 and 24 (Fig. 3). The study showed that Diamond and Hermes are closely related which is the norm with commercial germplasm. It is recommended to use CIP lines 23, 21, 25, 27 and 24 in potato breeding programs if determined to have the desired traits for the respective crop improvement objectives as they will require less backcross cycles to attain commercially viable traits.

3.2 Routine Identification of Commonly Grown Tobacco Varieties in Zimbabwe Using DNA Barcoding and Phylogenetic Analysis.

Tobacco (*Nicotiana tabacum)* is an economically important cash crop that is widely grown in Zimbabwe using varieties developed by the Tobacco Research Board (TRB). Leaf from the Zimbabwean tobacco cultivars is well known for its flavour and quality and is widely used in tobacco brands the world over. These varieties are also grown in the region and beyond and thus it is necessary to develop robust identification methods. The main objective of the study was to provide an efficient method for variety identification and differentiation for the most commonly grown TRB developed varieties of tobacco using the internal transcribed spacer (ITS) region. This work would be preceded by the design of suitable primers for efficient utilization in the laboratory.

Thirteen tobacco varieties were used in the study, and deoxyribonucleic acid (DNA) sequencing, phylogenetic and single nucleotide (SNP) analysis were carried out to differentiate the varieties. Results showed that the traditionally universal rice primers (URP) could not distinguish some of the varieties efficiently. The dendogram analysis of sequencing data indicated that ITS analysis was sufficient to distinguish even the near isogeneic lines. Additionally, SNP analysis revealed the polymorphisms among the varieties, and allele specific primers were designed from the SNP analysis data. Compared to DNA sequencing, allele specific primers present a reliable, efficient and inexpensive way of DNA analysis in a laboratory, thus making them useful for future tobacco variety analysis in dispute resolution cases.



Plant Tissue Section

MISSION

The Plant Tissue Culture section focuses on Research and Production for Revenue generation for the Board. Products and Services on offer are Protocol development for a wide range of plant species to meet client demands, micropropagation services for internal product development to commercial horticulture production.

Goals

To offer plant tissue culture and micropropagation services for the production of pathogen free planting material, G0 minituber production and Sweet Potato seedlings

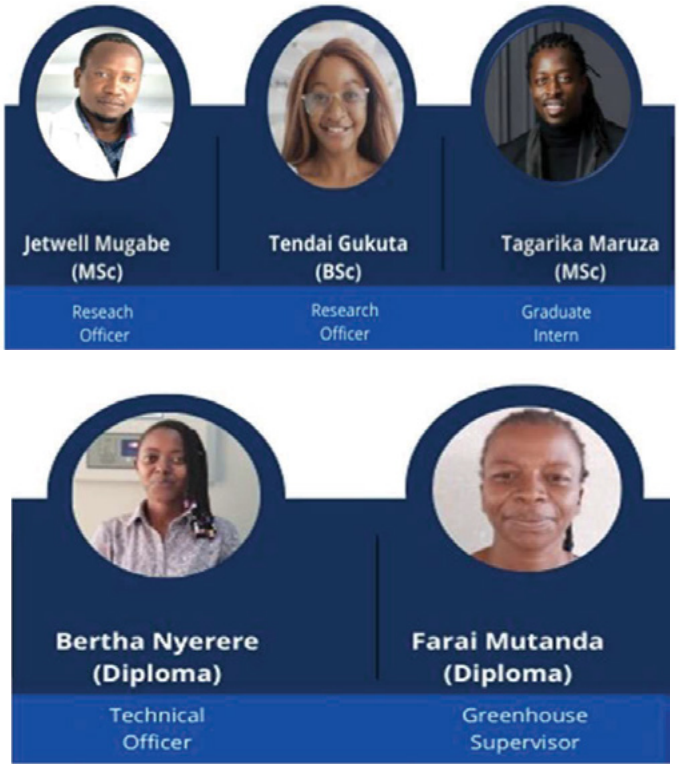
To carry out research and optimization of tissue culture protocols for selected crop species.

OBJECTIVES

To use innovative technology to efficiently produce and manipulate plant material for commercial, scientific and conservation applications.

1. To be the largest producer of virus free planting material in the country and beyond.
2. To be able to propagate any plant material in-vitro through protocol development
3. To preserve genetic material in vitro for future use and breeding purposes

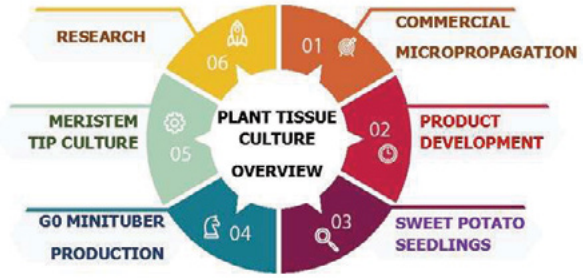
Meet the team



INTRODUCTION

Plant tissue culture is a cutting-edge technique that involves the sterile cultivation of plant cells, tissues, or organs on nutrient-rich media. By providing the necessary nutrients, vitamins, and growth factors, and controlling environmental conditions such as light intensity, temperature, and humidity, tissue culture offers numerous advantages in agriculture and production.

One of the **key benefits** of plant tissue culture is its ability to rapidly multiply plants clonally. This allows for efficient and quick propagation of desirable plant varieties. Additionally, tissue culture enables the selection of disease-free meristematic tissue, contributing to disease elimination and healthier plant production.



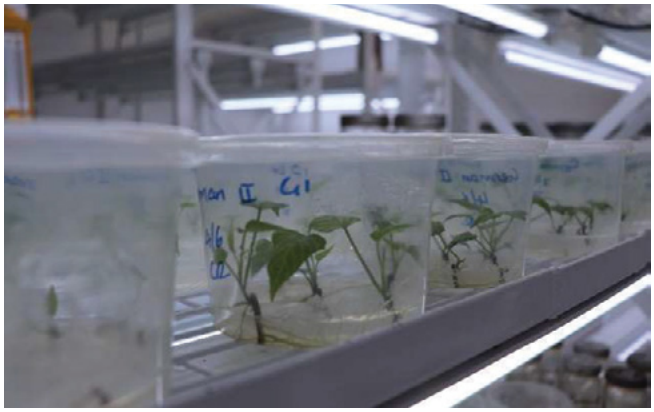


Figure 2. Tissue culture plantlets in the growth room

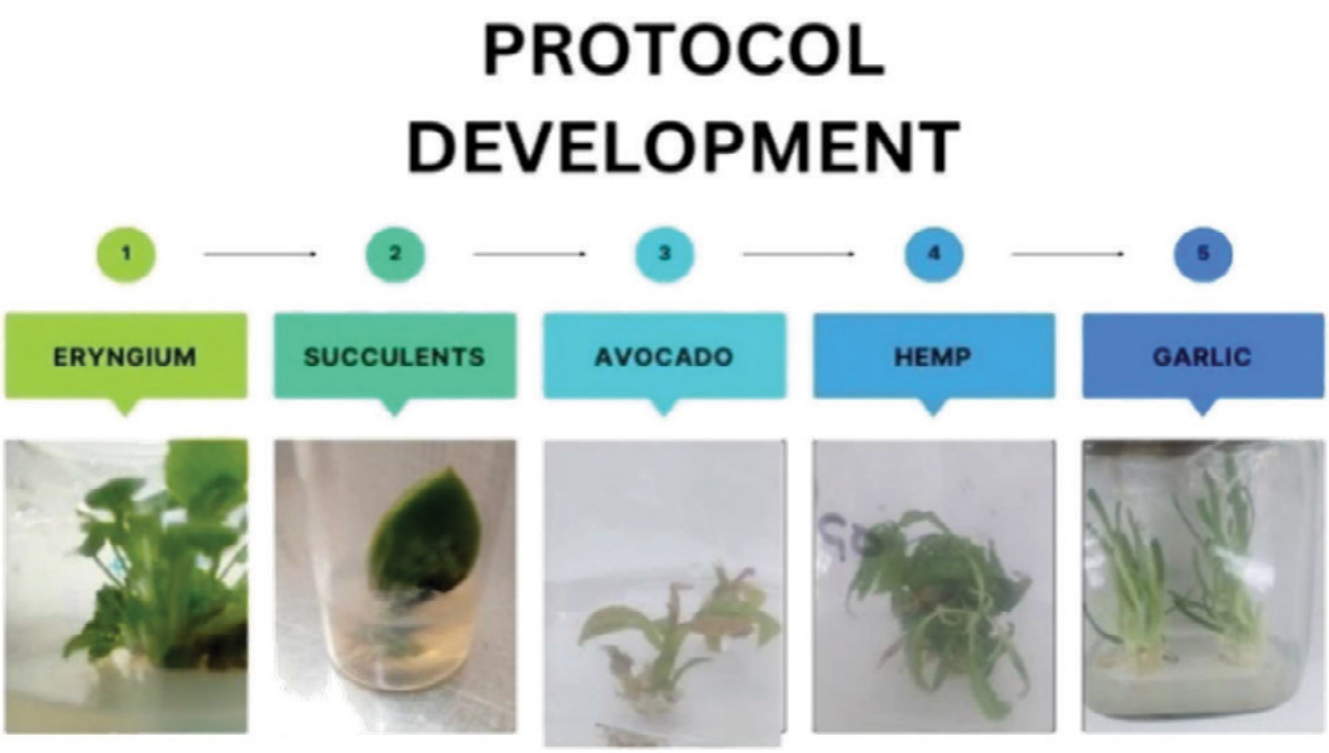
Horticultural crops are the most widely used application of plant tissue culture techniques. The technique enables the production of large numbers of disease-free, genetically identical plants. It also allows for the creation of hybrids between incompatible plants via embryo rescue, somatic hybridization, or embryo culture.

RESEARCH

The Zimbabwean landscape of crop agriculture has expanded with ventures like black berry cultivation and potentially resurgence of floriculture. These ventures, along with other forms of agriculture, depend on disease-free and true-to-type planting material for guaranteed success. Tissue culture protocol development involves identifying commercially viable plants that can be micro-propagated in vitro to produce virus-free cone plantlets. The selected material undergoes initiation, transitioning it from field/greenhouse to aseptic laboratory conditions, followed by rapid in vitro multiplication. Organogenesis facilitates the development of essential plant organs, allowing the acclimatization of plantlets from the lab to greenhouse conditions, and ultimately to field-like conditions. Identification of crops for protocol development occurs through three main routes: walk-in clients with specific crops of interest, agricultural trends and forecasting, and serendipitous discovery.

PROTOCOL DEVELOPMENT

The research in plant tissue culture centres around cultivating client-specific plant materials using micropropagation techniques. The laboratory receives diverse plant specimens such as hemp, succulents, ginger, eryngium, avocados and garlic.



Commercial Production Overview

LABORATORY AND GREENHOUSE PRODUCTION

The laboratory's primary objective revolves around the commercial micropropagation of Irish potatoes and sweet potatoes. Following the successful completion of the micropropagation process within the lab, the plant material undergoes a crucial transfer to the greenhouse for subsequent production. This strategic move is undertaken to fulfill the specific requirements of clients who seek a steady and dependable supply of these crops.

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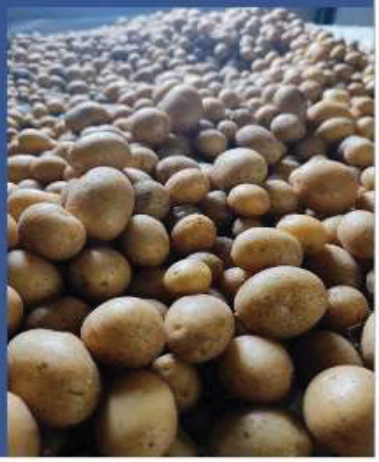

Introduction

Kutsaga, in support of National Development Strategy 1 (NDS1) and the Horticultural Growth Recovery Plan, carries out G0 Irish potato mini-tuber production and sweet potato seedling production through the process of plant tissue culture technology. This helps in reducing the import bill as well as promoting food and nutritional security for the nation. Plant tissue culture has emerged as an effective tool in modern agriculture, with numerous applications including the production of disease-free plants. The main limitation to yield potential is disease infestation and plant tissue culture offers a solution through meristem tip culture.

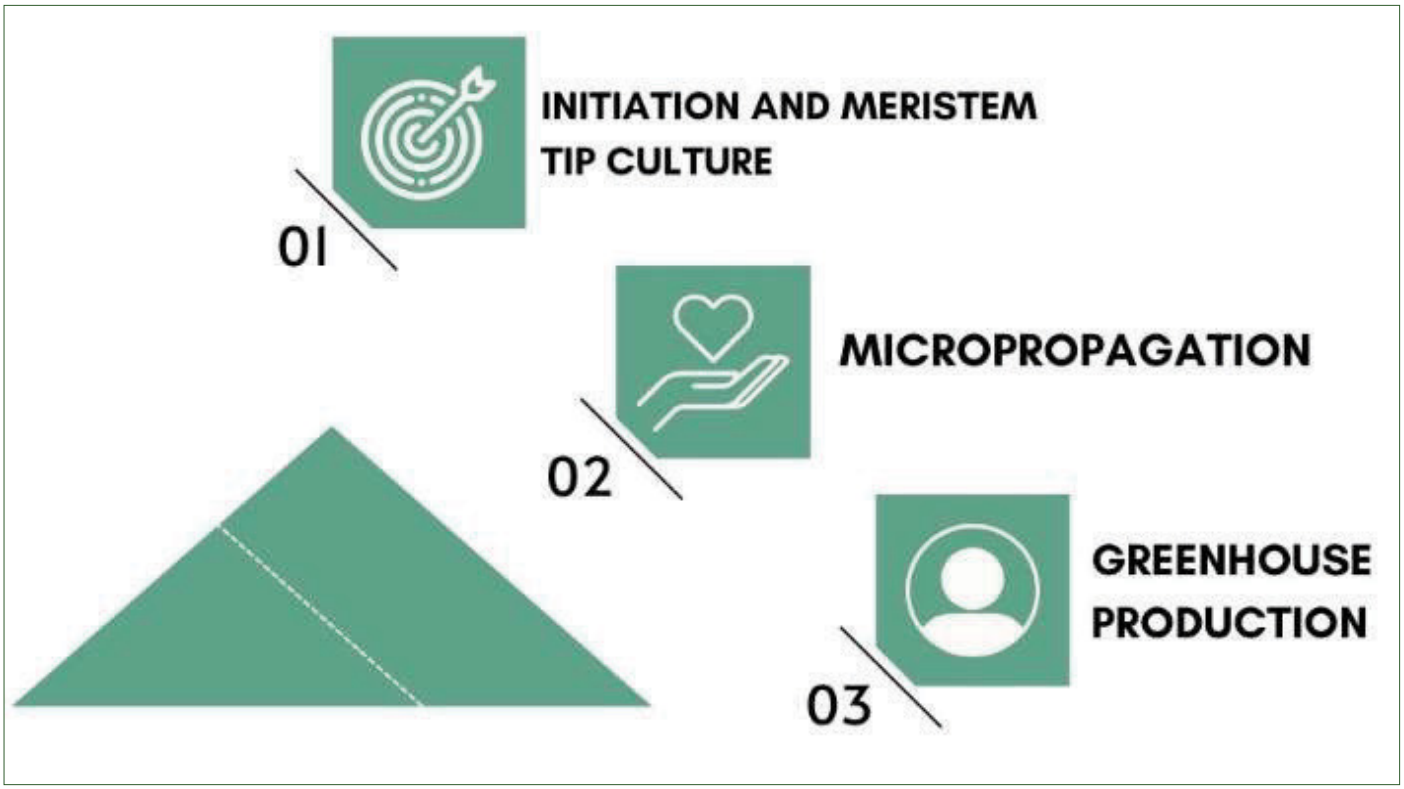

Figure 4. Plant Tissue Culture Process Summarized

1. Irish Potato G0 Mini-Tuber Production

Kutsaga currently produces 2 varieties of G0 mini-tubers and these are Hermes and Diamond. Hermes is a variety that is mainly grown for processing, has a yellowish flesh and has a yield potential of up to 60 tonnes per hectare. Diamond is a variety with a white flesh, mainly grown as a table potato and has a yield potential of up to 60 tonnes per hectare. However, to expand the varieties that are available to growers considering that Irish potato was declared a strategic crop in 2012, Kutsaga is undertaking research and development of 28 potato lines from CIP, Peru for future breeding efforts. Micropropagation work is carried out in the state-of-the art plant tissue culture facility with a capacity of 1 million plantlets at one go. In the year under review, some 1,009,474 mini-tubers were produced against a target of 600,000. This represents a 168% achievement.

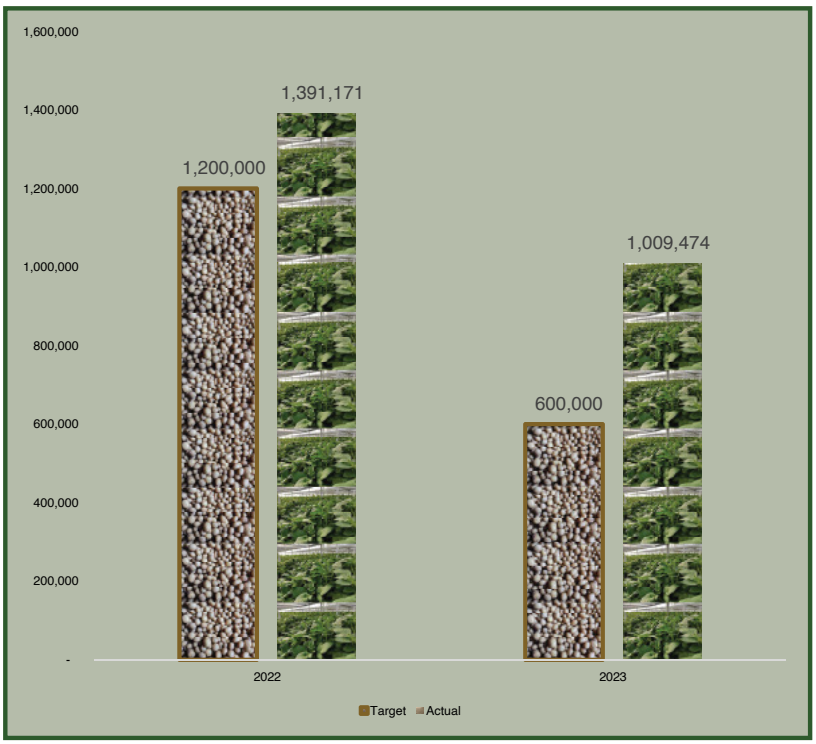

Figure 5. Number of mini-tubers produced for the year 2022 and 2023

The G0 mini-tubers undergo a rigorous process of Grading, counting, treatment and packaging as well as sprouting before being dispatched to the Kutsaga Seed potato out-growers scheme for further multiplication till G4 which is then sold to growers for table potato production.

2. SWEET POTATO

Kutsaga, in support of the Presidential Rural Development Program and the Ministry of Lands, Agriculture, Fisheries, Water, and Rural Development's mantra of 'Food security, everywhere, everyday….' is producing sweet potato seedlings for distribution to all provinces of Zimbabwe. The Presidential Rural Development Program aims to improve nutrition at the household level, and thousands of local farmers have benefited from the technology after receiving elite sweet potato seedlings from the laboratory. The implementation of this program has not only improved food security at the household level for the villagers but has also enabled them to generate income by selling sweet potatoes in both domestic and international markets. Fig 6 shows some sweet potato seedlings being harvested for dispatch to various provinces for the Presidential Rural Development Program and Fig 7 shows the distribution of the sweet potatoes by province. In 2023, some 1,145,484 sweet potato seedlings were produced against a target of 1,000,000 seedlings, indicating a significant success in achieving the goals of food security. (Fig 8)

Figure 6. Sweet potato seedlings being harvested for dispatch to various provinces

The sweet potato varieties produced and distributed by Kutsaga range from those with white flesh (German II and Chingovha) (Fig 9) to those with orange flesh (Alisha, Delvia and Beauregard). Of particular importance are the orange-fleshed sweet potato varieties that are biofortified with beta-carotene which is a precursor for vitamin C, making them highly nutritious. Other essential nutrients found in biofortified sweet potatoes include niacin, copper, pantothenic acid, potassium, fiber, fat, proteins, and carbohydrates.

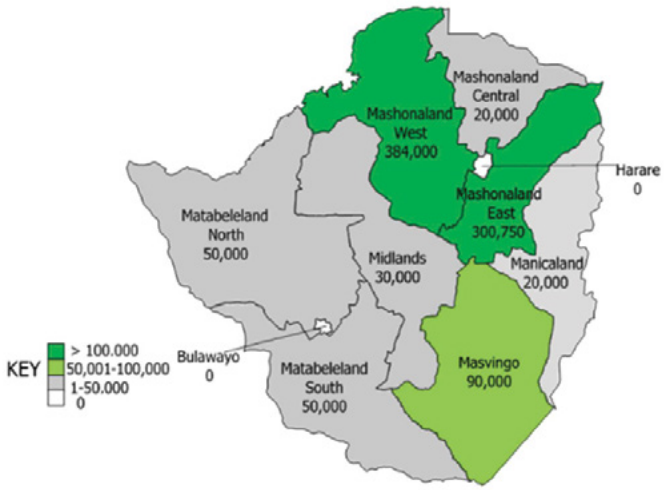

Figure 7. The number of sweet potato seedlings produced and their distribution among provinces for the Presidential Rural Rural Development Program

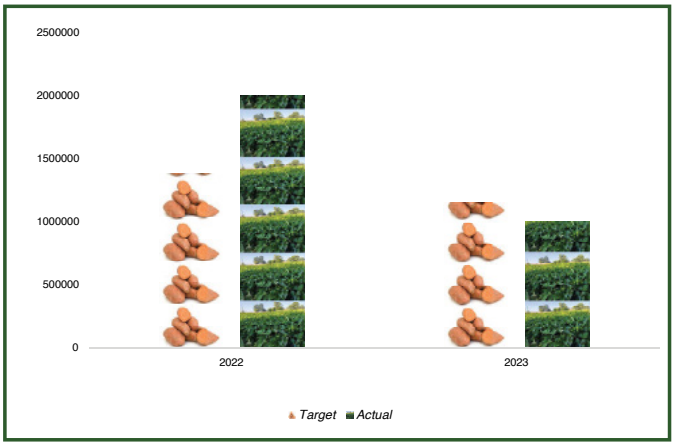

Figure 8. The number of sweet potato seedlings produced in 2022 and 2023 against targets. Since inception of the program in 2021, some 2,654,205 sweet potato seedlings have been distributed to various provinces.

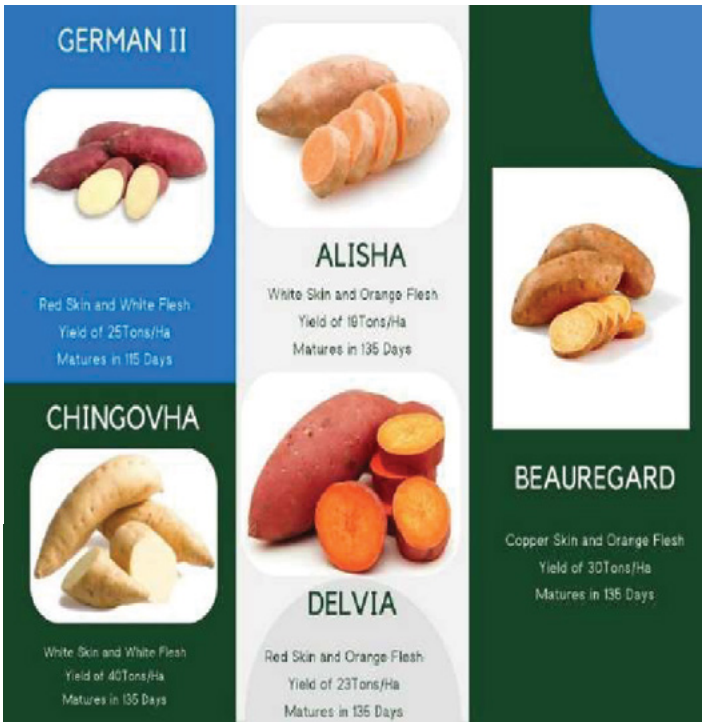

Figure 9. Sweet potato varieties available at Kutsaga and their characteristics.

