TOBACCO RESEARCH BOARD

KUTSAGA

ANNUAL REPORT

2022

Contents


Potato

OUR VISION

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

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
Out 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

CEO Changes

30 March 2022
Dr. D. Garwe leaves Tobacco Research Board

April – August 2022
Mr. O. Mharapara appointed as Acting CEO

26 September 2022
Dr. F. Magama appointed as Substantive CEO

Registered Address

P. O. Box 1909
Harare

Business Address

Kutsaga Research Station
Airport Ring Road
Harare
Tel: 08688002604

Bankers

Standard Chartered Bank Zimbabwe

AFC Commercial Bank Zimbabwe

CBZ Bank Limited

Auditors

Baker Tilly Zimbabwe

Board of Directors

Mr. Stanley Mutepfa
Chairman

Dr. Frank Magama
Chief Executive Officer

Vice-Air Marshall Innocent Chiganze (Rtd)

Mr. Aaron Denenga

Dr. Dumisani Kutywayo

Mrs Florence Miti

Prof. Florence Mtambanengwe

Ms Chenai Garise-Nheta

TOBACCO RESEARCH BOARD
KUTSAGA

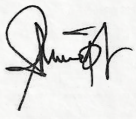
Letter of Remittal

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

Dear Sir,

I have the privilege, on behalf of the Tobacco Research Board, to submit for your consideration, the Annual Report covering the research year and the audited financial statements for the year ended 31 December 2022.

Yours faithfully,



Stanley Mutepfa
CHAIRMAN

Chairman's Report

DEAR STAKEHOLDERS

I have great pleasure in presenting the Tobacco Research Board ('TRB') 2022 Annual Report. In 2022, the Tobacco Research Board (TRB) delivered an excellent performance despite a challenging operating environment. The institution's achievements in 2022 were the result of the collective skills, drive, and innovative thinking of our staff members. I salute and thank our TRB team and thank them for another year of their dedication and hard work.

OPERATING ENVIRONMENT

The year under review was characterised by several economic challenges notably hyperinflation, high production costs, foreign currency shortages and power outages. Inflation stood at two hundred and forty-three and eight-tenths percent (243,8%) which was an exponential increase compared to the rate of inflation as at December 2021 which stood at sixty-one percent (61%). Although the 243.7% was much lower compared to earlier in the year, it remained in hyper-inflation territory and resulted in the sustained depreciation of the value of the local currency against the United States dollar. The effects of COVID-19 on the local and global economy continued in the period under review albeit to a lesser degree than the previous reporting period

.

The Russo-Ukrainian conflict which broke out in February 2022 generally put further pressure on supply chains and the global economy and in particular caused disruptions in the natural gas supply chain. Given that natural gas is a key ingredient in nitrogen production, the conflict drove up the global prices of fertilizer. Given the already fragile state of Zimbabwe's economy characterised by high production costs, the Zimbabwean economy in general and the agricultural sector, in particular, felt the adverse impact of this conflict more readily in the form of increased fertilizer prices and imported global inflation.

Despite the above challenges exacerbated by global events, we will continue to implement our Strategic Plan and invest our best efforts to develop and nurture our capabilities to deliver value to our stakeholders.

FINANCIAL PERFORMANCE

Due to hyperinflation during the reporting period, the financial results for the year ended 31 December 2022 are inflation adjusted. The results were prepared in terms of the Public Finance Management Act [Chapter 22:19] and International accounting standards and IFRS. In complying with the said accounting standards, the Board of Directors applied necessary judgement and assumptions where appropriate.

Revenue at ZWL$ 9 147 800 501 was 667% higher than the translated prior period. Surplus for the year was ZWL$ 4 334 866 237.

> "**The Tobacco Research Board delivered an excellent performance despite a challenging operating environment...** [as a] result of the collective skills, drive, and innovative thinking of our staff members.

TRB, however, remained in a strong financial position. Assets increased from ZWL$1 273 million to ZW$ 7 026 million. Current liabilities went up by 361% from ZWL$ 393 million to ZW$ 1 811 million while current assets increased by six-hundred and forty-one percent (641%) from ZWL$ 869 million to ZW$ 6 446 million. TRB funded most of its operations from resources generated internally and ended the year with a total of ZWL$ 2 105 million in cash and cash equivalents.

RESEARCH AND DEVELOPMENT

Zimbabwe has been experiencing sustained and adverse climate change developments notably in the form of late onset of rains and a gradually shortening season. To address these challenges, TRB has, over the years, devoted considerable efforts to producing climate-smart varieties. Those efforts have produced promising results and TRB will be releasing four (4) drought-resistant varieties designed to perform in marginal areas will be released in 2023.

BUSINESS DEVELOPMENT

There was a general decline in product sales during the period under review compared to 2021. Gromix sales declined by ten percent (10%), Float Trays sales declined by sixteen percent (16%) and Floatfert sales declined by ten percent (16%). On a positive note, the sales of G4 seed potato increased by thirty percent (30%) tobacco seed sales increased by twenty percent (20%).

TRB continues to increase its foothold in the regional market. During the period under review Agents in Zambia increased their volume of sales by thirty percent (30%). An increase in seed exports was recorded during the year. Tobacco seed exports to Mozambique, Uganda, Malawi, Bangladesh, Brazil, Rwanda, Tanzania, Madagascar, and Zambia increased by a seventy-four percent (74%) increase compared to the previous reporting period.

HUMAN RESOURCES

As a research institution, our staff is our most important resource. Our ability to deliver value to our stakeholders depends on our ability to attract and retain the best scientific and administrative talent. This has become especially important in the current operating environment. Our staff remain core to our strategy and we will continue to support this crucial pillar of our strategy by prioritising the welfare of our staff.

OUTLOOK

During the third quarter of the year, tight monetary measures were introduced by the authorities that yielded positive results in the form of stable exchange rates and a slowdown in inflation. Tobacco Research Board remains cautiously optimistic that this trend will continue in 2023. However, despite this cautious optimism, production costs are expected to remain high and the general operating environment is expected to remain constrained for the foreseeable future.

Despite these anticipated challenges, TRB has developed considerable resilience developed over years of operating in difficult operating environments largely due to its dedicated and innovative staff. I am confident that TRB will continue to deliver value to its stakeholders buoyed by increased export performance which will mitigate the challenges associated with the local operating environment. Accordingly, TRB will intensify its efforts to expand its market share in the region.

ACKNOWLEDGEMENT AND APPRECIATION

I am grateful to our stakeholders for their continued support. I also thank my fellow Board Members for their contributions, guidance and commitment to the institution, management team and staff members of TRB for their dedicated hard work under the challenging circumstances that prevailed during the period under review.

Mr Stanley Mutepfa
Chairman

Chief Executive Officer's Report

Dear Stakeholder, I am delighted to introduce the Tobacco Research Board's 2022 Annual Report; my first as CEO. I assumed the office in the last quarter of the year. It is my singular honour to be helming this iconic agricultural research institution and steer it into the future. I would like to take this opportunity to express my heartfelt gratitude to my predecessor, Dr Dahlia Garwe's stellar stewardship over the past 10 years. I would also want to express my gratitude to our Executive Director of Business Development and Marketing, Mr Oswell Mharapara, who kept the ship steady during the period between the departure of Dr Garwe and my appointment as the CEO. As we enter the next chapter of our proud 72-year history, I have been listening to our stakeholders very closely and I am optimistic about the future that we all share, building upon strong foundations to expand our impact and increase our reach. Since starting in this role, it has become increasingly clear to me that while the tobacco industry remains an attractive sector, it is undergoing significant changes both locally and internationally bringing both challenges and opportunities. The future of our institution will be decided by how well we anticipate and respond to the opportunities our shifting environment presents. Under my stewardship, the Tobacco Research Board (TRB) will navigate these challenges to the best of its ability and exploit the opportunities the evolving tobacco industry will present.

The continued success of the institution is driven by our dedicated staff members who provide the energy, enthusiasm, and ingenuity that drive our success. The key, to our continued success, will be the institution's ability to attract and retain world-class talent in all our spheres of activities. I am a firm believer in the power of high-performing teams. Accordingly, building a world-class workforce and driving a high-performance culture is a key pillar of my strategy to steer the institution into the future.

Our commitment to science and research excellence and being a responsible, innovative and pace-setting agricultural science research institution will continue under my leadership.

TRB'S CONTRIBUTION TO VISION 2030

The Tobacco Research Board is well placed to contribute immensely to the National Development Strategy 1 and ultimately to Vision 2030. The focus areas for TRB in NDS1 fall under Human Capita Development and Food Security and Nutrition thematic working groups. The work conducted on a day to day basis is guided by the various Agricultural Sector's plans including the Tobacco Value Chain Transformation Plan (TVCTP) aimed at achieving a US$5bn tobacco industry by 2025, the Agriculture and Food Systems Transformation Strategy (2020 -2024) and the Horticulture Recovery and Growth Plan (2020 -2025). These blueprints are aimed at achieving food security and import substitution and ultimately improved incomes and standards of living in line with Vision 2030.

SEASON QUALITY AND CROP PERFORMANCE

The rainfall season was characterized by a late start to the rains followed by an erratic rainfall pattern in the middle and a lot of end-of-season rains that continued well into May. Growers thus experienced a rather dry October and November months as seen from the three TRB stations (Kutsaga, Banket and Oriental) where only 2, 9 and 16% rainfall was received in this period. At Kutsaga following some meaningful rainfall in mid-December, January turned

out to be dry, February had lots of rainfall being received while March was once again dry. The December rains while very welcome, came accompanied by some extreme weather, mainly hailstorms which resulted in some hail damage that affected the commercial and experimental crops at Kutsaga station. The period of low rainfall (January and March) led to signs of drought stress being observed on some field crops. Thereafter, April and May saw significant amounts of rainfall being received and at the end of the season some 806 mm had been received at Kutsaga Station, 773 mm at Banket and 638 mm at Oriental station.

RESEARCH HIGHLIGHTS

Agrochemical Evaluation: The research team continued to screen and select greener agrochemicals for use on tobacco. The recommended lists were sent through to the Tobacco Industry and Marketing Board for approval. Much research was also conducted on searching for and availing biocontrol products as highlighted in the Plant Health Services and Crop Production & Molecular Technologies reports.

Variety Evaluation: The work conducted for the last three seasons on developing varieties suited to marginal areas finally came to an end. From the cohort of 14 experimental test hybrids (ETH) that have been under evaluation in preliminary agronomic breeding trials (PABT) for their fit to the ideotype in marginal growing areas (Masvingo and Tengwe) four test hybrids were selected. The four test hybrids named ETH 1/18, ETH 4/18, ETH 5/18, and ETH 10/18 will be placed on limited release in the 2023 season.

International Variety Evaluation: Positive feedback was received on the performance of Kutsaga varieties being grown or evaluated in various countries across the world. The agronomists conducting agronomic adaptation trials in Italy reported that Kutsaga varieties were performing very well. This was after an initial assessment of field trial to evaluate several varieties for resistance to root-knot nematode showed that K RK70 was indeed resistant to the Italian nematode spp. Similar sentiments have been received from Ethiopia, Tanzania, Zambia, Mozambique and Malawi where some of TRB's varieties are now widely sought after.

Research Collaborations: Research collaborations provide platforms for sharing research expertise, increase productivity and efficiency, and enhance the quality of research. TRB research team continued to fully participate in the international CORESTA collaborative trials. In addition, three papers were presented during the virtual CORESTA Congress held from 10-28 October 2022. The abstracts for these presentations were subsequently published on in the Programme book and abstracts available on https://www.coresta.org/sites/default/files/events /CORESTA 2022_Programme and Abstracts2.pdf.

PRODUCTION

Seed Production: Burley and flue-cured tobacco seed for the 2021/22 season was produced from 10 sites including Kutsaga Station and set targets were met. This enabled the institution to ensure the maintenance of an adequate 5-year stock cover of tobacco seed of all popular varieties. The nation can thus be assured that adequate seed is available for Zimbabwe and the region.

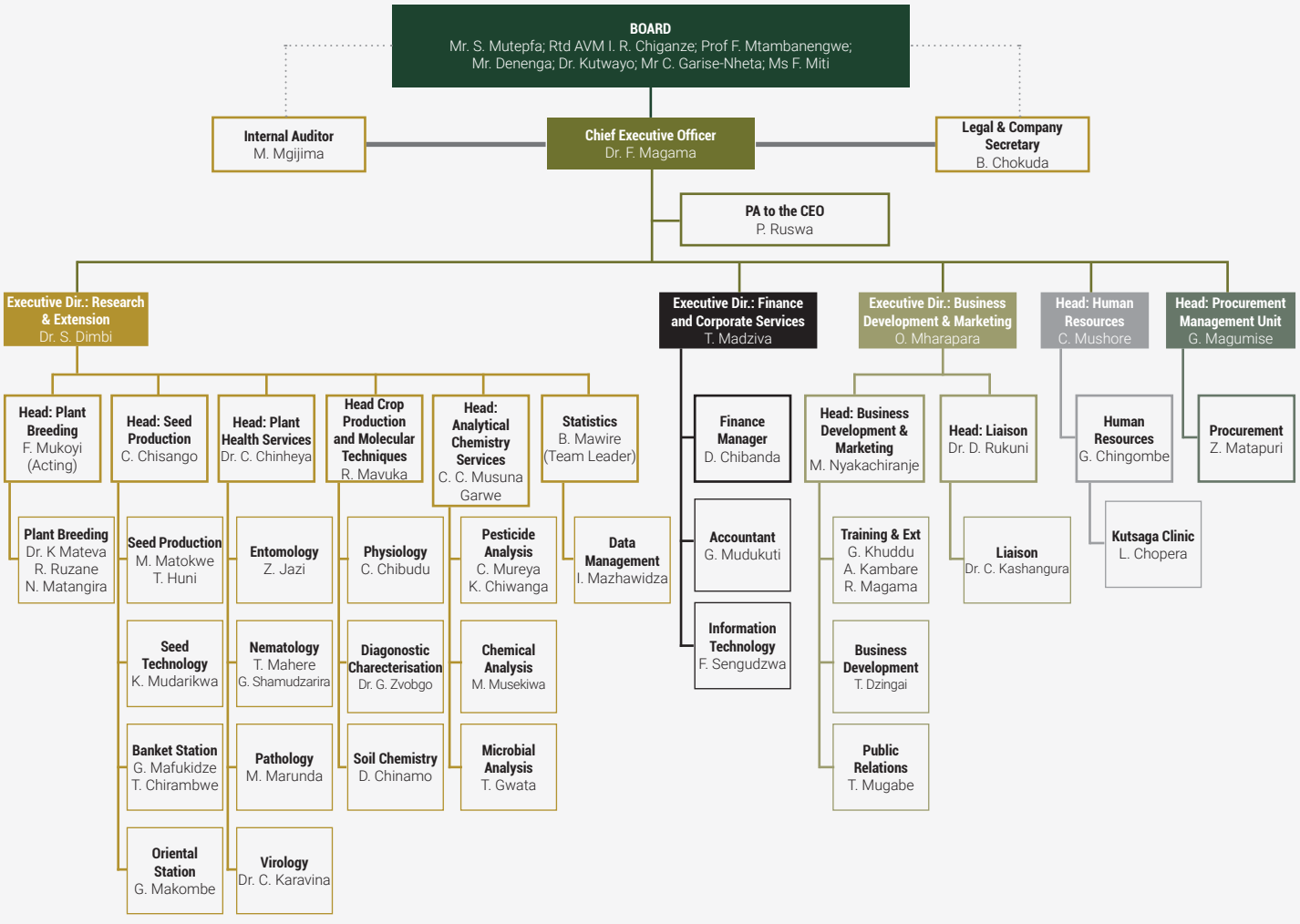
Presidential Rural Developmental Program: The TRB fully participated in the Presidential Rural Developmental Program (in pursuit of the acceleration of Vision 2030) launched in December 2021. The Board's role in this programme has been to provide tissue-culture-generated, virus-free sweet potato planting material for the village nutrition gardens. Some 1.4 million seedlings were produced & dispatched to various provinces through the Department of Agricultural Research Innovation & Development.

G0 Mini-tuber production: The production of G0 Irish potatoes has steadily increased as the greenhouse infrastructure was increased at the end of 2021. Thus, from January to December 2022, some 1.39 million G0 Irish potato mini-tubers were produced and dispatched to contract growers. This was 116% of the set target of 1,200,000 tubers. This project avails locally produced disease-free planting material to potato growers who used to import from South Africa and thus contributes to import substitution.

REFORMING AND RESTRUCTURING PROCESS

The TRB was directed by the parent ministry to reform and restructure to become the epicenter for national research, development and innovation on tobacco, inclusive of tobacco alternatives and alternates, for accelerated agricultural profitability and development. Establishing, enhancing and harnessing technologies for industrial applications, inclusive of biopharming, for national growth from January 2022. In the period under review various trials with the objective to evaluate alternatives to tobacco and alternative uses of tobacco were conducted in fulfilment of this directive. Details of these projects are under the CPMT and the PB reports.

Organogram



Staff List

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

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

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

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

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

Ms. P. Ruswa
Personal Assistant to Chief Executive Officer

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

Ms. M. Shonge
Personal Assistant to Executive Director - Finance and Corporate Services

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

INTERNAL AUDIT

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

RESEARCH AND EXTENSION

Crop Production and Molecular Technologies

Mrs. R. Mavuka
Head: Crop Production and Molecular Technologies
BSc (Hons) Biological sciences, MPhil (Zim), Postgrad. Dip. Pesticide Risk Management (UCT)

Mrs. C. Chibudu
Senior Research Officer - Physiology
BSc Agric (Zim), MSc (UK)

Ms. D. Chinamo
Research Officer - Soil Chemistry
BSc Agric (Zim), MSc (Zim)

Dr. G. Zvobgo
Research Officer - Molecular Biologist
BSc (Zim), MSc, PhD (China)

Ms. T. Gukuta
Research Officer
B Tech in Biotechnology (Zim), SMBE (Malawi), ARIPO, Cert. in Aquaculture and Transformation, Cert. in Immunodiagnostic Tools, Cert. in Bioscience Business Development

J. Mugabe
Research Officer
BSc in Crop Science

T. Mushapaidze
Research Officer
BSc in Biological Sciences (Genetics and Microbiology)

Engineering

B. Muboni
Agricultural Engineer
B. Tech Agric Engineering (Zim), Post Grad Cert in Engineering (China)

Material & Services

L. Mafuwa
Supervisor
HND, Nat Cert. in Machine Shop Engineering

D. Maonga
Plumber: Kutsaga
Nat. Certificate

J. Votadyo
Electrician: Kutsaga
National Certificate

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

Field Services

M. Kavene
Farm Consultant
Tobacco Culture Dip, Executive Dip in Gen Management, Sales and Marketing Dip, Crop Protections Accreditation Certificate, Tobacco Classification Certificate

Plant Breeding

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

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

R. Ruzane
Research Officer
BSc Biological Sciences (Zim)

Plant Health Services

Dr. C.C. Chinheya
Head: Plant Health Services
BSc Bio Sciences, MSc Tropical Entomology (UZ), PhD Plant Pathology (UKZN)

Dr. C. Karavina
Plant Virologist
BSc Agriculture (Crop Science), MSC Crop Protection (UZ), PhD Plant Pathology (SA)

M. Marunda
Research Officer- Pathology
BSc Agric (Zim)

T. Mahere
Research Officer - Nematology
BSc Biological Sciences, MSc in Hydrobiology and Fisheries, Nat Cert. in Project Management (UZ)

Mrs. G. Shamhudzarira
Research Officer - Nematology
BSc in Biological Sciences

Ms. Z. Jazi
Research Officer - Nematology
BSc (hons) in Biological Sciences

Seed Production

Mrs. C. Chisango
Head: Seed Production
BSc Agric, MSc (Zim)

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

Mrs. T. Huni
Research Officer- Seed Production
BSc Agric (Zim)

Ms. M. Matokwe
Research Officer- Soil Chemistry
BSc Agric, MPhil (Zim)

Mrs. K. Mudarikwa
Research Officer- Seed Technology
Cert Seed St

G. Makombe
Station Manager - Oriental
BSc Agric (Zim)

G. Mafukidze
Seed Agronomist
BSc Agric, MSc (Zim)

Statistical Services

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

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

Mrs. I. Mazhawidza
Records Supervisor

Analytical Chemistry Services

Mrs. C. Musuna-Garwe
Head: Analytical Services
Nat dip Appl Chem, BSc (Unisa), MBA (Nott):

M. Mutanhaurwa
Chemist
BTech in Chemical Technology – Chemistry

Ms K. Chiwanga
Chemist
BSc (Honors) in Applied Chemistry, MSc in Chemistry

C. Mureya
Research Officer – Chemistry
BSc (Zim)

T. Gwata
Senior Technical Officer – Microbial Analyst
Sip Appl Bio, HND Appl Bio

BUSINESS DEVELOPMENT AND MARKETING

O. Mharapara
Head: Business Development
MSc (Chem) (Czech), MBA (Zim)

T. T. Dzingai
Business Development and Marketing Officer
BSc Hon Economics UZ, MBA UZ

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

P. Muzoda
Supervisor – EPS Factory
Nat. Certificate

Mrs. Nyakachiranje
Head: Business Development
HBS (Zim), MBA (Zim)

Dr. C. Kashangura
Liaison Officer
BSc Honors, DPhil Biological Sciences (UZ)

G. Khuddu
Training Manager
Nat. Dip. Agric (Zim), Dip Agric; Dip. Mgt. Exec (Zim), MBA (Zim)

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

FINANCE AND CORPORATE SERVICES

Mrs T. Madziva
Head: Finance
BComm (Unisa, ACIS, Dip Bus Comp. Prog, MBA

D. Chibanda
Finance Manager
BComm Finance, CIS

F. Sengudzwa
Systems Administrator
HND, B Tech Information Technology

HUMAN RESOURCES

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

Ms L. Chopera
Nurse – Kutsaga Clinic
State Registered Nurse

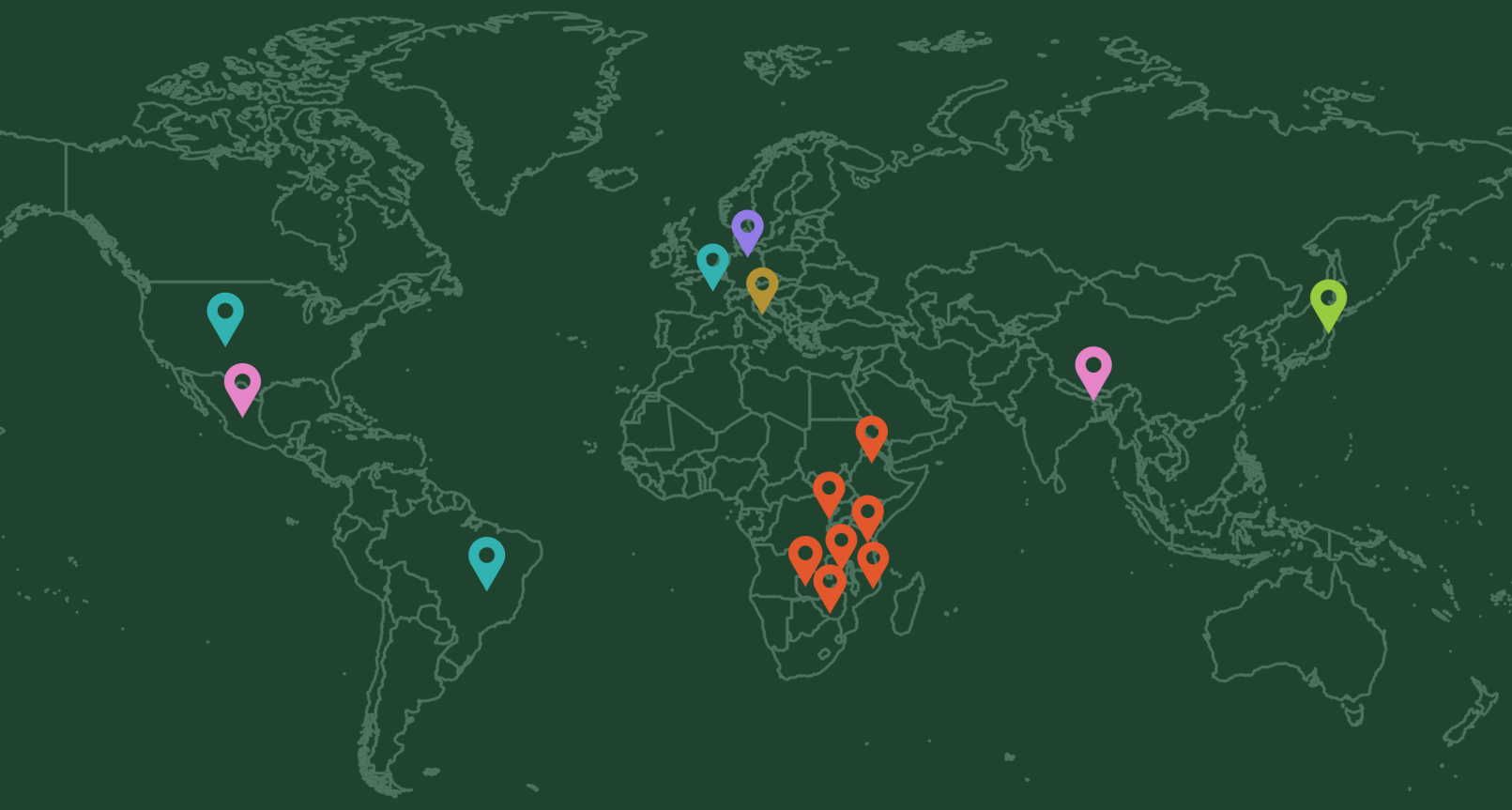
PROCUREMENT MANAGEMENT UNIT

G. Magumise
Procurement Manager
BComm Business Management, MSc Strategic Management and Corporate Governance, MCIPS, Dip. In Customs Legislation and Procedures

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)

TobaccoResearch Board Varieties

A Global Footprint



- Varietal Release & Commercial Production
- PVY Disease Resistance Trials
- Germplasm Exchange (Adaptation Trials)
- Cigar Wrapper Trials
- Global Low Nicotine Trials
- Yield and Agronomic Trials

TOBACCO RESEARCH BOARD
KUTSAGA

01 Plant Breeding Division

Our mission is to develop high yielding superior quality, multi-disease resistant varieties to maximize grower returns.

EXPERIMENTAL BREEDING

The overall aim of the breeding program is to produce multi-disease resistant varieties that meet grower and merchant requirements. Multi disease resistance ensures limited use of chemicals; is environmentally friendly and reduces production costs in the various growing regions of the country and beyond. Pursuant to this philosophy, all breeding experiments initiated in the 2021/22 season were successfully conducted. These were from the fundamental work clusters (bold number in parenthesis indicate number of trials conducted) viz; agronomic evaluation of advanced breeding lines/varieties **(3)**, disease breeding and retrofit programs **(6)**, seed production and quality assurance **(4)**, nicotine manipulation projects **(1)** and alternative crops/uses of tobacco **(2)**. The initial phase of the season (October to December 2021) was characterized by hot conditions and delayed start of effective rains and this imposed some limitations to growth and development on the trials. The second phase (Jan-March 2022) further exacerbated the limitations by being excessively wet. Despite these challenges, all trials were completed successfully. Of the trials conducted in the season, the following sections provide some highlights;

Breeding for drought escape

The project is a response to the declining quality of the agricultural seasons i.e., late start of the rains resulting in short seasons (Dec-Feb) coupled with expansion of tobacco production in districts previously considered to be marginal for tobacco production. The objective of the work is to develop varieties that can fit into the short season and marginal areas framework but still be capable of giving acceptable returns. The ideotype of these varieties should among other factors; have quick growth and maturity (speed to topping) to escape the detrimental effects of drought, be multi–disease resistance (especially root-knot resistance) and have a yield potential of at least 2.5 t ha-1.

In previous seasons, a cohort of 14 experimental test hybrids (ETH) were evaluated in preliminary agronomic breeding trials (PABT) for their fit to the ideotype in marginal growing areas (Masvingo and Tengwe) and also under simulated and natural drought conditions. From the tested cohort, four test hybrids (ETH 1/18, ETH 4/18, ETH 5/18, and ETH 10/18) selected on good agronomic performance were advanced to full evaluations under the Cooperative Cultivar Trial (CCT) scheme at Makoholi Research Station (Masvingo: marginal tobacco site), Kutsaga Research Station (Harare: ideal growing conditions) and Tengwe (Oldonyo farm: dry with high temperatures). The ETHs performed very well (see Annual Report 2020) and were further evaluated under Cooperative Cultivar Trials (CCT) in Lower Gweru and Matabeleland North (non-tobacco and very marginal crop production areas). In these expanded trials, the ETHs performed to the earmarked ideotype in terms of speed to topping, yield and quality.

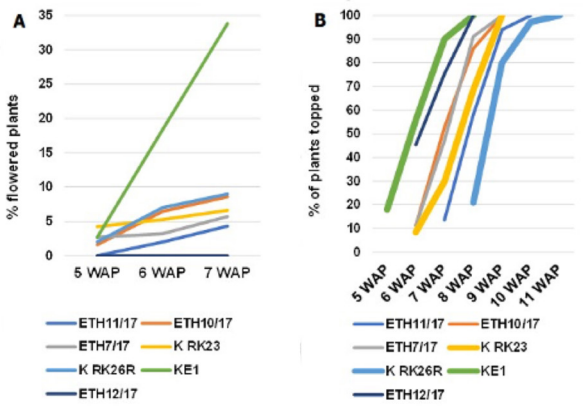


Fig 1.1: *Experimental test hybrids (ETH): (A) flowered plants, (B) speed to topping (topped at 18-19 leaves), with KE1 and K RK26R used as topping speed controls.*

Fig 1.1A shows the early flowering potential of the tested entries. The percentage of early flowering plants was between 0-9% and indistinguishable from the commercial variety (K RK26R) with the exception of the early flowering control variety (KE1) at 34%. Fig 1B 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.

