INNOVATION, TECHNOLOGY DEVELOPMENT AND TRANSFER PROGRAMME

Annual Budget Monitoring Report

Financial Year 2023/24

October 2024

Budget Monitoring and Accountability Unit
Ministry of Finance, Planning and Economic Development
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ABBREVIATIONS AND ACRONYMS

BIRDC	Banana Industrial Research and Development Centre
BMAU	Budget Monitoring and Accountability Unit
Bn	Billion
CHTC	China High-Tech Corporation
CLARF	Central Laboratory Animal Research Facility
CNC	Computer Numeric Control
COVAB	College of Veterinary Medicine, Animal Resources and Biosecurity
COVID-19	Corona Virus Disease
DLG	District Local Government
DNA	Deoxyribonucleic acid
EAC	East African Community
ELISA	Enzyme-linked Immunosorbent Assay
GMP	Good Manufacturing Practice
GoU	Government of Uganda
HIG	Human Immunoglobulin
HPLC	High-Performance Liquid Chromatography
IFMS	Integrated Financial Management System
ISO	International Organization for Standardization
ITDT	Innovation Technology Development and Transfer
JCRC	Joint Clinical Research Centre
KMC	Kiira Motors Corporation
LGs	Local Governments
MAK-BRC	Makerere University Biomedical Research Centre
MDAs	Ministries, Departments and Agencies
MFPED	Ministry of Finance, Planning and Economic Development
MUST	Mbarara University of Science and Technology
NDA	National Drug Authority
NDP	National Development Plan
NMR	Nuclear Magnetic Resonance

NMS	National Medical Stores
NRIP	National Research and Innovation Program
NSTEIC	National Science, Technology Engineering, Innovation Centre
NSTEI-SEP	National Science, Technology Engineering, Innovation and Skills Enhancement Project
OP	Office of the President
PIAP	Programme Implementation Action Plan
PRC	Polymerase chain reaction
PRESIDE	Presidential Scientific Initiative on Epidemics
R&D	Research and Development
RNA	Ribonucleic acid
RT-PCR	Reverse Transcription PCR
SARS-CoV-2	Severe Acute Respiratory Syndrome Corona Virus 2
TIBIC	Technology, Innovation and Business Incubation Centre
TSC	Technical Service Company
UCI	Uganda Cancer Institute
UIRI	Uganda Industrial Research Institute
UNBS	Uganda National Bureau of Standards
UNCST	Uganda National Council for Science and Technology
USD	United States Dollar

FOREWORD

At the start of the Financial Year 2023/24, the Government of Uganda outlined strategies to restore the economy back to the medium -term growth path and improve competitiveness. The strategic interventions that were prioritized under various programmes included: roads under Integrated Transport; electricity under the Sustainable Energy Development; irrigation under Agro-Industrialization; Industrial parks under Manufacturing; support to medical schools and science-based research and development under Human Capital Development; as well as oil and gas among others.

Annual programme assessments have been made, and it has been established that performance was fairly good. This implies that programmes are on track, but with a lot of improvements required. To that effect, I urge you to critically review the findings of the performance reports with a view to improving effectiveness in implementation of activities going forward. These monitoring findings form a very important building block upon which programmes can commence the reflective exercises.

The government has embarked on the 10-fold growth strategy that demands for enhanced efficiency and effectiveness within programmes. We cannot afford to have fair performance scores hence forth, as this will jeopardize the prospects of doubling the economic growth rates in the medium term.

Ramathan Ggoobi
Permanent Secretary/ Secretary to the Treasury

EXECUTIVE SUMMARY

The Innovation, Technology Development and Transfer (ITDT) Programme seeks to increase the application of appropriate technology in the production and service delivery processes. The programme has three sub-programmes, namely: Research and Development; Science, Technology and Innovation (STI) Ecosystem Development, and Industrial Value Chain Development.

During the period under review, the programme activities were executed through Vote 167: Science Technology and Innovations (STI) Secretariat and Vote 110: Uganda Industrial Research Institute (UIRI). There are three subventions under the programme namely: Banana Industrial Research and Development Centre (BIRDC), Kiira Motors Corporation (KMC) and Uganda National Council for Science and Technology (UNCST).

This report presents monitoring findings for the period 1st July 2023 to 30th June 2024 for three sub-programmes of Research and Development, Industrial Value Chain Development and STI Ecosystem Development.

Overall Programme Performance

The overall ITDT Programme performance was fair at 52.4%. Whereas the STI Eco systems development, and Industrial Value Chain Development Sub-programmes performed fairly, the Research and Development (R&D) sub programme registered poor performance.

The approved budget for the ITDT Programme for the FY2023/24 was Ug shs 256.656 billion (bn) which was revised upwards to Ug shs 1,035.016 bn. A total of Ug shs 968.707 bn (93.5%) was released and Ug shs 965.141bn (99.6%) spent by 30th June 2024. Vote 167 had the biggest share (96%) of the revised budget. The release and expenditure were very good.

Whereas absorption at vote level was good, most of the funds were transfers to subventions and grantees with over 70% going to DEI -Biopharma limited through a supplementary budget. The actual expenditure by the grantees was fair as at 30th June 2024 as most of the funds were committed but not spent. The fair expenditure at grantee level was attributed to the STI's delayed issuance of /authorisation to spend. Some beneficiaries had the resources on their accounts for two quarters awaiting expenditure authorisation.