Tissue Culture Products

As part of its product portfolio, Kutsaga offers, on a commercial scale, tissue culture-derived products to clients and these include Hass Avocados and Williams Bananas.(Fig10)

In 2023, the section had Hass Avocadoes and Williams Bananas on sale to both large and small-scale farmers.

Figure 10: Plantlets produced by tissue culture
A. Bananas B. Avocados

Williams Bananas

The Williams Banana variety is known for its specific bunch characteristics, which include a cylindrical shape, absence of hand compaction, longer and straighter fingers, and a higher yield of extra-large fruit per bunch as shown in Fig 11.

One of Williams' key advantages is its resilience, surpassing its main competitor, Grand Nain. It outperforms Grand Nain when faced with sub-optimal or extreme soil and climatic conditions. With Williams, you can confidently overcome challenges and enjoy optimal banana production even in unfavorable environments.

Figure 11. Williams Banana Fruit

Figure 12. Hass avocado properties

Hass Avocados

These avocados are sought after for their desirable characteristics and market demand. To ensure the production of disease-free and genetically uniform plants, Kutsaga is taking initiation efforts to introduce Hass avocados through in vitro propagation techniques.

Analytical Chemisty Services Division

Mission

The Analytical Chemistry Services Division (ACS) is made up of the chromatography, Chemical and Microbial sections. Its Mission is to provide world class value-adding chemical and pesticide analysis services. The division's purpose is to enable analysis-based lime and fertilizer recommendations, generate information on plant chemistry and crop nutrition requirements and to provide the tobacco industry with pesticides and chemical screening quality assurance services. All these services are provided through testing of soil, water, foliar, fertilisers, pesticide residues and actives in formulations, veterinary and pharmaceutical products, and microbial samples to our commercial clients in various industries and our internal clients, the Kutsaga researchers.

Analytical Chemistry Services Targets: The division's 2023 targets were firstly; to maintain and retain ISO/IEC 17025:2017 quality management system accreditation certificate and secondly, to analyse 3 000 soil, 700 formulations, 1 500 water, 5200 plant & foliar and 600 residues samples with a total target of 11 000 samples from internal and external clients. Lastly, the division also committed to develop and validate three test methods for use to support aforementioned sample targets.

Meet the team

Mrs C C. Musuna-Garwe
Head of Division
Nat dip Appl Chem, BSc (Unisa), MBA (Nott)

Cleopas Mureya
Research Officer
BSc (Zim)

Kudakwashe Chiwanga
Chemist
BSc (Honors) in Applied Chemistry, MSc in Chemistry

Musekiwa Mutanhaurwa
Chemist
BTech in Chemical Technology – Chemistry

The ACS Division & ISO/IEC 17025:2017 Quality Management System Accreditation

The ACS division is made up of three sections as shown below and the laboratory is accredited to ISO/IEC 17025:2017 standard by Southern African Development Coordination Accreditation System (SADCAS) accreditation body.

Annually the laboratory is audited for compliance by the same. In the period under review the lab was assessed by SADCAS and retained the accreditation certificate. To maintain the system, internal audits were carried out as scheduled. Also, nonconformities raised in both internal and external audits were cleared.

Proficiency tests: It is a requirement that various proficiency tests are done through bodies such as Agriculture Laboratory Association of Southern Africa (AGRILASA), Southern African Development Cooperation in Measurement Traceability (SADC-met) and FAPAS proficiency test for pesticide residues to ensure compliance and this was successfully done. Performance of Internal audits of the system were also done. The system was maintained and the ISO certification retained and responsible staff (Fig1.)

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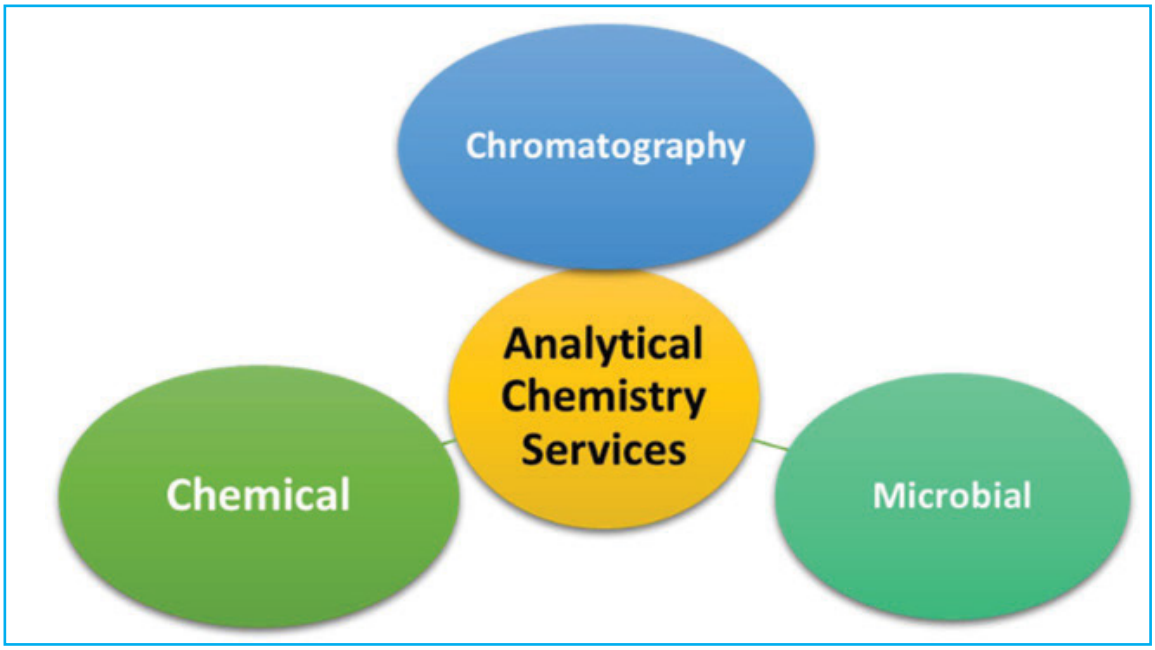


SADCAS
SOUTHERN AFRICAN DEVELOPMENT COMMUNITY

CERTIFICATE OF ACCREDITATION

TOBACCO RESEARCH BOARD, ZIMBABWE
Company Registration No. 20002613

Facility Accreditation Number: TEST-S 0061

is a SADCAS accredited Testing Laboratory
provided that all SADCAS conditions are complied with

This certificate is valid as per the scope stated in the accompanying schedule of accreditation, Annexure "A", bearing the above accreditation number for

CHEMICAL ANALYSIS

The facility is accredited in accordance with the recognized International Standard

ISO/IEC 17025:2017

The accreditation demonstrates technical competency for a defined scope and the operation of a laboratory quality management system

SADCAS is a subsidiarity organization of SADC. A memorandum of understanding between SADC and SADCAS serves as the basis for the recognition of SADCAS by SADC Member States as a multi-economy accreditation body

Mrs Maureen P Mutasa
SADCAS Chief Executive Officer

Effective Date (Issue No: 1): 31 March 2021
Certificate Expires: 30 March 2026

Figure 1: ISO/IEC 17025:2017 Accreditation certificate and the responsible ACS Team

SAMPLE TESTING SERVICE

1. Soil testing

Soil testing to establish the right quantities of lime and fertiliser required for optimal crop growth, is an important agricultural practice that all growers are advised to adhere to. In Zimbabwe it is recommended that all tobacco growers have their soils tested before establishing their crop. Soil testing ensures that the field gets specific lime and fertiliser recommendations and application which ensure economic yields for the grower. One of the challenges Zimbabwean farmers have been facing is poor soil health and in order to address this, there is ongoing research at Kutsaga aimed at rehabilitating soils to ensure soil remediation and improve yields and grower profits. So, in addition to lime and fertiliser recommendation tests, the lab is also involved in testing soil before and after rehabilitation initiatives. In 2023 the division analysed a total of 2900 soil samples and this was 96.7% of target (Fig 2).

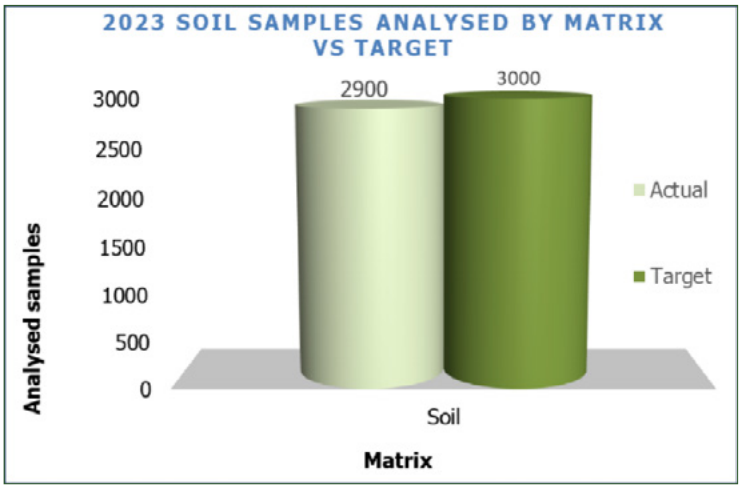


Figure 2: Soil samples analysed in 2023 versus target

Figure 3: Soil Initial Mineral Nitrogen establishment

Foliar & plant chemistry sample testing

Information on plant chemistry is vital during variety development research to produce a quality plant product. Levels of chemicals such as nicotine, nornicotine, reducing and total sugars, as well as chlorides need to be established during breeding and production of tobacco seed varieties to ensure the desired leaf quality is attained. This is also true of metals as well as trace elements such as nitrogen and nitrate which are vital chemical components of the leaf that have a bearing on leaf quality. All these testing services were provided to both the Board's research divisions as well as growers, merchants, food and feed manufacturers and other external clients in various industries except nornicotine which was only offered to the research divisions for breeding work. In the year under review, 4 151 samples were analysed and this was 80% of the set target (Fig. 4). All this work fits in well with the parent Ministry's Tobacco Value Chain Strategy whose main objective is to ensure that quality is assured along the whole tobacco value chain.

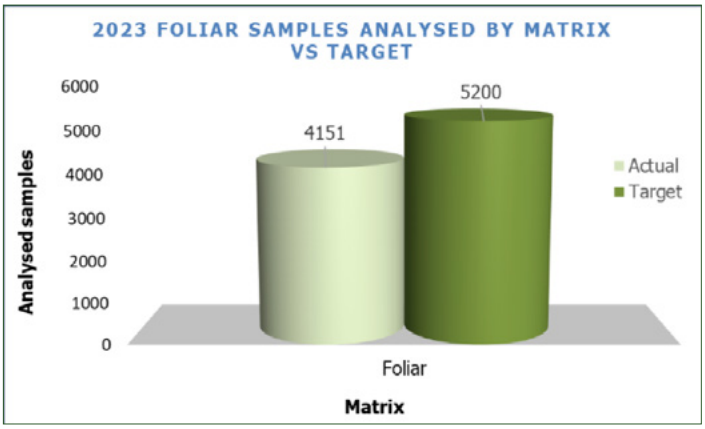


Figure 4: Foliar & plant samples analysed in 2023 versus target

2. Water testing

There is need to establish the chemical composition of water before using it for irrigation of crops, drinking or discharging of effluent into water bodies. Environmental issues such as water pollution, environmental pollution and global warming are currently topical globally, therefore, effluent water testing is required to ensure that the levels of various elements, metals, settleable and total dissolved solids, and other contaminants in wastewater are within acceptable levels. This assists with compliance with Environmental Management Authority regulations and ensures protection of underground water as well as open water bodies from contamination. This is done through the EMA Act (Chapter 20:27) and statutory instrument 7 of 2007 Environmental Management (Effluent and solid waste Disposal) Regulations which govern effluent discharge in Zimbabwe. Additionally, drinking water is crucial in maintaining the health and safety of consumers, while irrigation water needs to be monitored for metals such as heavy metals that may be injurious to crops. In this regard, the Analytical Chemistry Services division tested 1 703 water samples (114% of target) for the Board's Research Divisions as well as other external clients for quality monitoring in support of aforementioned (Fig 5.)

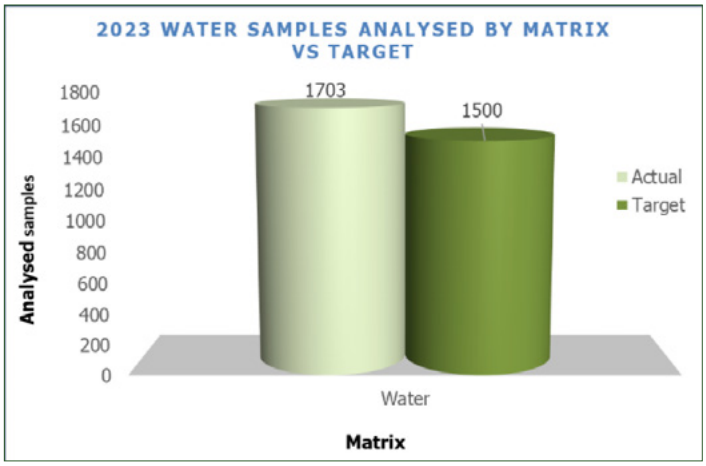


Figure 5: Water samples analysed in 2023 versus target

3. Pesticide residues analysis

Pesticide residues in the various matrices should be compliant with various regulatory requirements such as CORESTA MRL guidance residue levels and EU-MRLs. Certain levels are allowed in different matrices for regulatory purposes. The Analytical Chemistry Services Division offers a quality assurance service for both internal and external clients for pesticide

residues in various matrices. In 2023, the division analysed 767 pesticide residue samples and this was 128% of the set target (Fig 6).

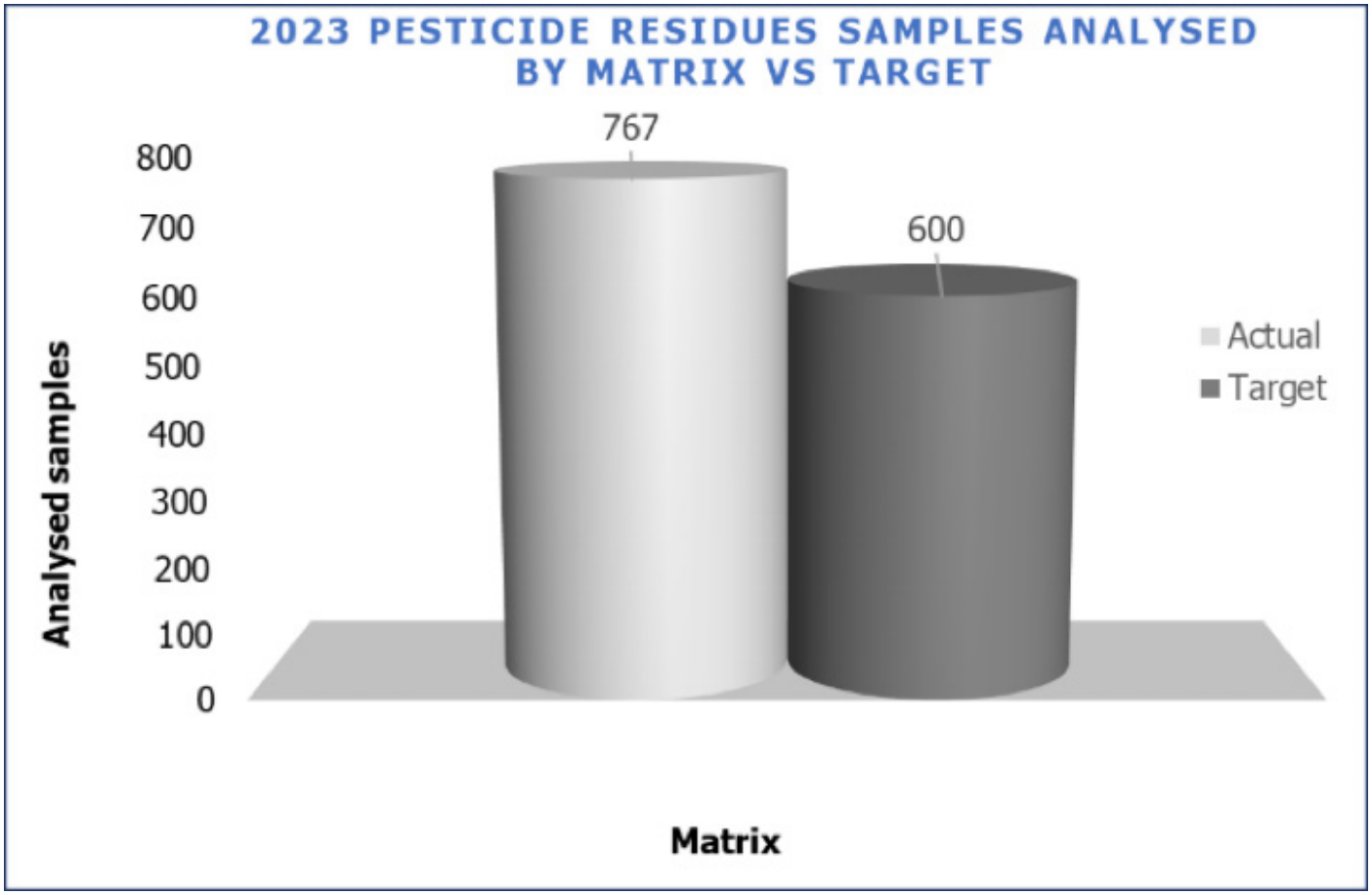


Figure 8: Pesticide residues samples analysed in 2023 versus target

4. Product active ingredient analysis

Pesticide products/formulations active ingredients need to be analysed to ensure compliance with specifications. Dilution of products during field applications are dependent on the product formulation specifications, therefore, their confirmation is important to achieve the desired efficacy of the product. This is a product quality assurance service offered by Analytical Chemistry Services Division to internal and external clients during the pesticide approval scheme service to register or re-register pesticides for use on tobacco or for application on other crops. The division tested 625 samples for active ingredients in 2023 (89.3% of target) (Fig 10).

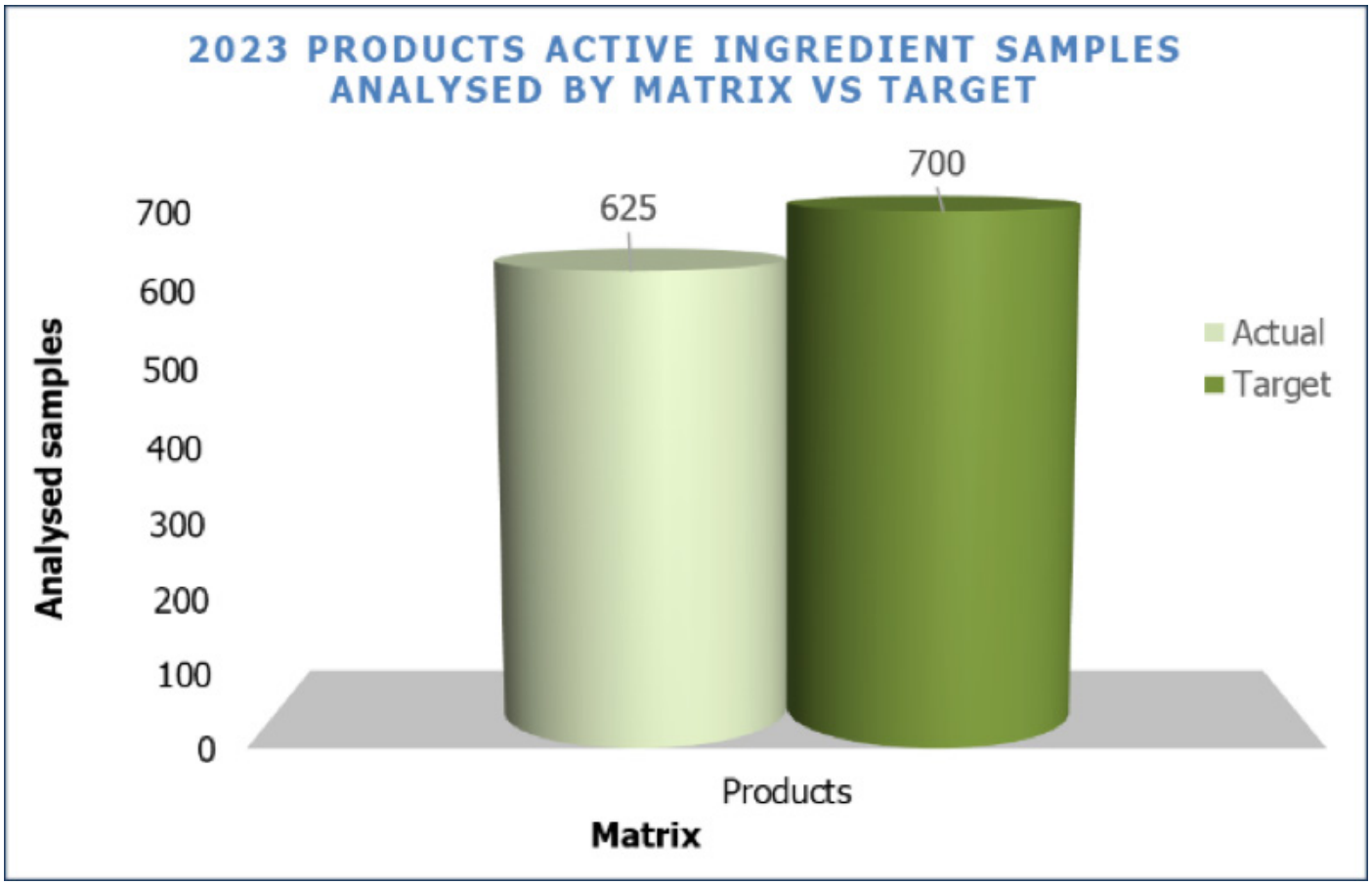


Figure 10: Products active ingredient samples analysed in 2023 versus target

Methods Developed and Validated for The Analysis of Various Analytes in Hemp

In 2018, the Zimbabwean government legalized the cultivation of industrial hemp for medicinal and research purposes. In 2020, the government further relaxed regulations, allowing for the cultivation of industrial hemp for commercial purposes as well. This shift in policy has created more research areas on hemp and its related products. Industrial hemp is used as a versatile crop with a wide range of potential uses, including in the production of fiber, textiles, food, building materials, and personal care products. This diversity of applications makes hemp a potentially lucrative crop for Zimbabwean farmers, offering them an alternative to traditional crops like tobacco, which is facing declining global demand.

Industrial hemp (Cannabis sativa) is being viewed as one of the potential alternatives to tobacco in Zimbabwe, in fulfilment of Article 17 of the WHO Framework Convention of Tobacco Control (Policy options and recommendations: Article 17 and 18). As such there is ongoing research at Kutsaga on various aspects of variety development, pest and disease management and optimization of agronomy of the crop in the field. To support this work, the ACS division develops standard operation procedures and methods so as to provide the chemistries that make the researchers' work meaningful. Below are some methods that were developed and validated for use to monitor and quality control Industrial hemp and medicinal cannabis and their products.

1. Method development and validation for the analysis of mycotoxins in hemp

Mycotoxins are secondary metabolites produced by certain types of moulds. The growing conditions for hemp are conducive to the growth of moulds and fungi which can produce carcinogenic mycotoxins including ochratoxin A and aflatoxins. Contamination of the crop can occur in the field, but also during the subsequent phases of transportation, storage, processing, or when the environmental conditions of temperature and humidity are right to develop fungal spores naturally present in the environment. Mycotoxins are highly toxic molecules and have harmful effects even at very low doses. Therefore, testing for the levels of mycotoxins in hemp is important to ensure consumer safety and quality control.

A liquid chromatographic method which include dispersive SPE cleanup before LC-MS/MS instrument analysis was developed and validated for mycotoxin analysis in hemp. The results that were obtained during this method development/validation experiment indicated that accuracy for mycotoxins analysis test results were within the acceptable range of 70-120%. Repeatability was shown to be less than or equal to 20%. The method had a low enough Limit of quantification of 0.050 ppm to enable accurate quantification of mycotoxin values above 0.050 ppm. Therefore, the developed method is accurate and reliable and is ready for use to test testing mycotoxins in hemp samples. Fig 12 shows a Chemist loading extracted hemp samples for micotoxin testing on hemp.

Figure 12: Instrument analysing Mycotoxins samples

2. Method development and validation for fibre analysis in industrial hemp

Currently, in Zimbabwe, there are no laboratories that are testing industrial hemp for fibers. Knowing the cellulose, lignin, and hemicellulose content helps to predict processing needs and final product properties like strength, flexibility, and absorbency potential of hemp. Testing helps researchers understand how hemp fibers respond to different processing methods and treatments, leading to the development of new and innovative products.