Data collected over seasons show that the ETHs are capable of good yields and quality in marginal regions and drought conditions through an ability to grow fast use limiting resources thus escapes drought. However, in the 2021/22 season, yield and quality data could not be collected for the site in Matabeleland North after the barn caught fire (Fig 1.2A) at the peak of reaping. Attempts to quickly repair the barn were not successfully, the repaired structure could not properly maintain curing temperatures resulting some curing leaf disorders (Fig 1.2B). Plans were put in place to repeat the trial in the following season to enable the collection of sufficient data for varietal performance assessments and decision making

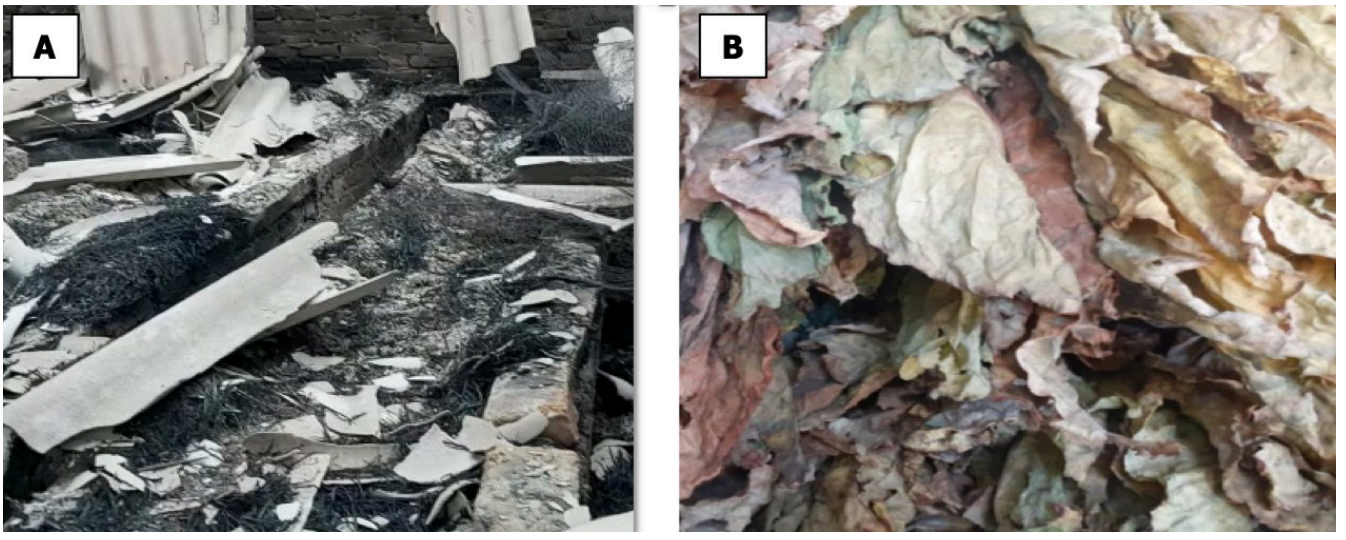


Fig 1.2: *Barn problems at the Matabeleland North site:* ***(A)*** *barn fire,* ***(B)*** *curing leaf disorders due to a defective barn.*

G HR1 seed purification

To arrest the debilitating and widespread practice of tobacco monoculture (due to limited land holdings), a high root-knot suppressing grass (G HR1) was bred and released to growers in 2016. Thus, this grass variety became another tool in a basket of measures being proffered to growers to address sustainability issues in tobacco production. Due to high demand for the variety, several generations were advanced through seed propagation to cater for the market. Given its outcrossing nature, it inadvertently got contaminated over time. In mitigation, a routine quality assurance exercise was initiated to reconstitute the original nucleus seed after several years of open field propagation. A battery of root-knot nematodes tests and assessments were implemented to select high performing selections (Fig 1.3A-D).

Fig 1.3: *Root-knot nematode assessments on a population of G HR1:* ***(A)*** *lab bioassays,* ***(B)*** *gall rating using the, Nausbum and Dalton Scale* ***(C)*** *field phenotyping* ***(D)*** *G HR1 phenotype.*

Fifteen elite selections evaluated over seasons had mean galling scores of less than 2 on the Nausbaum and Dalton scale (Fig 1.4). With forethought, selections 1, 5,10 and 12 were repeatedly observed to have high root-knot nematodes population suppression potential in an array of bioassay, appeared immune to nematode attack (no visible galling-zero scores) and had the typical phenotype (Fig.1.3D); these will constitute the recurrent population for the production of the nucleus seed. Nucleus seed will be passed to the Seed Production Division for onward multiplication of commercial seed. Commercial seed is expected to be available from December 2023 onwards. Additionally, a protocol development for tissue culture clonal multiplication was initiated and shall also be the basis of nucleus seed maintenance.

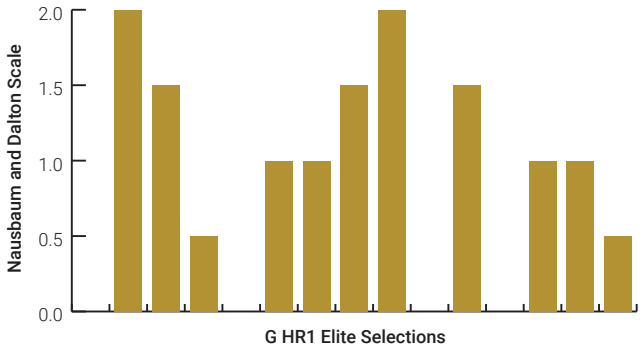


Fig 1.4: *Mean gall rating scores of elite G HR1 selections tested over three seasons. G HR1 selections 1, 5, 10 and 12 consistently had scores of zero on the rating scale.*

Inaugural Agronomic Trial of Shisha Tobacco

The long history of successful tobacco production in Zimbabwe, a huge grower base and a supportive Tobacco Research Board and its provision of ancillary services are part of the drivers for merchants to try to adapt other tobacco strains for production such as Cigar wrapper and Shisha tobacco. The cigar wrapper research progress has been previously reported *(see Annual Reports from 2017-2021)* and also highlighted elsewhere in this report. Shisha is flavored hookah tobacco which originates from the Middle East and certain areas of Asia. Shisha chefs in the Middle East are reported to combine tobacco leaves with honey, flavoring and other ingredients to create premium masterful blends.

This type of tobacco consumption is an emerging trend the world. A merchant company (Cavendish Lloyd) requested the Division to focalize research around this strain of tobacco with a view for commercial production. Thus, two imported Shisha varieties (Youri 1 and Youri 2) along with local controls (K RK26R, T68 and K110) were agronomically evaluated under two fertiliser rates [low nicotine (37.5 units N) and standard (80 units)] and three population densities [15 000 (standard), 25 000 and 32 000 plants ha-1] for adaptation to the Zimbabwean climate and for shisha quality parameters i.e. nicotine content less than 1% and reducing sugars > 20 % on dry weight basis.

Effects of plant population densities on yield of test varieties

The effect of plant densities on the yield of test varieties was determined (Fig 1.5). The results show that statistically significant declines ($p<0.05$) in yield when plant population increased from 15 000 plants ha-1 to 25 000 plants ha-1 across all varieties. However, only marginal yield declines were recorded when population changed from 25 000 plants ha-1 to 32 000 plants ha-1. The imported varieties Youri 1 and Youri 2 had the highest yields but were comparable to the standard local variety K RK26R at the three populations densities tested (Fig 1.5). Two local varieties T68 and K110 had the least yields across tested parameters.

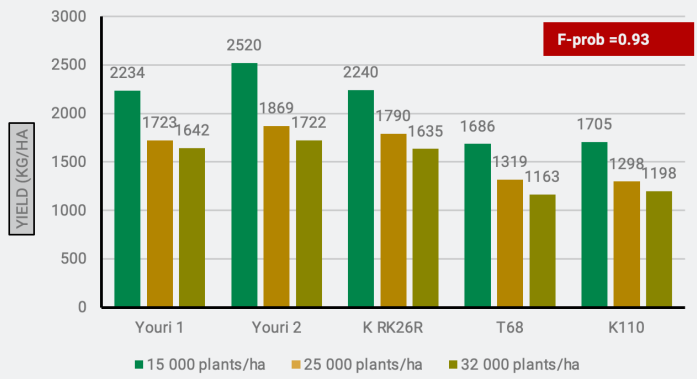


Fig 1.5: *Effect of plant population densities on yield of test varieties. Bars are statistical means of N>300 plants for stated treatment over three blocks.*

Effects of plant population densities on nicotine content of test varieties

The effect of plant densities on the nicotine content of three reaping groups (reaping numbers: 1-3, 4-6 and 7-9) of test varieties was determined (Fig 1.6 A-C). Results show that despite the population density or variety, nicotine content substantial declines in an acropetal manner by leaf position. Thus, it may be advisable to take middle and upper reapings for the parameters needed to satisfy shisha leaf quality. Reaping group 3 had generally the lowest leaf nicotine content. A nicotine content of 1.14% on dry weight basis (dwb) was the lowest achieved and this was with Youri 2 and K RK26R at 15 000 and 32 000 plants ha^{-1} respectively.

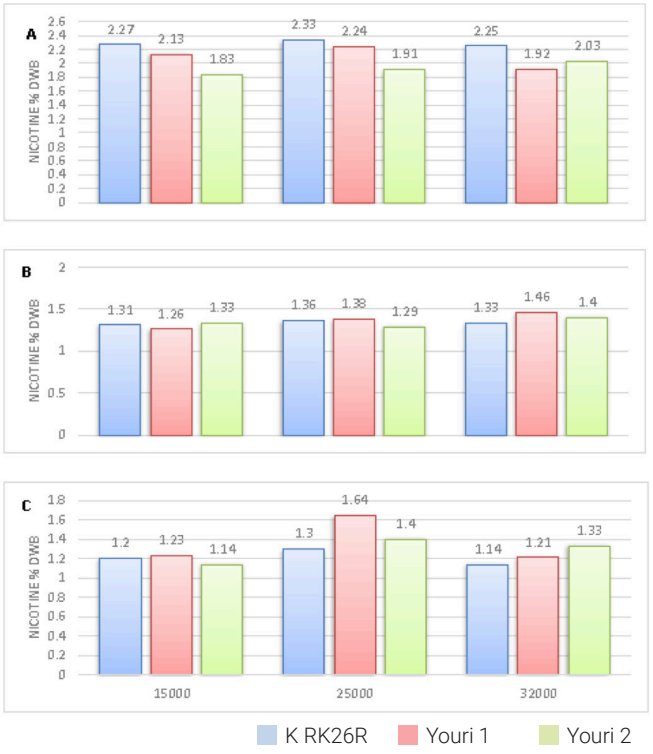


Fig 1.6: *Effect of plant population densities on leaf nicotine content of test varieties.* ***A:*** *Nicotine content of reaping group 1 (composite of reaps 1-3),* ***B:*** *Nicotine content of reaping group 2 (composite of reaps 4-6) and* ***C:*** *Nicotine content of reaping group 3 (composite of reaps 7-9). Each bar is a single nicotine measurement of a leaf sample of the respective composite at population densities of 15 000, 25 000 and 32 000 plants ha^{-1}.*

Grade indices of cured trial leaf

Tobacco leaf quality in this study was determined using a grade index (GI) and the purchase prices of the leaf grades (data not shown). Before these analyses could be done, leaf classification and grade distribution of the leaf from the various treatments was conducted. It was observed that across all treatments the proportion of leaf (L) grades was significantly low compared to other grades; this was despite the position of the leaf or reap number. Further, the style factor which is principally the texture and maturity of tobacco was predominantly of 3rd and 4th class with a slatey appearance (K class) indicating both the nature of the season and the imposed treatment effects. Lastly, lemon cures dominated the cured leaf colour.

Grade index (%) is generally taken as the measure of the usability of the trial leaves, with a higher-grade index value indicating better usability of the treatment under consideration. Table 1.1 shows the grade indices (%) obtained across treatments, overally grade index significantly increased from reaping group 1 to group 2 and marginally fell at reaping group 3. Thus, reaping group 2 had the best indices and varieties Youri 1 and 2 attaining the highest indices values of all the treatments.

Results that have been shared are from first season data and are very promising that it maybe be easily possible to produce a quality shisha leaf type in Zimbabwe. However, the need for multi-location trial over seasons is important for a nuanced and precise management of yield, quality and leaf nicotine concentrations. The diversification of strains of tobacco in Zimbabwe is very important as it creates a buffer against prices and viability challenges associated with a single strain for example flue cured.

Cooperative Cultivar Trial of B RK6 and B RK7 burley varieties

B RK6 and B RK7 burley varieties were developed to increase the repertoire of burley varieties available for regional markets especially Mozambique, Zambia and Malawi. B RK6 was primarily developed to provide above average resistance to Alternaria, Angular Leaf spot (Race 1) and root-knot nematodes while retaining a slow leaf ripening character. B RK7 was bred as a fast-growing variety suitable for stalk cutting with moderate to high root-knot nematode resistance. The two varieties have been on limited release for close to eight (8) years now. The drive to place them on open release is the motivation behind this trial since the varieties are highly sought after in Mozambique, Malawi and Tanzania.

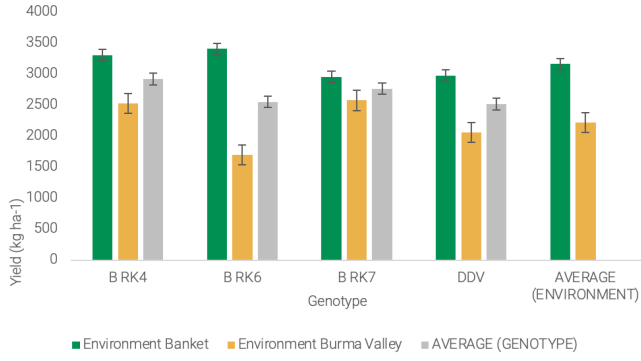


Fig 1.7: *Mass at untying for the Cooperative Cultivar Trial of B RK6 and B RK7 burley varieties.*

REAPS	FERT LEVELS		POP DENSITY			VARIETY				
Group	Low Nic	Standard	15000	25000	32000	Youri 1	Youri 2	K RK26R	T68	K110
1	41.22	39.08	38.1	40.3	42.04	44.06	44.87	36.98	38.03	36.79
2	54.69	55.65	54.89	54.53	56.09	59.3	59.1	53.97	53.1	50.37
3	53.64	50.33	54.24	51.24	50.48	52.78	53.66	51.23	51.86	50.39

Table 1.1: *Grade indices of cured trial leaf. Note: All values are percentages. Reaping groups are 1: composite of reap 1-3, 2: composite of reap 4-6 and 3: reap 7-9. Population density is number of plants ha^{-1}. The Kutsaga Grading Program Proprietary Software was used to generate the values.*

Fig 1.7 showed that the environment Banket had a greater average yield of 3155.09 kg ha^{-1} than Burma Valley, which had a yield of 2212.35 kg ha^{-1}. In the Banket environment, B RK6 produced the maximum yield of 3400.1 kg ha^{-1}, outperforming the control variety B RK4, which yielded 3300 kg ha^{-1}. In Burma Valley B RK7 had the highest yield (2571.21 kg ha^{-1}), compared to the control variety, B RK4, which yielded 2525.05 kg ha^{-1}.

The growing cigar and cigar wrapper industry

Following the focalization of agronomic research and the development of new cigar wrapper genetics to improve yields, enhance foliar disease resistance and ultimately produce excellent cigar wrapper quality four indigenous companies set up facilities for the production of wrappers and rolling of cigar for export markets. This was an increase from the Burma valley cigars which started in 2017, the last company recorded being British American Tobacco in the 1970s. The new entrants are; Mosi Oa Tunya Pvt Ltd, Gloriossa Cigars Pvt Ltd and ZimCigars Pvt (Fig 1.8).

Following the increasing numbers of firms entering this new industry, several articles were published in mainstream newspapers, social media platforms and interviews conducted on national television about TRB 's involvement in the creation and support of this new innovation. A common thread was that the cohort of the new cigar wrappers hybrids possess superior quality, aroma and taste as adjudged by various organoleptic panels and this gave impetus for the growth of the industry and acceptability of the cigar products in export markets.

Fig 1.8: *Logos and products of new indigenous companies forming the Cigar and cigar wrapper industry.*

TRB VARIETIES GLOBAL FOOTPRINTS

Fig 1.9: *Global and regional footprints for TRB bred tobacco varieties.*

Our varietal products have left permanent corporate imprints all across the world. Fig 1.9 depicts some of the nations where TRB varieties are used in research trials or where governments and private companies have commercialized and released the varieties. These varieties, without a doubt, provide a firm foundation for national yields and, as a result, revenue generation. The varieties are known for their high yield, outstanding quality characteristics and root knot nematode resistance (as demonstrated by trials in Perugia Italy.

Regional and international trials

Regional variety trials to showcase the superiority of Kutsaga genetics continued in a number of countries as previously reported. Rwanda which has recently started tobacco production has been in the forefront by expanding tobacco production output using Kutsaga products, services and technologies. Three companies; Trasformatori Tabacco Italia Soc. Coop. Agricola (Italy), Profigen (Brazil) and British American Tobacco (Mexico, Bangladesh and India) accessed seed for the purpose of evaluating Kutsaga varieties in their production zones. Trasformatori Tabacco Italia Soc. Coop. provided glowing reports on the performance of a number of Kutsaga bred varieties. As an example, Fig 1.10 shows K RK70 growing very well in a heavily root-knot nematode infested soil in Perugia in Italy while another test line is heavily succumbing. The adoption of Zimbabwe bred varieties in other countries is a matter of national scientific pride and also earns foreign currency for Zimbabwe. As an example, Fig 1.10 shows K RK70 growing very well in a heavily root-knot nematode infested soil in Perugia in Italy while another test line is heavily succumbing. The adoption of Zimbabwe bred varieties in other countries is a matter of national scientific pride and also earns foreign currency for Zimbabwe.

The adoption of Zimbabwe bred varieties in other countries is a matter of national scientific pride and also earns foreign currency for Zimbabwe.

Fig 1.10: *Root-knot nematode trial in Perugia Italy. RK70 shortened for the locally bred variety K RK70*

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 parentals (JB5 and BW9) and hybrids [Burley (B RK6 and BRK7), short season flue-cured varieties (T78, T79, T80, T81) and cigar wrappers (five varieties)] in the 2024 and 2024 seasons respectively. Fig 1.11 summarizes the variety development and release roadmap for the coming seasons.

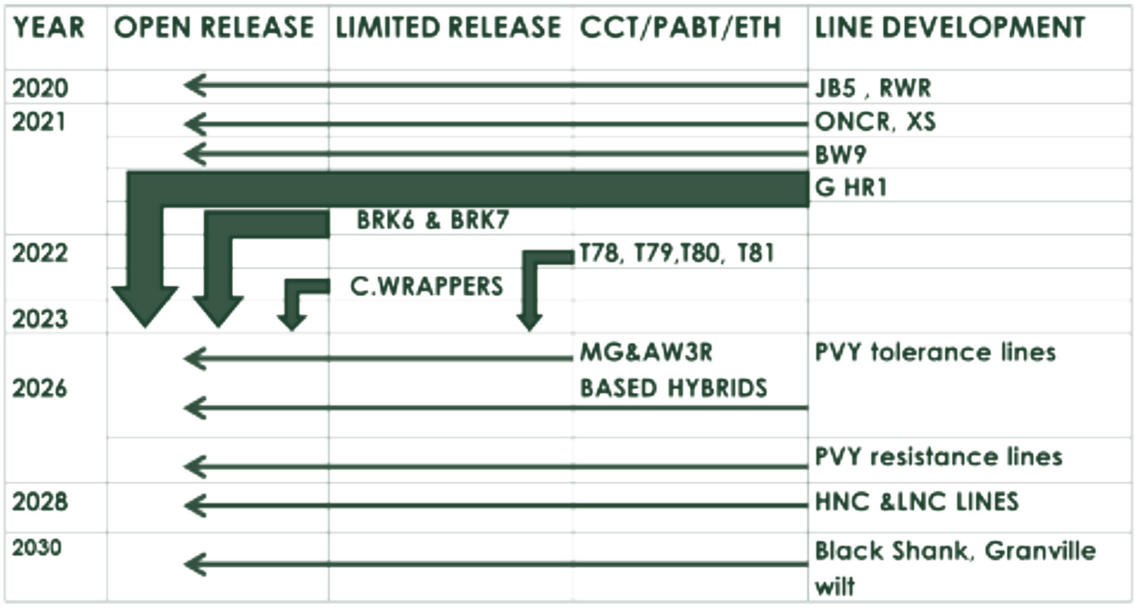


Fig 1.11: *Tobacco Research Board variety release roadmap.*

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

ALTERNATIVES TO TOBACCO AND ALTERNATIVE USES OF TOBACCO

Industrial hemp (Cannabis sativa L.) trials

The work on the agronomic evaluation of exotic industrial hemp varieties under Zimbabwean conditions continued with new sites established in Masvingo, and Banket stations (Fig 1.12). The new sites widen nationwide multilocation testing in order to provide more robust results. The varieties under trial include Italian varieties Zenit, Seculleni, Jubilleu and Elleta Campana and an American variety Isaiah-1. This is the second season of evaluation for these exotic hemp varieties, which provides the institution with reliable information to help guide farmers varietal selection and cultivation of hemp in Zimbabwe.

Even with research on the evaluation of exotic industrial hemp varieties is I ongoing, the Division is aware of the challenges with importing seed and the issues with photoperiod sensitivity and cannabinoid fluctuations. Therefore, to generate industrial hemp and medical cannabis varieties suited for Zimbabwe's agroecological conditions, the Division began a compliant breeding and agronomic program (making using local genetics and indigenous knowledge systems), aimed at developing adapted varieties. These new local varieties will not only be non-photoperiod sensitive (auto flower) but will be tetrahydrocannabinol (THC) compliant.

Fig 1.12: *Tobacco Research Board (TRB) agronomic evaluations of exotic industrial hemp varieties in Harare, Banket and Masvingo.*

Industrial hemp research-scale decorticator

To enable the Industrial hemp research to expand into the value chain aspects, a hemp decorticator was acquired in the period under review (Fig 1.13).

The machine is used to remove the tough woody interior known as the hurd, from the fibrous exterior of the stalk known as the bast and will enable the division to do an in-depth focused breeding on the characteristics of bast fibre and hurd. Additionally, the equipment is portable, which is crucial for increasing awareness and advancing extension work across Zimbabwe. In the near future, samples will be prepared and showcased to help start conversations with stakeholders about potential value addition projects. Investment in competitive and high-level research and development is critical for developing elite industrial hemp and cannabis genetics. More equipment is still required and efforts are in place to continue capitalizing the laboratories.

Fig 1.13 (a): *Small-scale industrial hemp decorticator (b)Industrial hemp that has been decorticated and separated into shorter hurd and longer bast fibers, respectively.*

Germplasm Collection

A research strategy to collect and utilize the widely adapted and available indigenous cannabis germplasm has progressed slowly due to no clear channel on who grants authority to allow for collections. Some accessions were received from the Ministry of Agriculture, Department of Research Specialist Services (DR&SS) while some were accessed from well-wishers who are in support of the research. Additionally, the division's efforts to find local accessions (specifically, seed adapted and derived from Zimbabwe) have been greatly aided by the Office of the President and Cabinet (OPC). For instance, the Binga seed (Fig 1.14), and other seed-lots were recently morphologically described using the recently published USDA Hemp Descriptor and Phenotyping Handbook, at Kutsaga in order to better comprehend the accessions for impending deliberate crossing for a range of breeding programs/initiatives.

The division is now working on acquiring a climate-controlled greenhouse in order to expedite breeding research operations.

Alternative uses of Tobacco

Informed by the WHO FCTC instituting a smoking ban and instructed by the Tobacco Value Chain and Transformation plan, the Division which is spearheading the search and research work on alternate uses of the tobacco crop. TRB has researched the quality and quantity of tobacco seed oil content, soluble protein content, and the use of tobacco stalks in the production of briquettes. For example, preliminary findings from an experiment exploring the viability of producing tobacco for oil extraction showed that Zimbabwe can generate 150 metric tonnes of tobacco seed, from which 52 000 metric tonnes of edible oil may be produced. More of these projects will constitute a greater percentage of volume of work in the Division.

Engagements with stakeholders and memorandums of agreement

The Plant Breeding Division continued to support and provide stakeholders with pertinent information on hemp and cannabis research and production. The division hosted a number of stakeholders (Fig1.15), international visitors (Fig 1.16), government representatives, academic staff (Fig 1.17), farmers, and students throughout the reporting period who were all interested in the new and developing industrial hemp business. Additionally, the division leveraged external and internal ties, which culminated in the drafting of multiple memorandums of understanding with regional Universities and organizations interested in collaboration in variety research, carbon credits, equipment, chemotype (cannabinoid) analysis and product development.

STAFF ISSUES

Dr. Frank Magama, previously HOD of the Plant Breeding Division, was appointed substantive CEO of the Tobacco Research Board on 26 September 2022. Mr. Francis Mukoyi was appointed Acting HOD of the Plant Breeding Division on the 1st of December 2022.

Fig 1:15: *Kutsaga industrial hemp experiments visited by stakeholders on the 25th of January 2023. From left to right: Mr. Ralph Ruzane (TRB), Mr. Rob Holmes (Executive officer of Tobacco Leaf Exporters of Zimbabwe - TLEZ), Mr. Moses Chiswa (Sustainability officer of TLEZ), Dr. Susan Dimbi (TRB) and Dr. Kumbirai Mateva (TRB).*

Fig 1.16: *Industrial hemp experiments visited by the Blue Earth team on the 30th of January 2023. From the left to right: Dr Kumbirai Mateva (TRB), Mr Byron Dick and Mr Jurie Geldenhuys.*

TOBACCO RESEARCH BOARD
KUTSAGA

02 Plant Health Services

Our mission is to provide timely, cost-effective, environmentally benign and sustainable integrated plant protection solutions.

DIVISIONAL RESEARCH THRUST

The Plant Health Services Division is guided by the Board's revised mandate which is premised on Vision 2030 and the Agriculture and Food Systems Transformation Strategy. In line with this, the Division has the following research thrusts at the core of its activities;

i. Screening and availing to growers environmentally friendly crop protection agents under the Pesticide Approval Scheme Service (PASS)
ii. 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.
iii. Prospecting for native biocontrol agents to manage abiotic (drought) and biotic (pests and diseases) factors hindering tobacco production
iv. Research on cost effective and sustainable integrated pest and disease management systems on tobacco and alternative crops.
v. 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).
vi. Engage in income generating activities to generate funds to support research (Plant Clinic, Kutsaga Gnatbuster® and Kutsaga Trichoderma® production)
vii. Afforestation and Agroforestry initiatives

In the period under review a total of 38 research trials were conducted in the Division (13 in Nematology, 16 in Pathology and nine in Entomology). The main objective of the research programme was to enable Good Agricultural Practices (GAP) through the use of research-based practises in the management of pests and diseases on tobacco by growers. This is in support of the Tobacco Value Chain Transformation Plan`s strategic intervention on sustainable intensification of tobacco productivity and production.

PESTICIDE APPROVAL SCHEME SERVICE (PASS)

The management of pests and diseases in the tobacco production cycle has historically relied on the use of 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 218 crop protections agents were evaluated in contract research trials for effectiveness in the control of pathogens, insect pests and root-knot nematodes. In the Pathology Skills Group, 124 crop protection agents comprising of viricides, bactericides, fungicides were evaluated and of these 12 were recommended for registration, while five were carried forward for testing in the 2nd season, 104 are in their 3rd season of evaluation and three discontinued due to non-performance.

Fig 2.1: *Seedbed and field trials at Kutsaga station*

The Entomology Skills Group evaluated 64 insecticides for their efficacy in the control of insect pests that included aphids, budworms, cutworms, leaf-miner, white-flies, white grubs and wireworms. Twenty-two products were recommended for registration, while 43 were carried forward for testing in the 2nd or 3rd season of evaluation and three were discontinued due to non-performance.

In the Nematology Skills group, 26 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 seven products were deemed ineffective. Two additional nematicides namely cyclobutrifluram (Tymirium) and chitosan were added to the list of nematicides recommended by the TRB, giving growers a wider choice of products to use. Fig 2.2 below shows the performance of cyclobutrifluram at 10 weeks in a tomato bioassay.

MONITORING AND DETECTION OF EMERGING OR RE-EMERGING PESTS AND DISEASES

Angular leaf spot

Angular leaf spot (ALS) (Fig 2.3) 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. Cool wet weather favours the spread of the disease. The 2022 season was characterized by continuous wet weather which exacerbated the incidence and severity of ALS in the different tobacco growing regions especially in the Eastern parts of the country Marondera, Macheke, Headlands, Rusape and Odzi to mention just a few.

Fig 2.3: *Field crops showing some of the leaf diseases brought into the plant clinic for diagnosis*

Fig. 2.2: *Mean gall ratings of tomato plants assayed with soils from test nematicide-treated plots*

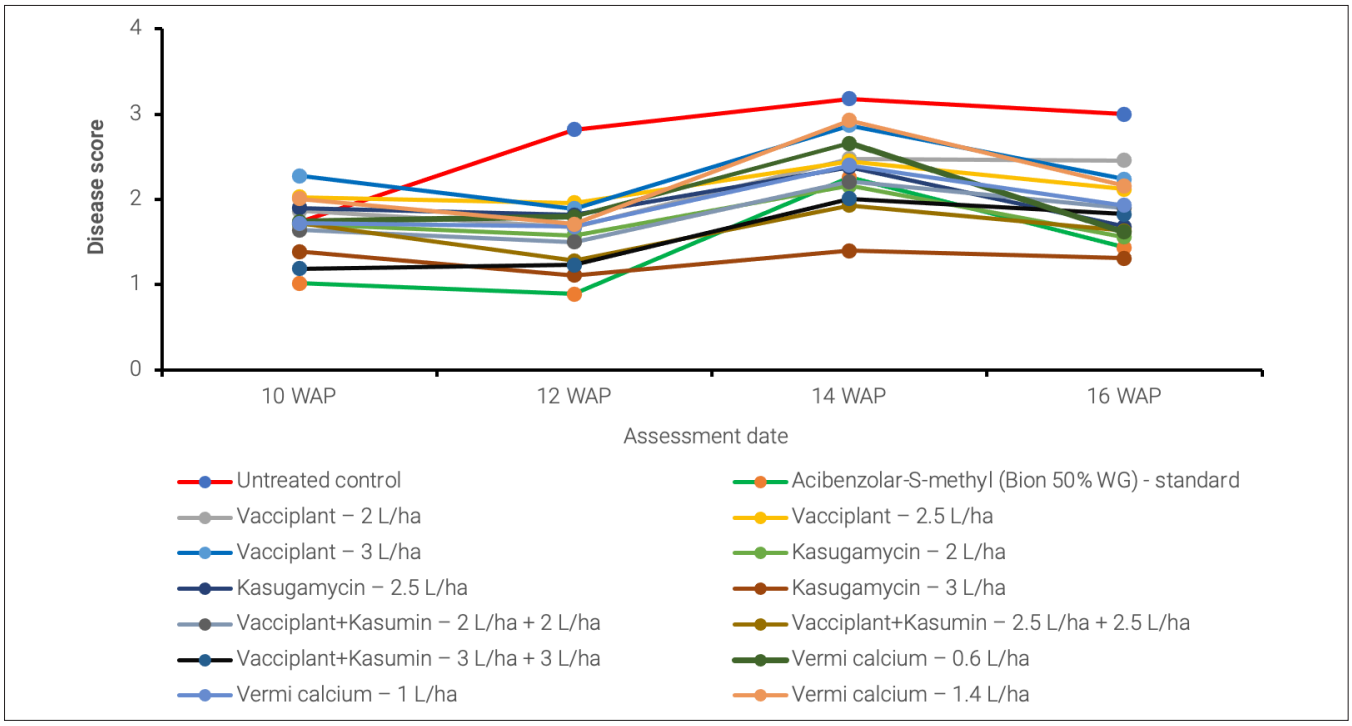


Fig 2.3: *Disease severity in from bactericide treated plots.*

For the management of this disease, field trials have been carried out in Marondera, Macheke, Headlands and Darwendale to evaluate bactericides for the management of ALS. Results from these trials have shown that products such as kasugamycin, vacciplant, kasugamycin+vacciplant and Rheum officinales+azoxystrobin are effective and these are now registered for use on tobacco in the field (Fig 2.4). Acibenzolar-S-methyl (Bion) also remains very effective especially when used for preventive control of the pathogen.

Fusarium

Fusarium wilt disease, caused by the soil-borne fungus Fusarium spp., is economically important and affects a wide range of solanaceous crops namely potatoes, tomatoes and peppers. Based on the Kutsaga Plant Clinic statistics Fusarium wilt disease have been on the increase in 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 tobacco, potato and tomato crops with symptoms of Fusarium wilt disease and then characterized using molecular methods based on targeted sequencing of the ITS 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 result from this study showed that Fusarium pseudoanthophilum was the most dominant species, followed by Fusarium fujikuroi and Fusarium chlamydosporum (see Table 2.1 and Fig 2.5). To the best of our knowledge, this is the first reporting of F. fujikuroi in Zimbabwe.