Across sub programmes, the infrastructure development outputs were estimated at 95% though behind schedule. Most of the implemented activities were under the Industrial Value Chain Development Sub-programme. The research and development related outputs posted a fair performance as most outputs were at procurement stage.

The programme achieved some of the objectives and targets of the NDP III such as increase in expenditure on the research and development and building human resource capacity for the STI, while others like increasing Intellectual Property (IPs) registered a dismal performance.

Research and Development Sub-programme

The sub-programme contributes to the objectives of building institutional and human resource capacity in STI and strengthening research and development capacities and applications. The sub programme performance was poor at 35.2%.

By 30th June 2024, one Intellectual Property Rights (IPR) was registered with the Uganda Registration Services Bureau (URSB) against a target of five. However, there were several trademarks, copyrights, industry designs and utility models registered. The registration of Intellectual Property Rights (IPR) was hampered by the lack of harmonized policy

framework on ownership and rights sharing between, the STI secretariat, host institutions and Innovators.

Industrial Value Chain Development Sub-programme

The sub-programme aims at increasing development, transfer and adoption of appropriate technologies and innovations; and development of requisite STI infrastructure. The sub programme performance was fair at 55.8% with all the three interventions posting fair performance.

A total of 29 grantees were monitored out of the 67 that were identified for funding during the period under review. The overall performance was fair as most of the grantees commenced implementation in the third quarter of the financial year and majority were in the initial stages of procuring equipment and service providers.

Three human vaccines were in the final stages of completing the animal trials (pre-clinical) before clinical trials. These were; Novel adeno-vector vaccine, inactivated vaccine and a sub-unit recombinant vaccine, however, the absence of a current Good Manufacturing Practice (cGMP) facility in the country was delaying the planned clinical trials.

Under the In-Vitro Studies of Natural Therapeutics of Uganda Program (INVONAT), a total of 48 samples were being studied for sterility, toxicity and safety, and inputs for the efficacy studies were under procurement by the end of the financial year due to delayed clearance to utilise funds.

Nine natural therapeutic drugs were at varying stages of progress (two for respiratory viral infections, five for *diabetes melitus* and one for malaria) and were undergoing clinical trials at the Clinical Trials of Natural Therapeutics (CONAT) based at Makerere University Lung Institute. The pre-clinical studies on the *GLUCOTAK* an antidiabetic herbal therapy was at 40% while the construction of a Good Manufacturing Practice (GMP) facility at the Natural Products Research and Innovation Centre (NAPRIC) at Busitema University registered 90% progress.

The reformulation of the UBV-01 into UBV-2 as an anti-breast cancer natural therapeutic was undertaken and was awaiting the conclusion of invi-tro studies to inform the next steps. However, the establishment of a GMP at Natural Chemotherapeutics Research Institute (NCRI) was halted and funds reserved for R&D in *"Pombe guard"* product but the communication on way forward had not been issued. The formulation and pre-clinical evaluation of herbal toothpaste at Busitema University progressed to 30% with the antimicrobial analysis of the extracts and pre-formulation and formulation studies on going while production of batch 1 (150 doses) for field testing had not commenced.

The fabrication of lithium-ion batteries for electric vehicle at Busitema University progressed to 30% with the renovation of a laboratory ongoing and some protective wear and sampling equipment procured. The Space Weather Science project progressed to 25% with base models and a prototype to display the weather parameters developed and ready for validation. The laboratory facility construction at Nagongera campus progressed to 75% and the procurement of weather equipment, development of a mobile application and data collection were ongoing.

The equipment for the Biomarker Research Facility at the Center for Global Health and Biosecurity at Makerere University was procured but not installed pending remodeling of the facility. The solicitation of bids for the remodeling was ongoing. To support the pre-clinical trials and animal research services, a total of 5,000 mice were bred at CoVAB - Makerere University and the Bio Safety Level 2 (BSL-2) Laboratory was operationalized. The

transformation and refurbishment of the lab animal house into a Bio Security Level 3 laboratory (BSL-3) to support animal studies for vaccine and therapeutics research was ongoing. The works involved painting, and fixing of tight doors, and Heating, Ventilation and Air Conditioning (HVAC) system. The breeding of the mice for research continued with up to 400 humanized ACE2 mice produced.

M/s Innovex, a private company based in Ntinda initiated the production and assembly of solar powered irrigation pumps and cooling components for freezers, and smart meters. The company was initiated into the manufacturing facility at Technology and Industrial Business Incubation Centre (TIBIC) Namanve under UNCST with partitioning of the facility ongoing by 30th June 2024. M/s Lwera Electronics another private grantee procured and installed equipment at the TIBIC in Namanve to support the development and assembly of electronics products.

To develop a national network of STI excellence, a website, curriculum for the pathogen economy, and e-learning tools were developed and 15 protégés were on boarded at COVAB. A mobile app for learning was developed and an online inventory was being updated.

The establishment of the coffee roasting and instant coffee processing facility in Ntungamo was at 62% progress for both civil works and installation of machinery. The operationalization of the Cassava Processing Plant Business in Gulu University did not take off since no funds were released to the grantee. One viable mosquito repellent product was certified under the commercialisation of 5 beauty and dermatology products from indigenous materials.