Some industries, such as textiles and construction, have specific standards for fiber properties. Testing ensures hemp products comply with these standards. Hence, the objective of this study was to develop and validate a method for fiber testing which is accurate and reliable using an ANKOM fiber analyzer machine.

A fibre analysis method was developed/validated where the hemp sample was decorticated and refluxed to determine cellulose, hemicellulose and lignin. The developed method showed that the hemp tested had 73.7% cellulose, 17.2% hemicellulose and 5.1% lignin, results which were acceptable based on incorporated proficient test quality control samples. Given that this method can quantify fibre in different hemp samples for breeding trials as well as commercial purposes, it was deemed fit for its intended use. This service will assure quality to the hemp industry. Fig 13 shows a Chemist loading extracted hemp samples on a hemp fibre analyser for testing.

Figure 13: Sample loading on hemp fibre analyser for testing

3. Method development and validation for the analysis of pyrethroids in cannabis spp

Pyrethroids are a group Crop Protection Agents (CPAs) that are commonly used in agriculture. They are known to be highly toxic to both humans and the environment. The medicinal use of Cannabis spp has prompted the increase in demand of safe and clean material since patients who use medicinal cannabis are vulnerable to exposure to these toxic pesticides. Growers should therefore act responsibly by ensuring that pesticides are in accordance with good agricultural practices. A multi-pesticide method for analyses of pyrethroids is important for monitoring pyrethroids in Cannabis spp at a lower cost.

A gas chromatographic method which included liquid-liquid extraction and solid phase extraction before GC-ECD instrument analysis was developed and validated. The results from this study showed that accuracy for pyrethroids analysis were within acceptable range of 70-120%, the method is precise with a relative standard deviation of less than 20% and a low enough Limit of quantification to enable accurate quantification of values above 0.01 ppm in any sample. Based on these findings, the method was deemed fit for its intended use and is ready for use for testing pyrethroids in industrial hemp. Fig 14 shows a Chemist working on an instrument for pyrethroid analysis.

Fig 14(below): A Chemist working on an instrument for pyrethroid analysis

Other methods developed

Additionally, two other new methods were developed and validated for a new sample matrix and new analytes during the year. These include method development/Validation of a method for product analysis of active ingredient of cyclobatrifluram (Fig 14 a) in formulations active ingredient analysis, and method development for Capsaicin (Fig 14 b) residue analysis in chilies. These are already in use to monitor quality of client samples.

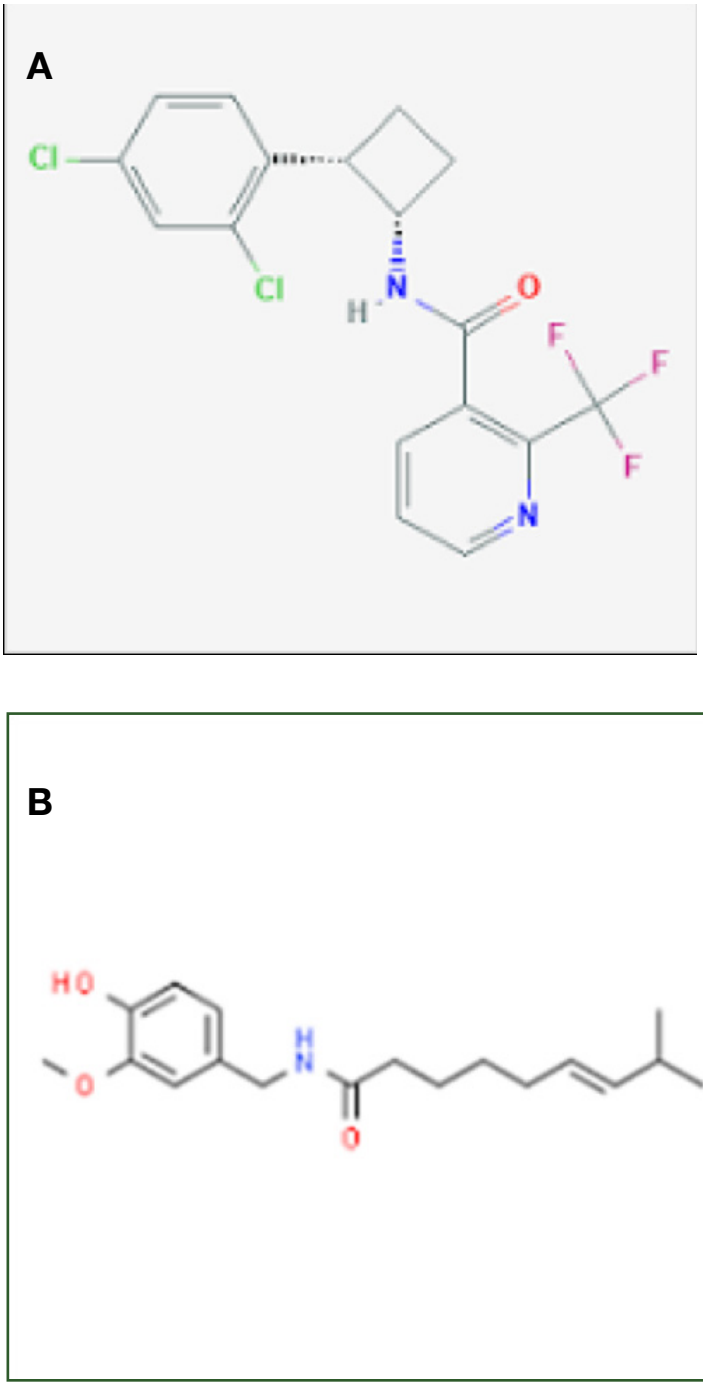


Figure 14 a & b: Chemical structurers of cyclobatrifluram and Capsaicin resp.

Field Services Division

Mission

To maximize value from Kutsaga Stations

Meet The Team

Mr M Kavene
Head of Field Services
Tobacco Culture Dip, Executive Dip in Gen Management, Sales and Marketing Dip, Crop Protections Accreditation Certificate, Tobacco Classification Certificate

Mr T Chirambwe
Banket Station Manager
Bed (Agric) Zim: MSc (Zim)

Mr G Makombe
Oriental station Team leader
BSc Agric (Zim)

1.0 RAINFALL

In the period season under view (2022/23) the rainfall pattern was as shown in Fig 5.1. below.

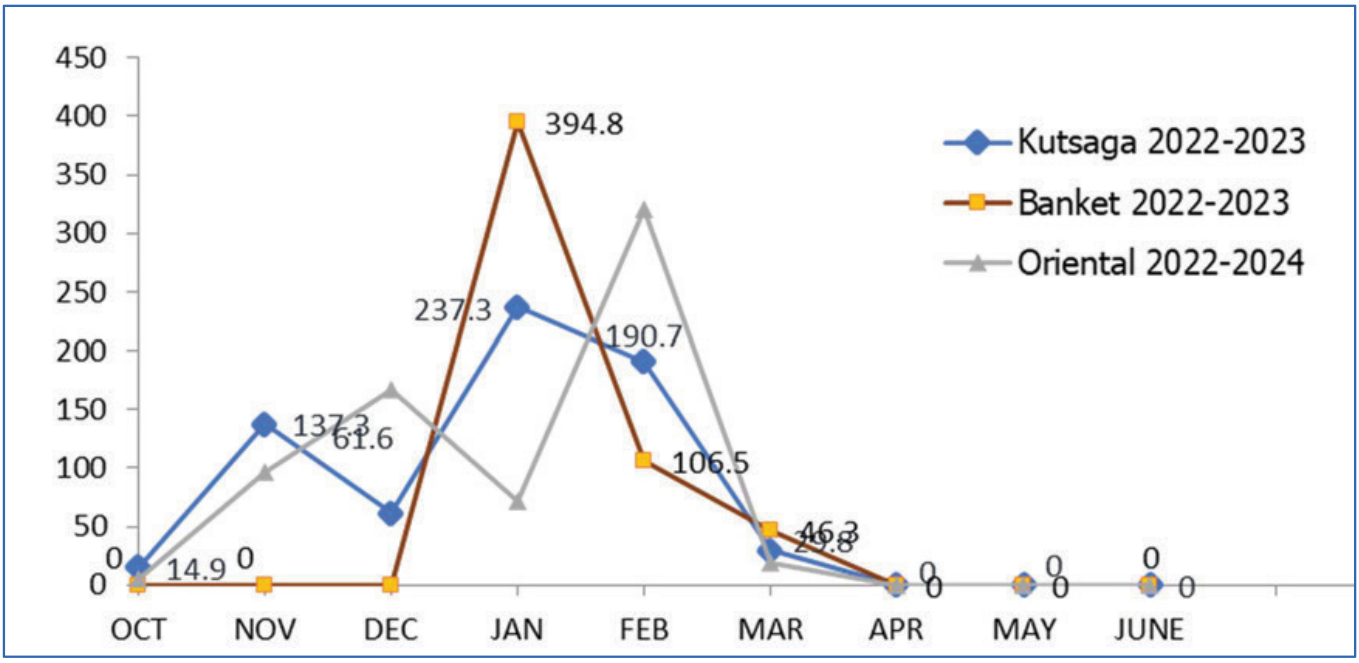


Figure 1.: Kutsaga Stations rainfall figs (mm) – Oct 2022 to June 2023

The rainfall figures in this report cover October 2022 to June 2023; a period which the crop was grown. Seedlings for the crop were established in June.

1.1 The growing season – Kutsaga station

The field crop was planted starting in September 2022. In the period between October 2022 to March 2023 a total of 671.68 mm of rain was received. This was 79.02 % of the long-term average

of 850 mm. January 2023 turned out to be the wettest month with some 237.3 mm of rainfall being received allowing the crop to expand and fill.

1.2 Rainfall-Banket station

The total rainfall received during the period January to December 2023 was 611.9 mm compared to 547.6 mm received in the previous season during the same period. This was 76.4% of the long-term average compared to previous season's 68.4% of 800 mm. There were more rains received during this period and this resulted in crops growing well.

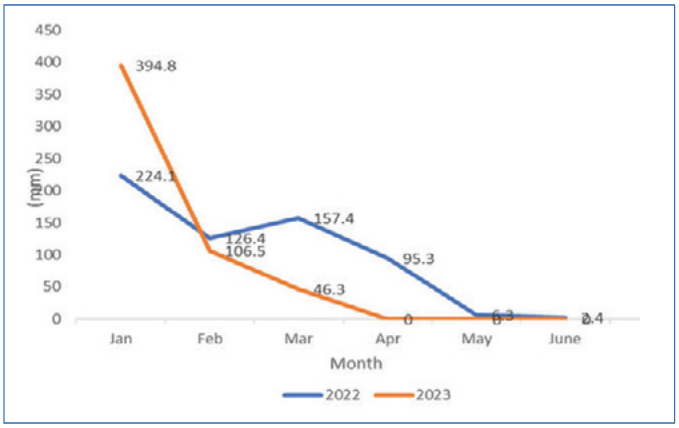


Figure 2: Banket Station monthly rainfall for 2022 and 2023 season

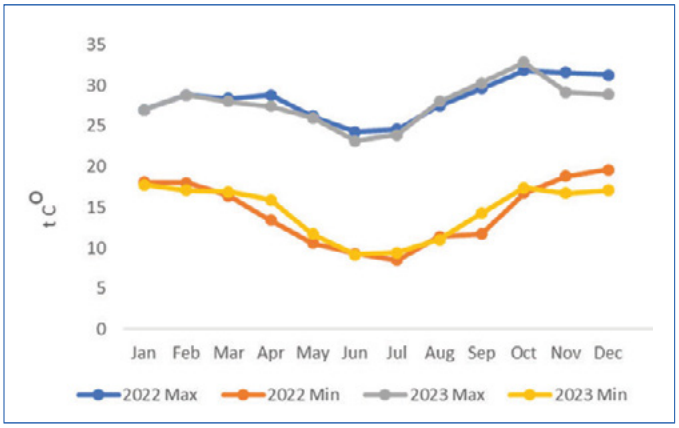


Figure 3: Banket Station monthly temperature data 2022 and 2023

On temperature, the period under review had a mean maximum temperature of 27.2 °C compared to 26.7 °C obtained in the same period of the previous season meaning there was no much difference on the pattern. The same was true on the minimum temperatures with 2022 period having an average minimum temperature of 14.3 °C while 2023 period had 14.7°C. These temperatures were quite conducive for crop growth.

1.3 Rainfall - Oriental station

The station received a total of 676.20 mm of rainfall during the period against a long-term annual average of 650 mm. The season received rainfall above normal and the monthly total rainfall figures recorded for the period were generally higher in comparison to the previous season (Fig 5.3.1). Effective rains were received mid of November and the highest rainfall was recorded in the month of February.

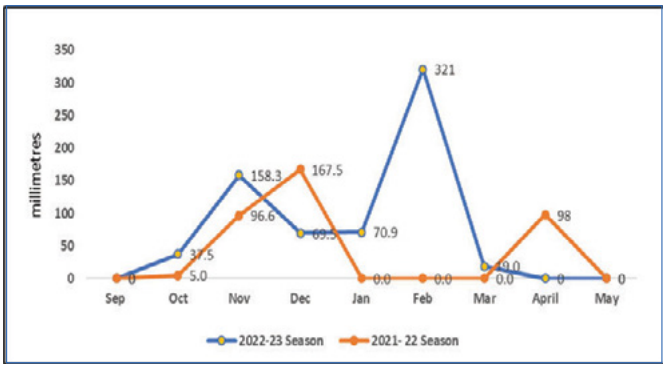


Figure 4: Oriental Station monthly rainfall (mm) for the 2021-22 and 2022-23 seasons

2.0 KUTSAGA STATION

The Field Services Division's responsibility is coordinating all activities that Kutsaga undertakes to ensure that all the set objectives are met. This included working closely with all Research Divisions and the Seed Production Division to whom field management services are offered for experimental and seed crops. such as;

- Land preparation and maintenance of the established crops through to curing, grading and storage of the crops,
- To enable soil rehabilitation through crop

rotation, Katambora grass (GHR1) and Sunn-hemp crops are annually established in the relevant lands and the crops maintained to produce seed for internal use.

- This Division also undertakes various commercial revenue generating projects that include the production of flue-cured tobacco crop, eucalyptus seedlings and tobacco seedlings.

2.1 The Tobacco Crop

For the 2022/23 season, a total of 60 ha of flue-cured tobacco was established. Of this 55 ha was irrigated while five ha was dryland tobacco. From this hectarage, 190.7 tonnes were produced and sold at an average price of $3.55 per kg (Fig 5.1.2). This was against targets of 192 tonnes thus a 99.3 % was achieved.

Figure 5. Kutsaga team inspecting a cured tobacco in the grading shed at Kutsaga. 5.2.2

2.2 Eucalyptus Seedlings

In order to enable sustainable tobacco production, Kutsaga has since 2013 been producing high quality eucalyptus seedlings for the industry (Fig 5.6). In the period under review, some 1.5 million gum seedlings were produced and the greatest share of these were for Sustainable Afforestation Association while some were taken by individual tobacco farmers and others were given out for free to growers.

Year	Target	Produced	% of Target
2012	1.8 million	2.0 million	111.11 %
2022	1.4 million	1.478 million	105.57 %
2023	1.5 million	1.5 million	100 %

Figure 6. (a) Eucalyptus seedlings in seedbeds at Kutsaga Farm (b) Eucalyptus firewood for tobacco curing at Kutsaga Farm.

2.3 Commercial Tobacco Seedlings

Some 4.56 million flue-cured commercial tobacco seedlings were produced at Kutsaga farm during the period under review to support growers who were unable to establish their own seedbeds and also for those that fell short on their requirements. Fig 7 above one of the tobacco seedbeds at Kutsaga.

Figure 7. Commercial tobacco seedlings at Kutsaga Farm

2.4 Experimental and Seed crops

The farm also offered services to the researchers by establishing and maintaining some 7 ha of experimental crop and 0.75 ha of seed crops at Kutsaga station (Fig 8)

In addition, some 4 ha of Katambora GHR1 seed crop and 10 ha of sunn-hemp crop were established by the farm to be used for Nematode suppression and soil rehabilitation in the experimental plots.

Figure 8 Sunn-hemp crop established at Kutsaga for rotation and soil rehabilitation.

2.5 Capital Items Acquired During the Period Under Review

In an effort to capitalise the farm new Trailed Rhome harrow was acquired. This brought the number of the Rhome harrows to two. Additionally, a new 75 Hp irrigation pump was procured for the farm (Fig 9).

Figure 9. (a) A newly acquired heavy duty CRSG-BALDAN 20 Disc Rhome Harrow Supplied by FARMEC (b) A new Franklin 75 Hp irrigation pump acquired for the farm.

2.6 Challenges and Mitigation

The challenges faced included vandalism of the boundary fence and cutting down of trees by intruders, leading to the depletion of Kutsaga forests. Additionally, veld fires were on the increase during winter. The board has increased security details to assist in their regular patrols and it is hoped that cutting down of trees and setting of veld fires will be restrained.

3.0 BANKET STATION

3.1 Seed Potato Production

The station was tasked to produce seed potato in two batches during the 2023 season of 2.5 and 2 hectares. The variety grown was Diamond G1.(Figure 10) The first planted 2.5 ha produced a total of 883 523 tubers which gave a multiplication factor of 8.84 against a target of 800 000 with a multiplication factor 0f 8.0. This was 110.44 % of the target. The second planting produced a total of 474 725 tubers which translated to a multiplication factor of 6 against a target of 640 000 with a multiplication factor of 8.0. This was 74.17 % of the target. Despite deploying a spraying programme to arrest diseases, the crop was not spared by *Rhizoctonia* root rot and leaf miner which depleted the yield. A more robust spray programme will be devised and implemented.

Figure 10: Diamond G1 seed potato at vegetative stage

3.2 Experimental Tobacco Crops

Six trials for Plant Breeding Division (BW9 nematode introgression, Parental hybrid proving, cigar wrapper trials, CCT and Hemp trial) were managed at the station. Grading and classification of all PB trials was done and completed. The station also successfully managed the CORRESTA Chloride fertilizer trials for Productivity and Molecular Technologies.

Figure 11 Trials at Banket station
(a) Pre-control plots of BRK4 (B) a CORESTA collaborative trial on Chloride fertilisers

3.3 Station Developments

In order to improve productivity at the station, water resources improved through construction of a reservoir with a holding capacity of 2 million litres of water.(Figure 12) The water was being drawn from Devonia Mine which is adjacent to the station. A memorandum of understating was signed between Kutsaga and the mine owners on a symbiosis bases that Kutsaga install a pump in the mine shaft and pump the water for use at the station. When fully functional the reservoir will mitigate the perennial water, shortage experienced at the station.

Figure 12. A 2 000 m3 reservoir constructed at the station

3.4 Housing project

The Banket new housing project was completed and certificates of occupation given by The Ministry of Local Government.Mmbers of staff welcomed the initiative and subsequently moved to the new houses.

Figure 12. All the 8 blocks were corrected and certified habitable.

3.5 Corporate Social Responsibility

A total of 15 inmates and two officers from the Zimbabwe Prisons and Correctional services based at the station were trained in various aspects of tobacco production and graduated.

4.0 ORIENTAL STATION

4.1 Services to Kutsaga Divisions

a. Site for Tobacco Experimentation

One flue-cured tobacco Cooperative Cultivar trial (CCT) and an industrial hemp trial were established at the station (Fig 5.3.2). Some six hemp cultivars were evaluated in the hemp trial. Both trials started off well but were later affected by persistent rains that fell in February resulting in some leaf spot disease prevalence. However, researchers were able to collect useful data from the trials.

Figure 13 Some trials at Oriental station flue-cured tobacco CCT trial and industrial hemp trial at a) early flowering and b) seed set stage

b. Site for Seed Production

One seed plot (0.13 ha) for tobacco seed (K RK26R variety) was established and managed at the station. (Figure 14a) Adequate seedlings for the required populations for the KRK26R parental were raised and the seed crop was established in the fields. A total yield of 121.9 kg (243%) of processed seed was obtained against a target of 50 kg.

A seed potato crop was established for seed multiplication on one hectare and two seed potato varieties Diamond and Hermes were planted on 0.5 ha plots each. (Figure 14a) The potato crop was harvested at the end of the season and a total, of 128 000 tubers (80%) for Diamond and 70 265 tubers (41%) for Hermes were produced against a target of 160 000 tubers for each variety.

Figure 14. Seed production plots. (A) KR26R pollen parental at budding stage. (B) Diamond seed potato crop at 7 WAP.

5.0 Water project

The integration of a backup system to supply water for irrigation at the station from the boreholes feeding into temporal water storage (water bladders) was completed (Fig 6a). The challenge remains, that the temporal storage has a smaller capacity (100 m3) and is inadequate to meet the station's water requirements at peak. A second borehole was drilled to improve the water supply and was due for equipping and integration into the backup system. Some booster pumps were installed for the distribution of water from the temporal storage to the fields (Fig 6b).

Figure 15 a) Water bladders for temporal water storage b) Installed booster pump for water distribution

Materials and Services

OUR MISSION

To provide equipment, machinery, infrastructure and vehicle maintenance services as well as manage the fleet to ensure the smooth running of operation at all Kutsaga stations.

Meet The Team

Mrs C Chifamba

Superintendent

Msc Climate change and sustainable development
BTech (Honors) Degree in Agricultural Engineering
NC Engineering drawing and designing
Certificate in Fleet management

Mr J Chipfunde
Motor Mechanic
Nat Drip Logistics and Transport, Class 1 Journeyman Motor Vehicle Mechanics, Nat Cert in Auto Electrics

C. Ranganayi
Motor Mechanic
Journeyman Class 2

Mr T Dzawo
Fitter

Mr J. Votadyo
Electrician Kutsaga
National Certificate

The year 2023 was punctuated by numerous activities in which the division took part. The following projects and activities were undertaken;

1.0 Motor Vehicle Workshop

All scheduled monthly vehicle checks were done on time. Services were done though some exceeded their service mileages and hours due to delays in procurement of service kits. The repairs of vehicles, tractors and loaders was also affected by delays in payment of spares and service providers.

A total of 10 new Toyota GD6 4 x 2 pickup trucks were added to the fleet. Additionally, a 7 hp compressor was bought for tyre maintenance.

Delays in the procurement of spare parts and service kits are some of the challenges faced by the department during this period.

2.0 Machine Shop

A total of four mower blades for Banket station and one seed potato grading automated machine were fabricated.(Figure1)

Figure 1: Fabricated seed potato grader

The section managed to maintain all barns in preparation for the 2023/24 season despite the delays in the procurement of the requested material. The team serviced the seed packing

and pelleting machines and actively took part in the repair of boilers in preparation for commissioning. Furthermore, the water pumps, machinery and various equipment at all TRB stations were repaired.

3.0 Building Section

This section made sure the institution's infrastructure (barns, roads and Kutsaga Village houses)
remained intact and well maintained.
Figure 2: Building during barn maintenance

They constructed the float beds for commercial as well as experiment tobacco and gumtree seedling production. Periodic station roads maintenance was done. The main challenge for this section is lack of basic building tools like trowels, spirit levels and shovels among others.

4.0 Plumbing

The plumbing section, besides the daily maintenance of the water and sewer reticulation system, installed a 0.5Ha drip irrigation system for a drought trial for Plant Health Services.

The Banket water project kept the plumbers on their toes for the greater part of the year. They installed the pipework linking the mine (water source) to the newly constructed 2 mega litre reservoir. A new mainline was also installed that would be feeding from this reservoir. Work was

done hand in hand with the machine shop in maintaining the water pumps to make sure the irrigation systems are in shape.
The main challenge in this section are the old systems (irrigation, sewer and water) that burst constantly and the delays in the procurement of the requested material.

5.0 Carpentry

The section made50 dibble boards, fixed 6 seeders and 70 slate packs for FSD and made screen cages for PHS. The team also took part in the maintenance of barns and Kutsaga houses.

6.0 Electrical Workshop

At Banket station, the section installed a powerline for the renovated houses and installed a 30Hp submersible water pump extracting water from the mine to the 2 mega litre reservoir. They worked hand in glove with the machine workshop in repairing and maintaining water pumps at Oriental and Kutsaga stations.