Table 2.1: *BLAST results for Fusarium isolates*

Sample ID	Grade	Name	Description
FOX001	99.10%	NRL_163682	Fusarium pseudo-anthophilum CBS 414.97
FOX002	99.00%	NRL_163682	Fusarium pseudo-anthophilum CBS 414.97
FOX003	99.70%	NRL_111889	Fusarium fujikuroi CBS 221.76
FOX004	98.70%	NRL_163682	Fusarium pseudo-anthophilum CBS 414.97
FOX005	99.60%	NRL_111889	Fusarium fujikuroi CBS 221.76
FOX007	99.00%	NRL_163682	Fusarium pseudo-anthophilum CBS 414.97
F0X008	99.00%	NRL_163682	Fusarium pseudo-anthophilum CBS 414.97
FOX009	97.10%	NRL_172283	Fusarium chlam-ydosporum var. chlamydosporum CBS 145.25
FOX010	98.70%	NRL_163682	Fusarium pseudo-anthophilum CBS 414.97
FOX012	96.90%	NRL_172283	Fusarium chlam-ydosporum var. chlamydosporum CBS 145.25

Another interesting finding from the BLAST results, showed that the corresponding Fusarium pseudoanthophilum sequence in NCBI was sourced from Zimbabwe, confirming that this strain has been reported previously in Zimbabwe.

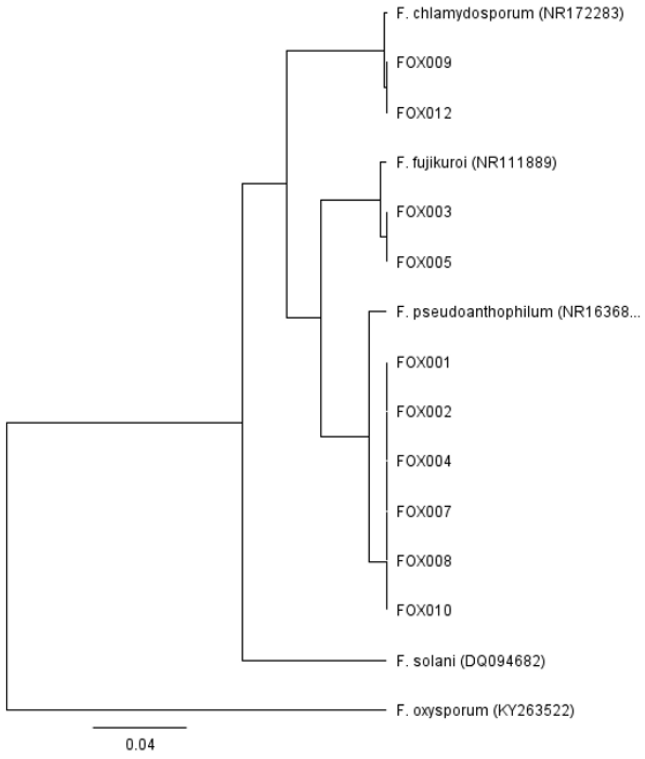


Fig 2.5: *Phylogenetic tree of Fusarium isolates*

APHIDS MONITORING AND PVY TRANSMISSION

The surveillance of aphid populations is a key component of virus management in tobacco as aphids serve as vectors. PVY outbreaks have previously been related to high aphid populations. Routine monitoring of winged tobacco aphids at Kutsaga through yellow water pan traps was conducted. 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 2.6a). This period is associated with most crop establishments which support population build-up of aphids. However, contrary to this known trend, the last season (2021-22) was characterized by an early onset of aphid peaks in September, which was unexpected and alarming. The Tobacco Research Board subsequently issued alerts to the industry on this abnormality. Recommendations on scouting, monitoring and management measures to suppress aphid population build-up were given to the industry. The industry acknowledged the Board's measures and this yielded positive results as noted by the significant aphid decline in November (Fig 2.6b). Climate change, coupled with lack of compliance to tobacco legislated dates is projected to drive aphid populations on an upward trend. This will potentially increase the risk of aphid transmitted viruses in the upcoming 2022-3 tobacco season. The Board regularly alerts and advises on the best aphid management practices.

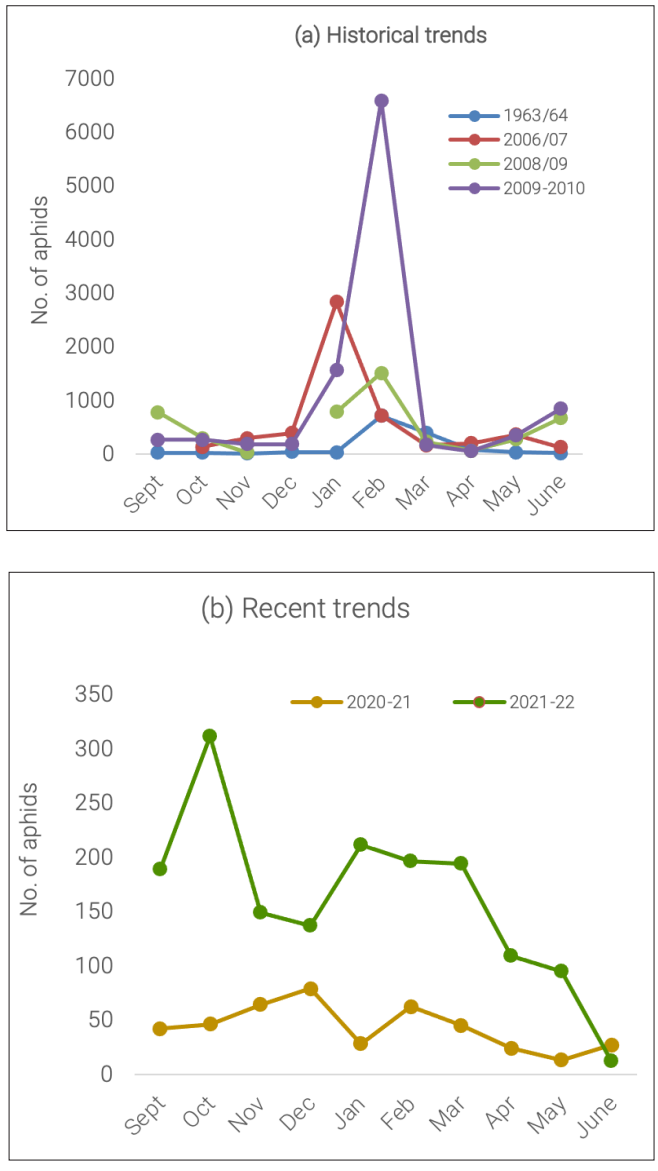


Fig 2.6: (a) *Historical and* **(b):** *recent aphid catches in yellow water pan traps*

In the past, seasonal winged aphid population trends have been used to predict the incidence and intensity of aphid transmitted virus outbreaks. In order for statistical inferences to be drawn from the data, an aphid prediction model was developed in the time under review using statistical modelling methods. Historical data on aphid flight catches together with climate variables were compiled. Together these data were combined in a mission to develop a statistical PVY prediction model, in line with efforts to incorporate Big Data analytics in pest monitoring. Components considered were Aphid counts, temperature, wind speed, wind direction, rainfall and sunshine. The modelling was done using a method called Vector Auto Regression (VAR) Modelling through a Time Series Forecasting. The results of the project were an output of a prediction equation which is based on Aphid Catches & Maximum Temperature and the equation used is:

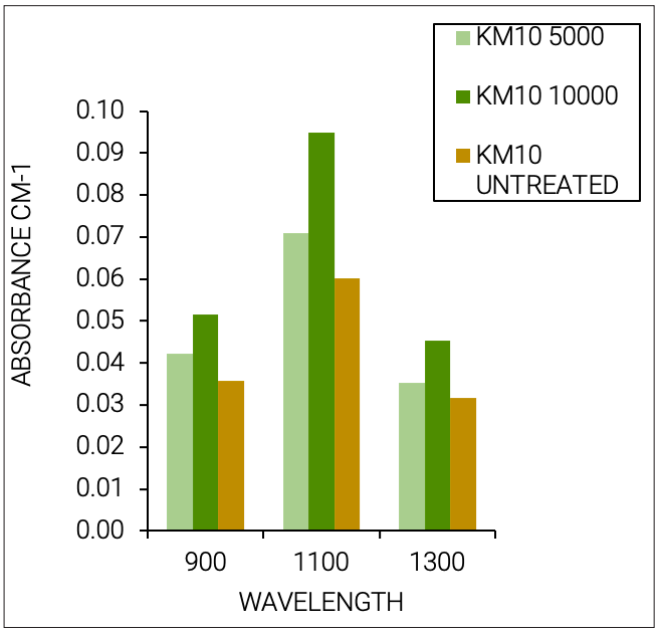
$$\textbf{Aphid Count} = 31.48 - 1.20\text{Temp\_Max}_{t-1} + 0.45\text{Aphid Count}_{t-1} + 1.56\text{Temp\_Max}_{t-2} + 0.26\text{Aphid Count}_{t-2} - 1.22\text{Temp\_Max}_{t-3} - 0.17\text{Aphid Count}_{t-3}$$

The model is, however, still in the testing stages. Continuous data input and testing is expected to refine the model's accuracy over time.

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 the crops using an FTIR-ATR Spectrophotometer in the ACS Division for eight weeks per experimental run. Preliminary results of the first 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. 2.7).



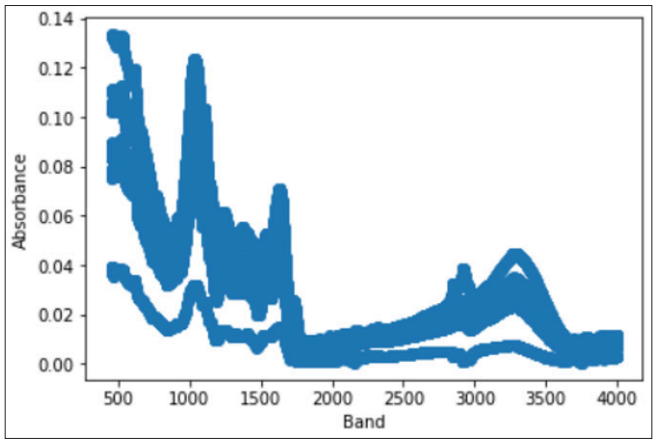


Fig 2.7: *Fourier Transform Infrared (FTIR) data of leaves at 1 week after inoculation*

Visible differences were only picked at 4 weeks after inoculation between the resistant K RK75 plants from infested plots and those from non-infested plots. The highest RKN galling was noted in K M10 pots inoculated with the 10,000 RKNs at 4 weeks after inoculation (Fig 2.8).

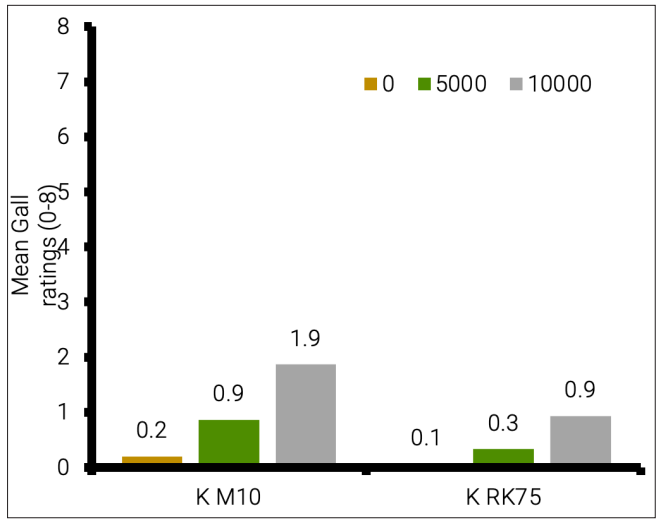


Fig 2.8: *Mean nematode galling in tobacco plants noted 4 weeks after inoculation.*

BIO-PROSPECTING BIO-CONTROL AGENTS FOR THE CONTROL OF FUSARIUM AND ROOT-KNOT NEMATODE DISEASE COMPLEX ON POTATO

As part of its expanded mandate the TRB evaluates alternatives to tobacco which include hemp, chia and potatoes. Potatoes, however, are susceptible to diseases that affect solanaceous crops. Some fungal and bacterial species have shown great potential as biocontrol agents against some soil borne pathogens. Native isolates of Trichoderma spp. can be used as bio-control agents against Fusarium and Root-Knot Nematode disease complex on potatoes. Bioprospecting for fungi was carried out and a trial which evaluated the efficacy of Trichoderma isolates against Fusarium wilt was carried out in the greenhouse.

The results (Fig 2.9 & Fig 2.10) showed that Trichoderma T28 and Trichoderma Dam3 were comparable to Trichoderma T77 at treating Fusarium and suppressing root-knot galling. These isolates have shown great potential and further studies are to be done on them as they can bring value-addition to Kutsaga products like Gromix®, potato tubers, tobacco seed and seedlings, and horticultural seedlings.

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.

Evaluation of Trichoderma-treated crops in short tobacco rotations

Rotation crops notably sunnhemp and G HR1 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.

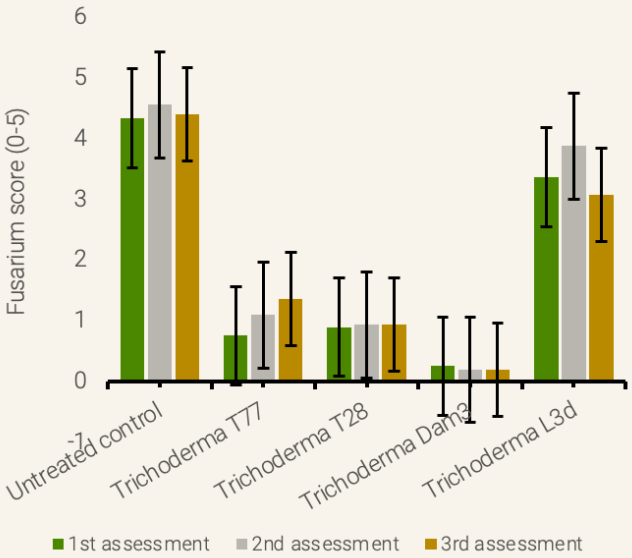


Fig 2.9: *Fusarium wilt scoring*

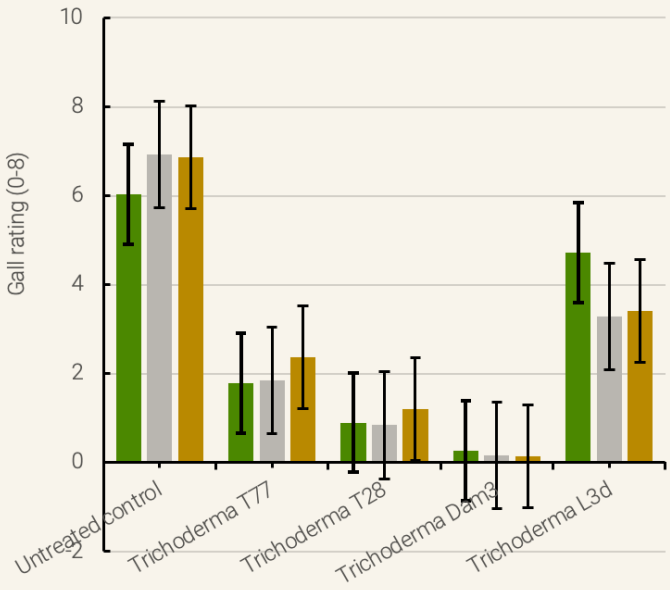


Fig 2.10: *Root-knot nematode galling*

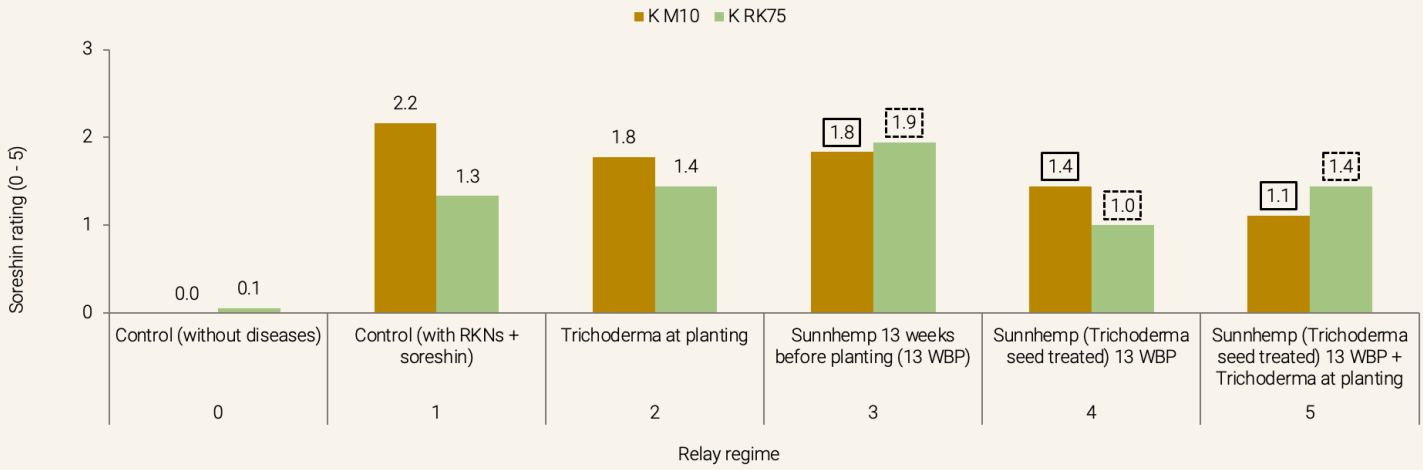


Fig 2.11: *Soreshin assessments of tobacco relayed with sunnhemp*

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 had markedly lower disease than those from disease control plots with merit noted when T77 was applied at transplanting. 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 BCA like T77 as the carryover of soilborne pathogens is promulgated.

Results in the first two seasons of this trial, which evaluated sunnhemp seed-treated with T77 as a relay crop indicated that seed treatment coupled with the application of Trichoderma harzianum at planting significantly reduced RKN infestations and galling in plots planted with highly susceptible K M10 (Fig 2.12). 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.

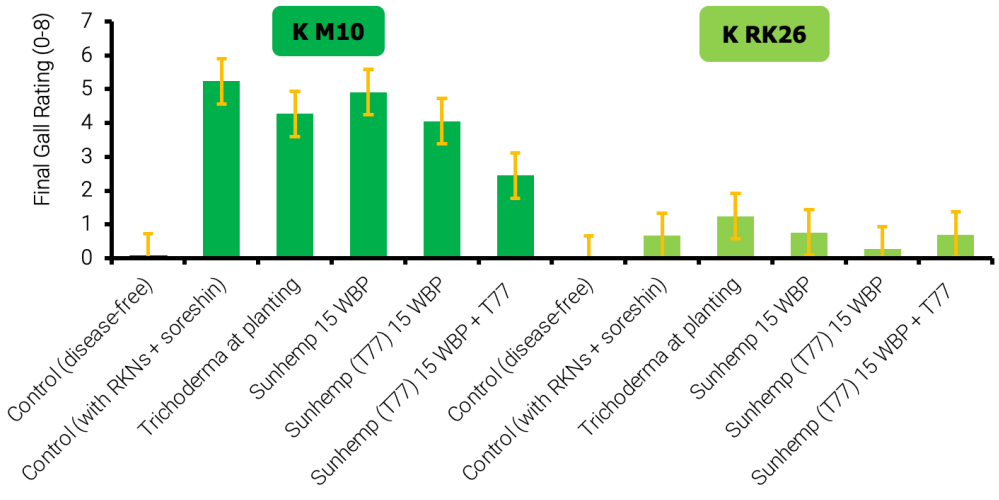


Fig 2.12: *Final Root knot nematode galling*

Agroforestry

Agroforestry is an economically and ecologically sound practice that incorporates cultivation, conservation and tree planting alongside crops or livestock farming. The intentional combination of agriculture with forestry increases biodiversity and reduces erosion. It can also significantly add to the Board's revenue base. In the recent past tree crops such as macadamia and avocadoes have become strategic export crops. The Board can reserve dedicated plots for the commercial cultivation of these crops.

A total of 17,224 trees were successfully planted at Kutsaga Station under the Afforestation Project on the tree planting day held on Friday 16 December 2022. The trees planted include Eucalyptus grandis (11,000), E. camaldulensis (6,000), Avocado (200) and Orange (24) trees.

AFFORESTATION AND AGROFORESTRY

Afforestation

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. There has been a significant increase in tobacco farmers in recent years, the majority of which depend on wood for curing tobacco. This has resulted in increased demand for timber resulting in rapid degradation of Zimbabwean indigenous forests to meet householders' needs and provide curing fuel. There has been a lot of studies on Eucalyptus species as an alternative curing fuel. However, eucalypts are generally regarded as undesirable in smallholder farming communities due to the leaf phenology which in unattractive for cohabitation with other annual crops. There is, therefore, urgent need to identify additional tree species with limited competitive effects on crops.

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 204 samples were received in the Kutsaga Pathology Plant Clinic from Jan to December 2022. Tobacco samples constituted 32.4% (66) and non-tobacco samples 67.6% (138). Tomatoes and potatoes made up the majority of the non-tobacco samples as in the past seasons. The major plant health challenges on tobacco in the season were the leaf diseases that included angular leaf spot, Alternaria and Frogeye and phytotoxicity arising from improper application of agrochemicals. The season was generally wet and hence the severity of the bacterial and fungal diseases. Potato Virus Y (PVY) was lower as compared to the previous seasons and this can be attributed to preventive measures that growers were advised to put in place such as the use of planting hole aphicides.

An unprecedented 944 samples were received and processed in the Nematology Plant Clinic in the period January to December. Tobacco samples constituted 69.5% (656 samples) and non-tobacco samples 30.5% (288). 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. This can be attributed to the revival of the horticultural industry in the country through projects such as the Presidential Rural Horticultural Programme and the adoption of alternative crops to tobacco by most growers.

COMMERCIAL PROJECTS

Trichoderma production

Trichoderma harzianum is a biological control agent that is effective for the management of Rhizoctonia diseases on tobacco and other crops. This product was isolated and developed by the Tobacco Research Board (TRB) in early 1980s. This product was patented by the TRB. Agricura and the TRB partnered in a project were TRB would supply the Trichoderma harzianum isolate and Agricura would produce the product commercially. Trichoderma harzianum was commercially produced for use on tobacco and other crops by Agricura in the late 1980s. More than 96 tonnes of the product was produced and sold in the early 1990s and the production of Trichoderma grew. However, in 2004, commercial production seized due to economic challenges. This was devastating to the growers who had grown accustomed to using this product. To enable the growers to once again access this product, the TRB embarked on a programme to produce this bio-control agent in-house in the Plant Pathology Skills Group. In the period under review, the Skills Group produced 436.78 kg of the product which is 87.36% of the target of 500 kg for the year. Already the institution has plans to upscale production through upgrading of the production infrastructure. This project has a dual purpose of ensuring that growers use greener crop agents enabling tobacco production to be sustainable while at the same time adding to the array of commercial projects that enable the TRB to generate the much-needed resources that support research work.

Development of new bio-formulations for Kutsaga Trichoderma 77

One of the main factors that have the potential to affect economic feasibility of a biopesticide product is formulation technology. Many biopesticides are based on living organisms. The viability of these organisms will have to be maintained at acceptable levels during the formulation process and storage. Appropriate formulation can increase product stability and viability that can reduce inconsistency of the product in the field. Technical and chemical compatibility and application method are prerequisite for the success of a new biopesticide product in the agricultural industry. Good formulation can be reflected by the long product storability. Several commonly used biopesticide formulations include granules, pellets, dry powder, and wet powder. Granules can protect the active agent from desiccation and also provide basic food for the agent. Powder is easy to apply by suspending it in water and also can cover a wide area of application. Powder formulation is also suitable for seed treatment. Currently, the Kutsaga T77 formulation is a dry powder. Work was carried out to develop an innovative approach to improve the shelf-life, field-persistence, efficacy and cost-effectiveness of Kutsaga biopesticides.

Three inert materials (Starch, CF-11 Cellulose and Sand) were used to make T77 formulations at three different ratios 1:1, 2:1, and 3:1. These formulations were stored and CFUs calculated after every week in storage for 13 weeks. As expected, CFU counts for all formulations reduced over time. However, of interest was how the CFUs of raw T77 compared to any of the mixtures, was comparable over time. The current results show that we can safely bulk our T77 with inert materials without risk of losing CFU viability.

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 and farm visits were done and approximately over 900 farmers and extension officers were trained.

Staff from the Division also trained seed potato graders to identify pests and diseases during seed potato re-grading. The potato tuber moth (PTM) was the most prevalent pest at the Kutsaga grading sheds. The training highlighted the PTM life cycle and stages in development as well preventative and treatment methods that are effective for PTM control. The consequential damage caused by soft and dry with relations to PTM damage were also discussed with regards to disease assessment, and treatment recommendations.

Staff issues

1. Mr T. Sagonda a Plant Pathologist resigned from the institution.
2. Dr. C. Karavina joined the Division.
3. The Division mentored seven students on attachment from Bindura University of Science Education, Chinhoyi University of Technology and the University of Zimbabwe, who all completed projects on various aspects of the division's programme.

TOBACCO RESEARCH BOARD
KUTSAGA

03 Crop Production & Molecular Technologies Division

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 characterization services for pests, disease and plant genotypes. In addition, the Division offers commercial micropropagation, horticulture seedling production and lime and fertilizer recommendations to stakeholders in the agriculture and horticulture sectors.

CROP PRODUCTION

Contract Research/ Pesticide Approval Scheme Service

The Pesticide Approval Scheme Service (PASS), is a grower advisory and pesticide registration system which offers assurance that all agrochemicals recommended for use on tobacco have been tested and approved to be safe for use on tobacco. In the period under review, 16 Agrochemicals from new sources were evaluated and of these, 14 were recommended for use whilst 2 test products are to be evaluated for the second and third season. Additionally, 15 bio-stimulants, o growth enhancers, soil conditioners and organic foliar fertilizers were tested in the field for their suitability for use on tobacco. The availing of organic based products enhances sustainability in tobacco production and the Division will continue to scan for and evaluate more products in this category.

This continual search for and evaluation of crop protection agents from a variety of sources gives the Zimbabwean tobacco grower a wide variety of products to choose from for use in tobacco production.

Fundamental and Applied Research – The Research Thrust

A total of 28 fundamental and applied research trials were established in the Crop Production Section in the period under review. These comprised ten (12) trials in Agronomy, twelve (12) in Soil Chemistry and seven (4) in the Physiology Skills group.

The Soil Chemistry and Physiology research was testing and availing to tobacco growers sustainable and effective sources of phosphorous and sulphur for plant establishment and growth. Emphasis has been on the use of polyphosphates and polysulphates (as sources of phosphorous and sulphur respectively). The research was also focused on optimisation of the tobacco seed production fertiliser regime to enable the production of high yields of quality tobacco seed. Additionally, as a strategy for addressing soil degradation challenges that growers face due to monoculture, emphasis was on the evaluation and availing of plant growth promoting hormones, bio-fertilisers and alternative short-rotation crops for use in the tobacco production cycle.

Agronomy research focused on seed and seedling enhancement, with the objective of enabling growers to start off with quality seed/seedlings in their tobacco production endeavours. Trials were also conducted on best weed management practices, effective sucker control and soil-less seedling growth medium enhancement. In addition, quality tests to enable the continuous production of a quality Kutsaga Gromix product were carried out

2022 Key Outputs: Research

Three research themes were addressed:

- Weeds & Sucker management
- Soil fertility & stability studies
- Crop Nutrition research

Weed and Suckercide Research

Pre- And -Post Emergence Herbicide Research

Weeds pose a threat to the tobacco crop as they compete for nutrients, water, solar energy and space; thereby reducing crop yield. Due to the presence of survival properties which include vegetative reproductive structures, dense root system and seed dormancy, weeds have the ability to outgrow the main crop and are difficult to control. Research was conducted to evaluate the efficacy of two post-emergent herbicide formulations and nine pre-emergence herbicides (2 new active ingredients and 7 old molecules from new sources) for weed control in tobacco production. Metrobromuron was one of the new pre-emergent herbicides evaluated for broadleaved weeds control and was applied at 1.7- 4.6 litres per hectare solely and in combination with S-Metolachlor, 3 days before or after transplanting. Preliminary results indicated that the highest rate of Metrobromuron at 4.6l/ha combined with S-Metolachlor (Fig 3.1) controlled both grass and broadleaved weeds effectively for 6 weeks compared to sole Metrobromuron applications (Fig 3.2), as observed in the first season of testing. However, it was observed that the plots treated with Metrobromuron had stunted growth as compared to the standards. Soil samples were collected in all the plots where Metrobromuron was applied and submitted to the Analytical Chemistry Services laboratory for herbicide residue analysis. This pre-emergent herbicide will be tested for the 3rd and final season, and there may be a need to review rates used in order to manage the stunting effects.

Fig 3.1: *Metrobromuron at 4.6l/ha + S-Metolachlor applied after transplanting, at 21 days.*

Fig 3.2: *Metrobromuron applied at 2L/ha before transplanting, at 21 days.*

Growth Regulators Research

FOCUS	CONTEXT	PROGRESS 2022	WAY FORWARD 2023
Investigate potential bio-suckercide and new suckercide formulations for effective sucker control in tobacco production.	Axillary shoots, can reduce tobacco yields and quality, therefore timeous and effective chemical control measures should be adopted. However, the detrimental and residual effects of suckercides, has led to the withdrawal of some effective suckercides. Understanding these effects has led to the research of new suckercide for use in tobacco, which are effective and environmentally sustainable.	A total of 9 suckercides were evaluated: • Three contact suckercides; one of these a biological suckercide (pelargonic acid) • Three Systemic suckercides • Both contact and systemic suckercides at different concentrations Suckercides with both contact and systemic, are effective and cost effective compared to stand alone chemicals. This assists to reduce grower's production costs. The biological suckercide has been evaluated for 4 seasons and results showed that sole applications have high phytotoxicity effects (Fig 4), the same results were observed in the previous season.	Studies highlight the need for continued search of biological suckercides both contact and systemic, as this is a sustainable solution to sucker management which is safe to both humans and the environment.

Soil Fertility and Stability Research

Soil fertility and soil quality management remains a major agricultural production problem which has been caused by continuous monocropping and the excessive use of fertilizers and agrochemicals. Therefore, soil health has been deteriorating over the past few decades leading to a quest for sustainable production practices with greater resource use efficiency. Against this background research on biological fertilisers, soils conditioners, growth enhancers and cropping systems was done during the period under review.

Demonstration trial for biofertilizers: Enhancing sustainability in tobacco production

Sustainable agriculture on a limited space of land is a huge problem for most tobacco growers in Zimbabwe. The pressure on land resources continuously depletes soil productivity leading to over use of synthetic fertilisers to compensate for the loss in soil quality. This practise is not sustainable and poses an environmental risk as tobacco is grown on sandy to sandy loam soils that are prone to leaching, leading to the contamination of water bodies. In addition, the over use of synthetic fertiliser compromises soil biodiversity thus impeding the sustainable function soil ecosystems. Previous research focused on alternative ways of improving soil productivity through the use of various soil amendments and biofertilisers under reduced chemical fertilisation. Whilst most of the evaluated products failed, a few showed great potential for use on tobacco and these were showcased in this demonstration trial. These products include K-humate, Supergrow, QCM360, CalSap, Fresh P and Orgfert. The purpose of the trial was to disseminate research results to growers in a palatable manner and encourage uptake of sustainable methods of tobacco production.