The Banana Industrial Research Development Centre (BIRDC) generated sales revenue amounting to Ug shs 2.568bn (51.3% of the target). Laboratory equipment such as the Fourier Transform Infrared Spectroscopy (FTIR) spectrometer, High Performance Liquid Chromatography (HPLC), incubator, oven and tablet machine among others were procured and installed. The contract for the Drum Dryer was signed and procurement of additional bakery equipment, warehousing facility and cold room was ongoing. The final audit for International Standards Organisation (ISO) certification was undertaken with a score of 95%. At least 20.3% of the planned 4,000MT of fresh *Matooke* were procured from the Farmers and 22.6% of the *Matooke* was processed to chips. The construction of five collection centres had not commenced and the BIRDC institutional framework was yet to be finalised.

The civil works for the TIBIC and NSTEI under UNCST were complete. The installation of equipment was completed and the 25 engineers who were trained in China were undergoing hands on training with the equipment at Rwebitete, in Kiruhura district.

All engineering machinery, equipment and spare parts for the Technical Service Company (TSC) were delivered and tested. A functional equipment leasing, and machinery rental program was implemented with 60% of the equipment leased while other equipment remains parked at Courtyard Hotel-Lyantonde, unused. However, it was noted that the NEC was not timely honouring the invoices and remitting funds to the UNCST bank account which affected the NTR targets.

The operationalisation of the two centres of TIBCI and NSTEI was ongoing with a phased recruitment of staff, curriculum development, finalisation of frameworks, operational plan and guidelines. However, there was no budget for operations and maintenance of the NSTEI equipment which poses a risk to the equipment and a possible failure to take off as planned.

STI Ecosystem Development Sub-programme

The sub-programme performance was fair at 66.19%. The interventions of design and conduct practical skills development programmes posted very good performance while the intervention of Support the establishment and operations of Technology and Business Incubators, and Technology Transfer Centers performed poorly.

The final draft of the National STI Strategy was completed and was ready for presentation to Cabinet and a draft STI revised policy was developed. The first drafts of the National Aerospace Policy, Strategy and Business Model were also developed. A think tank on aeronautics and space science was constituted. On the other hand, the National STI advancement and outreach strategy was not developed during the period under review.

Under the Uganda Industrial Research Institute, the upgrade and renovation of Lira and Nakawa incubation centre was on going at varying stages. The renovation covered replacing of the water pipes, supply of additional new equipment, replacement of doors, partitioning and repair of the perimeter walls and recasting the building walls.

The geotechnical and topographical surveys for the pathogen economy industrial park land in Katuugo, Nakasongola district were completed. Additionally, the STI established collaboration with the government of CUBA to support the design of the different components in the proposed pathogen park.

The overall construction and equipping of the Kiira Vehicle Plant in Jinja progressed to 95%. Equipping of the plant progressed to 90% with most of the equipment installed including the chassis line, trim and final assembly line, Quality Inspection and Testing (QIT) facility, paint shop, and warehouse and logistics. The pending activities included final installations in the body shop while the production facility was at 63%. Other ongoing works were on access roads and the tower.

A total of 28 (23 electric and 5 diesel) buses were manufactured and Uganda was allocated a World Manufacturing Identifier (WMI). Subsequently the first Vehicle Identification Number (VIN) was issued and by 15th July 2023, a total of 28 Vehicle Identification Numbers (VINs) had been issued.

The assembly and production of the 28 buses at Luwero Industries Limited was completed and these were either leased, rented out, or being used by Kiira Motors Corporation (KMC) for the campus tours. In addition, the e-bus skilling program was ongoing. The leasing and renting out of buses generated a total of Ug shs 3.2bn as at 30th June 2024. The training of the first cohort of 105 e-bus operators was completed and 101 graduated after passing all tests. The KMC had recruited 15 of these graduates. Nine new Direct Current (DC) chargers with varying capacities were acquired bringing the total number of electric chargers to 15 of which 3 were deployed.

The National E-mobility strategy was developed and published, and an e-public transport system was developed pending piloting in Jinja City. The UIRI continued to support the skilling of interns and apprenticeships in disciplines such as: machine workshop practice, electrical installation and maintenance, laboratory analysis, Computerised Numerical Control (CNC) machining, welding, material testing, hydraulics and pneumatics, Printed Circuit Board (PCB) production, programmable logic control (PLC), and textile product design and production, among others.

Conclusion

The overall ITDT Programme performance was fair at 52.4%. There was a considerable increase in the human resource capacity for the STI through the various recruitment of protégés and enrolment of PhD students on the various research and innovation projects. On the other hand, the legal and regulatory framework progressed albeit behind schedule as most of the policies, regulations and strategies did not reach their final stages.

The pre-clinical studies for the three human vaccines were nearing completion with preliminary results meeting the minimum standards. However, the absence of a GMP facility was affecting the take off and completion of clinical studies. Slow progress was registered in the area of registering Intellectual Property Rights.

The civil works and installation of equipment and machinery at NSTEIC and TIBIC were completed and the training of trainers was ongoing at the NSTEI-Rwebitete. The construction and tooling of Kiira Vehicle Plant progressed to 95% though behind schedule. A total of 28 (23 electric and 5 diesel) buses were manufactured and Vehicle Identification Numbers issued. Laboratory equipment for the BIRDC was procured and installed at Bushenyi while procurement of additional equipment for the *Tooke* factory and bakery was ongoing.