The team was active during the assessments to come up with solar tender specification and during the site visits. Scheduled maintenance of generators, compressors and air conditioners were done.

Projects

Description	Progress
Solar Installation	Tender approved. Contacts being drafted
Seed potato shed	Steel structure erected. Civil works on progress (45%)
Banket water project	95%
Banket house renovations	100%
Banket houses sewer system	100%

Statistical Services Division

Mission

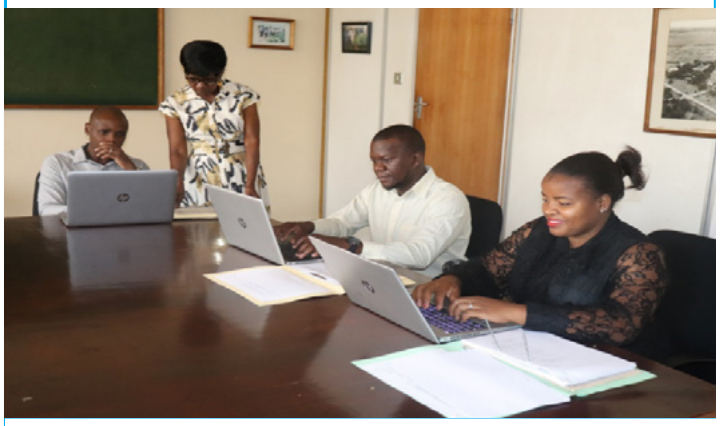
To provide efficient and innovative experimental designs, data analysis and statistical consultancy services as a basis for recommending new crop management practices. The department is also the central repository of all official Kutsaga statistics.

Meet The Team

Ms. B Mawire
Team Leader
BSc And Compt Sci, BSc (Hons) Stats and Operations Research (Zim

Mrs. I Mazhawidza
Data Manager
HND

Mr. S Banana
Research Officer – Biometrics and Bioinformatics
BSc Stats & Math



EXPERIMENTAL DESIGNS

Scientific experiments are designed to conduct research in an objective and controlled manner to maximize precision and draw specific conclusions regarding research questions. In the year 2023, one hundred and eleven (111) trials were established and from these seventy-three (73) were designed, whilst the rest proceeded with experimental designs recommended in the previous season.(Figure1)

Figure 1. A Biometrician advising plant breeding students on the appropriate design for a greenhouse trial.

DATA ANALYSIS

Three hundred and forty-three (343) data sets were captured and validated to check for errors and ensure data integrity is maintained at every stage of the research process. A total of four hundred and twenty-two (422) data sets were analysed using several mathematical techniques such as the Analysis of Variance, Mean separation techniques, Principal Component analysis, Logistic regression, Multiple Linear Regression and Survival analysis. Some other methods were used for handling missing data and analysis of non-parametric data. Data analysis is crucial in Research as it identifies patterns, trends and relationships within the data which can be used for decision making.

MONITORING AND EVALUATION

In monitoring and evaluation, data is routinely collected from projects and programs so as to track how a project is progressing towards its goals and ensuring that it makes a positive impact. Information on key performance indicators is collected and updated in the form of reports, matrices and dashboards which are a type of graphical user interface.

During the period under review, weekly dashboard updates, monthly reports and quarterly organizational performance matrices were reviewed, updated and submitted to management and the Ministry of Lands, Agriculture, Fisheries, Water and Rural development.

STATISTICAL CONSULTANCY

The department offered consultancy services to researchers and students with statistical issues. (Figure 2) The enquiries were mainly on the interpretation of statistical results, visual presentation of scientific data, as well as designing surveys and questionnaires. The Biometricians made seventy-five (75) field, lab, and greenhouse trial visits to better understand the trial dynamics and advise on improving precision if necessary. Some of the visits were made so as to layout trials as per experimental design.

Figure 4: Biometricians advising on leaf measurements

Training

Three training sesions were conducted during the year. The trainings focused on capacitating staff and students on experimental design. Researchers who understand experimental designing conduct their experiments more efficiently. In the first session seventeen (17) students were trained on the principles of experimental design, and in the second session twenty (20) students and three (3) Researchers were taught on measures of central tendency and dispersion. The final training session on Experimental Designs equipped eighteen (18) students on the design, layout and analysis of the more complex designs such as the two factor experiments.

RESEARCH INFORMATION AND PUBLICITY

A total of 993 Kutsaga publications were sold from the Library and at the Auction floors.

Figure 3: Library magazines and books at the information help desk.

List of articles published in the year 2023

1. Farmer Magazine Articles

Title	Author(s)	Journal & Date of publication
Foliar disease control in tobacco fields	Chinheya C., Dimbi S. and Marunda M.	Zimunda magazine. Issue No.11, February 2023
Premature and early flowering in tobacco and its management	TRB	Zimunda magazine. Issue No.11, February 2023
Timeous soil sampling and early land preparation	Chinamo D.	Zimunda magazine. Issue No. 12, April 2023 and Zim Farming and Agribusiness. Volume 1, May 2023
TRB introduces climate-smart tobacco varieties: expected yield and income increase for Zimbabwean farmers in marginal areas.	Mukoyi F.	Zim Farming and Agribusiness. Volume 1, May 2023
Industrial Hemp THC limit: Zimbabwe sets industrial hemp THC limit at 1%, why does it matter?	Mateva K.	Zim Farming and Agribusiness. Volume 1, May 2023
Tobacco seedling production	Dimbi S.	Zimunda magazine. Issue No. 13, May 2023
Managing cold injury. Frost, pests and diseases	Chinheya C.	Zimunda magazine. Issue No. 13, May 2023
Horticulture seedling production: tips on producing horticulture seedlings using float tray system	Zinyandu F.	Maricho magazine. May issue, 2023
Short rotations: enhancing sustainability in tobacco production and managing soil	Mahere T., Chinheya C.C and Dimbi S.	Zimbabwe Tobacco Today. July issue, 2023
Stalk destruction: essential for disease control	TRB	Zimbabwe Tobacco Today. July issue, 2023
Seedbed pest and disease control	Mahere T., Karavina C., Nyamakura C. and Chinheya C.C	Zimbabwe Tobacco Today. July issue, 2023
Zimbabwe sets industrial hemp THC limit at one percent: What does it matter?	TRB	Zimbabwe Tobacco Today. July issue, 2023

How to choose a tobacco variety	Mukoyi F.	Zimbabwe Tobacco Today. July issue, 2023
Rebranding and Kutsaga trademark launch. A historic event		Zim Farming & Agribusiness Magazine. Volume 2, August 2023.
Tobacco Research Board has rebranded	Mutepfa S. and Magama F.	Zimunda magazine. Issue No.14, September 2023
HIT and Kutsaga driving sustainable innovation with industrial hemp- based materials	Mateva I. K. and Dimbi S.	Zim Farming and Agribusiness. Volume 3, December 2023
Building on a legacy of excellence: Kutsaga expands its mandate and rebrands in response to changing times	TRB	Zimbabwe Tobacco Today. September issue, 2023

2. Dear Grower Letters

Title	Author(s)	Journal & Date of publication
Stalk destruction reminder	Nyamakura C.	Dear Grower :10 May 2023
Agrochemicals approved by the Tobacco Research Board Agrochemicals approved by the Tobacco Research Board	Mavuka R.	Dear Grower: 31 January 2023 10 May 2023
Proper fumigant nematicide application	Mahere T.	Dear Grower: 10 July 2023
White mould on K RK66	Mukoyi F.	Dear Grower: 08 June 2023
Agrochemicals approved by the Tobacco Research Board	Mavuka R.	Dear Grower: 07 August 2023
False fire worm alert	Nyamakura C.	Dear Grower: 08 September 2023
Agrochemicals approved by the Tobacco Research Board	Mavuka R.	Dear Grower: 06 November 2023
Topping and sucker control: some sucker management advisory	Zinyandu F. and Mavuka R.	Dear Grower: 27 November 2023

3. Peer reviewed papers

Title	Author(s)	Journal & Date of publication
Evaluation of the potentials of Bacillus and Trichoderma isolates as biocontrol agents against Meloidogyne javanica and Phytophthora infestans and plant growth promoters in potatoes (Solanum tuberosum)	Chinheya C. C., Mahere T. and Karavina C.	European Journal of Plant Pathology, May 2023
Efficacy of biological & ecofriendly CPAs Sub-group report	Mavuka R.	CORESTA, 2023
Developing and Deploying Climate-Resilient Tobacco Varieties for Marginal Areas of Zimbabwe: Stability and adaptability analysis	Mukoyi F.	CORESTA, 2023
Photosynthetic Performance as A Tool in Detecting Infection in Tobacco (Nicotiana tabacum	Mateva K. I.	CORESTA, 2023
Evaluation of The Performance of Shisha Tobacco Under Zimbabwean Growing Conditions – AP35	Ruzane R.	CORESTA, 2023
Eukaryotic elongation factor (eIF4) targeted sequence analysis of PVY tolerant Kutsaga accession to determine nucleotide responsible for PVY resistance and CRISPR/Cas9 mutagenesis of a Kutsaga line for PVY resistance.	Zvodgo G.	CORESTA, 2023
Use of symbiotic nitrogen fixation endophytes in tobacco seedling production	Chinamo D.	CORESTA, 2023
Evaluation of sun hemp treated with Trichoderma in short Tobacco rotations for control of root-knot nematode (Meloidogyne Javanica) and disease complexes	Mahere T.	CORESTA, 2023
Diversity of Fusarium species infecting tobacco in Zimbabwe	Karavina C.	CORESTA, 2023

4. Presentations at conferences/workshop

Title	Author(s)	Conference Name & Date
The business of Brassicas production	Zinyandu F.	Agribusiness Media Webinar, June 2023
Cannabis landraces – how can we get the most out of them	Mateva K. I.	Pharma Connect Africa Conference, April 2023
Cannabis and African Health Systems	Mateva K. I.	European Conference on African Studies (EACS2023), April 2023
Communique to TIMB and other Tobacco stakeholders about the 2023-24 limited release programme,	Mukoyi F. and Mateva K. I.	TIMB, March 2023
Physiological studies for drought escape expression in yield and quality of short season flue cured tobacco hybrids in Zimbabwe	Mukoyi F.	ZPBA annual conference, May 2023
Pesticide residue mitigation strategies	R. Mavuka	Targeted interventions towards enhancing the registration and use of biopesticides in Zimbabwe, October 2023
CORESTA BIO-Subgroup Report	R. Mavuka	CORESTA Conference, Cancun, Mexico
Cannabis Policy in Zimbabwe: Legal, Policy & Socio-economic Experiences	Mateva K. I.; University of Bristol (Cannabis Africana)	Policy Workshop: Cannabis Policy in Zimbabwe; October 2023; Holiday Inn, Harare, Zimbabwe
Photosynthetic Performance as A Tool in Detecting Infection in Tobacco (Nicotiana tabacum)	Mateva K. I.; Mukoyi F; Ruzane R; Magama F; Dimbi S	CORESTA Agronomy & Leaf Integrity and Phytopathology & Genetics; November 2023; Cancun, Mexico
Developing and deploying climate-resilient tobacco (Nicotiana tabacum) varieties in marginal areas of Zimbabwe: stability and adaptability analysis in new tobacco varieties	Mukoyi F; Ruzane R; K.I Mateva; Magama F; Dimbi S	CORESTA Agronomy & Leaf Integrity and Phytopathology & Genetics; November 2023; Cancun, Mexico

4. Articles Written about TRB in various publications

Title	Author(s)	Journal & Date of publication
Tobacco quality under threat as crop flowers early	Mugabe T.	The Daily news, 04 January 2023
Premature and early flowering in tobacco and its management		Agriculture business, 01 January 2023
Tobacco harvesting in full swing	TRB	The Daily news, 05 January 2023
Potato virus threatens tobacco output	TRB	The Herald, 13 January 2023
Tobacco crop threatened as farmers clash over barn	TRB	The Herald, 16 January 2023
TRB releases approved agro-chemicals for 2023	TRB	The Zimbabwe news, 19 January 2023
Zimbabwe: TRB Releases Approved Agro-Chemicals for 2023	TRB	All Africa news, 19 January 2023
Control Tobacco foliar disease for improved yield TRB	TRB	The Herald, 21 January 2023
Commercialize sweet potatoes cassava production	TRB	The Herald, 23 January 2023
TRB tips tobacco farmers	Chinamo D.	Newsday, 26 January 2023
Diagnosis of nutrient disorders in flue cured tobacco	TRB	Zimpapers Agric-Journal, February 2023

War on food insecurity intensifies 450k sweet potato vines distributed	TRB	The Herald, 31 January 2023
Tobacco Research Board diversifies operations	TRB	The Business Times, 02 February 2023
Boost for industrial hemp growers	TRB	Daily News, 03 February 2023
Industrial Hemp THC limit set at 1pc: Why-does-it-matter?	TRB	The Herald, 03 February 2023
Zim sets cannabis THC limit at 1%	TRB	The Herald, 06 February 2023
New varieties on the market	TRB	Dailynews, 10 March 2023
Hemp production doubles	Mateva K.	Sunday Mail, 19 March 2023
Hemp production doubles	Mateva K.	Sunday Mail, 19 March 2023
Tobacco farmers explore international market	Mukoyi F.	Spiked media, 22 March 2023
Cigar wrapper	Mukoyi F.	Newsday, 22 March 2023
Zim`s hemp fortunes hinge on diversification into fiber, foods	Mateva K.	Hemp today, 22 March 2023
Government drills 700 boreholes under presidential rural development programme	TRB	Chronicle, 10 April 2023,
‘Tobacco farmers must choose fast-growing seed	Mukoyi F.	Newsday, 28 April 2023
Tobacco farmers must choose fast-growing seed	Mukoyi F.	The Standard, 28 April 2023
Tobacco farmers must choose fast-growing seed	Mukoyi F.	Zimbabwe Independent, 28 April 2023
TRB introduces climate-smart tobacco varieties	TRB	Zimpapers Agric Journal, May 2023
Facts on tobacco production	TRB	Zimpapers Agric Journal, May 2023

The Scientific Approach: Boosting Production Through In innovation	Magama F.	Tobacco Reporter, 01 May 2023
No topping, no double population and less fertiliser – that's shisha tobacco	TRB	The Herald, 03 May 2023
Zimbabwe will push research to develop domestic hemp varieties	Magama F.	Hemp today, 10 May 2023
New destroy tobacco stalks or face fine	Chinheya C.	Sunday Mail, 11 May 2023
Tobacco growers urged to destroy stalks	Chinheya C.	NewsDay, The Standard & Zim independant – 12 May 2023
Shisha tobacco takes Zimbabwe farmers by storm	TRB	Farmers Review Africa, 03 May 2023
Import substitution the way to go	Magama F.	Sunday Mail, 07 May 2023
Test water before planting tobacco seedlings: TRB	Chinamo D.	NewsDay, The Standard and Newsbeezer 31 May 2023
Over 1000 boreholes drilled under the presidential rural development programme	Magama F.	Chronicle, 2 June 2023
TRB rebrands		Sunday Mail, 06 June 2023
Zim on brink of record tobacco harvest	Magama F.	Sunday Mail, Bulawayo 24 and Zim Situation, 10 June 2023
Zimbabwe on brink of record tobacco harvest	Magama, F.	Herald, 11 June 2023
TRB to increase productivity levels	Magama, F.	Herald, 13 June 2023
Tobacco Research Board Anticipates Record Export Seed Sale in 2023		263Chat, 16 June 2023
TRB expands tobacco production to marginal areas	Magama, F.	Herald, 20 June 2023
Drought-Tolerant Tobacco Introduced	Magama, F.	Tobacco Reporter, 21 June 2023

TRB develops alternative crops following threats of tobacco ban	Magama, F.	Business Times, 22 June 2023
Drought-tolerant tobacco varieties released	Magama, F.	Tobacco Journal International, 22 June 2023
TRB eyes regional seed export market	TRB	Daily News, 24 June 2022
Tobacco farmer trainings intensify as 446 kg seed sold	Mugabe, T.	The Herald, 28 June 2023
Kutsaga, HIT partner to tackle climate change	Kutsaga	NewsDay and The Standard, 28 June 2023
Kutsaga rebranding pays of	Magama, F.	NewsDay & Zim Independent, 03 July 2023
Kutsaga,HIT partner for sustainable hemp research	Mateva I. K.	Sunday Mail, 29 June 2023
Tobacco Research Board Rebrands to Kutsaga	kutsaga	263Chat and Zimbabwe News, 30 June 2023
Farmers get 3m potato plantlets	Mutepfa S.	The Herald, 03 July 2023
Kutsaga stockpiles tobacco seed varieties enough to cover five years	Mutepfa S.	Business Times, 03 July 2023
Zimbabwean growers receive three million potato plantlets	Kutsaga	Fresh Plaza, 03 July 2023
Tobacco Research Board Rebrands, Embracing New Era of Agricultural Research and Innovation	Kutsaga	AgriBusiness, 04 July 2023
Tobacco Research Board (TRB) Rebrands to Kutsaga: Introduces New Logo	Kutsaga	DailyBrand, 04 July 2023
When set targets continue to be smashed records shattered	Kutsaga	The Herald, 04 July 2023
Zim faces new tobacco ban threat	Magama F.	Pindula, 07 July 2023
TIMB to inspect farms for undestroyed stalks		The Herald, 14 July 2023

Tobacco Research Board has rebranded	Magama F.	Financial Gazette Newspaper: 20-26 July 2023
Zim targets higher-yielding tobacco varieties	Kutsaga	The Financial Gazette, 26 July 2023
Fire guts Kutsaga offices	Mugabe T.	Business Times, Sunday mail, New Zimbabwe and 263Chat, 31 July 2023
Kutsaga rolls out more climate-smart varieties	Magama F.	Business Times, 03 August 2023
Zim posts record tobacco output	Kutsaga	Sunday Mail, 06 August 2023
New: Kutsaga announces approved chemicals for tobacco	Kutsaga	Sunday Mail, 09 August 2023
TRB gives greenlight to use of new agro-chemicals	Kutsaga	The Herald, Newsday 09 August 2023
Record-tobacco-hectarage-beckons-as-847kg-seed-sold		The Herald and Chronicle, 10 August 2023
Zimbabwe Seed Sales Hint at Record Hectarage		Tobacco Reporter, 10 August 2023
Kutsaga announces approved chemicals for tobacco	Kutsaga	The Sunday Mail, 09 August 2023
Zimbabwe Approves New Tobacco Agrochemicals	Kutsaga	Tobacco Reporter and Tobacco journal, 17 August 2023
Sand poachers threaten Kutsaga operations	Magama F.	The Sunday Mail, 20 August 2023
Tobacco milestone in Zimbabwe gives hope to other crops		Food for Mzansi: 21 August 2023
One-thousand-kg-tobacco-seed-sold	Magama F. and Mugabe T.	The Sunday Mail, 10 September 2023
New: Plant drought resistant tobacco varieties	Dimbi S.	The Sunday mail r, 13 September 2023
Tobacco planting techniques	Chinamo D. and Dimbi S.	Zimpapers Agric Journal, September issue 2023
Tobacco farmers urged to be wary of climate change	TRB	The Herald, 13 September 2023

Tobacco farmers urged to be wary of wireworms	Nyamakura C. and Chinheya C.	The Sunday mail, 20 September 2023
Be on the lookout for tobacco false wireworm	Chinheya C.	The Herald and Agroalerts, 13 September 2023
Sustainable innovations for industrial hemp (Hannabis Sativa L.) based materials	Mateva K., Musengi A. and Dimbi S.	Zimpapers Agric Journal, October issue 2023
Tobacco transformation plan crafted	TRB	The Herald, 11 October 2023
Develop markets to boost hemp farming,		Financial Gazette, 12 October 2023
New-long-serving-kutsaga-director-retires	TRB	The Sunday Mail, 17 October 2023
Tobacco planting intensifies	TRB	The Herald, 19 October 2023
Zim wins bid to host African Plant Breeders indaba	Magama F.	The Sunday Mail, 1 November 2023
Kutsaga blacklists 15 tobacco chemicals	Mavuka R.	The Sunday Mail, 10 November 2023

Business Development & Marketing Sector

Mission

To consistently satisfy our clients by developing and providing quality and innovative goods and services.

The sector comprises of the following groups;
Trainers and extension, Public Relations and marketing and Liason,Advisory and Special Projects

Purpose

1. To increase revenue for the Board
2. To coordinate all commercial activities
3. To disseminate knowledge, information, and technology
4. To market and sell Kutsaga products and services
5. To continuously improve relationships with stakeholders through a participatory approach

Outputs

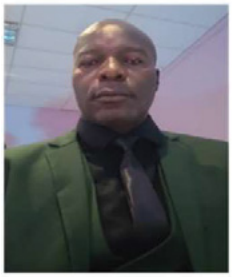
1. Marketing & sales of kutsaga products and services
2. Production of kutsaga products
3. Provision of sales information
4. Training of growers

Mr O Mharapara - Executive Director Business Development & Marketing

The institution bade farewell to Mr. Oswell Mharapara, Executive Director Business Development and Marketing who retired on the 31st of September 2023 after serving the institution for 29 years. A farewell dinner was hosted for him and stakeholders were also notified. Oswell joined the institution as a Research officer in 1994.

Meet the team

Mrs M Nyakachiranje
Head of Department
HBS (Zim), MBA (Zim)



Mr P Muzoda
Supervisor – EPS Factory
Nat. Certificate

Mr A Kambare
Training officer
Dip. in Agriculture

Mrs R Magama
Training and Extension Officer
BSc Agric (Hons)

Mr T R Dzingai
Marketing Officer
BSc Hon Economics UZ, MBA UZ

Ms V Musimurimwa
Regional Sales represantantitive
Dip. Marketing LCCI , BBA in Marketing, IMM, MBA GZU

Mr T Mugabe
Public and Communications Officer
BA in Media Studies (ZOU), BA (Honors) in Communication and Media, MSc in Digital Marketing, Cert. in Digital Marketing

Mr A Jeche
Regional Sales Rep.
for Mt Darwin and Masvingo

Mr I Mazhangare
Regional Agronomist
for Mash East, Manicaland, Masvingo, Midlands, Bulawayo, Mat North and Mat South

Mr N Mutasa
Regional Sales Rep.
for Mashwest

KUTSAGA PRODUCTS BRAND AWARENESS

Products Performance

The major focus during the year was on increasing sales growth through strengthening relationships and fostering personalised interactions with growers. (Table1)
The following products were sold during the period under review; 65 178 bags of Gromix^{Ultra}; 138 275 float trays; 51 640 litres of floatfert, and 7 377 672 tubers of G4 seed potato.

Table 11.1
Sales Statistics in comparison with the previous year

Product	Year 2022 Sales	year 2023 Sales	% Increase
Gromix (bags)	57 387	65 187	+14%
Float trays (Trays)	150 830	138 287	-8%
Float Fert (Litres)	55 917	53 248	-4.7%

Market Surveys

At the end of the year a customer satisfaction index survey was conducted and the overall customer satisfaction index for the institution was 78.4% which is a good score according to global standards. Knowledge and expertise of staff variable recorded the highest score of 88%. A number of programs are underway to continuously improve customer experience.

REGIONAL BUSINESS

In pursuit of increased visibility and business expansion in the region and global market, the institution amplified its marketing initiatives as well as engagement with relevant targeted markets. Some 787 kg of tobacco seed were exported to Mozambique, Uganda, Malawi, Rwanda, Tanzania, South Africa, and Zambia RK 4 and KR K 26 R continue to be the most preferred varieties in the regional market.

PRODUCTION

The main objective of the production sector is to efficiently and cost-effectively produce quality products that meet the demand for maximum customer satisfaction.

Float Trays Production

A total of 171,743 trays were produced during the year, 12% lower than 195,166 produced in 2022. Production was negatively affected by incessant power cuts and delays encountered during the NSSA Statutory Annual Boiler Overhaul.

Gromix Production

There were 77,861 bags of GromixUltra produced during the year, 3.5% down from last year's production. A total of 19 composts were constructed during the year from three sites as shown in table 2 below:

SEED POTATO

SEED POTATO PROJECT
In response to the nation's quest to be seed potato self-sufficient and ultimately improve food security at household level the seed potato production project continued to expand its operations. Seed potato of generations 1 to 4 was produced under an out-grower scheme of 118 growers resulting in a substantial increase of G4 seed availability. The seed crops were inspected throughout the crop cycles by Seed Services.