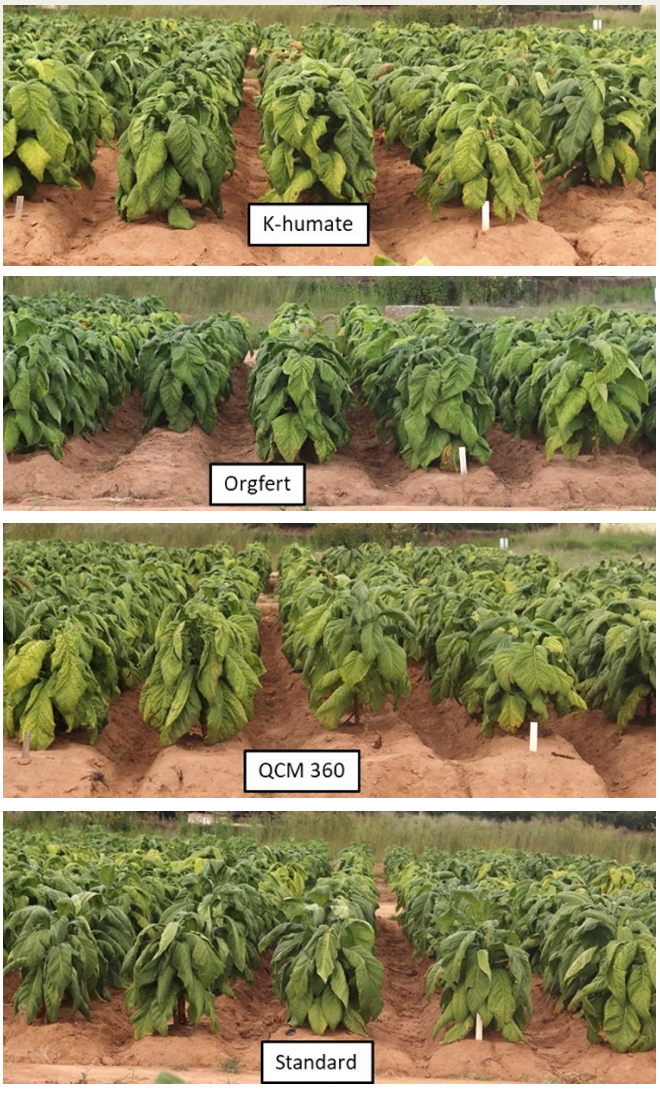


Fig 3.3: *Comparison of the standard fertiliser treatment to soil amendments K-humate, Orgfert and QCM360*

Evaluation of CalSulph on growth, yield and quality of tobacco

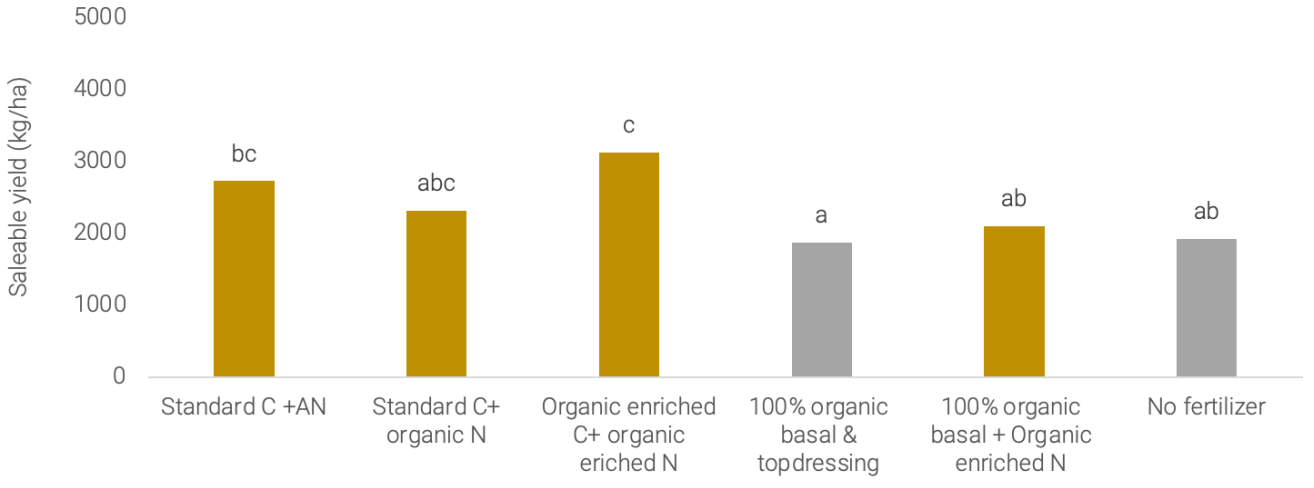
Gypsum, also known as Calcium sulfate (CaSO4.2H2O), is one of the earliest forms of fertilisers used in agriculture and has been applied to agricultural soils for more than 250 years. It is usually recommended where soil physical properties such as soil structure are limiting crop growth and also when Calcium and sulfur levels are insufficient for plant growth. This is because of its ability to correct soil physical and chemical properties to establish favorable plant growing environments. In this trial, the product CalSulph was evaluated for its chemical properties in supplying calcium and suphur to the plant. CalSulph is normal gypsum (23.29% calcium and 13.88% Sulphur) that has been ground down, to a very fine powder, with a mean particle size of 100 micron and subsequently granulated using an organic agent, a lignosulphinate, to form granules, allowing it to be spread easily, and be dust free. Three rates of CalSulph were evaluated i.e. 100, 50 and 20 kg/ha.

No Gypsum	305.50	879.75	1201.75	2387.00
F-probability	0.312	0.777	0.972	0.466
SED	41.6	221.8	218.5	233.0
LSD	90.6	483.3	476.0	507.6
CV %	23.0	36.9	25.5	14.2

Table 3.1: *Saleable Yield (kg/ha)*

Evaluation of organic enriched fertilisers on the growth, yield and quality of tobacco

Organic enriched fertilisers are fertilisers that contain both inorganic minerals and an organic component and largely have high carbon content which is largely responsible for soil texture improvement and hence water holding capacity. Furthermore, biofertilizer assist in reducing leaching losses and enhance synchrony of plant nutrient demand with supply. In this trial the effect of wholly Standard C + AN, Standard C + organic enriched N, Organic enriched C + Organic enriched N, 100% organic basal & top dressing ,100% Organic basal + Organic enriched N and no fertilizer application was tested on tobacco growth, yield and quality.



There were no significant differences in saleable yield (Table 3.1) and quality with the addition of CalSulph or the total exclusion of calcium sulphate (No gypsum treatment) from the fertiliser programme. Slight yield increases were however noted when 100 kg of CalSulph was applied. Therefore, it was concluded that addition of calcium sulphate as either gypsum or CalSulph did not result in improved yield and quality of the leaf in this season. These results are similar to the results obtained in the first season. Addition of calcium sulphate should be based on soil analysis and only applied in tobacco production when a deficiency of calcium or sulphur is noted. However, in this trial the CalSulph was applied as specified by the supplier, although soil calcium and sulphur levels were optimum for tobacco production.

Treatment	Reaping group			
	1	2	3	All Groups
Gypsum 100 kg/ha	231.75	703.75	1134.25	2069.75
CalSulph 100 kg/ha	275.25	930.25	1277.00	2482.50
CalSulph 50 kg/ha	223.00	786.67	1242.75	2252.42
CalSulph 20 kg/ha	244.75	953.50	1197.50	2395.75

Combining 100% or 40% organic enriched basal with organic enriched N produced saleable yields and leaf quality that was similar as shown by the saleable yields which were not significantly different. The results show that the yields were comparable to the standard fertilizer treatment. Combinations of organic enriched N with standard C, Organic Basal (100%) and Organic enriched C (40%) provide options suitable for tobacco production. In this trial the sole use of 100% organic enriched basal both as a basal and top dressing produced lower yield than the standard inorganic fertilizer treatment and therefore may not be suitable option however, the trial will be carried into next season in-order to validate trial results.

Sustainable tobacco production through the use of Biochar

Soil fertility and soil quality management remains a major agricultural production problem which has been caused by continuous monocropping and the excessive use of fertilizers and agrochemicals. Therefore, soil health has

been deteriorating over the past few decades leading to a quest for sustainable production practices with greater resource use efficiency. To date, biological fertilisers, soils conditioners, cropping systems have been evaluated so as to mitigate soil fertility effects. Against this background, research into Biochar, a charcoal produced via pyrolysis at a lower carbonization temperature under conditions of complete or partial anoxia, was initiated. Biochar can be used in a wide range of applications, including reducing greenhouse gas emissions, improving soil quality, and recycling waste, among others. Properties of biochar include large specific surface area, highly porous, ability to carry a large amount of negative charge and a high charge density, and can form an electromagnetic field. Addition of biochar increases soil active organic carbon, as well as increasing the abundance of soil microflora; these effects on the soil can help promote plant growth and development, leading to improved crop quality.

The following rates of Biochar 100%, 75% and 50% were evaluated in a randomized complete block design. Applications were done at planting and 3 weeks after planting, either as a sole application or in combination with standard fertiliser, where Biochar was added in the soil. The parameters measured included; full soil nutrient and microbial analysis, leaf geomean, stalk height measurements (at topping and biweekly thereafter), yield, grade index. The results showed that there were significant differences ($p<0.05$) in leaf geomean. 50% standard fertiliser + 50% biochar had leaf geomean comparable to the standard fertilizer (control) whilst 100% biochar recorded the least leaf geomean at all assessment dates (Fig.3.5).

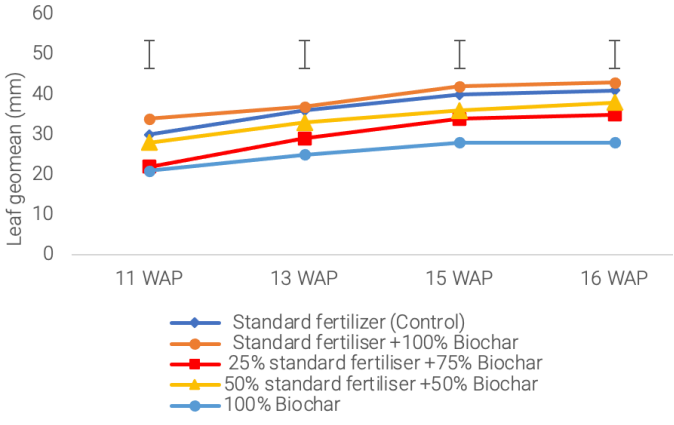
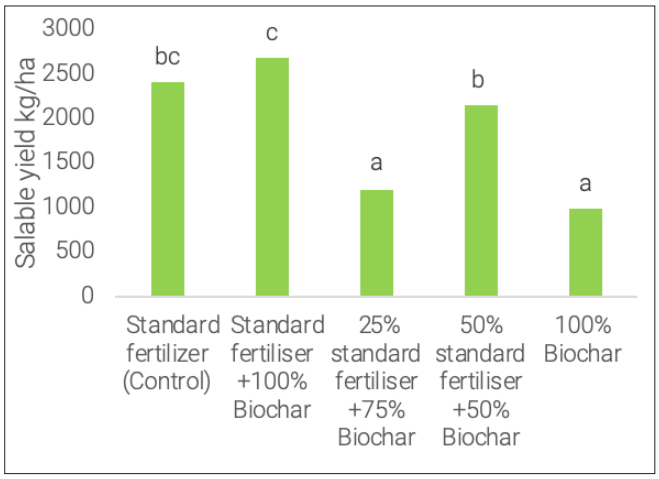


Fig 3.5: *Leaf geomean at 11, 13,15 and 16 weeks after planting (mm)*

Fig 3.6: *Experimental field crops with different fertilizer formulation*



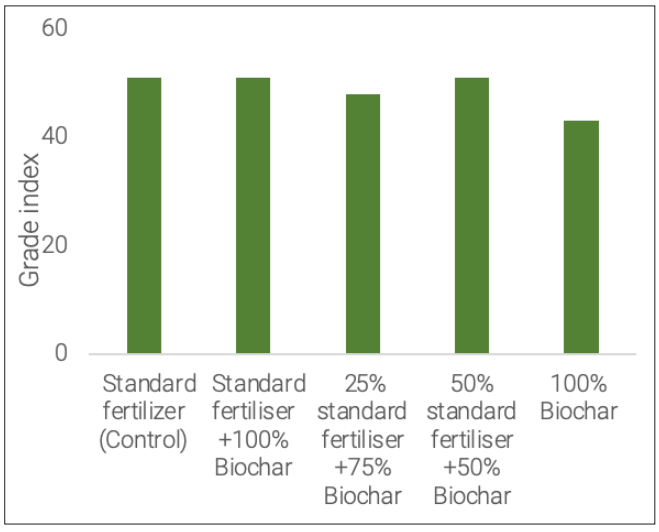


Fig 3.7: (a) *Saleable yield (kg/ha) and* **(b)** *Grade Index.*

The first season yield and grade index results indicate that Biochar has a vast potential to increase yield in tobacco production and additionally, the product can be used to reduce sole dependence of synthetic fertilizers as shown in the treatment with 50% standard fertilizer and 50% biochar (Fig 3.7). Considering that biochar can be made from tobacco stalks, this can therefore, reduce production costs and also assist growers with stalk destruction. Studies will continue into the second season to validate trial results as soil amendments build up over time.

CROP NUTRITION RESEARCH

Evaluation of plant growth promoting hormones

This trial was established to evaluate two plant growth promoting hormones i.e. auxin and cytokinin in tobacco production. Auxin and cytokinin are reported as crucial in controlling some developmental processes, such as the formation and maintenance of meristems. Meristems are responsible for establishing the whole plant body in particular shoot meristems give rise to the above-ground plant parts, whereas the root meristems produce the below-ground parts. The liquid seaweed concentrate, AfriKelp®, that was evaluated contains a ratio of high auxin and low cytokinin levels that stimulate the growth of crops. When auxin is applied exogenously to the plant leaves, it is transported down to the root tips and causes the roots to grow. In the root meristem, the plant produces cytokinins which are transported upwards and initiate corresponding shoot growth (Fig. 3.8).

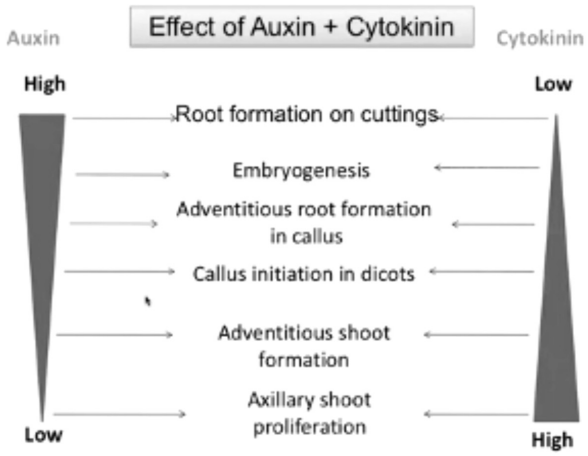


Fig 3.8: *The effect of different concentrations of auxin and cytokinin.*

The treatments established included addition of Afrikelp to either 100% or 80% standard fertiliser compared to treatments with no Afrikelp additions. Results of leaf expansion, saleable yield and quality were similar across all treatments, meaning addition of Afrikelp to the 100% standard fertiliser treatment had no addition al benefits. However, it was feasible to reduce chemical fertilization by 20% and supplement with Afrikelp resulting in similar yield and quality to the 100% chemical fertilization treatment.

Evaluation of POLY4 for rainfed tobacco production

During the year under review, we continued efforts to produce tobacco in a sustainable manner by evaluating POLY4 a multi-nutrient and low-chloride fertilizer suitable for organic farming. This fertiliser is derived from a naturally occurring mineral polyhalite, and thus negates the need for chemical processing. In this way, it has the lowest carbon footprint compared to other fertiliser products. In this first season trial, two POLY4 blends (6:28:18 and 10:24:16) were evaluated against the popular tobacco blends, High C (6:28:23) and High B (6:24:20). Planned observations include crop growth parameters such as plant vigour, stem height and diameter, number of leaves, leaf expansion and root biomass. The yield and quality of the cured leaf will also be measured. The performance of the POLY4 fertiliser blends should be comparable or better than the common tobacco blends and is as climate smart fertiliser alternative in tobacco production.

The effect of chloride fertilizer on TSNA and cured leaf quality

Tobacco-specific nitrosamines (TSNAs) comprise one of the most important groups of carcinogens in tobacco and tobacco products, particularly cigarettes and fermented dipping snuff. Recent studies in Kentucky have indicated that applications of the chloride form of potassium off

Fig 3.9: *Chloride evaluation trial at 6 weeks after planting*

season before establishing tobacco in the field reduces the amount of TSNA in the cured leaf compared to using potassium sulphate. In addition, fertilizer manufacturers are increasing the proportion of chloride compounds in fertilizer formulations to offset the increase in price of raw material. This has ramifications for the tobacco industry from two perspectives: fertilization with potassium chloride may be another tool towards the industry's goal of harm reduction, and it gives growers some latitude to reduce input costs. However, chloride above about one percent in cured tobacco leaf can cause poor cured leaf colour, impart an unpleasant flavour and aroma to smoke, reduce burn rate and cause cured leaf to hold more moisture, so a chloride fertilization strategy must be used with caution. The extent to which chloride will lower TSNA or affect quality across growing regions is not known. Therefore, this CORESTA collaborative trial was established to determine the effect of potassium chloride on TSNA and cured leaf quality in burley production (Fig 3.9). Planned observations in the first quarter of 2023 are TSNA, alkaloids, moisture content, chlorine, leaf yield and quality of the cured leaf.

HORTICULTURAL SEEDLING PRODUCTION

As it's contribution to government's Horticulture Recovery and Growth Plan which is aimed at reinforcing inclusive, sustainable and transformative rural horticulture subsector and private sector-driven recovery of the conventional horticulture sub-sector, the section produces a wide range of seedlings based on the horticulture calendar. In the period under review, a total of 3 047 074 (Fig 3.10) horticulture seedlings were dispatched against an annual target of 2 000 000 seedlings, where 85% of the seedlings produced were chillie seedlings. There was a 48% production increase compared to year. 3.4

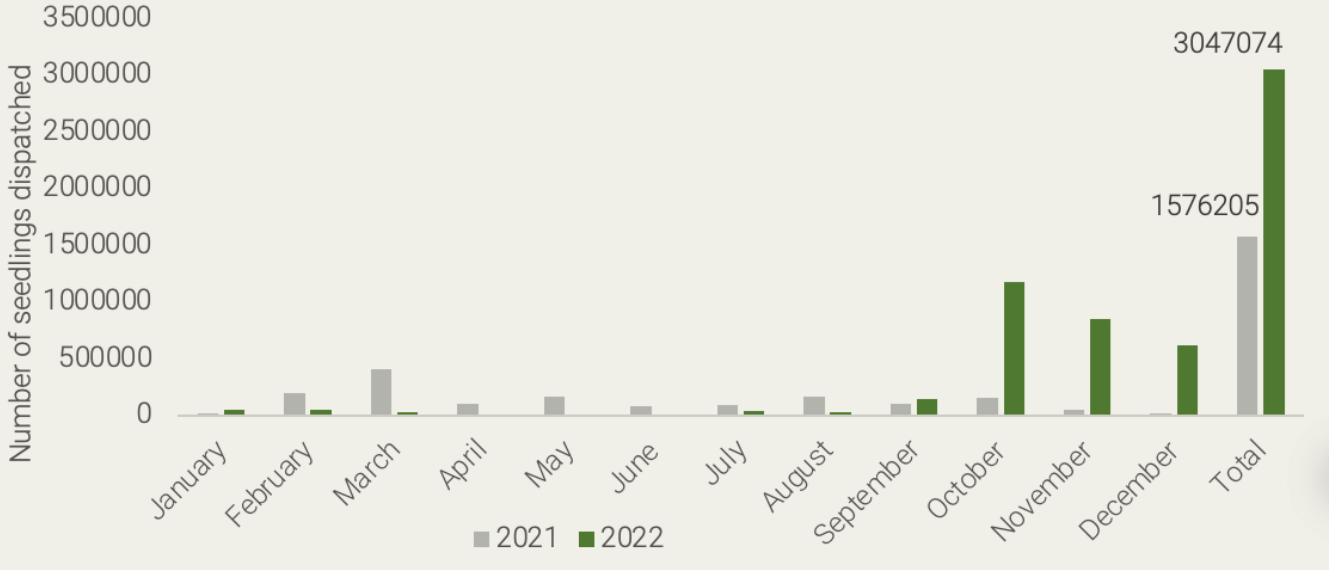


Fig 3.10: *Number of seedlings dispatched in 2021 and 2022.*

LIME AND FERTILIZER RECOMMENDATIONS

The section offers lime and fertiliser recommendations services to both tobacco and non-tobacco growers. This is because nutrient management is a key component of profitable and effective tobacco production. Supplying needed nutrients for crop production involves attention to four major fertilization factors (the 4Rs): right rate, right source, right placement, and right timing. Attention to these factors will provide adequate nutrition for crop production, maximises nutrient use efficiency which in turn maximises yields resulting in increased grower profits.

In the period under review, a total of 1 121 lime and fertilizer recommendations were processed and growers were given information on the rates of lime and fertilizers to use. This is a 32% increase compared to 763 recommendations done under the same period in the year 2021

MOLECULAR TECHNOLOGIES

The Molecular Technologies section seeks to provide accurate Molecular Biology based solutions in plant-based diagnostics and nucleic acid-based research. The laboratory is an ISO:17025 accredited laboratory and is a support pillar for research emanating from other TRB divisions namely Plant Breeding and Plant Health Services.

Over the years it has been in operation, the section has established robust methods and protocols for its testing services and has become an instrumental player in the nation in regards to testing for genetic modification in plants and plant derivative products. To date the section boasts of having tested thousands of samples for genetic modification contributing to the resolution of some national disputes pertaining to plant genetic modification. In all the testing procedures, the section adheres to strict guidelines of ISO 17025:2017 standard thus ensuring accuracy of the results and validity in the international community.

In line with advancement in Molecular Biology techniques, the section is rapidly advancing in utilising some of the new breeding techniques in providing new crop varieties and cost-efficient plant diagnostic practises. One such technique is the Clustered regularly interspaced short palindromic repeats (CRISPR-Cas9) and the Molecular section has achieved key milestones in the utilisation of CRISPR-Cas9 in modifying the tobacco gene in order to confer Potato Virus Y resistance.

2022 Key Highlights

Production of an active Biopharmaceutical product inducing the same response as the commercial product.

CRISPR-Cas9 gene editing on tobacco to confer *PVY* resistance

100% pass in Proficiency testing samples in all the participated events.

Retained SADCAS ISO 17025 accreditation status

Biosafety Level III laboratory status from the regulatory authority.

Obtaining Barcoding markers for tobacco DNA fingerprinting.

2022 Key Outputs: Commercial Testing

Service	Context	Progress in 2022	Way Forward 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.	**201** Samples analysed (100 % of the target)	Considering the adoption of quantitative test so as to determine the amount of genetic modification. This will help in food labelling.
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.	**115** Samples analysed (58% of the target)	We aim to do viral quantification and sequencing so as to provide comprehensive information to farmers.

2022 Key Outputs: Quality Management System

The laboratory adheres to International Standards Organization (ISO) in its operations. Following the 1 st periodic remote assessment of the laboratory and the Accreditation Approvals Committee meetings held on 10 and 12 November 2022, the lab was granted continued accreditation in accordance with ISO/IEC 17025:2017 by SADCAS.

Proficiency testing

The laboratory's proficiency in GMO testing was assessed by participation in the USDA/GIPSA programme. In the October round of the proficiency testing, the laboratory managed to obtain 100% in 35S and NOS

RESEARCH

2022 Key Outputs: Research

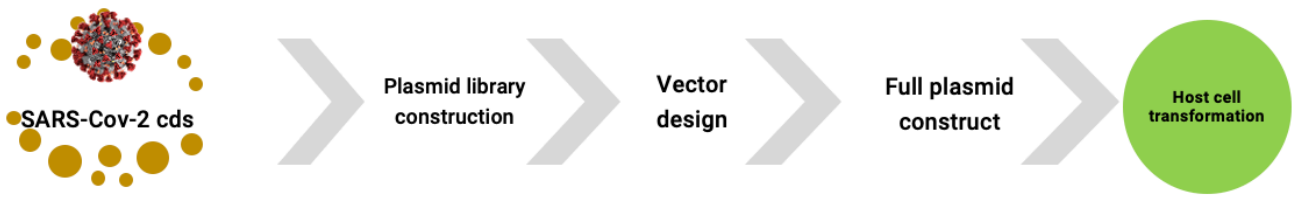
Three research themes were addressed :

- Biopharming of Pharmaceuticals
- Molecular marker development
- Tobacco variety development

Biopharming of SARS-Cov2 vaccine in tobacco

The genetic sequence of the SARS-COV2 has been made publicly available paving the way to the development of vaccines. However, no vaccine has been developed in Africa and Zimbabwe.

Thus, this study aimed to develop a COVID-19 vaccine using the S and N protein found on the COVID-19 in collaboration with private partners. The S and N proteins are important structural and nuclear proteins that are essential in the initial stages of infection of the virus, thus are the first line of molecular triggers of the human's immune system.



The Biopharming Workflow

This project aimed to develop the S and N protein-based SARS-Cov-2 vaccine in bacteria, yeast and plant expression platforms to essentially produce transient functional proteins that will be purified and brought to stable, large scale biopharming platforms. The project has progressed well and expectations are that the final product will be available during the first quarter of 2023. The research work was been conducted from February 2021 and the skills capacity attained since then have also paved the way to build capacity in production of other bioactive compounds such as human and animal vaccines and pharmaceuticals in the country.

a. Bacteria

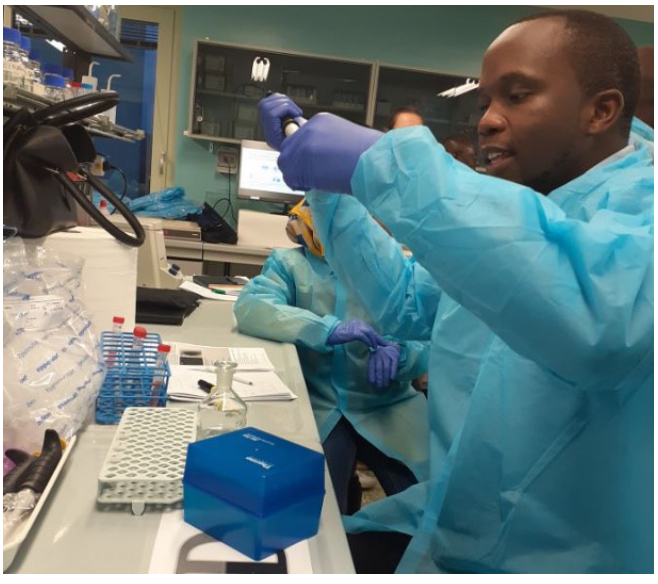
The production of the N and S proteins was done in bacteria (E. coli DH5α). The bacteria were transformed with the S and N-expressing plasmids and the expression was induced. The production of the N protein was successfully confirmed using a rapid antigen test. The S protein was conformed using an electrophoresis step. The cells confirmed to be producing were batch cultured and stored for scaling up purposes. In this regard, the work awaits the acquisition of implements and reagents for scaling up and quality control checks. When acquired, several quality control checks procedures have been put in place for processing.

b. Yeast

The production of the S protein was done in yeast cells (Pichia pastoris). The proteins were tagged hence a purification step ensued using a commercial purification kit. The purified protein was then used in pre-clinical trials were animal models (rabbits) were injected intramuscularly with the protein followed by an immunogenic test to determine the immune response in these animals. The results of this trial indicated a marginal positive response shown by production of IgA, IgM and IgG antibodies to the expected reference values for SARS-CoV-2 infection. The results were comparable to those obtained from the animal immunised with the available vaccine.

c. Plant

Plant expression work for the Ag-85A/MPT64 protein of Mycobacterium tuberculosis for the BCG vaccine and the VP1-encoded protein for the FMD vaccine was initiated with the design of the appropriate plasmid. Once acquired, modification of selected tobacco will be done for stable/ transient production of the BCG vaccine.



Development of scar markers for the identification of Kutsaga lines

Tobacco (Nicotiana tabacum) is widely grown in Zimbabwe and is deemed as the major cash crop of the country. Issues with tobacco theft usually arise during curing, baling and transportation, thus tobacco growers usually require fast, efficient and reproducible methods of identification in order to resolve such disputes. Thus, the major aim of the study was to utilize the internal transcribed spacer (ITS) region to identify and differentiate the mostly widely cultivated

tobacco varieties in Zimbabwe and design suitable primers for easier utilization in the laboratory. A total of thirteen tobacco varieties were used in the study. DNA was extracted and subjected to DNA sequencing.

ITS sequencing of the varieties was carried out and dendrogram constructed from the sequences in order to understand the genetic similarity within the varieties (Fig. 3.12). All the varieties showed sequence differences within the 0.01 and 0.02 range. KRK 29 had almost a similarity of 0.12 with all the varieties while that of the outgroup was almost 0.05. Although slight differences were noted in the ITS sequences, it's was evident that the ITS barcodes could better distinguish tobacco varieties in contrast to the universal primers.

Allele specific primers were designed after identification of single nucleotide polymorphism (SNP) regions. Fig 3.13 shows the schematic representation of the allele-specific primer PCR method. K 26R allele specific primers forms a perfect match at the 3` end (SNP) with K 26R DNA sequence but forms a mismatch with KRK 73 DNA, similarly KRK 73 allele specific primers forms a perfect match with KRK 73 DNA, but forms a mismatch with K 26R DNA.

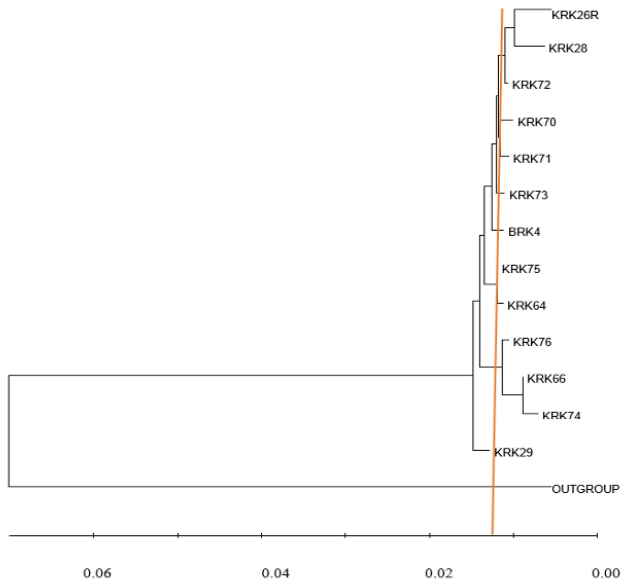


Fig 3.12: *ITS phylogenetic tree produced from sequencing the tobacco ITS region.*

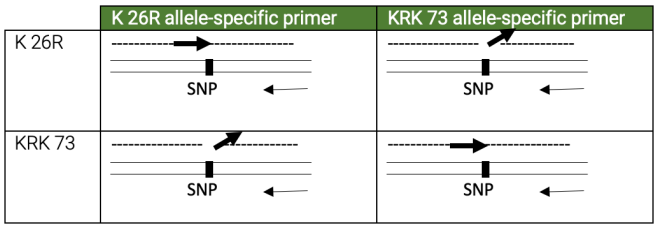


Fig. 3.13: *Schematic representation of the allele specific PCR; K 26R allele specific primers forms a perfect match at the 3` end (SNP) with K 26R DNA sequence but forms a mismatch with KRK 73 DNA.*

Tobacco Variety Improvement

CRISPR/CAS9 mutagenesis of tobacco for PVY resistance

Seeds of tobacco varieties VAM (PVY-resistant) and ONC (PVY-susceptible) were obtained from the Plant Breeding department at Kutsaga Research station. VAM was selected based on its PVY resistance status and ONC due to its ability to pass on genetic information to its progeny as a parental line and thus could be used in subsequent conventional breeding programs. Sequences and other information of the eukaryotic translation initiation factor (eIF4E) gene were obtained from National Centre for Biotechnology Information (NCBI) database (GenBank: KF155696.1). All sgRNAs were designed using the web-based tool CRISPOR (http://crispor.tefor.net/).