All capital investments and R&D grants were behind schedule, and this was partly occasioned by the continued delay by the STI to authorise use of funds by the grantees and difficulties in acquiring some critical equipment. Moreover, the STI was taking on many grantees in spite of inadequate resources leading to tokenism for some grantees and therefore unable to actualize the objectives for which projects were conceived to achieve. It was observed that the STI Secretariat amended some project objectives without revising the funding that made achievement of targets difficult.

The absence of a budget for operations and maintenance of NSTEI project under UNCST poses a risk of grounding the equipment. It was also observed that there was misalignment of the PIAP interventions with the annual planned outputs at the STI secretariat.

Recommendations

1. The STI Secretariat should accelerate the establishment of a central GMP facility at one of the collaborating institutions to ensure achievement of research objectives especially clinical trials for the vaccine development and therapeutics.
2. The STI Secretariat should timely authorise grantees to spend the funds disbursed to facilitate timely achievement of the set objectives.
3. The STI and host institutions should review the policies on sharing of proceeds from the Intellectual Property to adequately consider the individual innovator as opposed to only the STI and host institutions.
4. The STI should timely engage with innovators whose research has successfully progressed beyond prototyping and ready for commercialisation to act as a catalyst for innovation.
5. The STI secretariat together with MFPED and NPA should align the outputs in the work plan to the respective sub programmes and implementation plan.
6. The STI should harmonise the project objectives and titles to ensure achievement of agreed upon targets.

7. The STI should clarify roles between innovation and upscaling processes for innovations. The scientists should not manage the entire spectrum from bench research to industrial application as it weakens focus and effectiveness.

8. The STI should streamline funding for projects that play a supportive role to other innovators from project mode to program approach to facilitate continuity and reduce frustration of innovators. These projects include: CONAT, Invitro studies and animal research facility among others.

CHAPTER 1: INTRODUCTION

1.1 Background

The mission of the Ministry of Finance, Planning and Economic Development (MFPED) is, "*To formulate sound economic policies, maximize revenue mobilization, and ensure efficient allocation and accountability for public resources so as to achieve the most rapid and sustainable economic growth and development*."

The MFPED through the Budget Monitoring and Accountability Unit (BMAU) tracks the implementation of programmes/projects by observing how values of different financial and physical indicators change over time against stated goals and indicators. The BMAU work is aligned with budget execution, accountability, and service delivery.

Commencing FY 2021/22, the BMAU began undertaking Programme-Based Monitoring to assess performance against targets and outcomes in the Programme Implementation Action Plans (PIAPs)/Ministerial Policy Statements. The Semi-Annual and Annual field monitoring of Government programmes and projects was undertaken to verify receipt and expenditure of funds by the user entities and beneficiaries, the outputs and intermediate outcomes achieved, and the level of gender and equity compliance in the budget execution processes. The monitoring also reviewed the level of cohesion between sub-programmes and noted implementation challenges.

The monitoring covered the following Programmes: Agro-Industrialization; Community Mobilisation and Mindset Change; Digital Transformation; Human Capital Development; Innovation, Technology Development and Transfer; Integrated Transport Infrastructure and Services; Manufacturing; Mineral Development; Natural Resources, Environment, Climate Change, Land and Water Management; Public Sector Transformation; Private Sector Development; Sustainable Development of Petroleum Resources; and Sustainable Energy Development.

This report presents findings from monitoring the Innovation, Technology Development and Transfer (ITDT) Programme for the period 1st July 2023 to 30th June 2024.

1.2 Programme Goal and Objectives

The goal of the ITDT Programme is to increase the application of appropriate technology in the production and service delivery processes through the development of a well-coordinated STI ecosystem.

The objectives of the programme are:

i. To develop requisite STI infrastructure.
ii. To build human resource capacity in STI.
iii. To strengthen Research and Development (R&D) capacities and applications.
iv. To increase development, transfer and adoption of appropriate technologies and innovations.
v. To improve the legal and regulatory framework.

1.3 Sub-programmes

The ITDT Programme is implemented through the following sub-programmes:

i. Research and Development (R&D)
ii. Industrial Value Chains Development
iii. STI Ecosystem Development

1.4 Programme Outcomes

The third National Development Plan (NDPIII) ITDT Programme outcomes are:

i. Increased innovation in all sectors of the economy.
ii. Enhanced development of appropriate technologies.
iii. Increased R&D activities in the economy.
iv. Increased utilization of appropriate technologies.
v. An enabling environment for Science, Technology, Engineering & Innovation created.

The key targets to be achieved by this programme over the NDPIII period include:

i. Increase the Global Innovation Index from 25.3 to 35.0.
ii. Increase Gross Expenditure on R&D as a percentage of Gross Domestic Product (GDP (GERD) from 0.4 percent to 1 percent.
iii. Increase business enterprise sector spending on R&D (percent of GDP) from 0.01 percent to 0.21 percent.
iv. Increase the number of Intellectual Property Rights registered per year from 2 to 50.

CHAPTER 2: METHODOLOGY

2.1 Scope

This monitoring report is based on selected interventions in the ITDT Programme during FY2023/24. Implementation of the programme is spearheaded by Vote 167: Science, Technology and Innovations (STI) and Vote 110: Uganda Industrial Research Institute (UIRI). The funded subventions under STI include: The Uganda National Council for Science and Technology (UNCST), Kiira Motors Corporation (KMC), and Banana Industrial Research and Development Centre (BIRDC).