Table 11.6: Seed potato production by generation

Generation	Ha worth of seed produced
1	128
2	293
3	362
4	140

Table 11.7: Staff Training

Course	Staff
Diploma in Supervisory Management	1 - WIP
Tobacco inspector training	2 - WIP

Table 2 : Four-Year Composts Construction by Site

Site	2020	2021	2022	2023
Charter	13	7	11	7
Sheba	16	11	7	5
Nyanga Pine	11	16	16	7
Total	40	34	34	19

There was a notable downward trend in the quantity of compostable bark being obtained from the three existing sites over the past four years. Changes in the timber-cutting systems being introduced by our hosts have a significant effect on the amount of usable and compostable bark obtainable from each site. To hedge against potential supply risks associated with these changes, two additional sites namely Cashel Valley in Chimanimani and Erin Estates in Juliasdale are expected to start feeding into the project's supply chain next year. The Board also acquired a brand-new Backhoe Loader for the Sheba site to maximise production and quality at the site.

Sheba log Dec captured on 9 November 2023. The site had an increased timber productivity during the year. This in turn pushed the bark output realised in this period.

Bird's eye view Sheba Gromix Production Unit

The Board invested in machines required to move pine bark to composting yards as well as turn the composts regularly to ensure uniformity and optimal media quality is produced at all three sites in Manicaland.

Well-maintained modern Front-End Loader at Charter Production Unit.

All the sites were visited periodically to check on the quality of work. It was through these visits in addition to the lab analyses and bioassays that the intended Gromix quality was assured.

In line with increasing the number of bark sources for the project, the Board is expecting to start work at Cashel and Erin Estates. Cashel is in Chimanimani while Erin is in Nyanga.

Scrutinizing the particle sizes of sieved bark ready to be bagged and dispatched to Harare at Nyanga Pine on 20 October 2023.

Charter Production Supervisor Silas Jangwa (right) and Shift Leader Charles Chindondondo (left) have been key to the success of 2023's Gromix production. Silas Jangwa was one of the 2023 workers of the year.

2. Training and Extension

Mission:

To provide knowledge, advice, and technical assistance to any person growing tobacco whilst increasing sales of Kutsaga products and services.

Calendar-based training

The calendar-based training covering land preparation, seedling production (tobacco and horticulture), field management, reaping to marketing was done in all tobacco growing districts.(Fugure1) A total of four thousand nine hundred and thirty-three (4,933) farmers were trained. In addition, one thousand two hundred and nine (1,209) extension officers were trained on similar aspects under the Train-the-Trainer program.

Figure 1. Curverid tobacco Field officers

undergoing reaping and curing training

Table 1 Training statistics

Aspect	2021	2022	2023
Number of farmers trained	2,780		4,933
Number of extension officers trained	78	644	1,209

Outreach activities

A ten (10) ha float seedbed demo was set-up in Tete province for Mozambique leaf tobacco (MLT). This exercise was done in collaboration with the Plant Health Services Division. Trichoderma trials on both float trays and conventional seedbeds were also set. The objective of the project was to introduce, market and capacitate the float seedbed system in Mozambique. Farmers at three sites were trained and supplied with a total of 10 Ha worth of seedbed inputs. Seedlings successfully established at all the three sites with an 80 % pullable rate. Additionally, float seedlings were superior to conventional seedlings on survival and vigour in the field. Indications are that farmer capacitation stands at 70 % with only two training visits required per season.

Figure 2. Empowering farmers through outreach programs

Table 2. Summary of outreach activities conducted during the year

Activity	Target	Actual number carried out
Farm visits	20	9
Field days	25	11
Agricultural shows	8	5

The training and extension team participated in 8 Agricultural shows where the institution won several awards both at the district and provincial levels.

Table 3

Exhibition	Category and award
Mashonaland East	Second best in the Parastatal Service provider category
Manicaland	Best in the Research Industry category
Mashonaland Central	Second place for good exhibition in the tobacco sector.

Fig 3. Show set up displaying Kutsaga products.

Public Relations and Marketing

The major thrust of the Public Relations and Marketing division is to create mutually beneficial long-term relationships with all Kutsaga internal and external stakeholders. To this end, there was continued grower and stakeholder support through the marketing of Kutsaga products and services in the form of 43 commercial advertisements through radio, television, public and private newspapers in addition to social media platforms.

An average of 208 posts were shared on social media, (Twitter (X), Facebook, LinkedIn, Instagram and YouTube) to increase the Kutsaga brand awareness and the marketing of products and services for the year under review.

Additionally, Kutsaga participated in 33 exhibitions within Zimbabwe including the National Green Field Day in Mazowe, Zimbabwe and Italy Association (ZIMITA) and ADMA in Borrowdale, Zimbabwe Agricultural Show in Harare, SeedCo National Field Day in Kwekwe among other events, workshops, conferences and field discussion days. After a major blackout due to COVID-19, the flagship Tobacco Improved Productivity Scheme (TIPS) was resuscitated to reward the 55 growers and 49 ARDAS (Agritex) officers who excelled in the 2022/23 tobacco production season.

More so the Tobacco Research Board officially rebranded on 30 June 2023 in line with the directive from the parent Ministry of Lands, Agriculture, Fisheries, Water and Rural Development (MOLAFWRD) assuming a new corporate identity. illustrated in Fig 11.1 below.

Fig 4: Some of the important guest at the rebranding ceremony

Furthermore, a total of 1 306 guests visited Kutsaga from the Government, the media, foreign dignitaries - EU, SADC, Iran, Bulgarians, Tanzania, SADC Gene Bank, University of Zimbabwe, Chinhoyi University of Technology, Air Force of Zimbabwe, Industry players, etc. In addition, Kutsaga won the prestigious ZimTrade - Agricultural Inputs Exporters Award 2023.

A total of 190 articles were published between 1 January - 31 December 2023 in Zimbabwe (public and private), SADC, and international mainstream media profiling the Kutsaga products and services in the form of information, education, and communication (IEC) material.

Corporate Social Responsibility

Kutsaga donated 1.1 million free eucalyptus seedlings covering 495hectares as part of corporate social investment (CSI) towards sustainable tobacco production and these were distributed to growers and all walks of life in Mashonaland East, Mashonaland West, Mashonaland Central, Manicaland, and Harare. It is anticipated that more resources will be availed to enable greater visibility of Kutsaga in a two-pronged campaign of virtual and physical marketing and publicity campaigns with the internal and external stakeholders.

Table 4: Summary of Public Relations and Marketing Activities

Activity	Record
Marketing material development / collation	43
Stakeholder visits/tours	47
Exhibitions	33
Corporate Image strategy (rebranding)	1
Social media content creation and curation (weekly per platform)	3
Mainstream media publicity	190
Corporate social investment (CSI)	1

Table 11.9

AWARDS & ACCOLADES

Kutsaga was awarded the Agricultural Inputs award at the 2023 ZimTrade Exporters Awards held on the 19th of October 2023 at Meikles Hotel in Harare. Kutsaga was competing against major agricultural companies and won due to its high value of exports, unique competitive edge, and exclusive research and development conducted over the years.

STAFF TRAINING

As part of staff development capacity, an internal marketing day was held to train all staff members and students in customer care and product knowledge. Fig 11.6 Kutsaga Staff being trained on tobacco seed varieties and industrial hemp. A participatory approach was adopted to ensure the involvement of all participants during the training process.

The Division mentored 35 students from University of Zimbabwe, Chinhoyi University, Catholic University, Bindura University, and Midlands University (as shown in Table 11.10)

Table 5

University	Number of students mentored
University University of Zimbabwe	1
MSU	15
Catholic	3
Bindura	7
Chinhoyi	9
Total	35

LIAISON, ADVISORY AND SPECIAL PROJECTS

MISSION

To facilitate the sharing of tobacco production information and, related products and services with stakeholders for sustainable and profitable tobacco production.

VISION
To be the focal contact point in interactions between the Tobacco Research Board and stakeholders.

PURPOSE
To create an effective communication channel between the Tobacco Research Board and its stakeholders.

DIVISIONAL THRUST
In its bid to fulfil its mandate, the Division engaged in the following activities:

I. Advising tobacco growers on best management practices (BMPs) in the seedbed, lands, at harvesting, curing and grading, and any new research findings
II. Facilitating communication between Kutsaga (management and researchers), and growers and tobacco merchants for effective problem resolution and to address new grower needs
III. Presentation and attendance of Field Days, conferences and workshops for Kutsaga, tobacco merchant and agrochemical companies organized events
IV. Advocating for the use of Kutsaga Products such as Gromix, float trays, floatfert, Gnatbuster, etc.
V. Participating in the Ministry of Lands, Agriculture, Water, Fisheries and Rural Development (MLAFWRD) organized meetings, field days and conferences
VI. Advising management on ways to improve facilities (e.g. irrigation) and new projects at Kutsaga, Banket and Oriental stations for increased revenue generation.

Meet The Team

Dr. D. Rukuni
Head Liaison
BSc Agric (Zim),
MSc (Massey),
PhD (Florida)

Tobacco Grower Advisory
A total of thirty-six tobacco growers from the various tobacco growing districts were visited, while several others were also attended to through electronic platforms. (Figure 1) During the seedbed period, queries on the quality of Gromix were raised, such as weeds germinating in Gromix, and complaints on worms in the media and these issues were addressed by tightening the processes at the composting sites. Additionally, growers using the float system continued to experience problems with salts, fungus gnat, Rhizoctonia, Pythium and cold injury, and in all cases appropriate advice was rendered. As Kutsaga, we continued to advocate for the use of the float system versus the conventional seedbed method of raising tobacco seedlings.

In the lands, some of the problems encountered were white mould, Granville wilt, Black Shank, Rhizoctonia, Fusarium, a suspected complex of Black Shank and Fusarium, PVY and false wire worm damage. However, some of these problems were being exacerbated by the intermittent hot dry spells as sun scorch was also a common phenomenon. Agronomy related problems were herbicide phytotoxicity, and fertilizer leaching due to incessant rains, and early flowering in K RK26R. Also, post-harvest concerns ranged from curing, conditioning and grading, and these were also addressed adequately. In addition, effectiveness of flumetralin as a suckercide was addressed as growers were urged to watch out for the product label before applying the suckercide since some of them contained half the active ingredient, 125 EC versus the registered 250 EC. Awareness on another product, imidachlorprid was also raised because the two liquid formulations are either 200 SL or 350 SL, will can lead growers to under- or over application. A “Dear Grower” was sent out in respect of the two issues above.

Furthermore, in the past season, it seems the popularity of K RK74 and K RK70 was rising as replacements for K RK66 and K RK26R, respectively, as we continued to promote the growing of new varieties by large scale growers. Also, Kutsaga provided information on ranking varieties according to the resistance level (low to high) for each of the resistances that are listed in the variety information sheet, to enable growers to choose varieties that match the problems on their farms, e.g. Granville wilt, nematodes, etc.

The Tobacco Improved Productivity Scheme (TIPS) aims at training small scale growers on Best Management Practices (BMPs) for tobacco production. The training is done with the collaboration of the Agricultural and Rural Advisory Services (ARDAS) extension officers of the MLAFWRD. The scheme trained a total of 3 494 growers in 118 groups of small-scale tobacco growers and at the end of the season, grower assessments are made to choose the ones that have grasped the concepts and practiced them well. Furthermore, a total of 179 ARDAS extension officers were also trained. For the assessment part, the Division participated at seven sites in Gokwe, Seke/Beatrice, Marondera, Wedza and Mvuma, where a total of 15 growers were evaluated. This program plays a pivotal role in the Tobacco Value Chain Transformation Plan (TVCTP) that will see the country earn more foreign exchange from tobacco production.

Figure 1: Grower visits during the year. Granville wilt (Ralstonia solanacearum) was particularly a problem the past dry season. Insert: bottom left, granville wilt affected plants and right; cross section of affected plant showing typical laddering symptoms.

Liaison

Several engagements were made with local stakeholders, such as the interactive Ministry of Lands, Agriculture, Water, Fisheries and Rural Development (MLAFWRD) meeting held at Pandari, the prize giving ceremony for the Young Farmers Association and participation

in the judges panel for the best small-scale tobacco grower for the Zimbabwe Agricultural Society competition. Additionally, Kutsaga participated in a tour with the Zimbabwe Tobacco Association (ZTA) president and his team in Norton, Marondera and Mvurwi where growers were appraised on current research results on nematodes, and pests and diseases control and, new varieties from Kutsaga. A first of its kind discussion forum was hosted by Kutsaga where the ZTA and the tobacco trade were appraised on current tobacco research activities. Also, The 63rd Zimbabwe Tobacco Seed Association (ZTSA) annual general meeting was attended, and some issues discussed were the Kutsaga monopoly on seed production and sales; and the request to allow imported varieties to be grown in Zimbabwe after the relevant testing period and approval.

In international stakeholder engagements, a representative from Afro Holdings, of Namibia visited to discuss a proposal Kutsaga to export Irish potato mini-tubers to Namibia for further multiplication to produce later generations of seed potato. Additionally, a Dutch company, Go&Grow was also engaged to discuss the seed potato cold chain and size-grading equipment for potatoes; and furthermore, SADC EXCHANGE and HCG, a South African seed exchange organisation was also engaged to increase the seed potato varieties range that Kutsaga could provide for the local market. Moreover, another meeting was held with a businessman, Mr. Nathan Gatt from Malta who intends to introduce equipment for converting agro-bio waste to produce bio-charcoal and briquettes for tobacco curing.

Kutsaga participated in the "The 3rd China-Africa Economic and Trade Expo – CAETE)" in Changsha, China, where Kutsaga exhibited its research activities, products and services to the Chinese business community as well as other participating African countries. Other linkages were made with companies such as Innotek, a Chinese company that is involved in the "internet of things – IOT"; and they have a keen interest in introducing turn-key portable/mobile tobacco barns and also, retrofitting existing barns for improved efficiency. In addition, a familiarization tour was also made in Trelawney for Iranian visitors who were interested in small-scale and large-scale tobacco production practices.

Seed potato

One hundred and seventy-eight (178) internal seed potato inspections were done and another 42 were conducted with Seed Services and all of them passed except one during the period ending in April 2024. Additionally, seven farm inspections were done and only one failed. The search for partners with land for seed potato production was continuous and possible players such as ARDA were identified.

Kutsaga will benefit immensely from being allocated land dedicated to seed potato research and production. In this regard, the organization has applied for land in Mashonaland East and Manicaland, and a response is yet to be received from the MLAFWRD.

Special Projects

These projects are aimed at commercial projects initiation and establishment in order to expand the revenue generation capacity of the institution through new projects and augmentation of existing ones.

To this end, the Banket Station water supply improvement project was successfully implemented. There is now a two million litres reservoir constructed to store water extracted form the mine on the neighbouring farm and, two boreholes were resuscitated giving a total of five operational boreholes now. A 30 hp submersible pump was also acquired to extract water from the mine to the reservoir, and a booster pump to deliver water from the reservoir into the land is in place. And finally, a travelling irrigation system capable of irrigating 25 ha per week in a seven-day cycle was acquired and is now operational.

An initial 10 ha maize crop was therefore planted and in addition, five ha of G1 seed potato crop

was planted during the year to reduce costs in the seed potato production program by excluding out-growers in this early generation.

Additionally, a preliminary plan has been laid out for the Oriental Station in Masvingo for augmentation of the water supply for commercial cropping programs. The special projects will enable full potential utilization of the Kutsaga stations for maximum revenue generation.

FIELD DAYS AND EVENTS ATTENDED

- A golf tournament organized by the Federation of Young Farmers Clubs Zimbabwe (Fyfcz) was attended in Marondera. Kutsaga also sponsored some prizes of seed potato pockets for the various winners to show visibility in the seed potato business.
- Attended a ZPMA seed potato grower organized field day in Domboshava at Mushambi Farm where growers shared information on ways to improve seed potato yields.
- A University of Zimbabwe Expo was attended at the Innovation Hub, where local companies and individuals showcased their inventions and various products and services.
- A field day was attended at Kuguta Estates in the KweKwe/Mvuma area where beef, wheat, and potato production were showcased. Officiating were the MLAWF&RD Permanent Secretary, Dr. John Basera and the Minister of State for Provincial Affairs for Midlands, Honourable Larry Mavima. Kutsaga also exhibited at the field day, to promote products and services.

PUBLICATIONS

1. The Zimbabwe Potato Micropropagation Association (ZPMA) guide to seed production was finalized for publication.
2. A new edition of the Flue-Cured Recommendations handbook was also finalized for publication.
3. The Flue-Cured Tobacco Production Field Guide is still under review.
4. Editing of a Cooperation Centre for Scientific Research Relative to Tobacco (CORESTA) document on Leaf Sustainability was completed and sent back to the CORESTA Working Group Secretariat at North Carolina State University.

Internal Audit Division

Mission

To provide independent and objective assurance, management advisory services and insight with continuous evaluation and improvement in risk management, control and governance processes to enhance and protect organizational value.

Meet the Team

Ms M. Mgijima
Head of Internal Audit
BComm (Honors) in Accounting (Zim), CIMA, COP

Mr S. Tafireyi
Auditor
BCom Accounting (ZOU)

INTRODUCTION

Internal audit offers the assurance and advisory services to the institution through audits, assurance reviews and advisory reviews. These services are determined by the process to be reviewed and needs of the client.

The major risks faced by the institution necessitate regular reviews in order to align with the organisation's strategic objectives. The International Professional Practices Framework of the Institute of Internal Auditors also influence how our audit engagements are performed as well as various public companies' Acts. Internal Audit's work plan is developed based on a dynamic risk assessment process.

Relationship nurturing with stakeholders is paramount to the success of internal audit division so as to promote an understanding of the division's mandate in relation to value enhancement for the institution. The internal audit's effectiveness is propelled by sturdy relations with management and the audit committee as stakeholder concerns and emergent risks are identified and resolved.

SUMMARY OF INTERNAL AUDIT WORK 2023

For the 2023 financial year, internal audit delivered 10 assurance engagements split between routine audits and assurance reviews, which focused on the most significant risks for the institution.

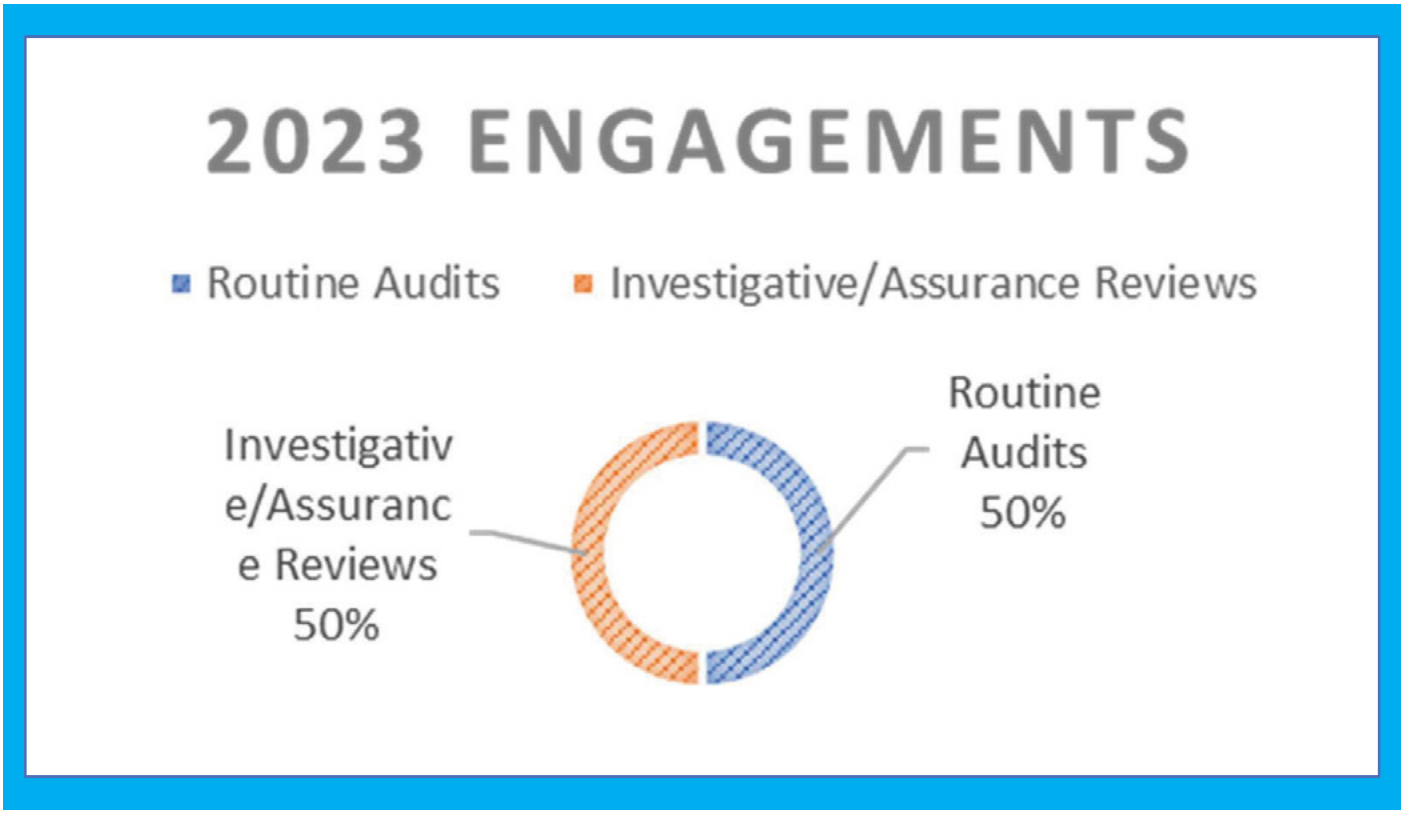


Figure 1: Proportion of routine audits to investigative engagements

The work program considered the following objectives;

I. to ascertain that risks are appropriately identified and managed
II. to establish that systems of controls are laid down and operate to achieve the most economic, efficient and effective use of resources.
III. to review and appraise the soundness, adequacy and application of the whole system of internal control;
IV. to establish the extent of compliance with established policies and procedures and laws and regulations;
V. to ascertain that institutional assets both physical and intellectual, records, and data are safeguarded
VI. to ascertain that resources are acquired economically and used efficiently
VII. to ensure that financial, managerial, and operating information is accurate, reliable, and timely.

Other than the audits, the Internal Audit division also prepared the following statutory documents;

- Annual risk-based Audit Plan
- Rolling Strategic Internal Audit Plan 2023-2025
- Internal Audit Charter

RISK MANAGEMENT

Risk assessments were completed quarterly by all divisions. Risk registers were reviewed and the following recognized as the key risks affecting the organization;

Table 1: Kutsaga Internal and External Risks

TOP KUTSAGA RISKS (EXTERNAL)	TOP KUTSAGA RISKS (INTERNAL)
ENVIRONMENTAL RISKS Veld fires, floods, drought, storms, climate change	**FINANCIAL RISKS** Cashflow, funding, profitability
ECONOMIC RISKS Inflation, exchange rates	**OPERATIONAL RISKS** Power cuts, machine breakdowns, aging equipment, procurement
TECHNOLOGICAL RISKS Cyber-crime, internet lines reliability, systems failure, hardware failures, data breaches, malware infections, spams, phishing	**HEALTH & SAFETY** Fire, accidents, injuries, health impact
COMPLIANCE RISKS Acts, S.I. Standard bodies, ISO certifications, NSSA, EMA, OPC, Monetary policies etc.	**LABOUR RISKS** Staff attrition, remuneration, shortage of staff, succession plan
LEGAL Contractual, litigation	**SECURITY AND FRAUD RISKS** Misappropriation of assets, inventory losses, forgery, theft, fraud
PRODUCT PRICING Product costing and pricing	**REPUTATIONAL RISKS** Product quality, poor relations with stakeholders,
	COMPETITION Market competition for tobacco and other products and services

STAFF ISSUES

The staff compliment for the division grew to two people during the year as the Internal Audit assistant joined the division in June 2023.

The Head Internal Auditor was appointed to the position after successfully completing the fixed term contract period.