Fig 3.14: *Gene construct of the gRNA cloned between the T7 promoter and gRNA scaffold.*

Results showed the growth of the plants in cocultivation media after 2 days, 6 weeks in selection and regeneration media, and in rooting media after 11 weeks after transformation.

Fig. 3.15: Leaf disc transformation of the transformed ONC tobacco plants. A. growth of the plants in cocultivation media after 2 days, B. 6 weeks in selection and regeneration media, and in rooting media after C. 11 weeks after transformation.

Thereafter sequencing analysis was compared by BioEdit and dendrograms were constructed. Results showed that about 50% differences were observed between the wild type and the transformed ONC. Sequencing analysis revealed 2 single base deletions in the 3` regions of the eIF4E sequence of the ONC transformed lines (Table 3.2).

	Variety	Sequences	Description
Mutation 1	ONC wild-type	ACTTGCTGGGTGAAAG-GGGGCC	1 nt Del at 3`
	ONC trans-formed	ACTTGCTGGGTCCATCG-GG**G - C**	
Mutation 2	ONC wild-type	ATCGTCGTCGGC-TACTTCA	1 nt Del at 3`
	ONC trans-formed	ATCGTCGTCGGC-TACTT**C-**	

Table 3.2: *Description of the mutation within the ONC tobacco edited lines.*

Gene mutagenesis of Kutsaga parental lines for the production of drought-resistant tobacco lines via CRISPR-Cas9

Drought is a devastating occurrence that can cause destruction of crops. In addition, the issues of climate change have exacerbated the need to drought-proof tobacco varieties from the vagaries of the weather. Genetic engineering of genes and transcription factors has been shown to provide defence mechanisms for plants to withstand drought conditions. Thus, this study aimed to utilize genetic engineering techniques to develop a tobacco parental line that can withstand drought conditions.

Two gRNA`s were designed targeting the DREB gene and the WRKY transcription factor (Table 3.3) and synthesised by Inqaba biotech. Cloning of then gRNA into pChimera and subsequent transformation is currently underway.

Genetic manipulation of elite tobacco lines for the production of low and high nicotine producing lines

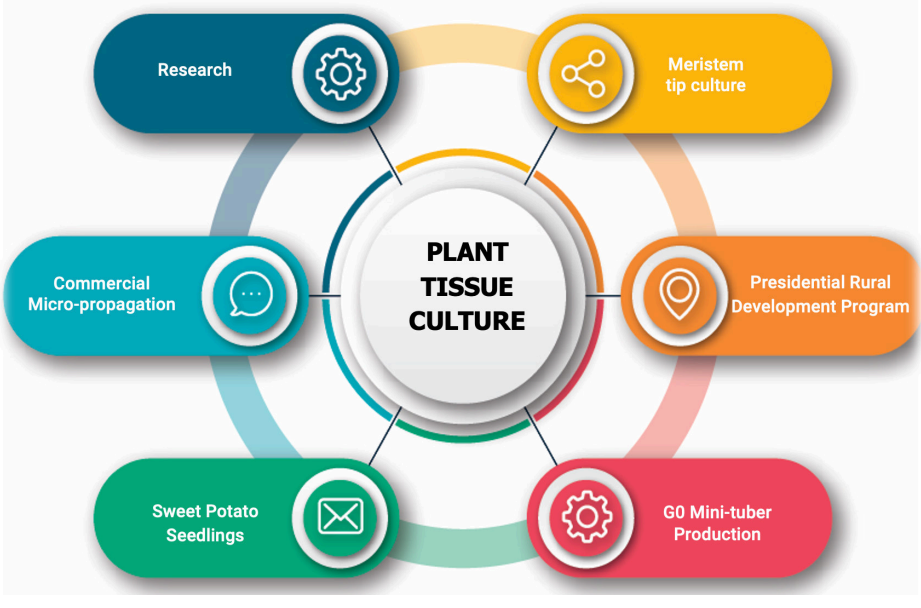
Nicotine is the predominant alkaloid in tobacco plants, accounting for ~90% of their total alkaloid content. It is the main addictive substance in cigarettes and as such, reducing nicotine content in tobacco leaves will aid the development of low-nicotine tobacco products. Prior work has shown that the manipulation of genes involved in nicotine biosynthesis can achieve this purpose. Two nuclear genes, Nic1 and Nic2, regulate nicotine levels in tobacco. nic1 and nic2 are semi-dominant mutations in Burley 21 that reduce leaf nicotine levels and the activities of multiple enzymes in the nicotine pathway and simultaneously increase polyamine levels in the cultured root. In this collaborative work with the Plant Breeding division, the main aim of the study was to utilize CRISPR-Cas9 to knockout out the Nic1 and Nic2 genes in tobacco and understand the relative gene expression of the NUP (nicotine transporters) genes thereafter.

Work was completed in the transformation of Agrobacterium for the purposes of transfection of tobacco. A positive result was obtained for the bacterial cells and leaf disks of Nicotiana benthamiana were then transfected with the construct-carrying bacterial cells.

The CRISPR editing of TB22 tobacco resulted in four (4) tentatively termed "Edited Plants" with altered nicotine synthesis pathways (NIC1.1). At three (3) weeks after planting, two (2) Edited Plants underwent total alkaloid testing courtesy of the Analytical Chemistry Services and compared against Unedited TB22 Tobacco at the same stage of growth. The nicotine quantities reported as total alkaloids of the Edited and Unedited TB22 Tobacco plants (2 samples each) were comparable with no significant differences.

Name	Scale	Purification	5' Modification	Sequence	3' Modification	Bases	Comments
PRIMER 1	0.01 (umole)	Desalting	None	ATTGTACGACTCACTATAGCAGTGTATCGGCCA GG	None	35	
PRIMER 1.	0.01 (umole)	Desalting	None	AGCTCTAAAACAGTCCCTGGCCGATACACTGAA AC	None	35	
PRIMER 2	0.01 (umole)	Desalting	None	TACGACTCACTATAGTCTCGCCAGTGTATCGGC CA	None	35	
PRIMER 2.	0.01 (umole)	Desalting	None	TTCTAGCTCTAAAACTGGCCGATACACTGGCGA GA	None	35	

Table 3.3: *gRNA for the DREB and the WRKY transcription factors.*



PLANT TISSUE CULTURE

Main Objective
Provide disease-free planting material and micropropagation services to increase revenue generation for the Board.

Background
Plant tissue culture is the aseptic cultivation of plant cells, tissues or organs on a chemical formulation known as media that provides the plant material with all the required nutrients, vitamins and growth factors and grown under controlled light intensity, temperature and humidity.

Plant tissue Culture provides several agronomical and production advantages such as;

- Rapid clonal multiplication
- Disease elimination - selection of disease-free meristematic tissue
- Cultivation of crops difficult to grow via conventional means
- Minimal space usages - an average of 10 times the plants in one-tenth of the space

Tissue culture starts with the selection of healthy plant from a desired mother plant. The plant material is sterilized and introduced to media in a process known as Initiation. The material grows in vitro and repeatedly multiplied, the plants developing organs such stems, leaves, nodes and roots. The plant material is then Hardened/ Acclimatized and then grown in the greenhouse or open field

2022 Key Outputs: Research
Two research themes were addressed :
Protocol development
Meristem tip culture

Protocol development

The laboratory's tissue culture section is involved in extensive research of plant material ranging from Eryngium, Giant William Banana, Zumbani (Lippia javanica), blueberries, blackberries, bamboo and strawberries. Additionally, provision of clean disease-free high yielding Irish seed potato seed and sweet potato is high on the agenda of the section. In this regard, and to improve farmers' Irish potato variety selection, some 33 new processing lines suited to our tropical environment were sought from the International Potato Centre (CIP), Peru. The lines were received in-vitro and are being micro-propagated before field evaluations and release of the lines can be done.

As part of expanding research, the Plant tissue culture section has also ventured into Banana and Avocado research and Fig 3.16a and b are a representation of some seedlings in the greenhouse following plant tissue culture efforts and reintroduction into the Laboratory material.

Fig 3.16: (a) *Blackberry in-vitro and ex-vitro plantlets with vegetative vigor* **(b)** *Blueberry material developing callus in the root zone as well as shoot induction*

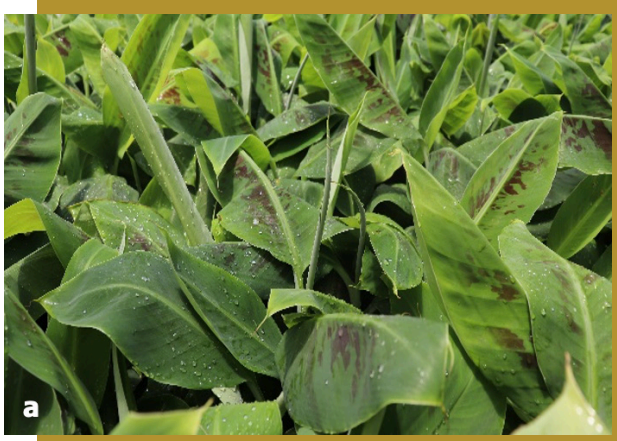


Fig 3.17a: *Banana seedlings from Plant tissue culture* **(b)** *Avocado seedlings being introduced in-vitro and maintained in the greenhouse.*

Meristem tip culture

Meristem tip culture is a process of culturing meristems in-vitro (both apical and axillary) that is free from viruses and is used to obtain virus-free plants by rapid multiplication (Fig 3.17). A total of 117,999 progeny plantlets have been produced by 2,218 dissected meristems, which have undergone viral indexing screening. All of the plantlets that were moved and planted in the greenhouses from January to December 2022 were virus-free as a result of meristem tip culture.

Fig 3.17: *The dissection of meristems, callus formation and shoot induction in the growth room.*

COMMERCIAL LABORATORY AND GREENHOUSE PRODUCTION

The laboratory commercially micro-propagates Irish potatoes and sweet potatoes with the primary goal being to produce material from the meristem tip culture that is virus-free. With five lamina flow cabinets and ten sitting positions, the new lab offers a sterile environment where processors sit and multiply in accordance with predetermined targets. Between January and December 2022, a total of 1,301,660 plantlets were micro-propagated. Fig 3.18 depicts the micro-propagation procedure in progress and the completed product in jars in the growth room.

Fig 3.18: *The shelves with micro-propagated plantlets and micropropagation procedure by plant tissue culture processors.*

Irish potato

The acute shortage of quality seed on the Zimbabwean market saw the TRB in 2020 being involved extensively in increasing seed potato production in the country through provision of adequate and timeous research and clean disease-free material to seed potato growers through Plant tissue culture. Material is cleaned through meristem tip culture, followed by virus indexing and micro-propagation then the hardened plantlets are then transplanted into the greenhouse under quarantine conditions to produce foundation or G0 seed. This high quality seed is then multiplied through out-grower schemes to produce seed for table potato production.

a. Laboratory

The laboratory micro-propagation of Irish potatoes is intended to ensure that plantlets capable of producing G0 mini-tubers are readily available throughout the year. Micropropagation is required to ensure disease-free and contamination-free mini-tubers. In to the period under review a total of 1,231,168 plantlets from 3 varieties were micro-propagated (Fig 3.19).

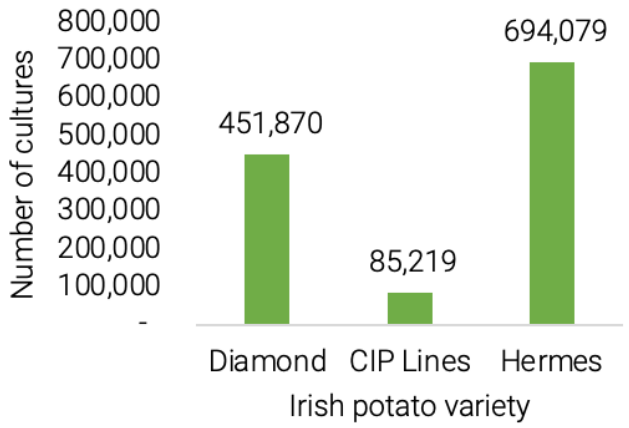
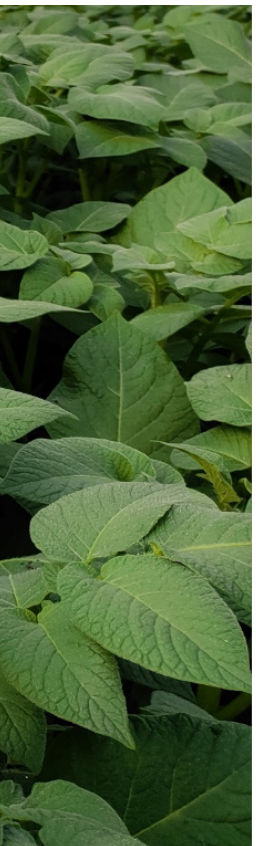


Fig 3.19: *The total number of Irish potato plantlets per variety cultured from January-December 2022*



b. G0 Mini-tuber production

The production of G0 Irish potatoes has been steadily increasing due to the new greenhouses that were constructed at the end of 2021. Each greenhouse's production cycle is set up to support seven plantings over the course of two years. From January to December 2022, the total number of mini-tubers produced was 1,391,171, which was 116% higher than the set target of 1,200,000 and a 169% increase over the same period in 2021 (Fig 3.20 and 3.21).

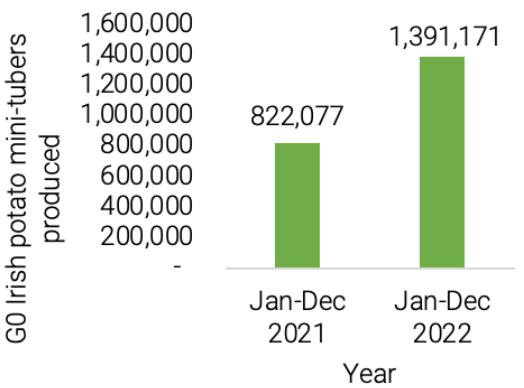


Fig 3.20: G0 mini-tubers produced between January to December years 2021 and 2022.

Fig 3.21: The vegetative stage and harvested mini-tubers.

Sweet Potato

i. Laboratory

Six different sweet potato varieties; Chingovha, Alisha, Beauregard (2), Delvia, and German II were micro-propagated. Before being chosen as mother plantlets, all the micro-propagated varieties underwent meristem tip culture and virus screening and from these some 70,492 sweet potato plantlets were micro-propagated. Fig 3.22 displays the number of micro-propagated sweet potato plantlets for each variety.

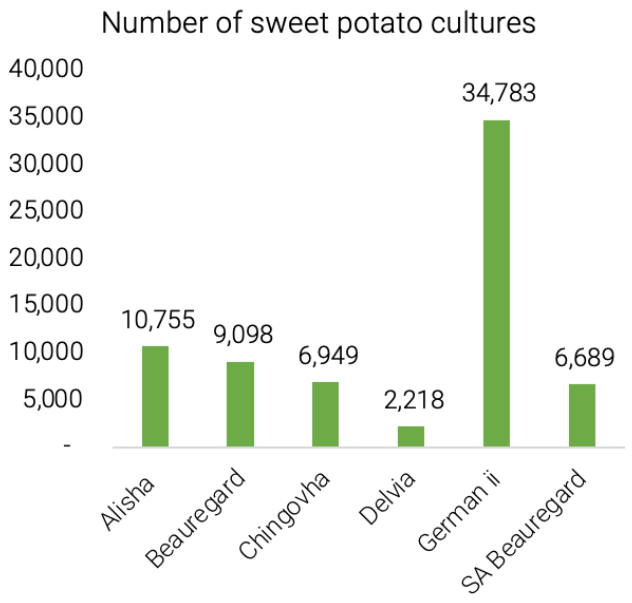


Fig 3.22: *The number of sweet potato plantlets that were cultured per variety from January to December 2022.*

ii. Greenhouse

The Tobacco Research Board (TRB) partnered with the Ministry of Lands, Agriculture, Fisheries, Water and Rural Development to produce and distribute sweet potato seedlings in the Presidential Rural Development Program. The Presidential Rural Development Program was established with the goal to assist rural households in raising their incomes, improving family nutrition, and producing feed stocks for local food processing. The programme has helped the villagers' food security at the household level and generate income from the sale of sweet potatoes to domestic or international markets. The seedlings are thus produced by tissue culture's meristem tip culture and micro-propagation techniques. To date, 1,483,151 out of the targeted 2,000,000 seedlings were dispatched to all provinces in Zimbabwe, and this represents 74% of the target (Fig 3.23 and 3.24). The production target was not met because there were no takers for the produced seedlings, despite the fact that production increased by 629% from the previous year.

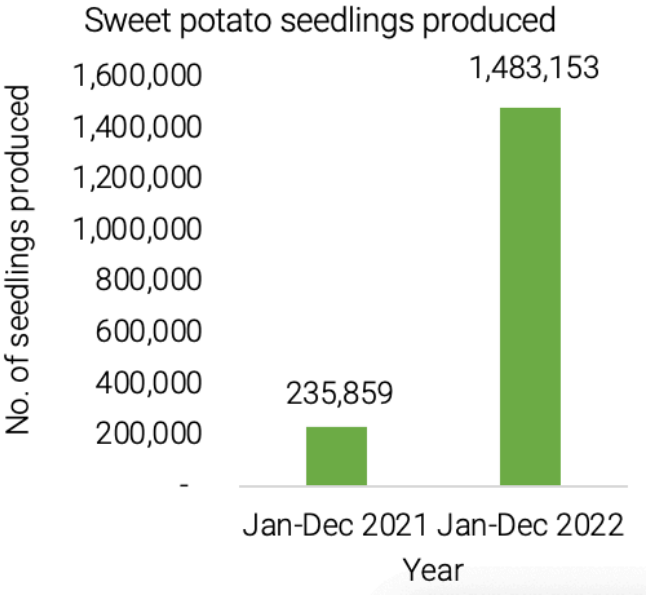


Fig 3.23: *The number sweet potato seedlings produced between January to December in 2021 and 2022*

TOBACCO RESEARCH BOARD
KUTSAGA

04 Analytical Chemistry Services Division

To provide world class value - adding chemical and pesticide analysis service.

Purpose

- To enable analysis-based lime and fertiliser recommendations
- To generate information on plant chemistry and crop nutrition requirements
- To provide a tobacco industry pesticide and chemical screening quality assurance service

ACCREDITATION

The Analytical Chemistry Services (ACS) Division is a state-of-the-art testing laboratory whose mandate is to provide world-class value-adding chemical and pesticide analytical testing services. The laboratory is accredited to the ISO 17025 Quality management system and can assure quality service. During the period under review the laboratory retained accreditation status after the annual external audit was carried out by the Southern African Development Community for Accreditation System (SADCAS) on the Quality Management System (QMS). To ensure that quality service is maintained the laboratory also participated in various training sessions, international proficiency tests and inter-laboratory tests.

SAMPLE PROCESSING

In the period under review 7 494 samples were processed in the laboratory against a target of 11 000 samples. In the same period last season 13 406 samples had been analysed. The decrease in samples analysed is attributed to the challenges faced with incessant power outages and power surges that led to multiple instrument breakdowns and increased down time. To remedy this problem a project to switch to the use of solar energy is underway.

Another challenge faced was the failure to receive imported reagents timeously. Fig 4.1 below shows samples distribution by matrix and by trend for analysed samples.

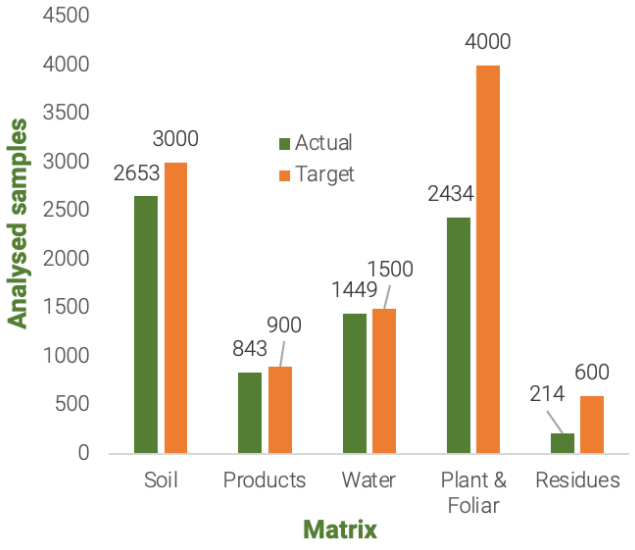


Fig 4.1: *Samples analysed against set targets*

METHOD VALIDATION

To enhance and broaden the testing scope, the division continually develops and validates methods for use in sample processing. In the period under review five methods (pesticide residues, microbial, cations and trace elements, heavy metals except Arsenic and Mercury, Sulphate and phosphate) in industrial and medicinal hemp and products were developed and validated. At the time of reporting the Division had started receiving and testing hemp samples for quality control monitoring using the new methods.

Two other test methods were also developed for pharmaceutical products (Bisacodyl and 4- Amino phenyl) and one for pyrethroid pesticide residues in Cannabis spp testing. These are already in use to quality control samples for clients.

STAFF

Three new members of staff including two laboratory technicians and one laboratory assistant joined the Division to complement and strengthen internal skills. Two students joined the Division from universities for work related learning purposes. As part of mentorship and training, they were allocated projects and trained on presentation skills after which they presented papers in the TRB seminar series.

CONFERENCES AND MEETINGS

In line with the board's thrust to ensure keeping abreast with global trends in sample analysis, Cabinet Musuna-Garwe attended CORESTA Agro-Chemical Sub Group meeting in Dubai during the period under review. This is a forum where thorough discussions of new and problematic methodologies take place, and benchmarking of results is also done through from proficiency testing results observed. This meeting was attended by 22 participants from 13 nations, among them USA, UAE, Austria, Germany, Japan Switzerland and Argentina. Key issues noted were that pymetrozine, flupyradifurone and pyperonyl butoxide presented testing challenges in various laboratories including the TRB lab. Also, that fluensulphone residues definition needed to be set before the Sub-group establishes its residue level. Below is a photograph capturing the proceedings (Fig 4.2)

Fig 4.2 (a): *Photo of some of the attendees at the CORESTA Agrochemical Analysis Sub-Group meeting in Dubai* **(b)** *Some of the attendees at the TRB Corporate governance training at Leopard Rock in Nyanga*

She also attended a Corporate governance training session with the Board members and other TRB managers in Nyanga were issues to do with corporate governance were unpacked.

Two members of staff attended the 18th SADCMET NAMWATER PT evaluation virtual workshop. This is a forum where lab representatives from Southern Africa discuss issues related to water proficiency testing including results and methodologies. This work supports and benchmark the laboratory's results to other laboratories in the region so as to support the laboratory's quality management system.

Additionally, one member of staff attended the organization's strategic meeting in Kariba standing in for the HOD who was in Dubai for a CORESTA Sub-group meeting during the same period.

TOBACCO RESEARCH BOARD
KUTSAGA

05 Field Services Division

To maximize value from Tobacco Research Board Stations.

KUTSAGA FARM

The Field Services Division's responsibility is coordinating all farming activities that the TRB undertakes to ensure that all the set objectives are met. This includes working closely with all Research Divisions and the Seed Production Division to whom they offer field crop management services. The services provided include;

- 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 a flue-cured tobacco crop, eucalyptus seedlings and tobacco seedlings.

Rainfall Pattern: 2021/22 season

Fig 5.1: *Kutsaga farm rainfall Figs (mm) – Oct 2021 to December 2022*

The rainfall Figs in this report cover October 2021 to June 2022; a period which the crop was grown and also when the seedlings for the 2022/23 season were established (Fig 5.1).

The 2021/22 crop was planted starting in September 2021. In the period between October 2021 to April 2022 a total of 806.10 mm of rain was received. This was 94.83 % of the long-term average of 850 mm. January 2022 turned out to be the wettest month with some 311.80 mm of rainfall being received allowing the crop to expand and fill.

The Tobacco Crop

For the 2021/22 season, a total of 55 ha of flue-cured tobacco was established. Of this 45 ha was semi-irrigated while the rest was dryland tobacco. From this hectarage, 173.5 tonnes were produced and sold at an average price of $3.13 per kg (Fig 5.2).

Fig 5.2 (a): *Vigorously growing tobacco crop of the varieties K RK76 at Kutsaga Research Station in February 2022*

Fig 5.2 (b): *Kutsaga bales at the ZLT sales floor and a top price received on the day of sale.*

Eucalyptus Seedlings

In line with the tobacco value chain transformation plan, TRB is participating with the Afforestation Blitz by producing high quality eucalyptus seedling for the industry (Fig 5.3).

Fig 5.3: *Eucalyptus seedlings in seedbeds at Kutsaga Farm*

In the period under review, some 1.5 million gum seedlings were produced for the industry. The greatest share of these were purchased by Sustainable Afforestation Association and the rest tobacco farmers for the purpose of establishing their own woodlots. Sales to individual growers are very low and an industry push is needed to ensure a greater majority of growers established their own woodlots.

Commercial tobacco seedlings

Fig 5.4: *Quality tobacco seedlings at Kutsaga Farm*

Some 10 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 5.4 above shows one of the tobacco seedbeds at Kutsaga.

Experimental and Seed crops

The farm also offered services to the researchers by establishing and maintaining some 10 ha of experimental crop and one hectare of seed crops at Kutsaga station (Fig 5.5 and 5.6). In addition, some 2 ha of Katambora GHR1 seed crop was established by the Farm to be used for Nematode suppression and soil rehabilitation in the experimental plots.

Fig 5.5 (a): *Freshly prepared land and ridged tobacco land just after planting*

The 2022-23 Season Status

At the time of reporting in December 2022, some 60 hectares of commercial tobacco crop had been established for the 2022/23 season.

Capital Items Acquired During the Period Under Review

In an effort to capitalize the farm a new Centre Pivot was acquired. This brought the number of Centre Pivots at Kutsaga to three (two towable & one fixed) and the potential irrigable land (under pivot) to 80 ha, provided adequate water is available. Additionally, a new tractor and sprayer equipment was procured for the farm.

Fig 5.7: *A newly installed* **A:** *centre pivot and* **B:** *a tractor at Kutsaga station You can add specifics such as how man ha it can irrigate and where it is installed. The brand name of the tractor and its horsepower.*

Challenges and Mitigation

The challenges faced included incessant power supply disruptions, leading to the predominant use of diesel generators for curing and irrigation of lands resulting in increased production costs.

There was also an increased rate of vandalism of equipment such as water pumps and center pivots. On three occasions span cables for the centre pivot, valued at some US$4 000 were stolen. Additionally, mugging of staff on their way to work was on the increase. The Board has since engaged the area police to assist the inhouse security team as they conduct their regular patrols and it is hoped that crime rate will be curbed. Additionally, the installation of security towers in the various lands was initiated.

06 Technology & Climate Change

Our mission is to improve efficiencies in agricultural systems through the development and integration of new innovative technologies

OBJECTIVES

This skills group exists to;

- Identify and proactively design innovative, mechanically-sound equipment and gadgets to meet the needs of growers and TRB Divisions.
- Demonstrate new technologies and their integration into farming systems by growers
- Develop climate-smart technologies, innovations and crop management practices (precision irrigation, water harvesting, storage and delivery technologies).
- Actively recommend new technologies to end users through extension
- Offer timely services to internal TRB clients (provision of efficient equipment, infrastructure and buildings repairs and maintenance services).

ACTIVITIES

- Designing of mechanically-sound equipment and gadgets to meet the needs of growers and TRB Divisions.
- Undertaking research work aimed at developing climate-smart farming technologies for farmers
- Offering training and advisory services to growers on new technologies
- Actively promoting newly developed effective technologies to end users
- Undertake timely repairs and maintenance of TRB equipment, vehicles, infrastructure and buildings.

Sustainable fuel-wood sources

In the face of the pending ban on the use of coal in tobacco production, the use of sustainably produced wood fuel such as the eucalypt is the immediately available option that growers can adopt. The TRB in partnership with Universal Leaf Tobacco continued with trials aimed at establishing the eucalypt wood requirements for the most popularly used barn types in Zimbabwe. This work will produce information on the wood requirements when growers convert to wood use for their former coal barns. This is necessary for ensuring sustainable tobacco production in Zimbabwe by reducing the country's carbon footprint.

Preliminary results of this trial showed that the tunnel had the lowest specific fuel consumption of only 3.88 kg of wood to cure a kg of tobacco, the twin-turbo, rocket barn, and retrofit twin-turbo had 3.96 and 5.17 and 7.58 respectively. This translated to fuelwood requirements of 27.48 – 53.69 respectively for curing one hectare of tobacco (equivalent to 1 700 kg) (Table 6.2.1).

Barn Type	Kg wood/ kg tobac-co	Amt of wood to cure 1700 kg (1 ha)	Amount of wood (cubic)	Land area to euca-lyptus (ha)
Tunnel	3.88	6 596 kg	27.48m3	0.23 ha
Twin Turbo (TT)	3.96	6 732 kg	28.05 m3	0.23 ha
Rocket	5.17	8 789 kg	36.62 m3	0.30 ha
Retrofit TT	7.58	12 886 kg	53.69 m3	0.45 ha

Notes:
i) A yields of 1 700 kg/ha used as this is the national average yield/ha
ii) One cubic meter = 240 kg of wood @12% moisture content.
iii) One ha of eucalyptus yields 120 m3 of wood.

In terms of eucalyptus woodlot establishment growers will need to have land area ranging from 0.23 ha – 0.45 ha depending on the barn being used. Therefore, only 1.5 ha of a eucalyptus woodlot is required for the purposes of curing 1 ha of tobacco using the rocket barn on a 5 year cycle. Users of the tunnel will only require 1.15 ha of a eucalyptus woodlot for each hectare of tobacco they establish if 100% wood curing is to be done.

Next steps : The results presented here are based on a single season. The trial will be conducted for another two seasons before conclusive results and recommendations are given. Concurrently, research work on the search for alternative tree species for wood fuel is ongoing.

Research on alternative tree species

While the eucalyptus tree species has been widely adopted as an immediately available source of tobacco curing fuelwood, research is also ongoing to search for and avail other tree species that growers can use. Currently, species that include bamboo, acacia, and the foxglove-tree or Ecoflora (Paulownia tomentosa) are under consideration due to their fast-growing nature.