The monitoring involved analysis and tracking of inputs, activities, processes, outputs and in some instances intermediate outcomes as identified in the Programme Implementation Action Plan (PIAP), Ministerial Policy Statements (MPSs), and quarterly work plans, progress and performance reports of Ministries, Departments and Agencies (MDAs).

A total of ten interventions out of 23 under the PIAP were monitored[1]. The selection of the interventions to monitor was based on the following criteria:

i. A significant contribution to the programme objectives and national priorities.
ii. Level of investment and interventions that had a large volume of funds allocated were prioritized.
iii. Planned outputs whose implementation commenced in the year of review, whether directly financed or not. In some instances, multiyear investments or rolled-over projects were prioritized.
iv. Interventions that had clearly articulated gender and equity commitments in the policy documents

2.2 Approach and Methods

Both qualitative and quantitative methods were used in the monitoring exercise. The physical performance of interventions planned outputs and intermediate outcomes were assessed by monitoring a range of indicators. The progress reported was linked to the reported expenditure and physical performance.

A combination of random and purposive sampling was used in selecting interventions and outputs from the PIAPs, MPS, and progress reports of the respective agencies for monitoring. To aid in mapping PIAP interventions against annual planned targets stated in the programme MPS and quarterly work plans, a multi-stage sampling was undertaken at three levels: i) Sub-programmes ii) Sub-sub-programmes and iii) Project beneficiaries. Regional representation was considered in the selection of beneficiaries and outputs.

[1] Strengthen the Intellectual Property (IP) value chain management; Design and implement special programmes for Nano technology, space exploration, nuclear technology, bio sciences, ICT and engineering; Strengthen the function of technology acquisition, promotion as well as transfer and adoption; Increase investment in R & D in key priority sectors like; agriculture, Oil & Gas, Minerals, Energy, Health, Transport; Create capacity on application of drones, satellite imagery through GIS, real- time disaster modelling, and widespread connectedness, improve emergency response and production; Support the establishment and operations of Technology & Business incubators and Technology Transfer centres; Increase investment in R & D in key priority sectors like; agriculture, Oil & Gas, Minerals, Energy, Health, Transport; Develop a framework for promotion of multi-sectoral and multilateral collaborations; Support the establishment and operations of Science and Technology Parks to facilitate commercialization; and Design and conduct practical skills development programmes.

2.3 Data Collection and Analysis

Data collection

The monitoring team employed both primary and secondary data collection methods. Secondary data collection methods include;

i) Literature review from key policy documents including, MPS FY 2022/23; National and Programme Budget Framework Papers, A Handbook for Implementation of NDPIII Gender and Equity Commitments, PIAPs, NDP III, quarterly progress reports and work plans for the respective implementing agencies, Quarterly Performance Reports, Budget Speech, Public Investment Plans, Approved Estimates of Revenue and Expenditure.
ii) Review and analysis of data from the Integrated Financial Management System (IFMS) and Programme Budgeting System (PBS) Quarterly Performance Reports.

Primary data collection methods on the other hand include:

iii) Consultations and key informant interviews with institutional heads and project/intervention managers.
iv) Field visits to various institutions, for primary data collection, observation, and photography.
v) Callbacks in some cases were made to triangulate information.

Data Analysis

The data was analyzed using both qualitative and quantitative approaches. Qualitative data was examined and classified in terms of constructs, themes, or patterns to explain events among the beneficiaries (interpretation analysis) and reflective analysis where the monitoring teams provided an objective interpretation of the field events. Quantitative data on the other hand was analyzed using advanced Excel tools that aided interpretation.

Comparative analyses were done using percentages, averages, and cross-tabulations of the outputs/interventions; The performance of outputs/interventions and intermediate outcome indicators was rated in percentages according to the level of achievement against the annual targets. The assessment of grants under the STI funding windows was based on the achievement of annual output targets (numbers) and the level of annual budget disbursements. The sub-programme score was determined as the weighted aggregate of the average percentage ratings for the output/intermediate outcomes in the ratio of 65%:35% respectively.

The overall programme performance is an average of individual sub-programme scores assessed based on outputs monitored. The performance of the programme and sub-programme was rated based on the criterion in Table 2.1. Based on the rating assigned, a BMAU colour-coded system was used to alert the policymakers and implementers on whether the interventions were achieved or had very good performance (green), good performance (yellow), fair performance (light gold) or poor performance (red).

Table 2.1: Assessment Guide to Measure Performance in FY 2023/24

Score	Performance Rating	Comment
90% and above		Very Good (Achieved at least 90% of outputs and outcomes)
70%-89%		Good (Achieved at least 70% of outputs and outcomes)
50%- 69%		Fair (Achieved at least 50% of outputs and outcomes)
49% and below		Poor (Achieved below 50% of outputs and outcomes)

Source: Author's Compilation

Ethical considerations

Introduction letters from the Permanent Secretary/Secretary to Treasury were issued to the respective MDAs, and beneficiaries were monitored. Entry meetings were held with the Accounting Officers or delegated officers upon commencement of the monitoring exercise. Consent was sought from respondents including programme or project beneficiaries. All information obtained during the budget monitoring exercise was treated with a high degree of confidentiality.