To keep abreast with emerging technologies and developments in Internal Audit and the public sector, the division sought for relevant outsourced workshops and trainings as shown in the table below;

Table 2: Workshops and trainings attended in the year

Name	Workshops and Training
M. Mgijima	Internal Control & Fraud Prevention
S. Tafireyi	Public Procurement Annual Symposium
M. Mgijima	Security Awareness
S. Tafireyi & M. Mgijima	CaseWare Audit Software Training
M.Mgijima	IPSAS Awareness
S. Tafireyi & M. Mgijima	IPSAS Detailed Training

Human Resources Division

Mission

To provide human resources and administrative support to the Tobacco Research Board and to attract, develop and retain competent staff that drive and sustain innovations.

Meet The Team

Mr L. C. Mushore
Head: Human Resources
EMBA (Zim) MSc Leadership and Change Mgt (Leeds Metro), Higher Dip. Human Resources, Dip. Training Mgt, Dip Personnel Management

Mrs. G. Chingombe
Human Resources Officer
HND Library and Information Science, Dip Human Resources Management

INTRODUCTION

In 2023, the operating environment for the institution was characterised by numerous macroeconomic challenges, such as hyperinflation, high production costs, and power outages. However, despite these difficulties, there was a notable improvement in employee relations. The Employee Engagement score rose by 8%, reaching 63%. This positive change was attributed to the successful implementation the Annual Strategic Plan Review Workshop, which introduced a performance contracting framework. As a result, the institution achieved a sound financial standing and enhanced its employee engagement.

LEARNING AND DEVELOPMENT

Capacity development continues to be a key focus for the institution, so several training initiatives have been implemented. The institution has organized various training courses, including lifting techniques training, Payroll, NSSA Occupational Health and IPSAS training, First Aid, Works Committee Training, and Works Council. Furthermore, all staff members have taken part in a transformation workshop as part of the ongoing restructuring process, which also encompasses a culture change.

EMPLOYEE RELATIONS

Employee relations were characterized by instability as a result of economic hardships, including ongoing inflationary pressures and a decrease in disposable incomes. Nonetheless, significant efforts were undertaken to tackle these obstacles. Notably, the working relationship between the Tobacco Research Board and the General Agriculture and Plantation Union has experienced a remarkable improvement. As a demonstration of goodwill, the Union generously contributed a 5Kv solar system to Kutsaga Clinic.

Employee Wellness Program

An employee wellness program was enhanced in 2023 with the addition of family planning and cervical screening, in addition to Zumba, HIV, and AIDS programs. In 2023, the employee wellness program underwent significant improvements by expanding its offerings to include family planning and cervical screening. These additions complement the existing Zumba, HIV, and AIDS programs, further demonstrating the organization's commitment to supporting the holistic well-being of its employees.

PRESIDENTIAL CLEAN-UP CAMPAIGN

During the period under review, the employees of the Board were actively engaged in the Monthly Presidential Clean Up Campaigns. Specifically, they have dedicated their efforts to cleaning up Airport Road and Domboramwari. This demonstrates their commitment to environmental stewardship and community involvement.

Figure 1. Kutsaga Clean-up Campaign

1. KEY HUMAN RESOURCES STATISTICS OF 2023

Month	Engagements/ Appointments	Contract Extension	Promotions	Resignations	Dismissal	Death	Clinic Visits	Work-Related Accidents	Retirement
January	3	4	0	1	0	0	259	0	0
February	1	8	0	2	0	0	231	0	0
March	16	2	0	1	0	2	264	0	0
April	5	4	0	0	0	0	252		0
May	0	0	0	0	0	0	197	0	1
June	2	0	0	0	0	1	215	0	1
July	1	0	0	2	0	0	252	0	0
August	16	0	0	0	0	0	162	1	0
September	9	2	0	1	2		187	0	0
October	4	0	5	2	2	0	202	0	1
November	3	7	1		0		210	1	0
December	1	0	0	0	0	0	177	1	1
Totals	**61**	**27**	**6**	**9**	**4**	**3**	**2608**	**3**	**3**

Procurement Management Unit

Mission

Our mission is to execute procurement and disposal of public assets in a manner that is sustainable to the environment, transparent, fair, honest, cost effective and competitive. We aim to be a responsive support services centre driving a modern efficient and effective procurement system to support operations of the Board.

We take pride in our integrity, accountability, fairness and professionalism in advancing the interest of our organisation, government and the general public at large in line with the Public Procurement and Disposal of Public Assets Act Chapter 22.23 (PPDPA Act).

Objectives of the Division

Objectives of our function are enshrined in the Public Procurement and Disposal of Public Assets Act Chapter 22.23 as specified in Section 4 of the same Act as follows:

- To ensure that procurement is conducted in a manner that is transparent, fair, honest, cost effective and competitive;
- To promote competition among bidders;
- To provide for the fair and equitable treatment of all bidders, leading to procurement contracts that represent good value for money;
- To promote the fairness and public confidence in procurement processes;
- To secure the implementation of any environment of any environmental, social economic and other policy that is authorised or required by any law to be considered by a procuring entity in procurement proceedings.

Meet the Team

Mr M Murinda
Head of Department
MSc Purchasing and Supply Chain Management, Full MCIPS: Professional Diploma (UK), Bcomm Purchasing and Supply Chain Management Diploma in Purchasing and Supply

Mr Z. Matapure
Procurement Officer
BComm Business Management (Honors), MSc in Supply Chain Management, HND in Purchasing and Supply Buyer, Nat. Dip in Stores Management and Stock Control (UK)

Ms L R Guveya
Procurement Officer
BSc(Hons) Degree in Supply Chain Management (2.1)-CUT, ZWDiploma in Procurement and Supply - (CIPS, UK)

Supply Market Outlook

The economic environment remained constrained mainly driven by micro and macro-economic variables coupled with the effects of rising inflation both locally and globally. The supply market was characterised by arbitrary pricing of goods and services due to speculative reasons and forward pricing. Resultantly, the government instituted a plethora of measures, including the decision to suspend payments to some contractors and increased the bank policy rate and medium-term lending rate to 200% and 100%, respectively. The Central Bank also maintained its tight monetary policy stance to keep a grip on inflation and exchange rate movements. Notwithstanding these challenges the Division continued to play its pivotal role of supporting the organisation's operations through various strategies like constant market analysis, price benchmarking, supply chain risks management and due diligence exercises to ensure that the organisation obtain value for money on all its procurements in-line with government thrust.

High value procurements in the year 2023

Table 1 shows a highlight of high value procurements that were conducted during the year 2023

TABLE 1: SELECTED LIST OF HIGH VALUE PROCUREMENT

PROCUREMENT DESCRIPTION	QUANTITY	SUPPLIER	VALUE
Supply and delivery of Backhoe loader	1	Croco Motors	US$78,000.00
Supply and Delivery of Toyota Land Cruiser	1	ESP MOTORS	US$98,000.00
Supply and Delivery of Desktop Computers	20	Craig Computers	US$34,000.00
Supply and installation of Solar System	1	Pristine Power Solution: Lot 1 Mwenje Technology: Lot 2	US$78,125.75 US$89,752.24
Supply and Installation of cold-room in Banket	2	Evergas	US$23,000.00
Gas chromatography machine	1	Perkin Elmer- Singapore	US$56,845.00
CM10 Powder	3.4tons	Germains Seed Technology-Germany	€34,412.15
Biolog	1	Alliance Global- Dubai	US$70,306.82
Seed Potato Coldroom	1	Carrier Air conditioning	US$125,597.92
UV/VIS Spectrometer	1	Perkin Elmer	USD $21,471.78
Expandable Polysterene raw material	34 tons	Loyal Crown- China	€108,630.00

Regulatory Compliance

As we aim for a 100 percent compliance to the regulations governing our procurement activities, the following reports were submitted in time to our regulator Procurement Regulatory Authority of Zimbabwe (PRAZ) as stipulated by the Public Procurement and Disposal of Public Assets Act Chapter 22.23:

- TRB Annual Procurement and Disposal Plan for the year 2023
- Annual Procurement Return for the year 2023
- 12 x Monthly Procurement return for the year 2023

Finance and Corporate Services Sector

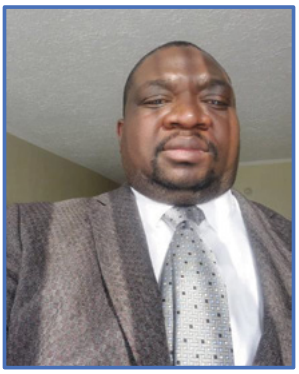
MISSION

- To provide accurate and timely information to enable decision making by all stakeholders.
- To provide efficient and effective support services in Information Technology and Security Services.

MEET THE TEAM

Mrs. T. Madziva
Executive Director: Finance & Corp Services
BComm (UNISA), MBA NTU, (UK) ACIS,
Dip Bus Comp. Prog

Mr D Chibanda
Finance Manager
CIS
BComm (Honour) Finance



Mr G Mudukuti
Accountant
CIMA (Associate)
Msc Strategic Business Management
Bachelor in Business Administration

Mr F Sengudzwa
Systems Administrator
HND, B Tech Information Technology

Mr F Nyahasha
Security Officer
Adv Dip in Security Management

A. FINANCIAL PERFORMANCE

1. REVENUE

The revenue for the year 2023 went up by 1057% in historical cost terms, from ZWL9,147 billion in the year 2022 to ZWL87,534 billion in the year 2023. In inflation adjusted terms the revenue went up by 475%.

The TRB revenue is made up of a tobacco levy and income from its own commercial projects.

Receipts from the tobacco levy went up by 1263% from ZWL1,5 billion to ZWL17,6 billion. In Inflation adjusted terms Tobacco Levy went up by 616%.

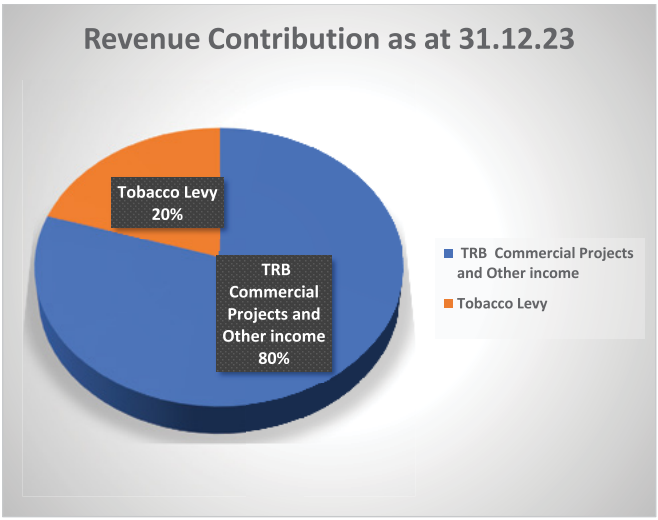
2. REVENUE CONTRIBUTION

The tobacco Levy contributed 20% of total revenue in the year 2023. 80% of

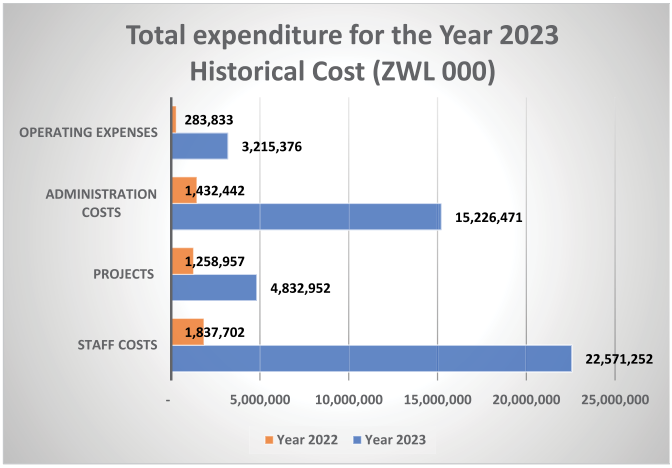
revenue came from TRB's commercial projects.

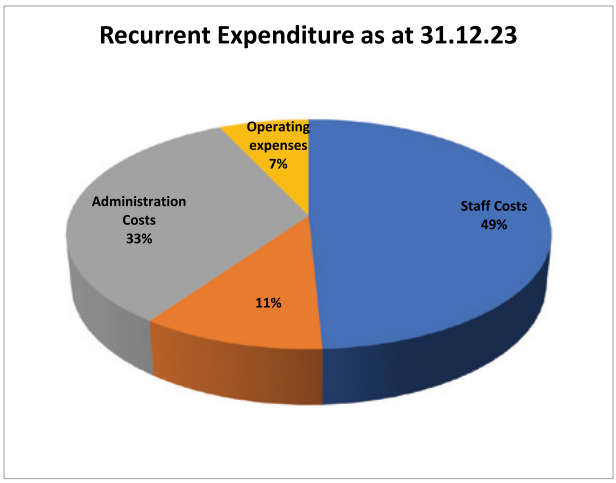
The major commercial products were Tobacco seed, Commercial tobacco production, Tobacco seedlings production, Seed Potato production, Float Trays, Gromix Production Float fert and Horticulture seedlings.

3. YEAR 2023 RECURRENT EXPENDITURE



In terms of Historical cost, recurrent expenditure for the year 2023 went up by 853% from ZWL4,9 billion to ZWL45.8 billion. In terms of inflation adjusted figures, recurrent expenditure went up by 210% from ZWL23,1 billion to ZWL 71,7 billion.





In the year 2023, 49% of recurrent expenditure went into staff costs and 33% of expenditure were administration costs. Projects and operating expenses consumed 11% and 7% respectively of total expenditure.

In terms of revenue allocation in Historical costing, staff costs consumed 26% of revenue and Administration costs consumed 17% of revenue. Projects and Operating costs consumed 6% and 4% respectively.

B. STATEMENT OF FINANCIAL POSITION AS AT 31 DECEMBER 2024

The statement of financial position has remained strong with total assets growing by 870% in Historical costs and by 270% in Inflation adjusted terms. Non-current assets, grew by 1097% in Historical cost and by 309% in Inflation adjusted terms.

Total capital expenditure was ZWL4,9 billion compared to ZWL270 million in the year 2022. The capital expenditure consumed 6% of total revenue in the year 2023. Current assets went up by 850% in Historical costing and by 138% in Inflation adjusted accounts.

Total reserves went up by 799% in Historical Terms and by 137% in Inflation adjusted terms. The major movement was in accumulated surplus that went up by 839% in Historical terms following the surplus that was recorded in the year 2023.

Current liabilities include Trade and other payables, Provision for leave pay and short-term loan that was acquired from a Contractor to fund the commercial tobacco crop.

C. STATEMENT OF CASHFLOWS AS AT 31 DECEMBER 2023

Closing cash and cash equivalents went up by 781% in Historical costing and by 83% inflation adjusted term. TRB closed the year 2023 on sound financial footing.

Kutsaga Financial Statements For The Year Ended December 2023

TOBACCO RESEARCH BOARD
GENERAL INFORMATION
Financial Statements for the year ended December 31, 2023

Country of incorporation and domicile	Zimbabwe	
Nature of business and principal activities	To develop and provide elite varieties and innovative agro-based technical services and products in order to maximize economic value from sustainable tobacco production.	
Directors	Mr. A. Denenga	Chairman
	Prof. F. Mtambanengwe	Vice - Chairperson
	Air Vice Mashal (Rtd). I. R. Chiganze	Board Member
	Mr. S. Mutepfa	Board Member
	Dr D. Kutywayo	Board Member
	Ms C. Garise – Nheta	Board Member
	Mrs. F. Miti	Board Member
	Dr. F. Magama	Chief Executive Officer
Registered office	Airport Ring Road, P. O. Box 1909 Harare, Zimbabwe	
Bankers	Standard Chartered Bank CBZ	
Auditors	Baker Tilly Chartered Accountants (Zimbabwe)	

TOBACCO RESEARCH BOARD
INDEX TO THE FINANCIAL STATEMENTS
Financial Statements for the year ended December 31, 2023

Contents

TOBACCO RESEARCH BOARD
DIRECTORS' RESPONSIBILITY AND APPROVAL OF FINANCIAL STATEMENTS
for the year ended December 31, 2023

The directors are required in terms of the Tobacco Research Act [Chapter 18:21] to maintain adequate accounting records and are responsible for the content and integrity of the financial statements and related financial information included in this report. It is their responsibility to ensure that the financial statements fairly present the state of affairs of the organisation as at year end of the financial year and the results of its operations and cash flows for the period then ended, in conformity with the requirements of the International Financial Reporting Standards. The external auditors are engaged to express an independent opinion on the financial statements

The financial statements are prepared in accordance with International Financial Reporting Standards and are based upon appropriate accounting policies consistently applied and supported by reasonable and prudent judgements and estimates.

The directors acknowledge that they are ultimately responsible for the system of internal financial control established by the organisation and place considerable importance on maintaining a strong control environment. To enable the directors to meet these responsibilities, the board of directors sets standards for internal control aimed at reducing the risk of error or loss in a cost effective manner. The standards include the proper delegation of responsibilities within a clearly defined framework, effective accounting procedures and adequate segregation of duties to ensure an acceptable level of risk. These controls are monitored throughout the organisation and all employees are required to maintain the highest ethical standards in ensuring the organisation's business is conducted in a manner that in all reasonable circumstances is above reproach. The focus of risk management in the organisation is on identifying, assessing, managing and monitoring all known forms of risk across the organisation. While operating risk cannot be fully eliminated, the organisation endeavours to minimise it by ensuring that appropriate infrastructure, controls, systems and ethical behaviour are applied and managed within predetermined procedures and constraints.

The directors are of the opinion, based on the information and explanations given by management, that the system of internal control provides reasonable assurance that the financial records may be relied on for the preparation of the financial statements. However, any system of internal financial control can provide only reasonable, and not absolute, assurance against material misstatement or loss.

The directors are satisfied that the organisation has access to adequate resources to continue in operational existence for the foreseeable future.

The external auditors are responsible for independently auditing and reporting on the organisation's financial statements. The financial statements have been examined by the organisation's external auditors and their report is presented on pages 4 to 6.

The financial statements set out on pages 7 to 31 which have been prepared on the going concern basis, were approved by the board of directors on 5/6/2024. and were signed on their behalf by:

Approval of financial statements

.....
Director

.....
Director

bakertilly

Chartered Accountants
Celestial Office Park, Unit
D & H Block 1, Borrowdale
Road, Borrowdale, Harare
Zimbabwe

T: +263 242 369 730, 369
737, 301 598, 301 537

enquiries@bakertilly.co.zw
www.bakertilly.co.zw

INDEPENDENT AUDITOR'S REPORT

To the Members of Tobacco Research Board

Report on the Audit of the Financial Statements

Opinion

We have audited the inflation adjusted financial statements of Tobacco Research Board set out on pages 7 to 31 which comprise the Statement of Financial Position as at 31 December 2023, the Statement of Profit or Loss and Other Comprehensive Income, Statement of Changes in Equity, Statement of Cash Flows for the year then ended, a summary of significant accounting policies and other explanatory notes to the financial statements.

In our opinion, the Inflation adjusted financial statements present fairly, the Statement of Financial Position of Tobacco Research Board as at 31 December 2023, and its financial performance and its cash flows for the year then ended in accordance with International Financial Reporting Standards ("IFRS") and in a manner required by the Tobacco Research Act [Chapter 18:21].

Basis for Opinion

We conducted our audit in accordance with International Standards on Auditing (ISAs), Our responsibilities under those standards are further described in the Auditor's Responsibilities for the Audit of financial statements section of our report. We are independent of the board in accordance with International Ethics Standards Board for Accountants Code of Ethics for Professional Accountants (Parts A and B) (IESBA Code) and other independent requirements applicable to performing audits of financial statements in Zimbabwe. We believe that the audit evidence we have obtained is sufficient and appropriate to provide a basis for our audit opinion.

Key Audit Matters

Key audit matters are those matters that, in our professional judgment were of the most significance in our audit of the financial statements of the current period. These matters were addressed in the context of our audit of the financial statements as a whole, and in forming our audit opinion thereon, and we do not provide a separate opinion on these matters. We determined the matters below to be key audit matters to communicate in our report.

ADVISORY • AUDIT • TAX • ACCOUNTING

Baker Tilly Chartered Accountants trading as Baker Tilly is a member of the global network of Baker Tilly International Ltd., the members of which are separate and independent legal entities.

Key audit matter	How our audit addressed the key audit matter
Hyperinflation Accounting (High risk area and significant judgement)	
Following the Public Accountants and Auditors Board ("PAAB") designation of Zimbabwe as hyperinflationary economy, the board applied IAS 29 – *Financial Reporting in Hyperinflationary Economies*. Hyperinflationary accounting was determined to be a matter of most significance to the audit due to the complexity and subjectivity relating to the application of the Standard. IAS 29 requires significant judgments to be made by management considering the guidelines provided in the standard.	We obtained an understanding of the board's process for identifying hyperinflationary economies and evaluated the policy in relation to hyperinflation accounting. Our audit procedures included, among others: • We assessed and tested the indicators of hyperinflation on the Zimbabwean economy by corroborating these with industry report and our own understanding of the economy. • We recomputed and tested the hyperinflation workings prepared by management by evaluating the rationale for the economic indicators included (such as the inflation rate, cumulative inflation rate, consumer price indices from various sources). • We tested the source data used by agreeing it to supporting schedules. • We assessed the reasonability of the assumptions used by comparing these to externally available industry, financial and economic data; and; • We tested restatement of the statement of financial position and income statement items for correct restatement in terms of IAS 29. We found that the inflation adjustments were properly done in terms of IAS 29.

Responsibilities of the Directors for the Financial Statements

The directors are responsible for the preparation and fair presentation of the financial statements in accordance with International Financial Reporting Standards and the Tobacco Research Act [Chapter 18:21] and for such internal control as the directors determine is necessary to enable the preparation of financial statements that are free from material misstatement, whether due to fraud or error.

In preparing the financial statements, the directors are responsible for assessing the board's ability to continue as a going concern, disclosing, as applicable, matters related to going concern and using the going concern basis of accounting unless the directors either intend to liquidate the entity or to cease operations, or have no realistic alternative but to do so.

Auditor's Responsibilities for the Audit of the Financial Statements

The objectives of our audit are to obtain reasonable assurance about whether the financial statements as a whole, are free from material misstatement, whether due to fraud or error, and to issue an auditor's report that includes our opinion. Reasonable assurance is a high level of assurance, but is not a guarantee that an audit conducted in accordance with ISAs will always detect a material misstatement when it exists. Misstatements can arise from fraud or error and are considered material if, individually or in the aggregate, they could reasonably be expected to influence the economic decisions of users taken on the basis of these financial statements.

As part of an audit in accordance with International Standards on Auditing, we exercise professional judgment and maintain professional scepticism throughout the planning and performance of the audit. We also:

- Identify and assess the risks of material misstatement of the financial statements, whether due to fraud or error, design and perform audit procedures responsive to those risks, and obtain audit evidence that is

sufficient and appropriate to provide a basis for our opinion. The risk of not detecting a material misstatement resulting from fraud is higher than for one resulting from error, as fraud may involve collusion, forgery, intentional omissions, misrepresentations, or the override of internal control.

- Obtain an understanding of internal control relevant to the audit in order to design audit procedures that are appropriate in the circumstances, but not for the purpose of expressing an opinion on the effectiveness of the entity's internal control.
- Evaluate the appropriateness of accounting policies used and the reasonableness of accounting estimates and related disclosures made by the directors.
- Conclude on the appropriateness of the directors' use of the going concern basis of accounting and based on the audit evidence obtained, whether a material uncertainty exists related to events or conditions that may cast significant doubt on the board's ability to continue as a going concern. If we conclude that a material uncertainty exists, we are required to draw attention in our auditor's report to the related disclosures in the financial statements or, if such disclosures are inadequate, to modify our opinion. Our conclusions are based on the audit evidence obtained up to the date of the auditor's report. However, future events or conditions may cause the board to cease to continue as a going concern.
- Evaluate the overall presentation, structure and content of the financial statements, including the disclosures, and whether the financial statements represent the underlying transactions and events in a manner that achieves fair presentation.
- Obtain sufficient appropriate audit evidence regarding the financial information of the entities or business activities within the board to express an opinion on the financial statements.
- We are responsible for the direction, supervision and performance of the audit. We remain solely responsible for the audit opinion.

We communicate with the directors regarding, among other matters, the planned scope and timing of the audit and significant audit findings, including any significant deficiencies in internal control that we identify during our audit.

Report on Other legal and regulatory requirements

The financial statements of Tobacco Research Board have been drawn up in compliance with the requirements of the Tobacco Research Act [Chapter 18:21] and Public Finance Management Act [Chapter 22:19].

Baker Tilly

.....