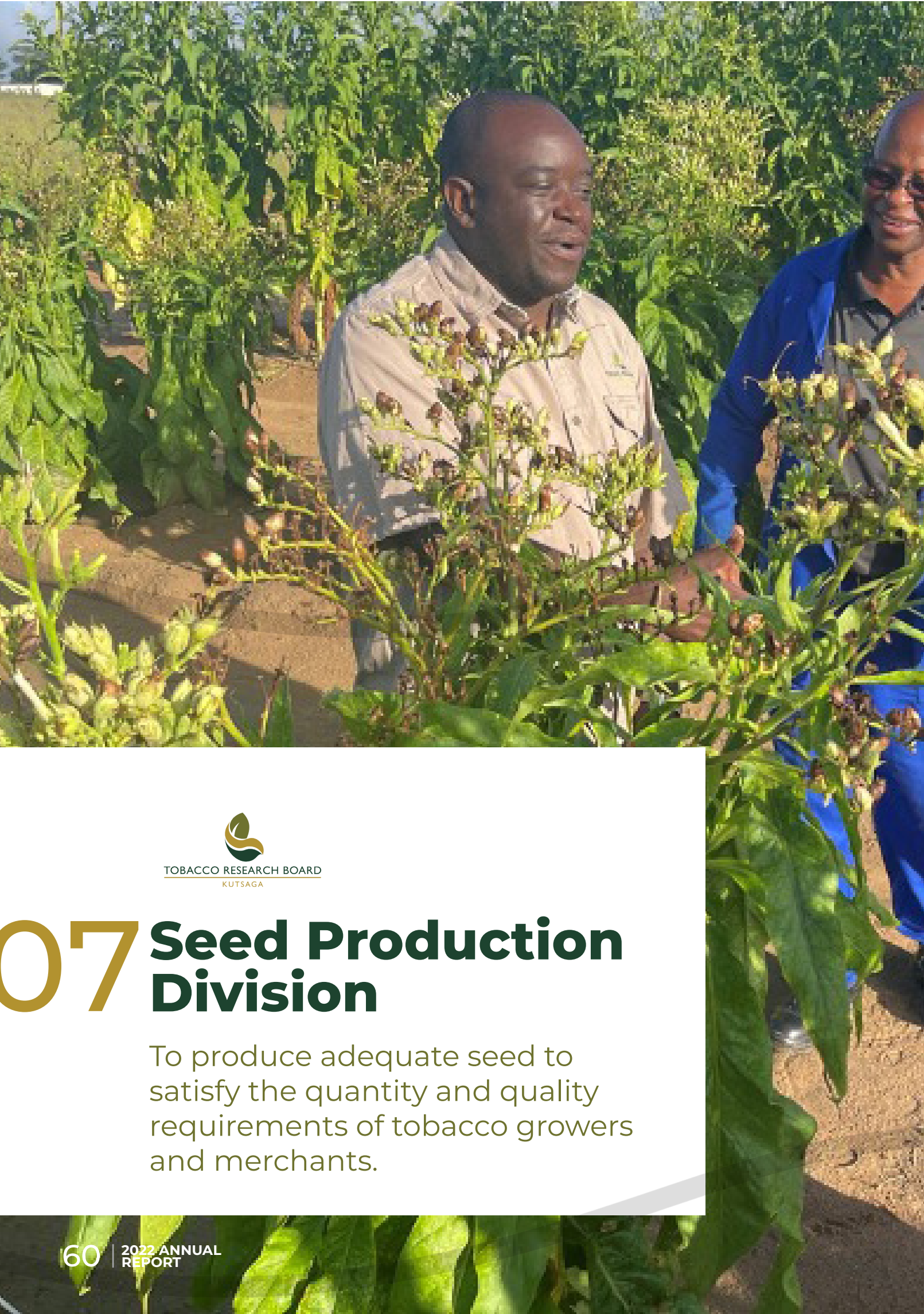
Paulownia tomentosa is an extremely fast-growing deciduous tree that belongs to the family Paulowniaceae, and is native to central and western China. This tree species purported to be among the 10 fastest growing trees in the world is widely grown in several European countries for timber and biomass production.

The TRB has since established an Ecoflora tree mini-plantation with the objective of producing wood that would be used to evaluate its suitability for tobacco curing. This work is being done in partnership with Bellview farm who provided seedlings for the plantation.

Fig 5.9: Dr Chinheya of TRB examines an ecoflora tree at nine month after planting

Alternative Curing Fuels

A wide range of renewable and environmentally friendly curing fuels have been evaluated at TRB in collaboration with various private entities and are now recommended for use by growers. These include biomass briquettes such as bana grass and paper briquettes. Work is ongoing to evaluate the use of biogas, ethanol, and solar energy for tobacco curing.



TOBACCO RESEARCH BOARD
KUTSAGA

07 Seed Production Division

To produce adequate seed to satisfy the quantity and quality requirements of tobacco growers and merchants.

PRODUCTION IN THE 2021/22 SEASON

In an effort to actualize the Tobacco Value Chain Transformation Plan (TVCTP), which aims to increase tobacco production to 300 million kg and earn the country US45 billion by 2025, a number of seed plots were established with the aim of producing 1 170 kg of tobacco seed (120 kg burley and 1 050 kg flue cured seed).

The season's production was specifically to beef up stocks of B RK4, K RK26R and K RK70. The seed crops were established at TRB's three stations and also at five off-station sites for the purposes of spreading risk. The off-station sites were in Beatrice (2), Chegutu, Headlands, and Guruve.

Most crops were established in September under irrigation with most out-growers using drip irrigation. All pollen parental crops were established in the first week of September and all sites had adequate water to sustain the crops up to the start of the rainy season.

At most sites the rainfall season started in mid-October with normal to above normal rains being received in the season. Rainfall distribution was poor, however the use of irrigation ensured moisture availability as required. The availability of moisture enabled timeous and effective fertiliser application and usage by crops. This resulted in healthy and vigorous crops, which translated to good yields (Fig. 7.1). The overall performance of the crops was very good with a total seed yield of 1 769 being achieved against a set target of 1 170 kg (151%).

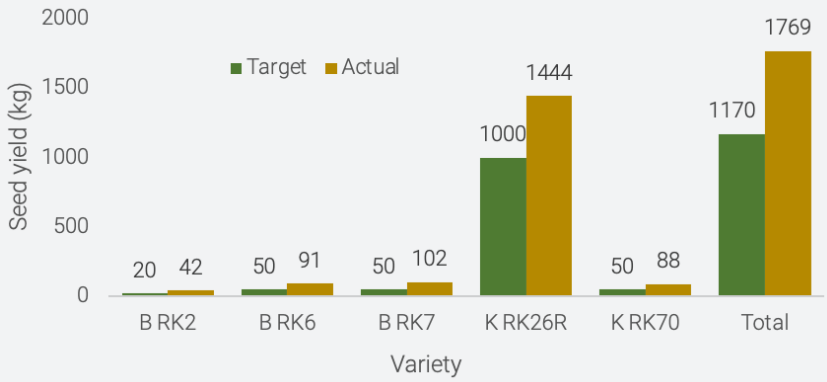


Fig 7.1: *Quantity of seed produced in the 2021/22 season*

QUALITY ASSURANCE

Post-harvest quality assurance is a very important aspect of seed production and is done to ensure that growers get high quality seed. This is done in the TRB seed testing laboratory and is monitored by the National Seed Authority of Zimbabwe, Seed Services. Seven hundred and eighty-eight samples were processed for purity and germination tests in the seed testing laboratory (Table 7.1).

Table 7.1: *Samples processed in the seed testing laboratory and seed enhancement*

Operation	No. processed in Jan – Dec 2022	Target- Jan -Dec 2022	% of target
Sampling	1 714	1 356	126.4%
Purity tests	117	98	119.3%
Germination tests	1 546	1 088	142.0%
Pelleting	14 471 ha	36 901 ha	39.2%
Film coating	777 kg	800 kg	97.1%

Table 7.2: *Challenges faced in the 2020/22 season and mitigatory measures taken*

Challenge	Impact	Mitigation
Hailstorm damage at the early vegetative stage	Plant losses within tolerance	Engaged the Seed authority for way forward. Crops were cleaned up and nurtured.
Electricity outages – less irrigation cycles than planned	Affected irrigation and pollen processing. Some crops did not perform to maximum potential	Solar powered irrigation systems installed at some sites
Late start of rainfall season & mid-season drought	Inadequate moisture for plant growth Slow take-off of some crops and poor seed filling.	Sustenance irrigation was done. Work underway to upgrade/improve irrigation infrastructure at some sites
Labour shortage at peak pollination	Available staff worked long hours – fatigue and unhealthy work-life balance	Continuous engagement Regular review of wages recommended
Covid-19	Minimal work disruption	Strictly observed WHO recommendations

BANKET STATION

Rainfall

There were no significant differences in the total rainfall received between the two seasons under review. The 2020- 2021 season had slightly more rainfall compared to the 2021-2022 season, with a total of 799.9 mm received during the period of September to May, which is 99.9 % of the long-term average (Fig 7.2). On the other hand, the 2021 – 2022 season received 97.9% of the long-term average of 800 mm. The rainfall distribution was also well spread out up to April, which promoted crop growth and was almost similar between the two seasons under comparison.

In terms of temperatures, the mean maximum temperature during the period of January to December 2022 was 27.2 oC, which is slightly higher than the 26.7 oC obtained in the same period in 2021 (Fig 7.3). The average minimum temperature during the 2022 period was 14.7 oC, which is slightly higher than the 14.3 oC obtained in the same period of 2021. These temperatures were conducive to crop growth. Overall, it seems that the year 2022 had better weather conditions for crop growth compared to the previous year, with more rainfall and conducive temperatures.

Seed Production

Despite slow take off early in the season, the rainfall received later resulted in robust crop growth, which surpassed the set targets for the three varieties of burley seed that were established (6.5-6.7). For B RK2, a yield of 41.445 kg was attained, which was 207% of the set target of 20 kg. For B RK6, the yield was 91.109 kg, which was 182% of the target of 50 kg while for B RK7, the yield was 102.075 kg, which was 204% of the target of 50 kg.

Tobacco Experimental Crops

Five trials for Plant Breeding Division (BW9 nematode introgression, Parental hybrid proving, cigar wrapper trials and CCT) were managed at the station. Grading and classification of all PB trials was done and completed. However, the cigar wrapper trials did not produce the

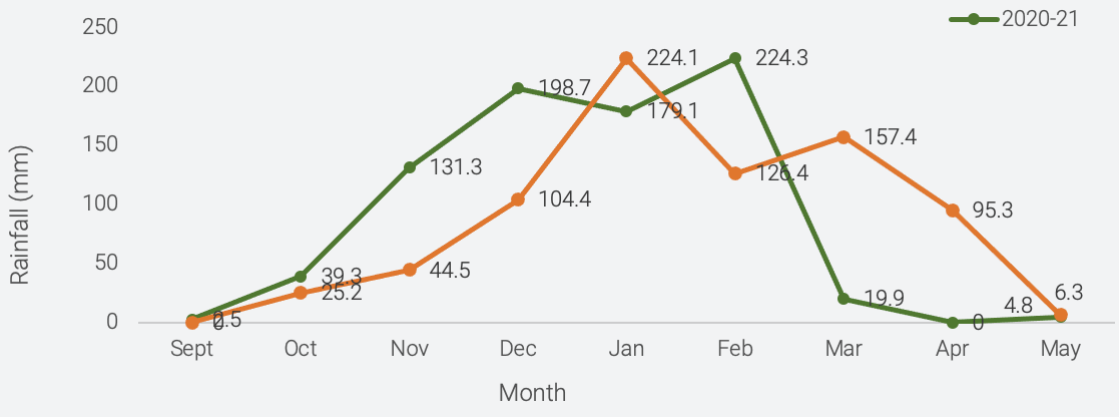


Fig 7.2: *Banket Station monthly rainfall for January to December (2021 and 2022)*

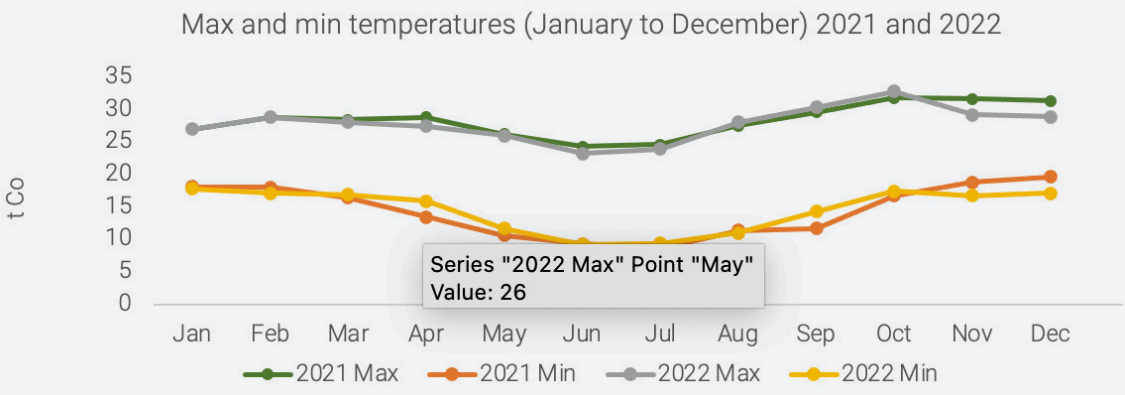


Fig 7.3: *Banket Station monthly temperature data (Jan – June) 2021 and 2022*

expected cures as 60% of the cured leaf fixed green due to prolonged humid conditions experienced during the curing phase.

B RK4 commercial leaf crop

The station was tasked to produce 2,000 kg of B RK4 commercial leaf on one hectare under dryland cropping. During the early vegetative stage, the crop experienced severe moisture stress, resulting in uneven growth. The station saved the crop by watering the plants using a bowser. Then some sufficient rains received later, allowed the crop to recover. As a result, a total of 2,790 kg of cured leaf was realized, which was 140% of the set target.

Seed potato production

The Tobacco Research Board, under the Zimbabwe Potato Micropropagation Association, started producing seed potato tubers, in an effort to actualize the agriculture and Food Systems Transformation Strategy (2020-24) and the Agriculture Recovery Plan (2020-24). The station was tasked with multiplying 2.54 ha of Diamond G0 seed potato tubers to G1. A total of 667,990 saleable tubers were realized, which is 76% of the target of 879,056 tubers. This indicates that the crop grew well, but did not meet the target set. However, it is worth noting that a total of 214,457 tubers were destroyed due to infestation with potato tuber moth, which accounted for a 24% loss of the total harvested tubers of 883,523. This is a significant loss and highlights the importance of pest management in seed potato production. Despite the loss, the project realized a net profit of USD 51,342, which is a positive outcome. This indicates that the project was economically viable and profitable, despite the challenges faced with pest infestation.

Fig 7.8: *A healthy Diamond seed potato crop at Banket Station.*

Corporate Social Responsibility

A total of 15 inmates and two officers from the Zimbabwe Prisons and Correctional Services (ZPCS) based at the station were trained in various aspects of tobacco and seed potato production and graduated.

ORIENTAL STATION

The station received a total of 638.6 mm of rainfall during the period against a long-term annual average of 650 mm. The season started late and the monthly total rainfall figures recorded for the period were generally lower in comparison to the previous season (Fig 7.9). The highest and lowest rainfall figures for the season were recorded in January and March respectively. A mid-season dry spell was experienced between February and March.

Services to Divisions

Site for tobacco experimentation

One flue cured tobacco Cooperative Cultivar trial (CCT) for Plant Breeding Division established on 0.23 ha was managed at Oriental Station. Trial management included data collection, reaping and curing. The cured leaf for the trial was submitted to Plant Breeding division at the end of the season for grading.

Site for Seed Production

A plot for K R26R tobacco seed was established at the station and seed processing was completed. A total of 171 kg of processed seed was obtained against a target of 100 kg.

Site for G HR1 rotation crop :

Some 41.5 kg of G HR1 seed for rotation crops were produced.

Housing project

Repairs and maintenance of the village staff houses damaged by a storm in 2019 were done. Repairs for House number 4 which experienced extensive damage were completed and the unit was now habitable. Outstanding were some repairs for Houses 3 and 5.

Water project

The backup system for the station's water supply was completed. This includes the integration of back-up storage (water bladders) to the raw water and clean water supply and installation of booster pumps for distribution of water to fields and work stations.

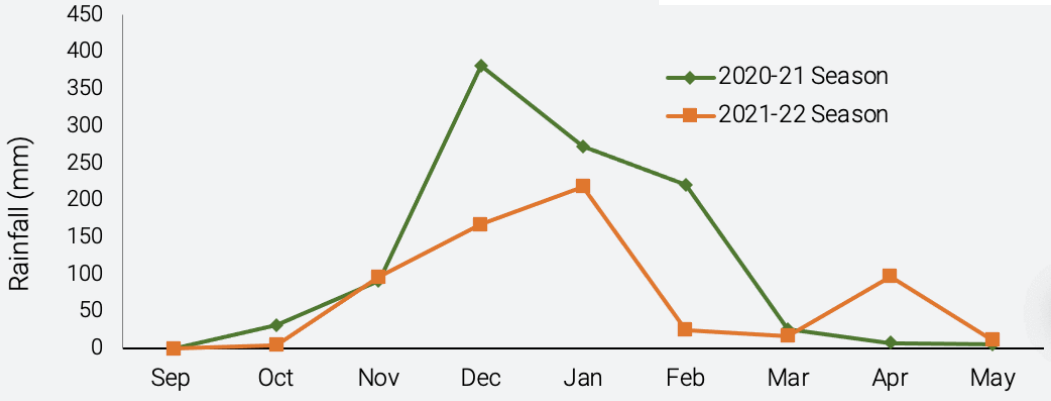
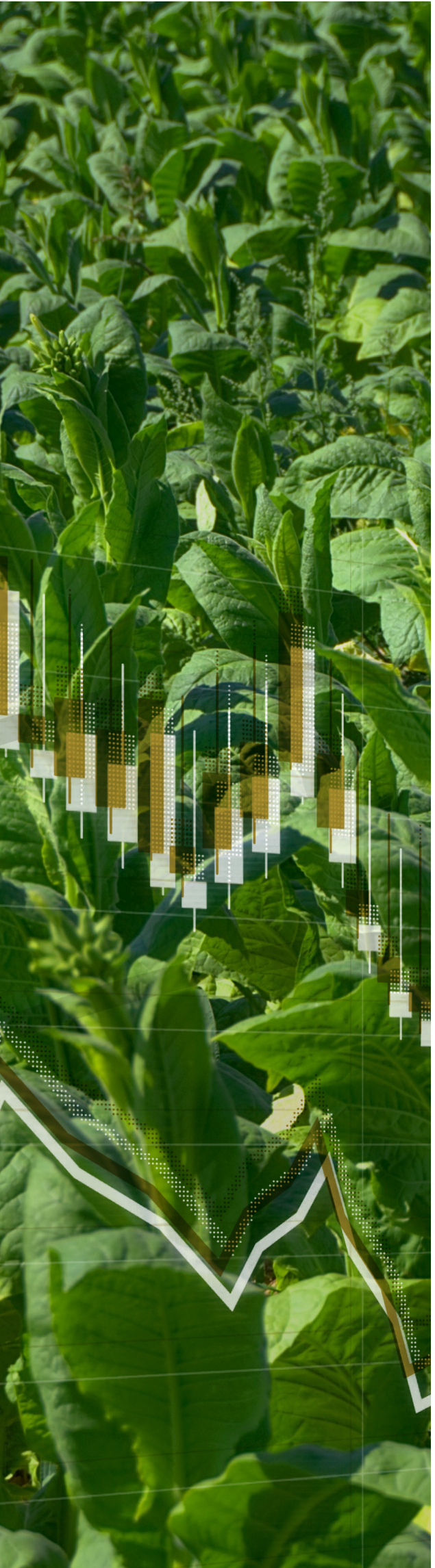


Fig 7.4: *Banket Station monthly rainfall for January to December (2021 and 2022)*

TOBACCO RESEARCH BOARD
KUTSAGA

08 Statistical Services

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



DESIGNING EXPERIMENTS

In 2022, a total of one hundred and five lab, greenhouse, and field experiments were established for the Research and Extension sector. From these, only fifty-two new designs were recommended whilst the rest carried on with the statistical designs from the previous season. The designing of experiments is done to ensure that the right type of data and enough of it is collected for analysis. Fig 8.1 below shows a biometrician discussing an experiment with a plant breeder.

Fig 8.1: *Biometrician giving advise to a Plant Breeding researcher on experimental design*

DATA ANALYSIS AND INTERPRETATION

Three hundred and five data sets were entered and validated whilst four hundred and nineteen data sets were analyzed giving a 16.38 % increase in data sets analyzed as compared to the same period last year (Fig 8.2). Eleven monthly projects' status reports were sent to management and Researchers.

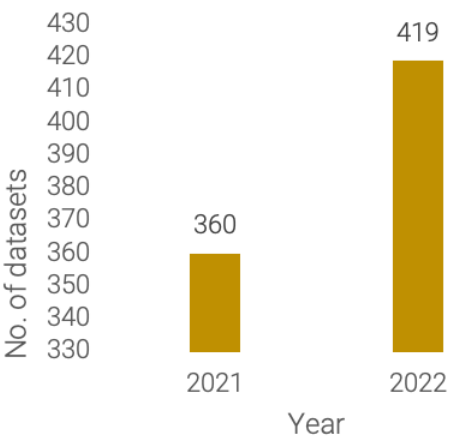


Fig 8.2: *Number of datasets analysed in 2021 and 2022*

BIG DATA ANALYSIS

Big data analytics involves the collection, examination, and analysis of large amounts of data to discover trends, insights, and patterns that can make data-informed decisions.

Using the aphid catches data collected by the Entomology department as well as the weather variables data for the period of 2016 to 2021, a model that can predict aphid counts for the next six months using weather variables data from 2016-2021 was developed using Vector Auto Regression Model (VAR). It is a multivariate time series model that relates current observations of a variable with past observations of itself and past observations of other variables in the system.

$$\text{Aphid Counts} = 31.48 - 1.20\text{Temp\_Max}_{t-1} + 0.45\text{Aphid Count}_{t-1} + 1.56\text{Temp\_Max}_{t-2} + 0.26\text{Aphid Count}_{t-2} - 1.22\text{Temp\_Max}_{t-3} - 0.17\text{Aphid Count}_{t-3}$$

CONSULTANCY

One-on-one consultancy services were offered to researchers on numerous statistical queries. Researchers were assisted with the interpretation of statistical results, laying out of trials, and advised on whether to salvage or terminate experiments that were affected by weather vagaries. Thirty-two visits were made to various field, lab, and greenhouse experiments. These comprised visits to the field, out-stations, greenhouses, and labs.

TRAINING

Training sessions were conducted in the Lecture theater on Experimental designs for new students as well as a refresher course for other staff members. Another training was offered to Research officers on the Importance of data integrity in research and how researchers can ensure data integrity in the research process. This will ensure the continuity of high-quality research at the institute as shown by the data's consistency, accuracy, and completeness.

The team was also involved in facilitating training on the functions of the DACOM weather station and sensor technology. The station consists of a sensor to measure real-time data on temperature and relative humidity, a rain gauge, and a datalogger with a solar panel and communication function. This technology will intensify research work in the areas of insect control, disease control, irrigation management, fertilizer management, and in-depth weather analysis

TOBACCO RESEARCH BOARD
KUTSAGA

09 Information & Publicity

LIST OF TRB PUBLICATIONS 2022

In the year 2022, seven scientific papers were published in high impact journals. Four were presented at a CORESTA Conference, one in the Bio nature Global Press hub and another in the highly esteemed University of Oxford-Plant Chemetics. Seventeen advisory letters to growers were sent alerting them of any emerging threats to the tobacco production value chain.

Table 9.1: *Peer Reviewed Publications*

Title	Author(s)	Journal
DNA Barcoding: A Practical Application	G. Zvobgo	CORESTA. October, 2022
Sustainable Soil Health solutions: Evaluation of biofertilisers for use on tobacco in Zimbabwe	D. Chinamo	CORESTA October, 2022
Molecular pharming techniques for implementation in the Zimbabwean context	T. Gukuta	University of Oxford- Plant Chemetics, October, 2022
Efficacy of biological & ecofriendly CPAs Sub-group report	R. Mavuka	CORESTA October, 2022,
Progress towards the evaluation of bio-control based insecticides & fungicides for use on tobacco in Zimbabwe	Z. Jazi	CORESTA, October, 2022
A novel method of using indigenous wood rotting fungi lignin degradation of tobacco stalks	N. Mgocheki, T. C. Marongwe, M. Marunda and M. Ganda, B Mawire	Bio nature Global Press hub September,2022
Monilinia fructicola is not the causal agent of stone fruit rot in Zimbabwe	M. Mabika, N. Mapope, C. Chinheya, E. Ngadze and E. Carstens	South African Journal of Plant and soil. July, 2022

Table 9.2: *Presentations at Conference/Workshop*

Title	Author(s)	Journal	Date of publication
Applications of gene editing for crop improvement in Zimbabwe.	G. Zvobgo	Genome Editing Training (MSU),	November, 2022
Tobacco Phytotoxicity Discussion	R. Mavuka	TRB	October, 2022
Tobacco Production Advisory	F. Zinyandu	Agribusiness Media Webinar	September 2022,

Table 9.3: *Farmer Magazine Articles*

Title	Author(s)	Journal	Date of publication
Timeous and effective weed management in tobacco; enabling your choice of variety to attain its yield potential	F. Zinyandu	Maricho magazine	Feb 2022
Control of major foliar diseases of tobacco	C. C. Chinheya, S. Dimbi and M. Marunda	Zimbabwe Tobacco Today	Apr 2022
Soil compaction- the silent yield killer in tobacco production	D. Rukuni	Zimbabwe Tobacco Today	Jun 2022
Reducing the risks associated with pesticide exposure from empty pesticide containers	R. Mavuka	Zimunda farming magazine	Sept 2022
Choosing the right tobacco variety for your area	F. Magama	Zimpapers Agriculture journal	Sept issue no. 1, 2022
Kutsaga, Centre of excellence in Tobacco Research that deserves support	TRB	Boka Farmers` magazine	Sept 2022
Tips for transplanting tobacco seedlings	TRB	Zimbabwe Tobacco Today	Sept Issue, 2022
The role of sweet potatoes in the Zimbabwean economy	J. Mugabe	Zimunda magazine	Issue no.10, 2022
Tobacco phytotoxicity alert	S. Dimbi	Zimunda magazine	Issue no.10, 2022

Tobacco agronomic practices for sustainable, economic production	C. Chibudu	Zimunda magazine	Issue no.10, 2022
Major foliar diseases of tobacco	Chinheya CC, Dimbi, S & Marunda M.	Zim. Tobacco Today.	Apr 2022
Managing drought in tobacco production"	D. Rukuni	Maricho Magazine	February, 2022
Tobacco Research Board steps up research into economically viable alternatives to tobacco"	S. Dimbi	Maricho Magazine	February, 2022

Table 9.4: *Dear Grower Letters*

Title	Author(s)	Journal	Date of publication
Fertiliser leaching adjustments in tobacco	D. Chinamo	Dear grower	27 Jan 2022
Angular leaf spot control	Mike Marunda	Dear grower	19 Jan 2022
Control of major foliar diseases on tobacco	C Chinheya, S Dimbi and Mike Marunda	Dear grower	28 Jan 2022
Status Of Industrial Hemp (Cannabis Sativa L.) Research At Kutsaga	R. Mavuka	Zimunda farming magazine	Sept 2022
Research	K. Mateva	Dear Grower	12 May 2022
Stalks destruction reminder	Z Jazi and Mike Marunda	Dear Grower	6 May 2022
Approved agrochemicals for use on tobacco	Z Jazi	Dear Grower	3 May 2022
Research progress on Biological Control	Chinheya C C and Dimbi S	Dear Grower	5 May 2022
Smuggling in, production and selling of unprescribed tobacco varieties in Zimbabwe	F. Magama	Dear grower	7 July 2022
Agrochemicals approved by TRB	Z. Jazi	Dear grower	31 Aug 2022
Some tobacco transplanting advisory	F. Zinyandu, S. Dimbi and R. Mavuka	Dear grower	06 Sept 2022
Pest and Disease Management in the seedbed	Chinheya C C	Dear grower	22 Sept 2022
Tobacco phytotoxicity alert	S. Dimbi	Dear grower	13 Oct 2022
Use TRB tested and appropriately registered tobacco agrochemicals only	S. Dimbi	Dear grower	17 Oct 2022
Premature and Early Flowering in Tobacco and Its Management	F. Mukoyi and K. Mateva	Dear Grower	28 Dec 2022
Annual tobacco stalk destruction reminder	Z Jazi	Dear Grower	April, 2022
Agrochemicals approved by the TRB.	Z Jazi	Dear Grower	April, 2022

Table 9.5: *Articles Written about TRB in various publications*

Title	Author(s)	Journal	Date of publication
Research key to survival of Zim`s tobacco industry	Dr Garwe	Herald Newspaper	14 Feb 2022
Take measures to eradicate aphids in potato	D. Rukuni	Herald Newspaper	21 Jun 2022
Energy saving tobacco barn to curb deforestation	O. Mharapara	Herald Newspaper	26 Aug 2022
Tobacco farmers urged to embrace float tray system	C. Chinheya	Sunday Mail,27 Aug 2022	27 Aug 2022
15 Zimbabwe firms exhibit in Mozambique	M. Nyakachiranje	Herald Newspaper	30 Aug 2022
Zimbabwe to tap into Mozambique Agriculture opportunities	O. Mharapara	Herald Newspaper	2 Sept 2022
Experts forecast record 2022/23 tobacco hectarage, as seed sales soar	O. Mharapara	Herald Newspaper	6 Sept 2022
Power of golden leaf as vehicle of economic emancipation	C. Chibudu	Herald Newspaper	9 Sept 2022
Call for farmers to clean tobacco barns	O. Mharapara	Newsday	16 Sept 2022
The TRB has urged farmers to ensure that tobacco barns are clean	O. Mharapara	Newsday	16 Sept 2022
The TRB urges tobacco farmers to choose recommended varieties	TRB Researchers	Newsday	21 Sept 2022
Small holder farmers slow to embrace float trays	G. Khuddu	Herald Newspaper	21 Sept 2022
TRB Rebrands	O. Mharapara	Sunday Mail	22 Sept 2022
Tobacco value chain transformation plan: actors respond	O. Mharapara	Herald Newspaper	22 Sept 2022
The TRB urges tobacco farmers to choose recommended varieties	F. Magama, F. Mukoyi, R. Ruzane	Newsday	23 May 2022
Choosing the right tobacco variety for your area.	TRB	ZimPapers Agriculture Journal	Sept Issue no. 1, 2022
Why annual clean-up of barns and tobacco storage facilities is vital	S. Dimbi and Z. Jazi	Herald Newspaper	03 Oct 2022
Reprive for Zimbabwe Tobacco	F. Magama	Herald Newspaper	18 Sept 2022
432 tobacco farmers convicted	T. Mugabe	Sunday Mail	04 Oct 2022
President appoints Dr. Magama to shepherd Tobacco Research		Herald Newspaper	13 Oct 2022
TRB appoints substantive CEO	TRB	Sunday Mail	20 Oct 2022
Farmers receive training on sustainable tobacco production	G. Khuddu	Herald Newspaper	21 Oct 2022
Seedbed pest and disease control	C. Chinheya	Zimpapers Agriculture Journal	Oct Issue no. 2, 2022
Tobacco agronomic practices for sustainable, economic production	C. Chibudu	Zimpapers Agriculture Journal	Oct Issue no. 2, 2022
Do not buy fertilizers, seed and chemicals from the street		Herald Newspaper	23 Nov 2022
NEW: 400 hectares tobacco damaged by fake chemicals	S. Dimbi	Herald Newspaper	18 Nov 2022
Afforestation programme to spawn revenue for schools	O.Mharapara	Herald Newspaper	17 Nov 2022
Moving towards a sweet potato driven economy	J. Mugabe	Zimpapers Agriculture Journal	Nov Issue no. 3, 2022
Responsible pesticide use on tobacco	S. Dimbi	Zimpapers Agriculture Journal	Nov Issue no. 3, 2022
The use of bio-fertilisers for sustainable tobacco production	D. Chinamo	Zimbabwe Agriculture Journal	issue no. 4 Dec 2022
Management of Pythium and Rhizoctonia in tobacco float beds	Mike Marunda and Zimazile Jazi	Pamphlet	8 Sept 2022

TOBACCO RESEARCH BOARD
KUTSAGA

10

Business Development & Marketing

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

KUTSAGA PRODUCTS BRAND AWARENESS

The Division continues to take marketing initiatives to heighten awareness of Kutsaga products and services in an endeavour to connect and maintain long-life relations with growers. The TRB's products and services were showcased at 12 agricultural shows, 46 Field days, 288 growers' meetings, and 37 discussion forums around the country.