2.4 Limitation

- Lack of reliable and real-time financial data on subventions on the IFMS.
- Mis-aligned PIAP interventions that do not relate to outputs and sub programmes in the work plan which affects performance assessment.

2.5 Structure of the Report

The report is structured into four chapters. These are the Introduction, Methodology, Programme Performance, Conclusion and Recommendations respectively.

CHAPTER 3: PROGRAMME PERFORMANCE

3.1 Introduction

The Innovation, Technology Development and Transfer Programme contributes to objective four of the NDPIII to enhance the productivity and social well-being of the population. During the FY2023/24, the Science, Technology and Innovation (STI) programme continued to support research and innovation through the key areas of import substitution, productivity acceleration and export promotion. This was done through the five bureaus of Mobility, pathogen economy, industry 4.0+, infrastructure innovation, and aeronautics and space science.

3.2 Overall Performance

3.2.1 Financial performance

The approved budget for the ITDT Programme was Ug shs 256.656 billion (bn) which was revised upwards to Ug shs 1,035.01 bn. A total of Ug shs 968.706 bn (93.6%) was released and Ug shs 965.102bn (99.6%) spent by 30th June 2024 (Table 3.1). The release and expenditure were very good. The very good absorption is because a significant amount of the release was disbursed to the different subventions and grantees for research and over 70% transferred to DEI-Biopharma limited however, actual absorption at grantee level was averagely fair. Vote 167-STI had the biggest share of the annual budget at 96.4% followed by UIRI at 3.2% while the support to the Uganda embassy in Russia, Moscow and the Ministry of Foreign Affairs had the least share at 0.01% and 0.05%.

Table 3.1: Financial Performance for the ITDT Programme FY2023/24 (Bn Ug shs)

Vote	Approved Budget	Revised Budget	Release	Expenditure	% release (approved budget)	% release	% expenditure
Science, Technology and Innovation	241.591	998.671	934.796	931.803	386.9	93.6	99.7
Uganda Industrial Research Institute	11.956	33.256	30.821	30.213	257.8	92.7	98.0
Uganda Registration Services Bureau	2.41	2.41	2.41	2.406	100	100	99.8
Uganda Embassy in Russia, Moscow	0.119	0.119	0.119	0.119	100	100	100
Ministry of Foreign Affairs	0.581	0.581	0.561	0.561	96.6	96.6	100
Programme total	**256.657**	**1,035.037**	**968.707**	**965.102**	**188.3**	**96.6**	**99.5**

Source: Quarter Four PBS Report FY2023/24

Physical performance

The overall ITDT Programme performance was fair at 52.4% (Table 3.2). Whereas the STI Eco systems development, and Industrial Value Chain Development Sub-programme performed fairly, the research and development sub programme registered poor performance. The poor performance was attributed to fewer Intellectual Property Rights (IPR) registered against the annual target. For purposes of FY2023/24, the physical performance of DEI pharmaceutical was not monitored.

The performance of infrastructure development was good although behind schedule. The construction and equipping[2] of the National Science, Technology Engineering, Innovation and Skills Enhancement Centre (NSTEIC) and the Technology and Industrial Business Incubation Centre (TIBIC) were complete. However, there were some few snags that were yet to be addressed at both sites. Equipment installation at the Kiira Vehicle plant was in the final stages while installation of the GoU funded IT equipment at the TIBIC was at varying completion levels.

The National E-mobility Strategy was approved, and clinical trials for 3 vaccines was partially achieved due to absence of corresponding Good Manufacturing Practice (cGMP) facilities in Uganda. Implementation of research grants was hindered with the STI secretariat's delay in issuance of expenditure approvals. The commercializing of the Tooke plant registered slow progress attributed to lengthy procurement of required equipment. As at 30th June 2024, Tooke plant realised 50% of the targeted revenue.

Table 3.2: ITDT Programme Output Performance by 30th June 2024

Sub-program	Physical Performance (%)	Remarks
Research and development	35.2	Poor performance
Industrial value chains development	55.8	Fair performance
STI Eco systems development	66.19	Fair performance
Overall programme performance	**52.4**	**Fair performance**

Source: Field Findings

Detailed performance of the monitored sub programmes and interventions is given hereafter:

3. 3 Research and Development Sub-programme

The sub-programme contributes to the objectives of building institutional and human resource capacity in STI and strengthening research and development capacities and applications. The overall sub programme performance was poor at 35.2%. One intervention and one output were planned under the sub programme. The performance is summarized in Table 3.3.

Table 3.3: Performance of the intervention under the Research and Development Sub-programme by 30th June 2024

Intervention	Colour code	Remark
Strengthen the Intellectual Property (IP) value chain management	35.2%	Poor performance

Source: Field Findings

3.3.1 Strengthen the Intellectual Property (IP) value chain management.

The intervention contributes to the objective of strengthening Research and Development (R&D) capacities and applications. The planned output under the intervention for FY2023/24

[2] Equipping component using the external financing from the EXIM Bank of CHINA

is model value addition services. The intervention performance was poor. Detailed performance is reported hereafter.