Partner: Fungai Nyagwaya
PAAB Practising Number: 0477
Baker Tilly Chartered Accountants (Zimbabwe)
Celestial Office Park,
Unit D & H Block, Borrowdale Road,
Harare

Date: 06/06/2024

TOBACCO RESEARCH BOARD

STATEMENT OF FINANCIAL POSITION

as at December 31, 2023

	Note	INFLATION ADJUSTED 2023 ZWL$	INFLATION ADJUSTED 2022 ZWL$	HISTORICAL COST 2023 ZWL$	HISTORICAL COST 2022 ZWL$
Assets					
Non current assets		**11 412 631 295**	**2 788 506 068**	**6 944 676 467**	**580 153 140**
Property, plant and equipment	4	9 542 697 475	2 774 916 086	5 084 881 268	577 325 723
Financial assets at amortised cost	5	1 864 718 304	7 459 808	1 858 810 521	1 552 025
Biological assets	6	5 215 516	6 130 174	984 678	1 275 392
Current assets		**73 824 122 347**	**30 984 826 660**	**61 227 122 930**	**6 446 442 664**
Biological assets	6	4 357 746 619	1 889 795 335	4 357 746 619	393 174 937
Inventories	7	23 135 775 805	6 048 993 319	10 538 776 388	1 258 502 719
Trade and other receivables	8	27 778 269 237	12 928 852 838	27 778 269 237	2 689 868 478
Cash and cash equivalents	9	18 552 330 686	10 117 185 168	18 552 330 686	2 104 896 530
Total assets		**85 236 753 642**	**33 773 332 728**	**68 171 799 397**	**7 026 595 804**
Reserves and liabilities					
Reserves		**59 450 507 712**	**25 065 190 139**	**46 902 849 264**	**5 214 852 833**
Capital reserve		65 792 604	65 792 604	13 688 256	13 688 256
Revaluation Reserve		1 112 640 055	1 112 640 054	231 486 540	231 486 540
Accumulated surplus		58 272 075 053	23 886 757 481	46 657 674 468	4 969 678 037
Current liabilities		**25 786 245 930**	**8 708 142 589**	**21 268 950 133**	**1 811 742 971**
Trade and other payables	10	16 050 689 078	7 261 928 652	16 050 689 078	1 510 855 852
Provisions	11	6 197 850 926	488 223 034	2 439 234 494	101 575 582
Short-term loan	12	3 537 705 926	957 990 903	2 779 026 561	199 311 537
Total reserves and liabilities		**85 236 753 642**	**33 773 332 728**	**68 171 799 397**	**7 026 595 804**

5 June, 2024.

Mrs. T. Madziva,
(Executive Director-Finance and Corporate Services).

5 June, 2024.

Dr. F. Magama,
(Chief Executive Officer).

5 June, 2024.

Mr. A. Denenga,
(Board Chairperson).

TOBACCO REASEARCH BOARD

STATEMENT OF PROFIT OR LOSS AND OTHER COMPREHENSIVE INCOME

for the year ended December 31, 2023

	Note	INFLATION ADJUSTED		HISTORICAL COST	
		2023	2022	2023	2022
		ZWL$	ZWL$	ZWL$	ZWL$
Revenue	13	73 904 702 563	25 553 002 748	39 430 109 344	5 316 343 025
Cost of sales	14	(9 614 804 427)	(6 051 179 208)	(4 832 951 566)	(1 258 957 497)
Gross profit		**64 289 898 137**	**19 501 823 540**	**34 597 157 778**	**4 057 385 528**
Government grant	15	**37 606 420 231**	**7 283 836 932**	**17 628 785 264**	**1 515 413 905**
Other income	16	**44 897 694 793**	**9 238 152 085**	**29 619 782 910**	**1 922 012 293**
Expenditure		**(62 058 073 406)**	**(17 082 189 333)**	**(41 013 098 083)**	**(3 553 976 767)**
Staff costs	17	(35 477 967 670)	(8 832 916 150)	(22 571 251 802)	(1 837 702 309)
Administration expenses	18	(21 278 411 739)	(6 885 030 071)	(15 226 470 685)	(1 432 441 500)
Operating expenses	19	(5 301 693 996)	(1 364 243 111)	(3 215 375 596)	(283 832 958)
Monetary loss		(51 205 990 747)	-	-	-
Surplus for the year before net finance income		**33 529 949 009**	**18 941 623 225**	**40 832 627 868**	**3 940 834 958**
Net finance income	20	**855 368 562**	**1 893 911 340**	**855 368 562**	**394 031 278**
Surplus for the year		**34 385 317 571**	**20 835 534 565**	**41 687 996 431**	**4 334 866 237**
Total comprehensive income for the year		**34 385 317 571**	**20 835 534 565**	**41 687 996 431**	**4 334 866 237**

TOBACCO RESEARCH BOARD

STATEMENT OF CHANGES IN RESERVES

for the year ended December 31, 2023

Inflation Adjusted

	Capital reserve ZWL$	Accumulated surplus ZWL$	Revaluation Reserve ZWL$	Total ZWL$
Balance at January 01, 2022	65 792 604	3 051 222 916	1 112 640 055	4 229 655 574
Surplus for the year	-	20 835 534 565	-	20 835 534 565
Balance as at December 31, 2022	**65 792 604**	**23 886 757 481**	**1 112 640 055**	**25 065 190 139**
Balance at January 01, 2023	65 792 604	23 886 757 481	1 112 640 055	25 065 190 139
Surplus for the year	-	34 385 317 571	-	34 385 317 571
Balance as at December 31, 2023	**65 792 604**	**58 272 075 052**	**1 112 640 055**	**59 450 507 710**

TOBACCO RESEARCH BOARD

STATEMENT OF CHANGES IN RESERVES

for the year ended December 31, 2023

Historical Cost

	Capital reserve ZWL$	Accumulated surplus ZWL$	Revaluation Reserve ZWL$	Total ZWL$
Balance at January 01, 2022	13 688 256	634 811 800	231,486,540	879 986 596
Surplus for the year	-	4 334 866 237	-	4 334 866 237
Balance as at December 31, 2022	**13 688 256**	**4 969 678 037**	**231 486 540**	**5 214 852 833**
Balance at January 01, 2023	13 688 256	4 969 678 037	231 486 540	5 214 852 833
Surplus for the year	-	41 687 996 431	-	41 687 996 431
Balance as at December 31, 2023	**13 688 256**	**46 657 674 467**	**231 486 540**	**46 902 849 263**

TOBACCO RESEARCH BOARD

STATEMENT OF CASH FLOWS

for the year ended December 31, 2023

	Note	INFLATION ADJUSTED 2023 ZWL$	INFLATION ADJUSTED 2022 ZWL$	HISTORICAL COST 2023 ZWL$	HISTORICAL COST 2022 ZWL$
Cash flows from operating activities					
Net cash generated/(utilised) in operation activities		**15 084 257 872**	**10 084 344 128**	**20 562 909 486**	**2 098 063 899**
		14 228 889 310	**8 190 432 789**	**19 707 540 923**	**1 704 032 621**
Surplus for the year		34 385 317 571	20 835 534 565	41 687 996 431	4 334 866 237
Adjustment for:		**2 991 010 200**	**(2 925 303 120)**	**(2 151 614 304)**	**(608 613 985)**
Depreciation charge for the year	4	602 329 522	139 142 254	328 294 395	28 948 768
Increase in leave pay provision	11	5 709 627 893	260 439 459	2,337,658,913	54 184 845
(Profit) or Loss on Asset Dispossal	18	2 372 632	65 109	2,372,632	13 546
Fair Value adjustment on Biological Assets	6	(2 467 951 284)	(1 431 038 602)	(3,964,571,682)	(297 729 866)
Interest received		(1 876 998 369)	(1 975 496 361)	(1 876 998 369)	(411 005 172)
Interest paid		1 021 629 807	81 585 021	1 021 629 807	16 973 894
Changes in working capital:		**(23 147 438 462)**	**(9 719 798 656)**	**(19 828 841 203)**	**(2 022 219 631)**
(Increase)/Decrease in trade and other receivables		(14 849 416 399)	(11 482 161 751)	(25 088 400 759)	(2 388 882 087)
(Increase) in inventories		(17 086 782 486)	(3 974 948 313)	(9,280,273,669)	(826 994 344)
Increase in trade and other payables		8 788 760 424	5 737 311 407	14,539,833,225	1 193 656 799
		855 368 562	**1 893 911 340**	**855 368 562**	**394 031 278**
Interest received		1 876 998 369	1 975 496 361	1 876 998 369	411 005 172
Interest paid		(1 021 629 807)	(81 585 021)	(1 021 629 807)	(16 973 894)
Cash flows from investing activities					
Net cashflow from investing activities		**(9 228 827 382)**	**(987 428 977)**	**(6 695 190 354)**	**(205 436 176)**
Acquisition of property, plant and equipment	4	(7 422 739 370)	(1 296 791 465)	(4 865 928 443)	(269 799 535)
Disposal of property , plant and equipment	4	50 255 826	-	27 705 870	-
Acquisition of biological assets	6	914 658	5 142 634	290 715	1 069 932
Interest Capitalised on long term Investments		(1 857 258 496)	304 219 854	(1 857 258 496)	63 293 426
Cash generated from financing activities					
Net cash generated from financing activities		**2 579 715 024**	**820 536 830**	**2 579 715 024**	**170 713 998**
Short term loans acquired	12	4 975 784 399	3 215 916 815	4 975 784 399	669 076 628
Repayment of short term loans	12	(2 396 069 375)	(2 395 379 985)	(2 396 069 375)	(498 362 631)
Net decrease in cash and cash equivalents		**8 435 145 515**	**9 917 451 981**	**16 447 434 156**	**2 063 341 721**
Cash and cash equivalents at the beginning of the year		**10 117 185 170**	**199 733 189**	**2 104 896 530**	**41 554 809**
Cash and cash equivalents at the end of the year	9	**18 552 330 686**	**10 117 185 170**	**18 552 330 686**	**2 104 896 530**

TOBACCO RESEARCH BOARD

NOTES TO THE FINANCIAL STATEMENTS

for the year ended 31 December 2023

1 General information

The Tobacco Research Board (the "Board") was established in 1950 under the Tobacco Research Act [Chapter 18:21], with a mandate of directing, controlling and carrying out tobacco research in Zimbabwe.

2 Basis of preparation

2.1 Statement of compliance

The financial statements for the year ended December 31, 2023 have been prepared with the aim to comply with International Financial Reporting Standards (IFRS) as issued by the International Accounting Standard Board (IASB). The financial statements are prepared from statutory records that are maintained under the historical cost convention. The financial statements have been prepared in compliance with requirements of IAS 29. Comparative figures for the year ended 31 December 2022 have also been restated in accordance with the requirements of IAS 29.

Inflation indices used

The Group adopted the Zimbabwe consumer price index (CPI) compiled by Zimbabwe National Statistics Agency (ZIMSTAT) as the general price index to restate transactions and balances as appropriate. The indices and conversion factors used to restate these financials are given below.

Date	Indices	Conversion Factor
31 December 2023	65 703.43	1.00
31 December 2022	13 669.80	4.8065
1 January 2022	4 190.00	15.6810

2.2 Basis of measurement

The financial statements are based on the statutory records that are maintained under the historical cost basis, except for property, plant and equipment which are measured at revalued amounts.

2.3 Functional and presentation currency

These financial statements are presented in Zimbabwean Dollars (ZWL$) which is the official functional currency. All the financial information presented has been rounded to the nearest dollar. The financial statements are presented in Zimbabwean Dollar ("ZWL$") in order to comply with laws and regulations particularly Statutory Instrument 33 of 2019 (SI33) and (S.I) 32 of 2019, with which the Reserve Bank of Zimbabwe announced a new currency called RTGS dollar ("ZWL").

2.4 Critical accounting judgments and key sources of estimation

In the application of the Board's accounting policies, which are described in note 3, the Directors are required to make judgements, estimates and assumptions about the carrying amounts of assets and liabilities that are not readily apparent from other sources. The estimates and associated assumptions are based on historical experience and other factors that are considered to be relevant. Actual results may differ from these estimates. The estimates and underlying assumptions are reviewed on an ongoing basis. Revisions to accounting estimates are recognised on the period in which the estimates is revised if the revision affects only that period or in the period of the revision and future if the revision affects both current and future periods.

2.4.1 Property, plant and equipment

The carrying amount of property and equipment would be determined using the existing policies on depreciation. Depreciation is provided on the qualifying equipment over the useful life of the asset in order to progressively write the asset down to its residual value. The useful lives of these assets are reviewed on an annual basis. The directors are of the view that for all property plant and equipment categories, there were no material developments during the year and up to reporting date requiring the revision of previously determined useful lives of the property, plant and equipment.

2.4.2 Impairment and allowances for credit loss policies

IFRS 9 replaces the 'incurred loss' model in IAS 39 with an 'expected credit loss' (ECL) model and results in credit losses being recognised earlier than under IAS 39. The new impairment model applies to financial assets measured at amortised cost (for example loans and advances, trade and other receivables, cash and cash equivalents) and corporate debt investments measured at FVOCI, but not to investments in equity instruments. As a consequence of the new standard, the Board has revised its impairment methodology under IFRS 9 for each of these classes of assets. The impact of the change in impairment methodology on the Board's total funds and reserves.

The ECL impairment loss allowance is an unbiased, probability-weighted amount determined by evaluating a range of possible outcomes that reflects reasonable and supportable information that is available without undue cost or effort of past events, current conditions and forecasts of forward-looking economic conditions.

The ECL model is dependent on the availability of relevant and accurate data to determine whether a significant increase in credit risk occurred since initial recognition, the probability of default (PD), the loss given default (LGD) and the possible exposure at default (EAD). Of equal importance is sound correlation between these parameters and forward-looking economic conditions.

ECL reflects an entity's own expectations of credit losses. However, when considering all reasonable and supportable information that is available without undue cost or effort in estimating ECL, an entity should also consider observable market information about the credit risk of the particular financial instrument or similar financial instruments.

In the absence of sufficient depth of data, management apply expert judgment within a governance framework to determine the required parameters. The expert judgement process is based on available internal and external information. Estimates regarding credit risk parameters and the impact of forward-looking information used in the calculation of the ECL loss amount should be reviewed at each reporting date and updated if necessary. The ECL loss amount depends on the specific stage where the financial instrument has been allocated to within the ECL model:

- Stage 1: At initial recognition a financial instrument is allocated into stage 1, except for purchased or originated credit impaired financial instruments.
- Stage 2: A financial instrument is allocated to stage 2 if there has been a significant increase in credit risk since initial recognition of the financial instrument.
- Stage 3: A financial instrument is allocated to stage 3 if the financial instrument is in default or is considered to be credit impaired.

Under IFRS 9, impairment loss allowances are measured on either of the following bases:

i. 12-month ECLs: these are ECLs that result from possible default events within the 12 months after the reporting date; and
ii. Lifetime ECLs: these are ECLs that result from all possible default events over the expected life of a financial instrument.

The Board has elected to apply the IFRS 9 simplified approach in measuring expected credit losses. This uses a provision matrix when determining the lifetime expected loss allowance for all trade receivables. When determining whether the credit risk of a financial asset has increased significantly since initial recognition and when estimating ECLs, the Board considers quantitative and qualitative information, based on the Board's historical

experience, credit assessment and including forward-looking information. The Board's assessment of a significant increase in credit risk from initial recognition consists of a primary and secondary risk driver as follows:

i. The primary risk driver aligns to the quantitative credit risk assessments performed, such as the credit score, credit rating, probability of default or arrears aging of a financial instrument.
ii. The secondary risk assessment considers a broad range of qualitative risk factors based on a forward looking view such as economic and sector outlooks. The secondary risk assessment can be performed on a portfolio basis as opposed to a quantitative assessment at a financial instrument level.

2.4.3 Growing crops

Growing crops are valued at the total cost of establishing the crop as at year end because the tobacco is not grown for commercial purposes but for the research and experimental purposes. Tobacco Research Board is not a commercial entity.

2.4.4 Valuation of tobacco seed inventory

Tobacco seed inventory is valued at standard cost using the best estimate of the average costs which are accumulated in the production process. This estimate is reviewed annually on the basis of the circumstances prevailing at each statement of financial position date and revised accordingly. The standard cost used was $2 382.25.

2.5 ADOPTION OF NEW AND REVISED STANDARDS

2.5.1 New and revised standards that are effective for annual periods beginning on or after January 1, 2023

2.5.1.1 Amendments to IAS 1 and IFRS Practice Statement 2

Amendments to IAS 1 require that a Company discloses its material accounting policies instead of significant accounting policies. Further amendments explain how a Company can identify a material accounting policy. The developed guidance and examples to explain and demonstrate the application of the four-step materiality process.
A four step materiality process
Step 1 – Identify information that has the potential to be material
Step 2 – Assess whether the information identified in Step 1 is in fact material by considering quantitative (size) and qualitative (nature) factors.
Step 3 – Organise the information within the draft financial statements in a manner that supports clear and concise communication.

Step 4 – Assess the information provided in the draft financial statements as a whole by considering whether it is material both individually and in combination with other information.

2.5.1.2 IAS 8 Accounting policies changes in accounting estimates effective for annual periods beginning on or after 1 January 2023

A definition of accounting estimates (Amendments to IAS 8) to help entities to distinguish between accounting policies and accounting estimates.

The definition of accounting estimates, are monetary amounts in financial statements that are subject to measurement uncertainty.

Entities develop accounting estimates if accounting policies require items in financial statements to be measured in a way that involves measurement uncertainty.

Clarification was made on a change in accounting estimate that results from new information or new development is not a correction of an error. Furthermore, the effects of a change in an input or a measurement technique used to develop an accounting estimate are changes in accounting estimates if they do not result from the correction of prior periods errors.

A change in an accounting estimate may affect only the current period's profit or loss, or the profit or loss of both the current period and future periods. The effect of the change relating to the current period is recognized as income or expense in the current period. The effect if any, on future periods is recognized as income or expense in those future periods.

3 Summary of significant accounting policies

3.1 Property, plant and equipment

Property, plant and equipment are stated at cost less accumulated depreciation and accumulated impairment losses.

Assets are depreciated on a straight-line basis over their anticipated useful lives as follows:

Buildings and improvements	60 years
Farm plant and machinery	10 years
Laboratory equipment	10 years
Motor vehicles	5 years
Computer equipment	5 years
Office furniture and equipment	10 years

The residual values of assets are reassessed each year. Where the residual value exceeds the carrying amount of the asset no depreciation is charged. At the end of each period management assesses whether there are any indications that an asset is impaired. If any such indication exists, management assesses the recoverable amount of the asset. Where the carrying amount of the asset is greater than the recoverable amount, the asset is written down to its recoverable amount with the adjustment being recognized in the revenue and expenditure statement.

The gain or loss arising on the disposal or retirement of an asset is determined as the difference between the sales proceeds and the carrying amount of the asset and is recognized in the revenue and expenditure statement.

3.2 Impairment of tangible and intangible assets

At the end of each reporting period, the Board reviews the carrying amounts of its assets to determine whether there is any indication that those assets have suffered impairment. If any such indication exists, the recoverable amount of the asset is estimated in order to determine the extent of the impairment (if any). Where it is not possible to estimate the recoverable amount of an individual asset, the Board estimates the recoverable amount of the cash-generating unit to which the asset belongs. Where a reasonable and consistent basis of allocation can be identified, corporate assets are also allocated to individual cash-generating units, or otherwise they are allocated to the smallest group of cash-generating units for which a reasonable and consistent allocation basis can be identified.

Recoverable amount is the higher of fair value less costs to sell and value in use. In assessing value in use, the estimated future cash flows are discounted to their present value using a pre-tax discount rate that reflects current market assessments of the time value of money and the risks specific to the asset for which the estimates of future cash flows have not been adjusted. If the recoverable amount of an asset (or cash-generating unit) is estimated to be less than its carrying amount, the carrying amount of the asset (or cash-generating unit) is reduced to its recoverable amount. Impairment is recognized immediately in the revenue and expenditure statement, unless the relevant asset is carried at a revalued amount, in which case the impairment is treated as a revaluation decrease.

Where an impairment subsequently reverses, the carrying amount of the asset (or cash-generating unit) is increased to the revised estimate of its recoverable amount, but so that the increased carrying amount does not exceed the carrying amount that would have been determined had no impairment been recognized for the asset (or cash-generating unit) in prior years. A reversal of impairment is recognized immediately in the revenue and expenditure statement, unless the relevant asset is carried at a revalued amount, in which case the reversal of the impairment is treated as a revaluation increase.

3.3 Financial instruments

Financial instruments are contracts that give rise to financial assets or financial liabilities. Financial assets and financial liabilities are recognized on the Board's statement of financial position when the Board becomes a party to the contractual provisions of the instrument. These instruments are generally carried at their estimated carrying values.

Non-derivative financial instruments carried in the statement of financial position comprise: cash and cash equivalents, trade and other receivables, trade and other payables. These instruments are recognized initially at fair value plus any directly attributable transaction costs.

3.3.1 Financial assets

The Board's principal financial assets are trade and other receivables, treasury bills and cash and cash equivalents. Financial assets, for which fair value can be reliably determined with reference to an active market, are initially recognised at fair value and subsequently stated at a fair value with the change in value being credited or debited to distributable reserves.

Trade and other receivables are stated at their nominal value as reduced by allowances for estimated irrecoverable amounts. Cash and cash equivalents comprise cash on hand and

3.6 Foreign currencies

The functional and presentation currency is Zimbabwe dollars (ZWL). In preparing the financial statements, transactions in currencies other than the entity's functional currency (foreign currencies) are recognised at the rates of exchange prevailing at the dates of the transactions. At the end of each reporting period, monetary items denominated in foreign currencies are retranslated at the rates prevailing at that date. Non-monetary items that are measured in terms of historical cost in a foreign currency are not retranslated.

Exchange differences on monetary items are recognised in the revenue and expenditure statement in the period in which they arise except for:

- exchange differences on foreign currency borrowings relating to assets under construction for future productive use, which are included in the cost of those assets when they are regarded as an adjustment to interest costs on those foreign currency borrowings; and
- exchange differences on monetary items receivable from or payable to a foreign operation for which settlement is neither planned nor likely to occur, which are recognised initially in other comprehensive income and reclassified from equity to the revenue and expenditure statement on repayment of the monetary items.

3.7 Revenue from contracts with customers

Revenue from contracts with customers is recognised when control of the goods or services are transferred to the customer (that is, when the Board delivers its performance obligation under the contract) at an amount that reflects the consideration to which the Board expects to be entitled in exchange for those goods or services. There is no requirement to disclose information about remaining performance obligations as all contracts have an expected duration of less than one year.

3.7.1 Sale of goods

The Board's revenue from sale of goods is mainly from sale of tobacco seeds, tobacco crop and tobacco seedlings, pine bark and float trays. Revenue from sale of goods is recognised at the point in time when control of the asset is transferred to the customer, generally on delivery of the goods.

3.7.2 Rendering of services

Revenue from services rendered are mainly from laboratory analysis services. Revenue from sale of services is recognised at the point in time when the performance obligations are satisfied as services are rendered.

3.7.3 Interest income

Interest income is accrued on a time basis, by reference to the principal outstanding and at the effective interest rate applicable, which is the rate which exactly discounts estimated future cash receipts through the expected life of the financial asset's net carrying amount.

3.8 Retirement benefit cost

The Board contributes to a defined contribution pension fund for its permanent employees. The Board's contributions are charged to the income statement in the year in which they are due.

The Board also participates in the National Social Security Authority Scheme (NSSA). Payments made to NSSA are dealt with as payments to defined contribution plans, where the Board's obligations under the plans are equivalent to those arising in a defined contribution retirement benefit plan.

3.9 Provisions

Provisions are recognised when the Board has a present obligation (legal or constructive) as a result of a past event, it is probable that the Board will be required to settle the obligation, and a reliable estimate can be made of the amount of the obligation.

The amount recognised as a provision is the best estimate of the consideration required to settle the present obligation at the end of the reporting period, considering the risks and uncertainties surrounding the obligation. When a provision is measured using the cash flows estimated to settle the present obligation, its carrying amount is the present value of those cash flows (when the effect of the time value of money is material).

When some or all of the economic benefits required to settle a provision are expected to be recovered from a third party, a receivable is recognised as an asset if it is virtually certain that reimbursement will be received and the amount of the receivable can be measured reliably.