Client engagement was augmented through digital marketing platforms. Advertising, informative and advisory content was posted on Facebook, Twitter, YouTube and LinkedIn. An upward trend was recorded on digital media platforms traffic indicating positive interest and improved awareness on Kutsaga products and services.

REGIONAL BUSINESS

Tobacco Research Board continues to increase its market share in the regional market not only for tobacco seeds but for other Kutsaga products. During the period under review Agents in Zambia increased their volume of sales by 30%.

An increase in seed exports was recorded during the year. Seed exports increased by 74% in comparison to the previous year. Some 811 kg of tobacco seed were exported to Mozambique, Uganda, Malawi, Bangladesh, Brazil, Rwanda, Tanzania, Madagascar, and Zambia. B RK 4 and KR K 26 R continue to be the most preferred varieties in the regional market.

The Board participated at the Maputo International national Trade fair held in Marracuene district, province of Maputo in Mozambique from the 28th of August 2022 to 4 September 2022. A number of clients from Mozambique showed interest in Kutsaga products and services, sales leads were gathered, and strategic business partnerships were initiated to capitalise on market opportunities identified.

Potential clients inquiring on Kutsaga products in Mozambique during the Agribusiness Systems nursery in Boane Mozambique; Maputo International Trade Fair. A client sourced during the Maputo trade Fair.

STAFF TRAINING

Along with several developmental programs for sales representatives to enhance customer support skills, an interactive training program was conducted on customer care and product knowledge. The training was targeted at improving the quality of customer service delivery. A total of fifty-one sales team members inclusive of students were engaged to man Kutsaga selling points around the tobacco growing areas. The Division mentored 35 students on attachment from the University of Zimbabwe, Midlands State University, Catholic University, Bindura University and Chinhoyi University.

Victoria Musimurimwa (Head Office Sales Rep), Itai Mazhangarara (Regional Agronomist for Manicaland and Midlands) and Newton Mutasa (Regional Agronomist for Mashonaland West) completed their master's Degrees in Business Administration while Anorld Jeche (Regional Agronomist for Mashonaland Central) successfully completed his Diploma in Agroecology.

PRODUCTION AND SALE OF PRODUCTS

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.

A total of 68 000 bags of GromixUltra; 196 000 float trays and 68 000 litres of floatfert were produced. However, production was adversely affected by the unavailability of inputs and raw materials in the first quarter of the year due to financial resource constraints following economic headwinds. The situation improved in subsequent quarters and all products were available for the rest of the season.

Product Sales

The following products were sold during the period under review; 58 000 bags of GromixUltra; 151,000 float trays; 56,000 litres of floatfert and 6 585 000 worth of tobacco seedlings. The major focus was on increasing sales growth through strengthening relationships and fostering personalised interactions with growers.

AWARDS & ACCOLADES

The Tobacco Research Board won the ZimTrade Exporter of the year runner -up award in the Agriculture inputs sector in recognition of its commitment and growth in the export market.

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 sessions which covered topics ranging from seedling production, transplanting as well as reaping and curing (Fig.9.1) were well attended in all tobacco-growing areas. The year ended with five thousand

six hundred and twenty-five (5 625) farmers having received training against a year-end target of six thousand (6 000). Apart from the routine technical aspects, emphasis was put on producing tobacco in a sustainable manner. The team focussed on variety choice, irrigation methods, crop protection agents handling (use and disposal), afforestation, child labor, and protective clothing. As part of Corporate Social Responsibility, the Training and Extension team partnered with Public Relations personnel in distributing free gum seedlings to schools as well as growers in the Tobacco Improved Productive Site scheme.

Fig 10.1: *TRB Officer Mr. Chivasa conducting reaping and curing training in Mashonaland East.*

In line with sustainability and also objectives to reduce post-harvest losses as enunciated in the Tobacco Value Chain Transformation Plan, T+E engaged in a districts blitz of showcasing a new initiative that is a tobacco steam boiler (Fig. 9.2a & b) that is fired by wood and produce the right mist for condition cured leaf. It is expected that there will be a huge uptake of this misting equipment in the coming seasons.

Fig 10.2: (a) *Tobacco steamer on display at Wedza Ward 11 Tobacco field day*

Kutsaga TIPS

In a bid to promote Kutsaga varieties as widely as possible as well as to bridge the interaction gap created by the COVID pandemic, TIPS groups hosted variety demonstration plots to showcase the agronomic performance of selected varieties. This initiative was carried out at 98 Tobacco Improved Productivity Scheme (TIPS) groups spread across the four major tobacco-growing provinces. The localized variety demonstration concept was well received and appreciated by growers.

Fig 10.3: *TIPS growers practicing clipping.*

Outreach Activities

Training and Extension staff carried out routine farm visits to assess the performance of seedbeds established at the beginning of the season. The season progressed well apart from the few complaints of salt and cold injury as well as Pythium which were attended to in time. Of special mention is the 12-hectare float seedbed established for Mozambique Leaf Tobacco (MLT) and the subsequent follow-up visits to monitor the seedbed performance.

To achieve its mandate of disseminating information to all growers, the Training and Extension team shot a transplanting awareness video which aired on the national ZTV as well participated at various platforms such as agricultural shows, field days, and tobacco discussion groups. The institution won several awards at the various agricultural shows which were held at districts and provincial levels.

LIAISON

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

Tobacco Advisory

In the past year, large, medium and small-scale tobacco growers were interacted with through mainly 61 advisory farm visits against a planned 50 grower visits; and two field discussions against a planned five field days in the various tobacco growing districts. Additionally, several interactions were made virtually to support the grower in real-time, and solve problems before they got out of hand.

In tobacco seedbeds, the float system had major inquiries and discussions were on poor germination due to hard pellets; dry cells; clear plastic/nappy liner temperature management issues, fungus gnat, salt injury, Pythium root-rot, fertilizer burn and chemical phytotoxicity. In the field, several growers were affected by herbicide, insecticide, fungicide phytotoxicity, water-logging, and leaching due to excessive rains. Furthermore, the use of unregistered/deregistered agrochemicals was an issue of great concern and several growers were affected.

Some growers experienced J-rooting and stunting of planted seedlings due to soil compaction which is becoming a prevalent problem since many growers appeared to have abandoned deep sub-soiling (ripping) as a routine tillage practice, or are not using the recommended ridging on the rip-line technique to encourage deeper root penetration. This has promoted the Liaison team to concentrate on imparting key techniques on tillage practices.

Seed Potato

Activities under the Zimbabwe Potato Micropropagation Association (ZPMA) continued to expand exponentially with a total of 820 field and tuber inspections against a planned 150 inspections. For the first time, there was plenty of G4 seed potato for sale, augmenting revenue generation for the year. The total seed potato production program was at 181 ha with 75 growers for the variety Diamond, and 37 ha at 16 growers for Hermes, bringing the total area to 218 ha at 91 out-growers.

The grower base has expanded, and currently there are growers in Mt. Darwin, Karoi, Arcturus, Banket, Beatrice, Bindura, Centenary, Chakari, Chegutu, Norton, Zvimba, Domboshava, Mvurwi, Marondera, Glendale, Lalapanzi, Mhangura, Rafingora, Kwekwe, Masvingo, Gweru, Chipinge, Middle Sabi, Mwenezi, Zhombe, Rusape, Odzi, and additionally, this year saw an increase in growers from the Nyanga area.

As part of keeping the growers up to date with technical information, the ZPMA seed potato growing guide was produced and is awaiting printing, while the SOP for seed potato production was circulated through email and WhatsApp.

Fig 10.5: *Advisory services being rendered during one farm visit to share information on float seedbed management.*

Additionally, a seed potato cold storage space was built, completed and now in use; and will help store the G4 seed potato for longer periods when demand is low, thus reducing spoilage, notwithstanding, additional cold storage space is still required to handle growing volumes. Large quantities of seed potatoes were lost in the year due to rots that could not be contained at ambient temperatures in and outside the make-shift storage spaces. Also, more vehicles need to be availed to allow for improved operational efficiency for an expanded seed potato production program, thus increasing revenue generation for the Board.

In conclusion, the seed potato production program is slowly achieving the intended purpose of import substitution in order to save scarce foreign currency.

This facility will allow G4 seed to be kept for longer periods without spoilage when there is low demand for seed, such as during winter.

Staff matters

Dr. C. Kashangura was transferred to the Crop Production and Molecular Technologies Division in August, 2022.

AWARDS

During the period under review, Kutsaga products and services were exhibited at eight (8) agricultural shows held at district and provincial level. The institution won several awards namely:

- First Place Research Institution Category – Manicaland Show.
- First Place Parastatal Agribusiness Category – Mashonaland West Show.
- First Place Boards Category – Mashonaland Central Show.
- Second Place Overall winner – Mashonaland Central Show.
- Third Place Government Parastatal Category – Mashonaland East Show.

TOBACCO RESEARCH BOARD
KUTSAGA

11 Human Resources

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.

EXECUTIVE SUMMARY

The human resources strategy aligns with the institutional Strategy and its major transformation workstream through the Integrated Results Based Management (IRBM). This annual Human Resources report summarizes the results of the year 2022's people strategy efforts. During the period under review, Dr Garwe, resigned, and Dr Magama was appointed the Chief Executive Officer in September 2022.

LEARNING AND DEVELOPMENT

Staff development is part of the institutional capacity building approach to support staff in career development, on-the-job learning, knowledge-sharing to enhance a high-performance culture. Staff of all grades participated in the Financial literacy training that was facilitated by Old Mutual and the Zimbabwe Securities Exchange Commission.

Senior members of staff were involved in Corporate governance training, the training majored on the following,

- The Public Entities Corporate Governance Act [Chapter 10:31),
- The Public Entities Corporate Governance [General] Regulations, 2018,
- Board Induction Training for Public Entities,
- Strategic Planning Guidelines for Public entities,
- Accountability, Transparency and disclosure,
- Structure and Conduct of Meetings for Public Entities.

Research scientist or professionals were involved on various on the job learning by participating in various local, regional and international conferences, particularly CORESTA.

STAFF HEALTH AND WELL-BEING

The health and well-being of the workforce underpins the institution's ability to achieve its strategic goals and are essential components of Institutional success. Recognizing that healthy organizations achieve more, the TRB is aligning its health and well-being strategy with its new operating model at all levels of the institution to ensure a healthy work environment for all. To that end, every Friday afternoon has been dedicated to staff wellbeing programmes, these include, Sports, ZUMBA, Mini soccer, meditation and a reading culture.

As part of the Staff health and well-being programme the Mental Health awareness was conducted and the institution facilitated activities to support and promote mental health at the workplace. Individual support, interactive presentations and support to teams on a range of topics were facilitated. The Kutsaga Health Centre has attended to two thousand six hundred and eight (2608) visits by Staff and their dependents during the period under review. In addition, the Kutsaga Health Centre continues to provide counselling and after service support to staff and their dependents, and in some programs to the community at large.

EMPLOYEE RELATIONS

Management continues to monitor and reform of the employee relations system resulting improvements in the employee engagement index with a greater emphasis on information sharing the through the ongoing staff briefs, this is despite the challenging operational economic environment. During the period under review, employee relations were relatively stable, although the economic instability has created some difficulties for staff especially the persistent inflationary pressures and loss of value of disposable incomes.

Worker Representative Committee

A Worker Representatives Committee (Workers Committee) of fifteen (15) members was elected and subsequently trained by Officials from the Ministry of Labour and Social Welfare.

Trade Union Engagement

The General Agriculture and Plantation Workers Union of Zimbabwe held consultative meetings with the NEC Graded staff. The meetings were part of the institution initiatives to improve employee engagement at all staff levels.

STAFF MOVEMENTS

Engagements	19
Resignation	11
Retirement	5
Dismissal	4
Deaths	3

HEADCOUNT AS AT DECEMBER 2022

Description	2021	2022
Permanent /Full time	218	227
Fixed Term Contracts	93	103
NEC Graded Staff	483	653
Work Related Learning	34	43

TOBACCO RESEARCH BOARD
KUTSAGA

12 Internal Audit

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 organisational value.

AUDIT ASSIGNMENTS

The Internal Audit division started functioning for the year effective July 2022 when the Head Internal Auditor was engaged.

The following audits were done during the period July 2022 to December 2022;

Audit	Number
Routine	2
Ad hoc	3
Seed Kiosks spot checks	5
Off-station visits	5

Other than the audits, the Internal Audit division also prepared the following statutory documents;
- Annual risk-based Audit Plan for 2023
- Rolling Strategic Internal Audit Plan 2023-2025
- Internal Audit Charter

RISK

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

Category Risk	Risk
Operational	Failure to meet target production due to equipment breakdown, power cuts, inadequate water to irrigate crops Risk of veld fires, floods, drought
Financial	Failure to meet financial needs due to low revenues, cash inflow and bad debts Increased production and maintenance costs due to price increases
Labour	Risk of lower productivity and inefficiencies due to staff attrition and shortage of staff Risk of unethical behavior due to erosion of salaries

STAFF ISSUES

The Head Internal Auditor attended management training on Board Induction.

TOBACCO RESEARCH BOARD
KUTSAGA

13 Corporate Governance Report

For the year ended 31 December 2022

INTRODUCTION

For TRB, corporate governance involves how the Institution works and is organised to achieve its strategic objectives and deliver value to its stakeholders.

Corporate governance at TRB is based on both internal and external rules. The external governance rules are embodied in our establishing statute, the Tobacco Research Act [Chapter 18:21], Public Entities and Corporate Governance Act [Chapter 10:31], Public Finance Management Act [Chapter 22:19] and the National Corporate Governance Code 'ZimCode'. The internal rules include the Board Charter, Ethics Code and the policy documents adopted by the institution. The above governance framework set the governance and management standards that guide the operations of the institute. It endeavours to foster responsible conduct by our staff members particularly as this relates to compliance with all laws, disclosure of any conflicts of interest and conducting all their dealings honestly and ethically.

The continued success of the institution depends on the vibrancy of the above framework and our compliance with and adherence to the above corporate governance rules. The Board regularly reviews these structures and mechanisms to ensure they are consistent, both in form and in substance, with the regulatory requirements and best practices and helps us evolve with changing times.
The Board considers that the institution is substantially in compliance with the Public Entities and Corporate Governance Act [Chapter 10:31], Public Finance Management Act [Chapter 22:19] and ZimCode.

THE BOARD OF DIRECTORS

The Board of Directors has the ultimate responsibility for the governance, strategic direction, management and monitoring of the performance of the institution on behalf of the Government of Zimbabwe. The Board is constituted in terms of section 5 of the Tobacco Research Act [Chapter 18:21] as read with section 11 of the Public Entities Corporate Governance Act [Chapter 10:31]. The Board conducts its business in line with a Board Charter developed in terms of section 27 of the Public Entities Corporate Governance Act [Chapter 10:31].

Responsibility for the day-to-day management of the Institution has been delegated to the Chief Executive Officer (CEO) and his management team.

COMPOSITION

The Board comprises a majority of non-executive directors with seven non-executive Directors and one executive director. It is chaired by a non-executive chairman and meets at least once every quarter. The composition of the Board is designed to ensure that it independent of management and has the appropriate mix of skills and experience to drive the success of the institution.

BOARD 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.

EVALUATION OF THE BOARD

The work of the board is continuously evaluated and the evaluation is used to develop the work of the board. The Public Entity Corporate Governance Act [Chapter 10:31] sets out a process for evaluating the performance of the Board, its committees and individual directors. This process occurred during the year and was led by the Chair.

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 eight (8) meetings during the period under review. The attendance rate for all the directors was eighty-six percent (86%).

The Finance, Administration and Human Resources Committee held six (6) meetings. The attendance rate for its members was eighty-nine percent (89%).

The Research Extension, Business Development and Marketing Committee held four (4) meetings and the attendance rate was eight-seven and five-tenths (87.5%).

The Audit and Risk Committee held five (5) meetings. The attendance rate was ninety-three percent (93.3%). attendance rate.

A table summarizing individual attendance at the Board of Directors and Committee meetings is provided below.

(From 1 January to 31 December 2022)

Board Meetings

Board Meetings	Total number of meetings held	Number of meetings attended
S Mutepfa	8	8
F Mtambanengwe	8	6
I Chiganze	8	8
C Garise-Nheta	8	6
F Miti	8	8
A Denenga	8	6
D Kutywayo	8	6

Finance, Administration and Human Resources Committee

Finance, Administration and Human Resources Committee	Total number of meetings held	Number of meetings attended
I Chiganze	6	6
C Garise-Nheta	6	4
A Denenga	6	6

Research & Extention and Business Development and Marketing

Research & Extention and Business Development and Marketing	Total number of meetings held	Number of meetings attended
F Mtambanengwe	4	4
I Chiganze	4	3
F Miti	4	3
D Kutywayo	4	4

Audit and Risk Committee

Audit and Risk Committee	Total number of meetings held	Number of meetings attended
I Chiganze	5	4
C Garise-Nheta	5	5
A Denenga	5	5

SOCIAL RESPONSIBILITY

TRB prides itself on being a responsible juristic citizen. TRB is conscious of its social responsibility which, inter alia, includes the obligation to conduct our affairs in an economically, socially and environmentally sustainable manner. Towards that end, TRB pursues a two-pronged sustainability strategy; economic self-sufficiency and promoting the sustainable production of tobacco.

The Board is also conscious of its responsibility towards the institution's stakeholders and believes this is an important consideration for the continued success of the institution. During the reporting period, the Institution increased its social media presence to improve its engagement with stakeholders through various channels, including Facebook and Twitter. The institution also regularly engages with regulators and government agencies.

Our social responsibility strategy is informed by the principles;

(i) Adherence to the highest standard of professional ethics;
(ii) efficient and economical use of resources;
(iii) Providing sustainable benefits for our stakeholders;
(iv) Minimising our impact on the environment, both directly and through what we do for our stakeholders;
(v) Providing support for the well-being and development of our staff; and
(vi) Securing financial self-sufficiency.

ECONOMIC SELF-SUFFICIENCY

TRB recognises that its first social responsibility is to be economically self-sufficient so as not to be a financial burden on the State. Towards that end, TRB has a Business Development & Marketing Division that commercially produces agro-products and sells TRB's agro-produce notably tobacco seed, horticultural seedlings and seed potato. The revenue raised from these commercial activities constitute the bulk of the funding that TRB uses to fund its research activities.

PROMOTING THE SUSTAINABLE PRODUCTION AND USES OF TOBACCO

We want to contribute to the green transition of the tobacco production chain and meet our environmental responsibilities as a responsible research institution. It is in these areas that we believe we have the potential to make the most significant contributions to the development of society. TRB has dedicated itself to promoting the sustainable production of tobacco.

To that end, TRB is intensifying its research efforts into eco-friendly tobacco varieties such as cigar wrapping varieties and shisha tobacco which are both air cured as opposed to flu cured. This obviates the environmental damage associated with wood and coal fuel that is used in flu-cured tobacco varieties. We are also evaluating the efficacy of charcoal produced from sustainable plants such as kenaf and bana grass as a curing fuel.

During the period under review, TRB continued its research into plant-based vaccine production technology. The tobacco plant has promising biopharming attributes. It carries enormous potential to be a cheaper method of producing vaccines which can be immensely beneficial for a developing country such as Zimbabwe that does not have the financial and technological resources to produce vaccines in the more costly and complex conventional way.

TOBACCO RESEARCH BOARD
KUTSAGA

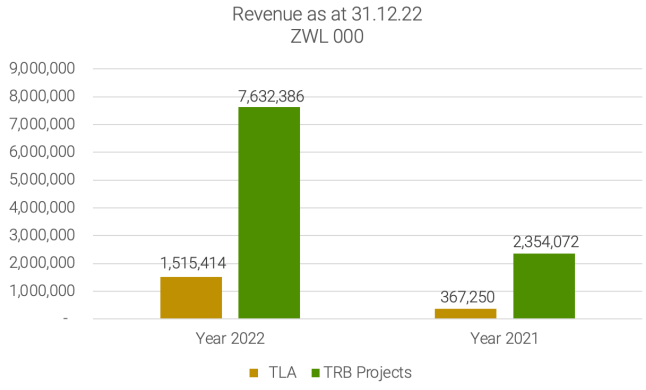
14 Finance & Corporate Services

STATEMENT OF PROFIT AND LOSS

Revenue

Revenue for the year 2022 went up by 213% in Historical terms from ZWL587 million in year 2021 to ZWL 1,84 billion in year 2022. In Inflation adjusted terms, the total revenue went up by 186%. TRB revenue is made up of a Tobacco Levy and income generated from its commercial projects. Receipts from the Tobacco Levy Account (TLA) went up by 313 % (224% inflation adjusted) while commercial income went up by 224% in Historical terms (231% inflation adjusted).

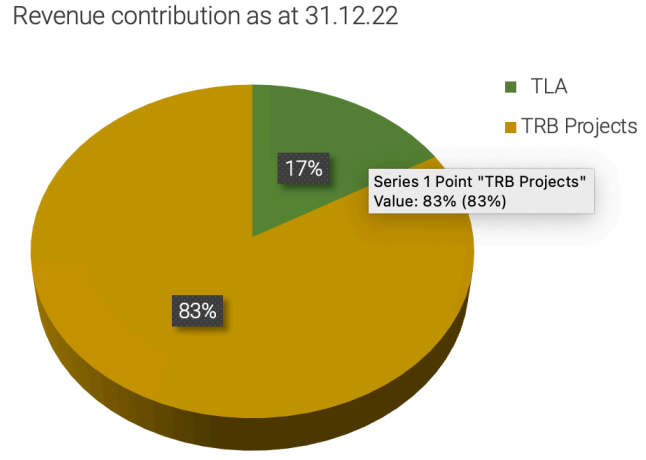
Year 2022 Revenue



The TLA contributed 17% to the total revenue while commercial revenue contributed 83% of total revenue. The major revenue lines were Tobacco seed, Seed Potato, Tobacco crop, Gromix and Float Trays.

Surplus

As at 31 December 2022 the surplus of ZWL4,33 billion (ZWL4,5 billion Inflation adjusted) was recorded compared to ZWL 124 million as at 31 December 2021. The surplus went up by 3392% (in historical terms (956% in Inflation adjusted)



Expenditure

Total expenditure for the year 2022 went up by 270% in historical cost terms and by 43% in inflation adjusted terms.

Operating costs consumed 3% of total revenue while administrations costs and staff costs consumed 16% and 20% respectively.

STATEMENTS OF FINANCIAL POSITION

The statement of financial position remained very strong with total assets going up by 452% from ZWL1,27 billion to 7,03 billion as at 31 December 2022. Non-current assets went up by 44% in historical terms (3% inflation adjusted). An increase of 641% in Historical terms was recorded in Current assets. The increase was mainly recorded in Inventories because of significant amounts of tobacco seed and seed potato that were on hand as at 31 December 2023. A significant increase was also recorded in Trade and other receivables due to outstanding debts owed by the surrogate contractors. Current liabilities increased by 361% (47% inflation adjusted). Trade and other liabilities included outstanding amounts owed to seed potato growers and tobacco seed growers. Short term loan is the Zimbabwe Leaf Tobacco (ZLT) loan of ZWL 199 million due for repayment at the next tobacco crop selling season.

STATEMENT OF CASH FLOWS

The year 2022 closed with a very healthy cashflow position. Closing cash and cash equivalents went up by 4,965% from ZWL42 million on 31 December 2021 to ZWL2,1 billion on 31 December 2022.

TOBACCO RESEARCH BOARD
KUTSAGA

15

Financial Report

For the year ended 31 December 2022

Directors' Responsibility and Approval of Financial Statements

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.

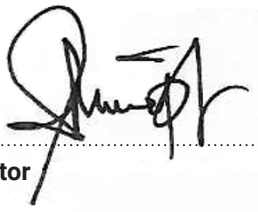
The directors are of the opinion, based on the information and explanations given by management, that the system of internal control provides reasonable assurance that the financial records may be relied on for the preparation of the financial statements. However, any system of internal financial control 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 87 to 89.

The financial statements set out on pages 90 to 117 which have been prepared on the going concern basis, were approved by the board of directors on 24/05/2023 and were signed on their behalf by:

Approval of financial statements



.....
Director

.....
Director

Independent Auditors' Report

To the Members of Tobacco Research Board

Qualified Opinion
We have audited the inflation adjusted financial statements of Tobacco Research Board set out on pages 91 to 118 which comprise the inflation adjusted statement of financial position as at 31 December 2022, and the inflation adjusted statement of profit or loss and other comprehensive income, inflation adjusted statement of changes in equity and inflation adjusted statement of cash flows for the year then ended, and notes to the financial statements, including a summary of significant accounting policies and other explanatory notes.

In our opinion, except for the matter discussed in the Basis for Qualified Opinion section of our report, the inflation adjusted financial statements present fairly, the statement of financial position of Tobacco Research Board Limited as at 31 December 2022, and its financial performance and its cash flows for the year then ended in accordance with International Financial Reporting Standards ("IFRS") and in the manner required by the Tobacco Research Act [Chapter 18:21].

Basis for Qualified Opinion
Impact of prior year Non-Compliance with International Accounting Standard 21 (IAS 21) – The Effects of Changes in Foreign Exchange Rates and International Accounting Standard 8 (IAS 8) – Accounting Policies, Changes in Accounting Estimates and Errors

The basis for qualification is due to misstatements contained in the opening balance for retained earnings of ZWL 2 703 511 960, which forms part of transactions that were affected by the following events:

- The opening balances for 2019 financial period were reported as USD end of 2018 financial year and translated to ZWL on the rate of 1:1 at the beginning of 2019. Additionally, transactions between 1 January 2019 and 21 February 2019 were recorded at the rate of 1:1 in compliance with SI33/19. Although the evidence in the market suggested that there was no longer parity between the USD and "local currency" up to 21 February 2019, the directors maintained an exchange rate of 1:1 in compliance with SI 33/19. This constituted a departure from the requirements of IAS 21.
- As the prior year financial statements have not been restated in accordance with International Accounting Standard 8 "Accounting Policies, Changes in Accounting Estimates and Errors" (IAS 8), the misstatements on the prior years' income statement is still carried forward in the current retained earnings balance. The effects of the noncompliance was considered material for the year ended 31 December 2022 but not pervasive.

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 Tobacco Research 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 most significance in our audit of the inflation adjusted financial statements of the current year. Key audit matters are selected from the matters communicated with those charged with governance, but are not intended to represent all matters that were discussed with them. In addition to the matters described in the Basis for Qualified Opinion section of our report, we have determined the matters described below to be the key audit matters. These matters were addressed in the context of our audit of the financial statements as a whole.

Our opinion on the inflation adjusted financial statements is not modified with respect to any of the key audit matters described below, and we do not provide a separate opinion on these matters.

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, management also evaluated and determined the economy of Zimbabwe to be hyperinflationary Tobacco Research Board applied the requirements of IAS 29 – Financial reporting in Hyperinflationary Economies. Hyperinflationary accounting was determined to be a matter of most significance to the audit due to high risk and the significance of the balances and transactions, and 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 IAS 29 are limited.	We obtained an understanding of the Tobacco Research Board process for identifying hyperinflationary economies and evaluated the policy in relation to hyperinflation accounting. Our audit procedures included, among others: • 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 tested restatement of statement financial position and income statement items for compliance to the requirements of IAS 29. • We assessed whether disclosures in the financial statements appropriately reflected the effects of the adoption of IAS 29. We found that the inflation adjusted financial statements have been properly restated 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 requirements of 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 organisation'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 organisation 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 statements 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 this financial statements.

As part of an audit in accordance with ISAs, 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 director's 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 Tobacco Research 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 statements to the related disclosures in the financial statements or, if such disclosure is inadequate, to modify our opinion. Our conclusions are based on the audit evidence obtained up to the date of our auditor's statements. However, future events and conditions may cause Tobacco Research Board to cease to continue as a going concern.

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.

Baker Tilly

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

Date 09/06/2023

Statement of Financial Posistion

as at December 31, 2022

	Note	INFLATION ADJUSTED 2022 ZWL$	2 021 ZWL$	HISTORICAL COST 2022 ZWL$	2021 ZWL$
Assets					
Non current assets		**1 427 308 004**	**1 387 364 942**	**580 153 140**	**403 679 278**
Property, plant and equipment	4	1 417 554 706	1 156 443 682	577 325 723	336 488 502
Financial assets at amortised cost	5	5 088 066	222 860 848	1 552 025	64 845 451
Biological assets	6	4 665 232	8 060 413	1 275 392	2 345 325
Current assets		**7 950 730 964**	**2 988 279 202**	**6 446 442 664**	**869 494 647**
Biological assets	6	393 174 937	328 025 619	393 174 937	95 445 071
Inventories	7	2 762 791 019	1 483 007 985	1 258 502 719	431 508 375
Trade and other receivables	8	2 689 868 478	1 034 430 028	2 689 868 478	300 986 391
Cash and cash equivalents	9	2 104 896 530	142 815 570	2 104 896 530	41 554 810
Total assets		**9 378 038 968**	**4 375 644 145**	**7 026 595 804**	**1 273 173 925**
Reserves and liabilities					
Reserves		**7 388 562 604**	**3 024 337 933**	**5 214 852 833**	**879 986 596**
Capital reserve		47 043 799	47 043 799	13 688 256	13 688 256
Revaluation Reserve		795 572 941	795 572 941	231 486 540	231 486 540
Accumulated surplus		6 545 945 864	2 181 721 194	4 969 678 036	634 811 800
Current liabilities		**1 989 476 364**	**1 351 306 212**	**1 811 742 972**	**393 187 329**
Trade and other payables	10	1 510 855 852	1 090 149 703	1 510 855 852	317 199 052
Provisions	11	222 988 875	162 872 485	101 575 582	47 390 737
Short-term loan	12	255 631 637	98 284 023	199 311 537	28 597 539
Total reserves and liabilities		**9 378 038 968**	**4 375 644 145**	**7 026 595 804**	**1 273 173 925**

31-05-, 2023.

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

31/05, 2023.

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

31/05, 2023.

Mr. S. Mutepfa,
(Board Chairman).