Model value addition services: To Strengthen the Intellectual Property (IP) value chain management, sensitisations campaigns on IP rights were carried out and as a result, one intellectual property right (IPR) was registered with the Uganda Registration Services Bureau (URSB) against a target of five. However, there were several neighbouring rights that were registered during the period under review as follows; 29 copyright application were submitted, 60 were registered including those of the previous FY. Three industrial designs were registered against a target of seven and one utility model was registered agains04t a target of four during the FY. A total of 1,196 local and 1567 foreign trademarks (TM) were registered against a target of 2,145 and 1587 respectively.

The expenditures under this intervention and output were on research, General staff salaries, guard, allowances, and security services, welfare and entertainment, among others.

Table 3.4: Performance of the Research and Development Sub-programme as at 30th June 2024

Outputs Performance								Remark
Intervention	Out put	Financial Performance			Physical Performance			
		Annual Budget (Ug shs)	% of budget received	% of budget spent	Annual Target	Cum. Achieved Quantity	Physical performance Score (%)	
Strengthen the Intellectual Property (IP) value chain management	Model Value Addition Services	10,195,511 ,776	100	100	100	35.2	35.2	One out of five IPRs was registered
Average Outputs Performance							**35.2**	***Poor performance***

Source: Field Findings

Conclusion

The overall sub programme performance was poor with one only out of the planned five intellectual property right (IPRs) registered with URSB.

3.4 Industrial Value Chain Development Sub-programme

The sub-programme aims to increase development, transfer and adoption of appropriate technologies and innovations; and development of requisite STI infrastructure. The sub-programme has three interventions and all were monitored. The sub programme performance was fair at 55.8%. Table 3.4 gives the summary performance of the sub-programme interventions as at 30th June 2024.

Table 3.5: Performance of Interventions under the Industrial Value Chain Development Sub-programme by 30th June 2024

No	Intervention	Colour code	Remark
1	Design and implement special programmes for Nano technology, space exploration, nuclear technology, bio sciences, ICT and engineering	54.4	Fair performance
2	Strengthen the function of technology acquisition, promotion as well as transfer and adoption	61.3	Fair performance
3	Increase investment in R & D in key priority sectors like; agriculture, Oil & Gas, Minerals, Energy, Health, Transport	57.6	Fair performance

Source: Field Findings

3.4.1 Design and implement special programmes for Nano technology, space exploration, nuclear technology, bio sciences, ICT and engineering

The intervention aims at building institutional and human resource capacity in STI. The planned outputs during the FY2023/24 were; technology and innovation, model value addition services, research and development, and industrial skills development. The overall intervention performance was fair. Detailed performance of the monitored output is presented hereunder.

Technology and Innovation: The plan was to develop and operationalise a space science programme by revamping and upgrading the Mpoma Earth Station. By the end of the FY, a satellite training platform was acquired for education purposes from the partners with software and additional equipment for the ground station. An inter-ministerial committee and task force were formulated to harmonise existing efforts and develop the national strategic direction for the space science sector. The development of a regional communication satellite was initiated with a project implementation roadmap in place.

3.4.2 Strengthen the function of technology acquisition, promotion as well as transfer and adoption

The intervention aims at increasing development, transfer and adoption of appropriate technologies and innovations. The planned outputs during the FY2023/24 included; technology and innovation undertaken, industrial skills developed, and model value addition services provided. The intervention performance was fair due to delayed commencement of research. The performance of the monitored outputs is presented hereunder.

Technology and Innovation: The plan was to; develop and commercialise five (5) beauty and dermatology products from indigenous materials; develop cassava value chains with three (3) cassava products on the market; build capacity to develop and produce Industry 4.0+ products locally; and 3 partnerships and collaborations formed with industry experts.

In a bid to develop and commercialise dermatology products from indigenous materials, two products namely; the mosquito repellent vaseline and lotion were developed from shea butter and ethno-medicinal plants against the annual target of five dermatological products. Plans were underway to ensure the commercialisation of the mosquito repellent under the *Mrepel* brand.

The STI Secretariat carried out a field survey to identify players along the cassava value chain, but the pilot production and marketing of high-end cassava value added products for wheat import substitution was not undertaken. The cassava grantee at Gulu University had not yet received funding by end of June 2024.

To establish an ecosystem to support industry 4.0 potential ideas into mature technologies, the STI operationalized the academia to research initiative with an intention of valorisation of research and development from universities. The STI finalized funds allocation to the academic research initiative and was working with the Regional Universities Forum to identify and incubate research projects at academic institutions across Uganda. On the other hand, the establishment of the robotics centre was differed to financial year 2024/25 due to funds limitation and renewed focus on electronics prototyping and manufacturing as a foundation for robotics.

Research and Development: The plan was to complete clinical trials for three (3) selected vaccines, prepare plans for the construction of the pathogen economy industrial park and support researchers to undertake innovations in various fields. It was noted that these were innovators whose funding was in the budget of the previous financial year (FY2022/23), but the funds were disbursed in the FY2023/24.

The clinical trials were partially done due to the absence of a GMP facility in the country while land was acquired in Nakasongola to establish a pathogen park.

The geotechnical surveys were done for the pathogen economy park under Ndiyo Biosciences and a masterplan was being developed with technical support from Cuba.