3.9.1 Provisions onerous contracts

Present obligations arising under onerous contracts are recognised and measured as provisions. An onerous contract is considered to exist where the Board has a contract under which the unavoidable costs of meeting the obligations under the contract exceed the economic benefits expected to be received from the contract.

3.9.2 Restructurings

A restructuring provision is recognised when the Board has developed a detailed formal plan for the restructuring and has raised a valid expectation in those affected that it will carry out the restructuring by starting to implement the plan or announcing its main features to those affected by it. The measurement of a restructuring provision includes only the direct expenditures arising from the restructuring, which are those amounts that are both necessarily entailed by the restructuring and not associated with the ongoing activities of the entity.

3.10 Borrowing costs

Borrowing costs directly attributable to the acquisition, construction or production of qualifying assets, which are assets that necessarily take a substantial period of time to get ready for their intended use or sale, are added to the cost of those assets, until such time as the assets are substantially ready for their intended use or sale.

Investment income earned on the temporary investment of specific borrowings pending their expenditure on qualifying assets is deducted from the borrowing costs eligible for capitalisation.

All other borrowing costs are recognised in the revenue and expenditure statement in the period in which they are incurred.

3.11 Agricultural activities

The Board grows tobacco principally for research purposes. Agricultural produce, biological assets are measured at cost. This accounting treatment does not comply with the requirements of IAS 41 “Agriculture”, because the tobacco is not grown for commercial purposes but for the research and experimental purposes. Tobacco Research Board is not a commercial entity.

3.12 Research and development costs

Expenditure on research activities is recognised as an expense in the period in which it is incurred. Development expenditure on an individual project is recognised as an intangible asset when the Board can demonstrate:

- the technical feasibility of completing the intangible asset so that it will be available for use or sale;
- the intention to complete the intangible asset and use or sell it;
- the ability to use or sell the intangible asset;
- how the intangible asset will generate probable future economic benefits;
- the availability of adequate technical, financial and other resources to complete the development and to use or sell the intangible asset; and
- the ability to measure reliably the expenditure attributable to the intangible asset during its development.

The amount initially recognised for internally-generated intangible assets is the sum of the expenditure incurred from the date when the intangible asset first meets the recognition criteria listed above. Where no internally generated intangible asset can be recognised, development expenditure is recognised in the revenue and expenditure statement in the period in which it is incurred.

3.13 Taxation

The Board's receipts and payments are exempt from income tax in terms of the third schedule to the Income Tax Act [Chapter 23:04].

TOBACCO RESEARCH BOARD

NOTES TO THE FINANCIAL STATEMENTS

for the year ended December 31, 2023

INFLATION ADJUSTED

4 Property, plant and equipment

	Land and buildings ZWL$	Farm plant and machinery ZWL$	Laboratory equipment ZWL$	Motor vehicles ZWL$	Furniture and office equipment ZWL$	Work in Progress	Totals 2023 ZWL$	Totals 2022 ZWL$
Opening carrying amount	**1 063 037 111**	**545 272 182**	**146 615 878**	**565 827 615**	**256 273 733**	**197 889 567**	**2 774 916 086**	**1 617 331 985**
Gross carrying amount	1 116 084 472	612 862 621	158 701 630	686 485 418	299 269 125	197 889 567	**3 071 292 833**	**1 774 605 525**
Accumulated depreciation	(53 047 361)	(67 590 438)	(12 085 752)	(120 657 804)	(42 995 392)	-	**(296,376,747)**	**(157,273,540)**
Additions at cost	678 004 521	1 080 499 510	1 264 429 049	2 950 119 970	979 141 298	470 545 021	**7 422 739 370**	**1296 791 465**
Disposals carrying amount	-	-	-	(11,242,449)	(11,803,734)	(29,582,275)	**(52,628,459)**	**(65,109)**
Gross carryng amount	-	-	-	(22,446,068)	(14,404,716)	(29,582,275)	**(66,433,059)**	**(104,157)**
Accumulated depreciation on disposals	-	-	-	11,203,618	2,600,981	-	**13,804,600**	**39,048**
Revaluation								
Depreciation for the year	(13 822 134)	(55 035 701)	(40 932 459)	(366 222 388)	(126 316 839)	-	**(602 329 522)**	**(139 142 254)**
Closing carrying amount	**1 727 219 498**	**1 570 735 991**	**1 370 112 468**	**3 138 482 748**	**1 097 294 457**	**638 852 313**	**9 542 697 475**	**2 774 916 086**
Gross carrying amount	1 794 088 993	1 693 362 131	1 423 130 679	3 614 159 321	1 264 005 707	638 852 313	**10 427 599 144**	**3 071 292 833**
Accumulated depreciation	(66 869 495)	(122 626 140)	(53 018 211)	(475 676 573)	(166 711 250)	-	**(884 901 669)**	**(296,376,747)**

TOBACCO RESEARCH BOARD

NOTES TO THE FINANCIAL STATEMENTS

for the year ended December 31, 2023

HISTORICAL COST

4 Property, plant and equipment

	Land and buildings ZWL$	Farm plant and machinery ZWL$	Laboratory equipment ZWL$	Motor vehicles ZWL$	Furniture and office equipment ZWL$	Work In Progress	Totals 2023 ZWL$	Totals 2022 ZWL$
Opening carrying amount	**221 166 568**	**113 444 748**	**30 503 668**	**117 721 339**	**53 318 159**	**41 171 240**	**577 325 723**	**336 488 502**
Gross carrying amount	232 203 157	127 507 047	33 018 128	142 824 387	62 263 419	41,171,240	**638 987 378**	**369 209 513**
Accumulated depreciation	(11,036,588)	(14,062,299)	(2,514,460)	(25,103,049)	(8,945,260)	-	**(61,661,655)**	**(32,721,011)**
Additions at cost	445 260 242	893 823 011	861 359 974	1,977,983,834	502 312 165	185,189,216	**4 865 928 443**	**269 799 535**
Disposals carrying amount	-	-	-	(2,925,478)	(6,735,595)	(20,417,430)	**(30,078,502)**	**(13,546)**
Gross carryng amount	-	-	-	(6,245,834)	(8,104,838)	(20,417,430)	**(34 768 102)**	**(21,670)**
Accumulated depreciation on disposa	-	-	-	3,320,357	1,369,243	-	**4,689,599**	**8,124**
Revaluation								
Depreciation for the year	(6 193 672)	(29 518 290)	(24 650 533)	(218 134 214)	(49 797 687)	-	**(328 294 395)**	**(28 948 768)**
Closing carrying amount	**660 233 138**	**977 749 470**	**867 213 109**	**1 874 645 482**	**499 097 042**	**205 943 027**	**5 084 881 268**	**577 325 723**
Gross carrying amount	677 463 398	1021 330 058	894 378 102	2 114 562 387	556 470 747	205 943 027	**5 470 147 719**	**638 987 378**
Accumulated depreciation	(17 230 260)	(43 580 588)	(27 164 993)	(239 916 905)	(57 373 705)	-	**(385 266 451)**	**(61,661,655)**

TOBACCO RESEARCH BOARD

NOTES TO THE FINANCIAL STATEMENTS

for the year ended December 31, 2023

		INFLATION ADJUSTED		HISTORICAL COST	
		2023 ZWL$	2022 ZWL$	2023 ZWL$	2022 ZWL$
5	**Financial assets at amortised cost**				
5.1	**Long term investments**				
	CABS	7 501 565	7 402 582	1 639 102	1 540 119
	Imara	1 857 216 739	57 226	1 857 171 419	11 906
	Total	**1 864 718 304**	**7 459 808**	**1 858 810 521**	**1 552 025**

CABS investment for $1 540 119 is held as security for mortagage loans taken for 10 years.

6	**Biological assets**				
6.1	**Non-current biological assets**				
	Horses	710 349	710 349	147 789	147 789
	Dogs	9 634 461	10,562,455	2 001 930	2,197,536
	Depreciation	(5 129 294)	(5,142,631)	(1 165 041)	(1,069,932)
		5 215 516	**6 130 174**	**984 678**	**1 275 392**
6.2	**Current biological assets**				
	Tobacco	4 357 746 619	1 889 795 335	4 357 746 619	393 174 937
		4 357 746 619	**1 889 795 335**	**4 357 746 619**	**393 174 937**
7	**Inventories**				
	Tobacco seed	11 050 719 517	2 624 608 263	5 033 808 371	546 053 940
	Potato Seed	9,295,068,168	1 983 536 402	4 234 076 513	412,677,916
	Other consumables	2 781 758 888	1 431 345 608	1 267 142 936	297 793 739
	Chemicals	8 229 232	9 503 046	3 748 568	1 977 124
		23 135 775 805	**6 048 993 319**	**10 538 776 388**	**1 258 502 719**
8	**Trade and other receivables**				
	Amounts owing for services and sales	-	116 231	-	24 182
	Seedling stop order receivables	27 364 935 779	13 106 035 021	27 364 935 779	2 726 731 514
	Value added tax refund	306 430 555	135 815 060	306 430 555	28 256 540
	Staff loans	249 310 321	7 968 377	249 310 321	1 657 834
	Other receivables	3 303 255 093	1 558 278 475	3 303 255 093	324 202 325
		31 223 931 748	**14 808 213 163**	**31 223 931 748**	**3 080 872 394**
	Less: Allowance for credit losses	(3 445 662 511)	(1 879 360 326)	(3 445 662 511)	(391 003 917)
		27 778 269 237	**12 928 852 838**	**27 778 269 237**	**2 689 868 478**

TOBACCO RESEARCH BOARD

NOTES TO THE FINANCIAL STATEMENTS

for the year ended December 31, 2023

		INFLATIONAL ADJUSTED		HISTORICAL COST	
		2023 ZWL$	2022 ZWL$	2023 ZWL$	2022 ZWL$
9	**Cash and cash equivalents**				
	Cash at bank	17 481 746 319	9 528 480 125	17 481 746 319	1 982 415 506
	Cash on hand	8 046 024	1 025 183	8 046 024	213 291
	Money market investments	1 062 538 343	587 679 862	1 062 538 343	122 267 734
		18 552 330 686	**10 117 185 170**	**18 552 330 686**	**2 104 896 530**
9.1	**Money market investments**				
	Tetrad Investment Bank Limited	795 309	3 822 653	795 309	795 309
	Agribank	-	21 542 354	-	4 481 921
	CBZ Bank Limited	1 062 538 343	566 137 508	1 062 538 343	117 785 812
		1 063 333 652	**591 502 515**	**1 063 333 652**	**123 063 043**
	Allowance for impairment for Tetrad Investment	(795 309)	(3 822 653)	(795 309)	(795 309)
		1 062 538 343	**587 679 862**	**1 062 538 343**	**122 267 734**
10	**Trade and other payables**				
	Trade payables	16 050 689 078	7 261 928 654	16 050 689 078	1 510 855 852
		16 050 689 078	**7 261 928 654**	**16 050 689 078**	**1 510 855 852**
11	**Provisions**				
	Provision for Audit fees	279 206 814	98 677 527	109 885 007	20 530 017
	Provisions for leave pay	5 918 644 113	389 545 508	2 329 349 488	81 045 565
	Provisions	**6 197 850 927**	**488 223 034**	**2 439 234 495**	**101 575 582**
12	**Short-term loan**				
	Zimbabwe Leaf Tobacco (ZLT)	3 537 705 927	957 990 903	2 779 026 561	199 311 537
		3 537 705 927	**957 990 903**	**2 779 026 561**	**199 311 537**

The ZLT loan will be repaid in full from proceeds of sale of tobacco during the 2023/2024 tobacco marketing season before any payments are made to theTobacco Research Board. Tobacco Research Board has a contract to grow and sell tobacco to ZLT.

TOBACCO RESEARCH BOARD

NOTES TO THE FINANCIAL STATEMENTS

for the year ended December 31, 2023

		INFLATION ADJUSTED		HISTORICAL COST	
		2023 ZWL$	2022 ZWL$	2023 ZWL$	2022 ZWL$
13	**Revenue**				
	Sale of goods	69 993 785 858	24 241 041 072	37 757 330 617	5 043 387 303
	Rendering of services.	3 910 916 705	1311 961 676	1 672 778 727	272 955 722
		73 904 702 563	**25 553 002 748**	**39 430 109 344**	**5 316 343 025**
	An analysis of the revenue for the year is as follows;				
13.1	**Sale of goods**				
	Tobacco seed sales	47 281 157 930	15 513 213 773	28 650 358 911	3 227 548 897
	Tobacco crop sales	3 747 988 675	1 114 122 467	1 589 442 768	231 794 958
	Gromix	2 625 519 523	789 182 703	1 362 759 461	164 190 722
	Float trays	1 490 542 450	650 559 634	764 918 454	135 349 971
	Seedling production	460 233 985	77 644 377	377 613 591	16 154 037
	Gum seedlings	120 412 879	74 787 874	50 975 681	15,559,736.60
	Floatfert	1 040 191 193	322 403 634	551 477 565	67 076 591
	Horticultural products	136 498 868	20 164 366	92 482 112	4 195 229
	Sweet Potato	4 730 559	5 602 849	2 473 402	1 165 682
	Seed Potato	13 086 509 796	5 673 359 396	4 314 828 672	1 180 351 482
		69 993 785 858	**24 241 041 072**	**37 757 330 617**	**5 043 387 303**
13.2	**Rendering of services**				
	Laboratory analysis	3 910 916 705	1 311 961 676	1 672 778 727	272 955 722
		3 910 916 705	**1 311 961 676**	**1 672 778 727**	**272 955 722**
	Total revenue	**73 904 702 563**	**25 553 002 748**	**39 430 109 344**	**5 316 343 025**
14	**Cost of sales**				
14.1	**Cost of goods sold**				
	Gromix	353 642 414	279 317 423	159 524 634	58 112 436
	Float trays	100 993 496	79 658 971	38 240 992	16 573 176
	Tobacco Seed production	623 295 539	474 458 499	425 615 909	98 711 848
	Tobacco Seedlings	-	9 602 670	-	1,997,851
	Gum seedlings	3,515,116.75	-	1 034 250	-
	Floatfert	545 590 682	200 914 819	258 131 802	41 800 649
	Horticultural products	577 233	18 719 112	136 000	3 894 541
	Seed Potato	5 718 743 383	4 240 646 185	3 304 166 492	882 273 210
	Sweet potato	-	180 244	-	37,500
	Tobacco crop	1,909,218,868	458 756 733	399 784 714	95 445 071
		9 255 576 731	**5 762 254 657**	**4 586 634 793**	**1 198 846 282**
14.2	**Cost of rendering services**				
	Laboratory analysis	359 227 696	288 924 551	246 316 773	60 111 214
		359 227 696	**288 924 551**	**246 316 773**	**60 111 214**
		9 614 804 427	**6 051 179 208**	**4 832 951 566**	**1 258 957 497**
15	**Government grant**				
	Tobacco levy	37 606 420 231	7 283 836 932	17 628 785 264	1 515 413 905
		37 606 420 231	**7 283 836 932**	**17 628 785 264**	**1 515 413 905**

TOBACCO RESEARCH BOARD

NOTES TO THE FINANCIAL STATEMENTS

for the year ended December 31, 2023

		INFLATION ADJUSTED		HISTORICAL COST	
		2023	2022	2023	2022
		ZWL$	ZWL$	ZWL$	ZWL$
16	**Other income**				
	Rental	55 566 700	15,661,885	32 925 802	3 258 480
	Land usage	-	302,118	-	62 856
	Royalties	1 823 895	25,728,043	1 823 895	5 352 760
	Exchange Gains	43 100 522 397	9,177,114,584	27 915 789 987	1 909 313 343
	Sundry	1 739 781 801	19,345,455	1 669 243 225	4 024 853
		44 897 694 793	**9 238 152 085**	**29 619 782 910**	**1 922 012 293**
17	**Staff costs**				
	Salaries and allowances	26 271 980 072	6 818 704 260	15 395 355 579	1 418 642 309
	NSSA	663 267 977	172 061 541	367 018 977	35 797 678
	Pension costs	912 122 921	210 832 267	611 790 441	43 863 990
	Standard levy	144 321 463	33 375 859	90 594 967	6 943 901
	Medical aid	2 090 494 996	649 684 754	1 164 409 311	135 167 951
	NEC	37 748 377	15 850 300	22 133 047	3 297 680
	Leave pay Provision	2 853 200 146	321 153 492	2 545 651 425	66 816 497
	Bonus provision	2 175 058 295	303 555 813	2 175 058 295	63 155 272
	Other employment costs	329 773 424	307 697 864	199 239 760	64 017 032
		35 477 967 670	**8 832 916 150**	**22 571 251 802**	**1 837 702 309**
18	**Administrative expenses**				
	Audit fees	109 885 007	98 677 527	109 885 007	20 530 017
	Directors' emoluments	202 302 165	49 157 037	125 780 265	10 227 200
	Depreciation charge for the year	602 329 522	144 284 885	328 505 338	30 018 701
	Allowance for credit losses	3 054 658 594	1 405 172 813	3,054,658,594	292 348 447
	Computers costs	328 774 337	62 829 725	192 207 303	13 071 825
	Travelling	1 537 886 832	628 058 649	992 509 919	130 668 605
	Repairs and maintenance	4 488 928 394	820 756 417	3 098 695 669	170 759 683
	Staff training	828 169 329	5 591 816	601 743 430	1 163 386
	Consultancy/ Legal fees	459 196 669	275 617 882	230 165 611	57 342 740
	Utilities	1 199 731 121	388 756 734	847 376 051	80 881 459
	Loss on Assets Disposal	2 372 632	65 109	2 372 632	13,546
	Motor vehicle expenses	3 220 678 897	1 080 426 515	1 966 345 875	224 784 462
	Insurance	459 247 452	200 585 767	285 635 431	41 732 189
	Security	1 084 820 954	302 963 030	742 997 817	63 031 942
	Telephone	1 191 238 454	291 406 856	758 301 620	60 627 662
	Bank charges	847 256 735	536 070 490	847 256 735	111 530 321
	Administration overheads	1 660 934 645	594 608 820	1 042 033 386	123 709 314
		21 278 411 739	**6 885 030 071**	**15 226 470 685**	**1 432 441 500**

TOBACCO RESEARCH BOARD

NOTES TO THE FINANCIAL STATEMENTS

for the year ended December 31, 2023

		INFLATION ADJUSTED		HISTORICAL COST	
		2023	2022	2023	2022
		ZWL$	ZWL$	ZWL$	ZWL$
19	**Operations expenses**				
	Tobacco seed selling costs	108 156 847	91 355 851	59 436 422	19 006 731
	Tobacco selling costs	297 087 671	24 589 515	117 163 312	5 115 888
	Fumigants and Insecticides	140,794,465	43 558 823	98,736,556	9,062,483
	Periodical subscriptions	318 668 412	61 092 936	205 240 340	12 710 483
	Utilities	271 745 027	46 718 860	232 184 610	9 719 934
	Small equipment purchase	620 800 344	127 577 843	349 103 176	26 542 774
	Seedbed and Greenhouse costs	671 766 781	144 972 931	444 324 089	30 161 850
	Tractors costs-fuel, oil and grease	241 766 210	91 283 100	148 235 558	18 991 595
	Tractors repairs and maintenance	403 177 328	66 324 261	177 685 192	13 798 868
	Laboratory Costs	780 919 522	382 615 437	606 767 673	79 603 753
	Field Marketing	1 033 254 063	173 065 490	536 567 807	36 006 552
	Grower Services	58 398 652	11 592 965	38 417 973	2 411 935
	Agricultural show expenses	355 158 675	99 495 098	201 512 886	20 700 114
		5 301 693 996	**1 364 243 111**	**3 215 375 596**	**283 832 958**
20	**Finance income/cost**				
20.1	**Finance income**	**1 876 998 369**	**1 975 496 361**	**1 876 998 369**	**411 005 172**
	Interest on short term deposits	1 053 287 606	1 697 053 242	1 053 287 606	353 074 637
	Interest on cash and cash equivalents	823 710 764	278 443 119	823 710 764	57 930 536
20.2	**Finance costs**	**(1 021 629 807)**	**(81 585 021)**	**(1 021 629 807)**	**(16 973 894)**
	Bank interest	(1 021 629 807)	(81 585 021)	(1 021 629 807)	(16 973 894)
	Net finance income	**855 368 562**	**1 893 911 340**	**855 368 562**	**394 031 278**
21	**Related party transactions**				
21.1	**Sales to senior management**	**13 722 064**	**2 819 243**	**6 250 656**	**586 548**

Sales to related parties are made at the normal selling prices charged by the Board and the terms and condition thereon are the same as those for sales to any of the Board's customers.

21.2	**Directors' remuneration**	**Board fees**	**Other**	**Total**	**Total**	**Total**	**Total**
	Chairperson	37 028 936	3 953 690	40 982 626	8 146 056	16 129 177	1 694 800
	Board members	180 645 837	97 966 613	278 612 450	41 010 981	109 651 088	8 532 400
		217 674 773	**101 920 303**	**319 595 076**	**49 157 037**	**125 780 265**	**10 227 200**
21.3	**Compensation to key management**						
	Salaries			6 055 602 499	593 438 079	2 383 251 013	123 465 740
	Pension			357 343 609	40 859 617	140 636 628	8 500 909
	Other benefits			1 254 411 445	425 164 941	493 687 845	88 456 245
				7 667 357 552	**1 059 462 637**	**3 017 575 486**	**220 422 893**

22 Retirement benefit plans

22.1 Defined contribution plans

The Board operates a defined contribution plan for qualifying employees in Tobacco Research Board Pension Fund. The assets of the plan are held separately from those of the Board under the control of Trustees. Where employees leave the plan prior to full vesting of the contributions, the contributions payable by the Board are reduced by the amount of forfeited contributions. The Board contributes 10% and employees contribute 5% of pensionable emoluments. The Board operates funded benefit plans for qualifying employees in National Social Security Authority Scheme. Contributions to the scheme are made in terms of the National Social Security Act [Chapter 17:04].

The Board's obligation with respect to the retirement benefit plans is to make the specified contributions.

Amounts charged in the Board's Revenue and Expenditure statement are as follows:

	INFLATION ADJUSTED		HISTORICAL COST	
	2023	2022	2023	2022
	ZWL$	ZWL$	ZWL$	ZWL$
Tobacco Research Board Pension Fund	912 122 921	210 832 267	611 790 441	43 863 990
National Social Security Authority	663 267 977	172 061 541	367 018 977	35 797 678
	1 575 390 898	**382 893 808**	**978 809 418**	**79 661 668**

23 Risk management

23.1 Financial risk management

Tobbacco Research Board defines risk as the possibility of losses which may be caused by internal or external factors. The Board provides oversight over the risk policies through the Internal Audit division. The Board regularly reviews its risk management policies and systems to reflect changes in operations.

23.2 Interest rate risk management

The only financial instruments that are sensitive to interest rate risk are money market investments, bank balances and cash. TRB is always on the lookout for the fluctuations in the prevailing levels of market interest rates.

23.3 Credit risk management

Credit risk refers to the risk that a counterpart will default on its contractual obligations resulting in financial loss to the Board. The Board has adopted a policy of only dealing with creditworthy counterparties and subjecting all new customers to credit verification checks. There is no concentration risk within the trade receivable balances.

Fair values

The fair values of all financial instruments are substantially equal to the carrying amounts reflected in the statement of financial position.

23.4 Liquidity risk

Ultimate responsibility for liquidity risk management rests with the Board of Directors, which has established an appropriate liquidity risk management framework for the management of the Board's short, medium and long-term funding and liquidity management requirements. The Board manages liquidity risk by maintaining adequate reserves, banking facilities and reserve borrowing facilities, by continuously monitoring forecast and actual cash flows, and matching the maturity profiles of financial assets and liabilities.

24 Going concern

The Directors have assessed the ability of the Board to continue operating as a going concern and believe that at the preparation of these financial statements, a going concern basis is still appropriate.

		INFLATION ADJUSTED		HISTORICAL COST	
		ZWL$	ZWL$	ZWL$	ZWL$
25	**Commitments to expenditure**				
	Commitments for the acquisition of property, plant and equipment	**19 401 024 505**	**7 039 417 253**	**7 635 493 134**	**1 464 562 000**

26 Subsequent Events

On the 5th of April 2024 the government of Zimbabwe introduced a new currency ZiG, which is equivalent to ZWL2 498.7242 , this will result in adjustment of balances to reflect their ZiG Value

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