Statement of Profit or Loss and Other Comprehensive Income

for the year ended December 31, 2022

	Note	INFLATION ADJUSTED		HISTORICAL COST	
		2022	2021	2022	2021
		ZWL$	ZWL$	ZWL$	ZWL$
Revenue	13	6 965 157 467	2 592 893 260	5 316 343 025	754 449 855
Cost of sales	14	(1 526 806 928)	(373 761 415)	(1 258 957 497)	(108 752 740)
Gross profit		**5 438 350 540**	**2 219 131 845**	**4 057 385 528**	**645 697 114**
Government grant	15	**2 353 556 895**	**1 262 164 800**	**1 515 413 905**	**367 250 000**
Other income	16	**2 019 551 015**	**40 244 201**	**1 922 012 293**	**11 709 788**
Expenditure		**(4 724 234 897)**	**(3 297 670 856)**	**(3 553 976 768)**	**(959 517 824)**
Staff costs	17	(2 649 167 427)	(2 018 719 436)	(1 837 702 309)	(587 383 448)
Administration expenses	18	(1 711 964 479)	(1 091 824 491)	(1 432 441 500)	(317 686 363)
Operating expenses	19	(363 102 990)	(187 126 929)	(283 832 958)	(54 448 013)
Monetary loss		(975 917 191)	0	0	-
Surplus for the year before net finance income		**4 111 306 362**	**223 869 989**	**3 940 834 958**	**65 139 079**
Net finance income	20	**394 031 278**	**202 741 349**	**394 031 278**	**58 991 314**
Surplus for the year		**4 505 337 640**	**426 611 338**	**4 334 866 237**	**124 130 393**
Total comprehensive income for the year		**4 505 337 640**	**426 611 338**	**4 334 866 237**	**124 130 393**

Statement of Changes in Reserves

for the year ended December 31, 2022

Inflation Adjusted	Capital reserve ZWL$	Accumulated surplus ZWL$	Revaluation Reserve ZWL$	Total ZWL$
Balance at January 01, 2021	47 043 799	1 755 109 856	795 572 941	2 597 726 595
Surplus for the year	0	426 611 338	0	426 611 338
Balance as at December 31, 2021	**47 043 799**	**2 181 721 194**	**795 572 941**	**3 024 337 933**
Balance at January 01, 2022	47 043 799	2 181 721 194	795 572 941	3 024 337 933
Monetary Loss	0	(141 112 970)	0	(141 112 970)
Surplus for the year	0	4 505 337 640	0	4 505 337 640
Balance as at December 31, 2022	**47 043 799**	**6 545 945 864**	**795 572 941**	**7 388 562 604**

TOBACCO RESEARCH BOARD

STATEMENT OF CHANGES IN RESERVES

for the year ended December 31, 2022

Historical Cost	Capital reserve ZWL$	Accumulated surplus ZWL$	Revaluation Reserve ZWL$	Total ZWL$
Balance at January 01, 2021	13 688 256	510 681 407	231,486,540	755 856 203
Surplus for the year	-	124 130 393	-	124 130 393
Balance as at December 31, 2021	**13 688 256**	**634 811 800**	**231 486 540**	**879 986 596**
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	0	4 334 866 237
Balance as at December 31, 2022	**13 688 256**	**4 969 678 036**	**231 486 540**	**5 214 852 833**

Statement of Cashflows

for the year ended December 31, 2022

	Note	INFLATION ADJUSTED 2022 ZWL$	INFLATION ADJUSTED 2021 ZWL$	HISTORICAL COST 2022 ZWL$	HISTORICAL COST 2021 ZWL$
Cash flows from operating activities					
Net cash generated/(utilised) in operation activities		**2 042 242 345**	**(18 923 711)**	**2098 063 899**	**(5 506 201)**
		1 648 211 066	**(221 665 059)**	**1 704 032 620**	**(64 497 516)**
Surplus for the year		4 505 337 640	426 611 338	4 334 866 237	124 130 393
Adjustment for:		**(342 611 238)**	**(231 524 418)**	**(608 613 985)**	**(67 366 276)**
Depreciation charge for the year	4	56 439 023	70 084 211	28 948 768	20 392 287
Increase in leave pay provision	11	60 116 390	115 025 164	54,184,845	33 468 681
(Profit) or Loss on Asset Dispossal	16	13 945	0	13,546	-
Fair Value adjustment on Biological Assets	6	(65 149 318)	(213 892 445)	(297,729,866)	(62,235,930)
Interest received		(411 005 172)	(217 685 612)	(411 005 172)	(63 339 622)
Interest paid		16 973 894	14 944 263	16 973 894	4 348 308
Changes in working capital:		**(2514 515 336)**	**(416 751 979)**	**(2 022 219 631)**	**(121 261 633)**
(Increase)/Decrease in trade and other receivables		(1655 438 450)	(205 736 546)	(2 388 882 087)	(59 862 822)
(Increase) in inventories		(1279 783 034)	(1206 849 801)	(826,994,344)	(351 155 087)
(Increase) in biological assets		0	0	-	-
Increase in trade and other payables		420 706 149	995 834 368	1 193 656 799	289 756 275
		394 031 278	**202 741 349**	**394 031 278**	**58 991 314**
Interest received		411 005 172	217 685 612	411 005 172	63 339 622
Interest paid		(16 973 894)	(14 944 263)	(16 973 894)	(4 348 308)
Cash flows from investing activities					
Net cashflow from investing activities		**(250 875 384)**	**(370 596 706)**	**(205 436 176)**	**(107 831 910)**
Acquisition of property, plant and equipment	4	(317 563 990)	(186 043 537)	(269,799,535)	(54 132 780)
Acquisition of biological assets	6	3 395 180	(7 177 006)	1,069,932	(2,088,282)
Interest Capitalised on long term Investments		63 293 426	(177 376 163)	63,293,426	(51,610,848)
Cash generated from financing activities					
Net cash generated from financing activities		**170 713 998**	**37 072 885**	**170 713 998**	**10 787 036**
Short term loans acquired	12	669 076 628	169 155 360	669 076 628	49 218 855
Repayment of short term loans	12	(498 362 631)	(132 082 475)	(498 362 631)	(38 431 819)
Net decrease in cash and cash equivalents		**1 962 080 960**	**(352 447 533)**	**2 063 341 720**	**(102 551 075)**
Cash and cash equivalents at the beginning of the year		**142 815 570**	**495 263 103**	**41 554 809**	**144 105 885**
Cash and cash equivalents at the end of the year	9	**2 104 896 530**	**142 815 570**	**2 104 896 530**	**41 554 809**

Notes to the Financial Statements

for the year ended December 31, 2022

1 General information

The Tobacco Research Board (the "Board") was established in 1950 under the Tobacco Research Act [Chapter 28:21], 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, 2022 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 figure for the year ended 31 December 2021.

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 2022	13 669.8	1.00
31 December 2021	3 977.5	3.4368
1 January 2021	2 608.8	5.2399

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.

Notes to the Financial Statements

for the year ended December 31, 2022

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 4, 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. These have been disclosed in note 3.1.

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.

Notes to the Financial Statements

for the year ended December 31, 2022

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

Notes to the Financial Statements

for the year ended December 31, 2022

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 $46.26.

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, 2022

2.5.1.1 IFRS 16 leases, effective for annual periods beginning on or after 1 January 2019.

A lease is defined as a contract, or part of a contract, that conveys the right to use the underlying asset for a period of time in exchange for consideration.

IFRS 16 requires lessees to recognise leases on their statement of financial position as lease liabilities with the corresponding right-of-use assets. Lessees are required to apply a single model for all recognized leases, but have an option not to recognise ‘short-term’ leases (i.e. leases with a lease term of 12 months of less) and leases of “low value” assets (e.g. personal computers).

Notes to the Financial Statements

for the year ended December 31, 2022

Lessees will be required to separately recognise the interest expense on the lease liability and the depreciation expense on the right of use asset. Lessee will also be required to re-measure the lease liability upon the occurrence of certain events (e.g. a change in the lease term, a change in future lease payments resulting from a change in an index or rate used to determine those payments). The lessee will generally recognise the amount of the re-measurement of the lease liability as an adjustment to the right-of-use asset.

IFRS 16 is effective for annual periods beginning on or after 1 January 2019. Early application is permitted provided the new revenue standard, IFRS 15, is applied on the same date. Lessees are required to adopt IFRS 16 using either a full retrospective approach or a modified retrospective approach.

However, the Board does not have any leases and the application of IFRS 16 had no impact on the financial statements.

2.5.1.2 IAS 19 Employee Benefits, effective for annual periods beginning on or after 1 January 2019.

On 7 February 2018, the IASB published 'Plan Amendment, Curtailment or Settlement (Amendments to IAS 19)' to harmonise accounting practices and to provide more relevant information for decision-making. An entity applies the amendments to plan amendments, curtailments or settlements occurring on or after the beginning of the first annual reporting period that begins on or after 1 January 2019.

In February 2018, the International Accounting Standards Board (IASB or the Board) issued amendments to IAS 19 Employee Benefits which address the accounting when a plan amendment, curtailment or settlement occurs during the reporting period. The amendments require entities to use the updated actuarial assumptions to determine current service cost and net interest for the remainder of the annual reporting period after such an event. The amendments also clarify how the requirements for accounting for a plan amendment, curtailment or settlement affect the asset ceiling requirements.

The amendments do not address the accounting for ‘significant market fluctuations’ in the absence of a plan amendment, curtailment or settlement. The amendments apply to plan amendments, curtailments or settlements that occur on or after 1 January 2019, with earlier application permitted.

Notes to the Financial Statements

for the year ended December 31, 2022

Previously, the Board noted that current IAS 19 implies that entities should not revise the assumptions for the calculation of current service cost and net interest during the period, even if an entity remeasures the net defined benefit liability (asset) in the event of a plan amendment, curtailment or settlement. That is, this calculation should be based on the assumptions as at the start of the annual reporting period.

However, the IASB concluded that it is inappropriate to ignore the updated assumptions when determining current service cost and net interest for the remainder of the annual reporting period. In the Board's view, using updated assumptions in this situation provides more useful information to users of financial statements and enhances the understandability of financial statements.

Determining current service cost and net interest

When accounting for defined benefit plans under IAS 19, the standard generally requires entities to measure current service cost using actuarial assumptions determined at the start of the annual reporting period. Similarly, net interest is generally calculated by multiplying the net defined benefit liability (asset) by the discount rate, both as determined at the start of the annual reporting period.
However, when a plan amendment, curtailment or settlement occurs during the annual reporting period, the amendments to IAS 19 specify that an entity must:
• Determine current service cost for the remainder of the period after the plan amendment, curtailment or settlement using the actuarial assumptions used to remeasure the net defined benefit liability (asset) reflecting the benefits offered under the plan and the plan assets after that event
• Determine net interest for the remainder of the period after the plan amendment, curtailment or settlement using: (i) the net defined benefit liability (asset) reflecting the benefits offered under the plan and the plan assets after that event; and (ii) the discount rate used to measure the net defined benefit liability (asset)

Effect on asset ceiling requirements

When an entity has a surplus in a defined benefit plan (because the fair value of plan assets exceeds the present value of the defined benefit obligation), it measures the net defined benefit asset at the lower of the surplus and the asset ceiling. The accounting for a plan amendment, curtailment or settlement may reduce or eliminate a surplus, which may cause the effect of the asset ceiling to change.

Notes to the Financial Statements

for the year ended December 31, 2022

The amendments to IAS 19 clarify that an entity first determines any past service cost, or a gain or loss on settlement, without considering the effect of the asset ceiling. This amount is recognised in profit or loss. An entity then determines the effect of the asset ceiling after the plan amendment, curtailment or settlement. Any change in that effect, excluding amounts included in net interest, is recognised in other comprehensive income.
This clarification provides that entities might have to recognise a past service cost, or a gain or loss on settlement, that reduces a surplus that was not recognised before. Changes in the effect of the asset ceiling are not netted with such amounts.

Accounting for 'significant market fluctuations'

Plan amendments, curtailments or settlements generally result from management decisions and thus differ from 'significant market fluctuations', which are discussed in IAS 34 Interim Financial Reporting and occur independently of management decisions. An example would be a significant increase in market yields on high-quality corporate bonds used to determine the discount rate.

The amendments to IAS 19 only address the measurement of current service cost and net interest for the period after a plan amendment, curtailment or settlement. The IASB decided that the accounting for 'significant market fluctuations' (in the absence of such an event) is outside the scope of these amendments.

The amendments to IAS 19 must be applied to plan amendments, curtailments or settlements occurring on or after the beginning of the first annual reporting period that begins on or after 1 January 2019. Consequently, entities do not have to revisit plan amendments, curtailments and settlements that occurred in prior periods. Earlier application is permitted and should be disclosed. It should be noted that first-time adopters are not provided with a similar relief from the retrospective application of the amendments. In accordance with IFRS 1 First time Adoption of International Financial Reporting Standards, a first-time adopter must apply all the requirements in IAS 19 retrospectively.

However, The Board does not run a defined benefit plan as this standard amendment does to have any impact on the financial statements.

Notes to the Financial Statements

for the year ended December 31, 2022

2.5.1.3 IAS 8 — Accounting Policies, Changes in Accounting Estimates and Errors- Definition of Material

In October 2018, the IASB issued amendments to IAS 1 Presentation of Financial Statements and IAS 8 Accounting Policies, Changes in Accounting Estimates and Errors to align the definition of 'material' across the standards and to clarify certain aspects of the definition. The new definition states that, 'Information is material if omitting, misstating or obscuring it could reasonably be expected to influence decisions that the primary users of general purpose financial statements make on the basis of those financial statements, which provide financial information about a specific reporting Company.' The amendments to the definition of material is not expected to have a significant impact on the Board's financial statements

2.5.1.4 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.

2.5.1.5 Amendments to IAS 37 Provisions, Contingent Liabilities and Contingent Assets

The amendment clarifies that when assessing if a contract is onerous, the cost of fulfilling it includes all costs related directly to the contract. Such cost include both

-The incremental costs of the contract (ie costs a company would avoid if it did not have the contract, like direct labour and materials)

-An allocation of other costs that relate directly to fulfilling the contract (Contract management and supervision, or depreciation of equipment used in fulfilling it).

Notes to the Financial Statements

for the year ended December 31, 2022

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.

Notes to the Financial Statements

for the year ended December 31, 2022

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

Notes to the Financial Statements

for the year ended December 31, 2022

demand deposits and other short-term highly liquid investments that are readily convertible to a known amount of cash and are subject to an insignificant risk of change in value.

3.3.2 Financial liabilities

Financial liabilities are classified according to the substance of the contractual agreement entered into. Significant financial liabilities of the Board are accounts payables, and other payables and these are measured at fair value net of transaction costs. Where the Board has financial instruments which have a legally enforceable right of offset and the Board intends to settle them on a net basis or to realize the asset and liability simultaneously, the financial asset and liability and related revenues are offset and the net amount reported in the statement of financial position and statement of comprehensive income, respectively.

3.3.3 Derecognition of financial liabilities

The Board derecognizes financial liabilities when, and only when, the Board's obligations are discharged, cancelled or they expire. The difference between the carrying amount of the financial liability derecognized and the consideration paid and payable is recognised in the revenue and expenditure statement.

3.4 Inventories

Inventories are stated at the lower of cost and net realizable value. Costs of inventories are determined on a weighted average basis.

3.5 Government grants

Government grants are not recognised until there is reasonable assurance that the grants will be received. Government grants are recognised in the revenue and expenditure statement on a systematic basis over the periods in which the Board recognizes as expenses the related costs for which the grants are intended to compensate.

Specifically, government grants whose primary condition is that the Board should purchase, construct or otherwise acquire non-current assets are recognised as deferred revenue in the statement of financial position and transferred to the revenue and expenditure statement on a systematic and rational basis over the useful lives of the related assets.

Government grants that are receivable as compensation for expenses or losses already incurred or for the purpose of giving immediate financial support to the Board with no future related costs are recognised in the revenue and expenditure statement in the period in which they become receivable.

Notes to the Financial Statements

for the year ended December 31, 2022

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 carried at fair value that are denominated in foreign currencies are retranslated at the rates prevailing at the date when the fair value was determined. 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 sales 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.

Notes to the Financial Statements

for the year ended December 31, 2022

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.

Notes to the Financial Statements

for the year ended December 31, 2022

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.

Notes to the Financial Statements

for the year ended December 31, 2022

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].

Notes to the Financial Statements

for the year ended December 31, 2022

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 2022 ZWL$	Totals 2021 ZWL$
Opening carrying amount	**755 726 965**	**159 462 499**	**24 876 491**	**106 365 713**	**50 952 157**	**59 059 859**	**1 156 443 683**	**1 040 484 356**
Gross carrying amount	780 622 674	181 437 649	29 730 373	154 273 821	63 774 880	59,059,859	**1 268 899 255**	**1 082 855 716**
Accumulated depreciation	(24,895,710)	(21,975,149)	(4,853,882)	(47,908,108)	(12,822,723)	-	**(112,455,571)**	**(42,371,360)**
Additions at cost	5 066 671	86 618 000	24 521 099	100,375,498	48 323 968	52 658 754	**317 563 990**	**186 043 537**
Disposals carrying amount	-	(8,240)	-	-	(5,705)	-	**(13,945)**	**-**
Gross carryng amount	-	(10,300)	-	-	(12,226)	-	**(22,526)**	**-**
Accumulated depreciation on disposals	-	2,060	-	-	6,520	-	**8,580**	**-**
Revaluation								
Depreciation for the year	(8 317 872)	(14 500 126)	(2 140 007)	(21 983 367)	(9 497 650)	-	**(56 439 023)**	**(70 084 211)**
Closing carrying amount	**752 475 763**	**231 572 133**	**47 257 583**	**184 757 844**	**89 772 769**	**111 718 613**	**1 417 554 706**	**1 156 443 682**
Gross carrying amount	785 689 345	268 045 349	54 251 472	254 649 319	112 086 622	111 718 613	**1 586 440 719**	**1 268 899 253**
Accumulated depreciation	(33 213 582)	(36 473 216)	(6 993 889)	(69 891 475)	(22 313 853)	-	**(168 886 013)**	**(112,455,571)**

Notes to the Financial Statements

for the year ended December 31, 2022

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 2022 ZWL$	Totals 2021 ZWL$
Opening carrying amount	**219 892 622**	**46 398 539**	**7 238 271**	**30 949 055**	**14 825 465**	**17 184 549**	**336 488 502**	**302 748 009**
Gross carrying amount	227 136 486	52 792 612	8 650 597	44 888 798	18 556 471	17,184,549	**369 209 513**	**315 076 733**
Accumulated depreciation	(7,243,863)	(6,394,073)	(1,412,326)	(13,939,743)	(3,731,006)	-	**(32,721,011)**	**(12,328,725)**
Additions at cost	5 066 671	74 724 735	24 367 530	97,935,590	43 718 318	23,986,691	**269 799 535**	**54 132 780**
Disposals carrying amount	-	(8,240)	-	-	(5,306)	-	**(13,546)**	**-**
Gross carryng amount	-	(10,300)	-	-	(11,370)	-	**(21,670)**	**-**
Accumulated depreciation on disposals	-	2,060	-	-	6,064	-	**8,124**	**-**
Revaluation								
Depreciation for the year	(3 792 725)	(7 670 286)	(1 102 134)	(11 163 306)	(5 220 317)	-	**(28 948 768)**	**(20 392 287)**
Closing 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**	**315 076 734**
Accumulated depreciation	(11 036 588)	(14 062 299)	(2 514 460)	(25 103 049)	(8 945 260)	-	**(61 661 655)**	**(32,721,011)**

Notes to the Financial Statements

for the year ended December 31, 2022

		INFLATION ADJUSTED		HISTORICAL COST	
		2022 ZWL$	2021 ZWL$	2022 ZWL$	2021 ZWL$
1	**Financial assets at amortised cost**				
5.1	**Long term investments**				
	CABS	5 059 099	4 963 079	1 540 119	1 444 099
	Imara	28 966	217 897 769	11 906	63 401 353
	Total	**5 088 066**	**222 860 848**	**1 552 025**	**64 845 451**

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	507 919	507 922	147 789	147 789
	Dogs	7 552 451	7,552,490	2 197 536	2,197,536
	Depreciation	(3 395 138)		(1 069 932)	
		4 665 232	**8 060 413**	**1 275 392**	**2 345 325**
6.2	**Current biological assets**				
	Tobacco	393 174 937	328 025 619	393 174 937	95 445 071
		393 174 937	**328 025 619**	**393 174 937**	**95 445 071**
7	**Inventories**				
	Tobacco seed	1 198 752 214	902 770 536	546 053 940	262 677 647
	Potato Seed	905,951,829	321 312 284	412,677,916	93,491,703
	Other consumables	653 746 596	251 091 889	297 793 739	73 059 791
	Chemicals	4 340 380	7 833 276	1 977 124	2 279 235
		2 762 791 019	**1 483 007 985**	**1 258 502 719**	**431 508 375**
8	**Trade and other receivables**				
	Amounts owing for services and sales	24 182	11 794 942	24 182	3 431 955
	Seedling stop order receivables	2 726 731 514	1 156 808 186	2 726 731 514	336 594 561
	Value added tax refund	28 256 540	14 690 930	28 256 540	4 274 596
	Staff loans	1 657 834	10 182 744	1 657 834	2 962 856
	Other receivables	324 202 325	180 037 301	324 202 325	52 385 155
		3 080 872 394	**1 373 514 103**	**3 080 872 394**	**399 649 122**
	Less: Allowance for credit losses	(391 003 917)	(339 084 075)	(391 003 917)	(98 662 731)
		2 689 868 478	**1 034 430 028**	**2 689 868 478**	**300 986 391**

Notes to the Financial Statements

for the year ended December 31, 2022

		INFLATIONAL ADJUSTED		HISTORICAL COST	
		2022 ZWL$	2021 ZWL$	2022 ZWL$	2021 ZWL$
9	**Cash and cash equivalents**				
	Cash at bank	1 982 415 506	126 978 959	1 982 415 506	36 946 857
	Cash on hand	213 291	4 447 738	213 291	1 294 151
	Money market investments	122 267 734	11 388 873	122 267 734	3 313 802
		2 104 896 530	**142 815 570**	**2 104 896 530**	**41 554 810**
9.1	**Money market investments**				
	Tetrad Investment Bank Limited	795 309	2 733 318	795 309	795 309
	Agribank	4 481 921	11 280 387	4 481 921	3 282 236
	CBZ Bank Limited	117 785 812	108 486	117 785 812	31 566
		123 063 043	**14 122 191**	**123 063 043**	**4 109 111**
	Allowance for impairment for Tetrad Investment	(795 309)	(2 733 318)	(795 309)	(795 309)
		122 267 734	**11 388 873**	**122 267 734**	**3 313 802**
10	**Trade and other payables**				
	Trade payables	1 510 855 852	1 090 149 703	1 510 855 852	317 199 052
		1 510 855 852	**1 090 149 703**	**1 510 855 852**	**317 199 052**
11	**Provisions**				
	Provision for Audit fees	45 069 546	7 334 465	20 530 017	2 134 097
	Provisions for leave pay	177 919 329	155 538 021	81 045 565	45 256 640
	Provisions	**222 988 875**	**162 872 485**	**101 575 582**	**47 390 737**
12	**Short-term loan**				
	Zimbabwe Leaf Tobacco (ZLT)	255 631 637	79 432 420	199 311 537	23 112 320
	Agribank	0	18 851 604	-	5 485 220
		255 631 637	**98 284 023**	**199 311 537**	**28 597 539**

The ZLT loan will be repaid in full from proceeds of sale of tobacco during the 2022/2023 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.

Notes to the Financial Statements

for the year ended December 31, 2022

		INFLATION ADJUSTED		HISTORICAL COST	
		2022 ZWL$	2021 ZWL$	2022 ZWL$	2021 ZWL$
13	**Revenue**				
	Sale of goods	6 563 316 303	2 385 157 357	5 043 387 303	694 005 283
	Rendering of services.	401 841 164	207 735 904	272 955 722	60 444 572
		6 965 157 467	**2 592 893 260**	**5 316 343 025**	**754 449 855**
	An analysis of the revenue for the year is as follows;				
13.1	**Sale of goods**				
	Tobacco seed sales	4 120 669 575	1 526 276 116	3 227 548 897	444 098 032
	Tobacco crop sales	351 332 230	117 842 491	231 794 958	34 288 434
	Gromix	249 808 061	158 350 012	164 190 722	46 074 841
	Float trays	191 155 336	130 743 556	135 349 971	38 042 236
	Seedling production	16 995 879	67 647 365	16 154 037	19 683 242
	Gum seedlings	18,688,532	-	15,559,737	-
	Floatfert	91 448 228	29 192 102	67 076 591	8 493 978
	Horticultural products	6 211 544	7 254 664	4 195 229	2 110 878
	Sweet Potato	1 897 922	858 135	1 165 682	249 690
	Seed Potato	1 515 108 997	346 992 917	1 180 351 482	100 963 954
		6 563 316 303	**2 385 157 357**	**5 043 387 303**	**694 005 283**
13.2	**Rendering of services**				
	Laboratory analysis	401 841 164	207 735 904	272 955 722	60 444 572
		401 841 164	**207 735 904**	**272 955 722**	**60 444 572**
	Total revenue	**6 965 157 467**	**2 592 893 260**	**5 316 343 025**	**754 449 855**
14	**Cost of sales**				
14.1	**Cost of goods sold**				
	Gromix	86 584 613	93 726 705	58 112 436	27 271 504
	Float trays	22 965 130	2 901 250	16 573 176	844 172
	Tobacco Seed production	140 361 234	80 686 458	98 711 848	23 477 205
	Tobacco Seedlings	3 660 325	4 928 821	1,997,851	1,434,131
	Gum seedlings	-	11 798 817	-	3 433 082
	Floatfert	55 719 073	17 476 701	41 800 649	5 085 167
	Horticultural products	4 220 005	1 170 508	3 894 541	340 581
	Seed Potato	1 047 195 379	108 726 598	882 273 210	31 635 998
	Sweet potato	122,343	382 653	37,500	111,340
	Tobacco crop	96,170,499	7 782 843	95,445,071	2 264 561
		1 456 998 601	**329 581 353**	**1 198 846 282**	**95 897 740**
14.2	**Cost of rendering services**				
	Laboratory analysis	69 808 327	44 180 062	60 111 214	12 854 999
		69 808 327	**44 180 062**	**60 111 214**	**12 854 999**
		1 526 806 928	**373 761 415**	**1 258 957 497**	**108 752 740**
15	**Government grant**				
	Tobacco levy	2 353 556 895	1 262 164 800	1 515 413 905	367 250 000
		2 353 556 895	**1 262 164 800**	**1 515 413 905**	**367 250 000**

Notes to the Financial Statements

for the year ended December 31, 2022

		INFLATION ADJUSTED		HISTORICAL COST	
		2022 ZWL$	2021 ZWL$	2022 ZWL$	2021 ZWL$
16	**Other income**				
	Rental	4 923 654	3,341,889	3 258 480	972 384
	Land usage	65 520	82,518	62 856	24 010
	Royalties	6 609 277	3,381,029	5 352 760	983 773
	Exchange Gains	2 002 372 983	18,741,090	1 909 313 343	5 453 064
	Sundry	5 579 581	14,697,675	4 024 853	4 276 558
		2 019 551 015	**40 244 201**	**1 922 012 293**	**11 709 788**
17	**Staff costs**				
	Salaries and allowances	1 885 144 224	1 520 037 052	1 213 545 071	442 282 662
	NSSA	57 296 442	26 953 585	35 797 678	7 842 640
	Pension costs	76 509 753	75 501 165	43 863 990	21 968 449
	Standard levy	10 060 953	7 829 755	6 943 901	2 278 211
	Medical aid	179 068 682	92 077 605	135 167 951	26 791 668
	NEC	4 659 846	16 084	3 297 680	4 680
	Leave pay Provision	84 520 577	172 452 061	66 816 497	50 178 090
	Bonus provision	63 460 273	105 872 756	63 155 272	30 805 620
	Other employment costs	288 446 678	17 979 371	269 114 271	5 231 428
		2 649 167 427	**2 018 719 436**	**1 837 702 309**	**587 383 448**
18	**Administrative expenses**				
	Audit fees	20 530 017	486 641	20 530 017	141 597
	Directors' emoluments	12 996 094	3 561 202	10 227 200	1 036 197
	Depreciation charge for the year	59 834 160	70 084 211	30 018 701	20 392 287
	Allowance for credit losses	292,348,447	119 025 561	292,348,447	34 632 670
	Computers costs	17 605 742	43 490 380	13 071 825	12 654 324
	Travelling	145 181 165	42 947 039	130 668 605	12 496 229
	Repairs and maintenance	215 456 994	132 419 204	170 759 683	38 529 796
	Staff training	1 234 820	2 998 622	1 163 386	872 504
	Consultancy/ Legal fees	72 494 199	43 550 590	57 342 740	12 671 843
	Utilities	99 258 271	54 384 564	80 881 459	15 824 186
	Loss on Assets Dispossal	13 546	-	13 546	-
	Motor vehicle expenses	290 596 278	145 025 744	224 784 462	42 197 900
	Insurance	62 414 675	42 208 720	41 732 189	12 281 401
	Security	78 377 366	28 199 324	63 031 942	8 205 111
	Telephone	83 072 240	89 301 344	60 627 662	25 983 864
	Bank charges	111 530 321	92 151 365	111 530 321	26 813 130
	Administration overheads	149 020 142	181 989 982	123 709 314	52 953 323
		1 711 964 479	**1 091 824 491**	**1 432 441 500**	**317 686 363**

Notes to the Financial Statements

for the year ended December 31, 2022

		INFLATION ADJUSTED		HISTORICAL COST	
		2022	2021	2022	2021
		ZWL$	ZWL$	ZWL$	ZWL$
19	**Operations expenses**				
	Tobacco seed selling costs	25 994 283	5 547 177	19 006 731	1 614 053
	Tobacco selling costs	8 692 916	4 673 230	5 115 888	1 359 762
	Fumigants and Insecticides	9,588,606	-	9,062,483	-
	Glassware	-	1 236 929	-	359 907
	Growers 'compensation	-	19 756 019	-	5 748 376
	Periodical subscriptions	13 882 538	5 234 643	12 710 483	1 523 115
	Utilities	11 348 120	7 017 737	9 719 934	2 041 939
	Small equipment purchase	37 078 346	17 664 174	26 542 774	5 139 716
	Seedbed and Greenhouse costs	44 620 745	26 643 232	30 161 850	7 752 337
	Tractors costs-fuel, oil and grease	23 309 078	12 589 269	18 991 595	3 663 079
	Tractors repairs and maintenance	20 418 513	24 268 744	13 798 868	7 061 436
	Laboratory Costs	97 411 836	29 803 614	79 603 753	8 671 908
	Field Marketing	43 822 955	8 302 905	36 006 552	2 415 882
	Grower Services	2 667 840	1 304 250	2 411 935	379 495
	Unrealised exchange loss	-	15 410 236	-	4 483 891
	Agricultural show expenses	24 267 212	7 674 771	20 700 114	2 233 115
		363 102 990	**187 126 929**	**283 832 958**	**54 448 013**
20	**Finance income/cost**				
20.1	**Finance income**	**411 005 172**	**217 685 612**	**411 005 172**	**63 339 622**
	Interest on short term deposits	353 074 637	190 703 386	353 074 637	55 488 648
	Interest on cash and cash equivalents	57 930 536	26 982 226	57 930 536	7 850 974
20.2	**Finance costs**	**(16 973 894)**	**(14 944 263)**	**(16 973 894)**	**(4 348 308)**
	Bank interest	(16 973 894)	(14 944 263)	(16 973 894)	(4 348 308)
	Net finance income	**394 031 278**	**202 741 349**	**394 031 278**	**58 991 314**
21	**Related party transactions**				
21.1	**Sales to senior management**	**1 287 649**	**434 438**	**586 548**	**126 408**

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	1 563 469	590 113	2 153 582	1 285 930	1 694 800	374 165
	Board members	6 725 561	4 116 950	10 842 511	2 742 020	8 532 400	797 841
		8 289 030	**4 707 063**	**12 996 094**	**4 027 950**	**10 227 200**	**1 172 006**
21.3	**Compensation to key management**						
	Salaries			271 044 339	221 542 207	123 465 740	64 461 769
	Pension			18 662 045	14 373 416	8 500 909	4 182 209
	Other benefits			194 187 994	50 406 212	88 456 245	14 666 612
				483 894 378	**286 321 835**	**220 422 893**	**83 310 590**

Notes to the Financial Statements

for the year ended December 31, 2022

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	
	2022	2021	2022	2021
	ZWL$	ZWL$	ZWL$	ZWL$
Tobacco Research Board Pension Fund	76 509 753	75 501 165	43 863 990	21 968 449
National Social Security Authority	57 296 442	26 953 585	35 797 678	7 842 640
	133 806 195	**102 454 750**	**79 661 668**	**29 811 089**

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.

Notes to the Financial Statements

for the year ended December 31, 2022

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.

25 Commitments to expenditure

	INFLATION ADJUSTED		HISTORICAL COST	
	ZWL$	ZWL$	ZWL$	ZWL$
Commitments for the acquisition of property, plant and equipment	3 215 152 959	984 329 774	1 464 562 000	286 408 803

TOBACCO RESEARCH BOARD
KUTSAGA

Airport Ring Road, P. O. Box 1909 Harare, Zimbabwe
VOIP: +263 (0)86 8800 2604
tobres@kutsaga.co.zw

www.kutsaga.co.zw