A total of 67 grantees were supported to undertake research and innovation in various fields however, most of the grantees were in the preliminary stages of implementation. Whereas funds were released to the grantees, the permission to spend was granted very late, with some taking up to six months from the time of receiving funds. During the period under review, 29 grantees were monitored to ascertain progress, and the findings are discussed below;

1. *Adeno-vector vaccine: Preclinical immunogenicity assessment and GMP process transfer*

The project aims at developing a SARS-CoV-2 vaccine using an Adenovirus vector and viral spike (S-glycoprotein) from Ugandan viral strains. The key objectives are; 1) Complete immunogenicity studies in humanized mice, and 2) Produce bulk stock for clinical trials under cGMP conditions. The project planned outputs included; Ugandan non-human primate (NHP) adenovirus vector developed; adeno-vector COVID-19 vaccine developed; and technical capacity for vaccine production built.

The following progress had been registered at the start of the period under review: Completed genotypic characterization of 73 faecal samples collected from chimpanzees; adeno-vector backbone was generated; three vaccine candidates (A23.1, Delta and Omicron) were generated from deleted adeno-vectors; bulk laboratory stock of both the vaccine and vector were generated; and capacity building of project staff in areas of bioinformatics, next generation sequencing and cytometry flow panels was done. Additionally, a PhD student was recruited with a focus on developing capacity for multivalent vaccines.

The project budget during the FY2023/24 was Ug shs one billion which was all disbursed to the implementer by 30th October 2023 however, permission to spend was granted in March 2024.

By end of the FY 2023/24, the pilot study on the vaccines to evaluate the safety and immunogenicity of the vaccines was completed. The results obtained from the safety studies met the minimum safety standards. Most of the products tested did not have any negative effects on the function of the organs (liver, kidney, heart, brain, spleen, and skeletal muscle) of the mice. The efficacy studies (to assess whether the antibodies are neutralising the virus) started in June 2024 and were expected to be completed in December 2024.

The request for patent rights for the indigenous vaccine backbone was submitted to the African Regional Intellectual Property Organization (ARIPO) pending substantial examination for finalization of the process. On the other hand, three PhD students were enrolled as part of capacity building, and they are at different levels of completion. The project was affected by delayed approval to spend the funds, inadequate resources to pay the project staff and the absence of a GMP facility.

2. Development and evaluation of recombinant sub-unit SARS-COV2 Spike Protein-based Sub-unit vaccines

This project developed a candidate Covid vaccine using recombinant vaccine technology. Under this funding, the objectives were to; 1) Establish cGMP for pilot production of subunit vaccine, and 2) Produce vaccine for clinical trials. During the first phase of funding, the Delta and Omicron spike antigen was successfully cloned and expressed. The safety and immunogenicity studies were completed.

The budget for the year 2023/24 was Ug shs 1.5bn all of which was disbursed and Ug shs 0.637bn spent by 30th June 2024. The conversion of the BSL3 laboratory progressed to 30% with the facility plans and bills of quantities generated following the support of GMP experts from Cuba. Additionally, the manufacture methods were optimised and patent applied for.

Sample vaccines were produced for clinical trials and the preliminary processes were being undertaken to have the vaccine approved by all the required agencies. The phase 1 clinical trial protocols were developed to 5% and the procurement of equipment such as the HVAC-HEPA filters, biosafety cabinets and bioreactor for protein expression to carry out the clinical trial was initiated. The manufacture methods were also optimised to 80%, the vaccine was characterised to 80% and the application for the patent submitted. Additionally, efficiency studies in humanised mice progressed to 50%.

The project was delayed by the change of facility from a cGMP to a BSL 3 lab for the production of the vaccine following M/s Alfasan's (production partner) lack of some equipment to manufacture human vaccines and the delayed approval to spend the funds by the STI secretariat.

3. Pre-clinical studies and GMP Production for Inactivated Vaccine

This is one of the pioneer human vaccine projects utilizing inactivated vaccine technology. The project has two objectives; 1) Completing the animal trials-preclinical immunogenicity assessment, and 2) Production of bulk stock for clinical trials in a cGMP facility.

The project budget was Ug shs one billion, all of which was released and Ug shs 0.622 billion (62.2%) expended by the 30th of June 2024. By end of the FY2023/24, the study had completed inactivation and purification, and also completed the pilot animal trials in Swiss mice. The results from the initial trials indicated no significant safety concerns and adverse effects

Analysis of the data was ongoing and pilot optimisation of collection of the cellular specimen before conducting the full pre-clinical trials on humanised mice for safety and immunogenicity. The absence of a GMP facility for pilot bulk production of seed stock and GMP stock was a hindrance to the progress of project.

Under the capacity building output, a total of three members completed their master's degree in different areas related to the project, three were in their final year while two had enrolled for master's degrees. The capacity building was intended to bridge the gap in the insufficient immunology skilled workforce.

The project was being delayed by lack of Good Manufacturing Practices (GMP) facilities in Uganda for production of GMP certified product for use in human clinical trials, discontinuous funding structure, limited access to high-containment laboratories (BSL-3) in Uganda, and insufficient immunology skilled workforce.

4. In-Vitro Studies of Natural Therapeutics of Uganda Program (INVONAT)

The project started in FY 2020/21 with a goal of evaluating the in-vitro (conducted in laboratory/test tube setting) anti-bacterial, anti-fungal and anti-viral capacity of natural therapeutic products in Uganda and for effective compounds to evaluate the related mechanisms of control. The project was conceptualised as a common user facility for in vivo (in living organisms) studies for natural therapeutics as well as vaccines. The key objective during the period under review was to take at least 15 experimental drugs through in-vivo studies (safety, and efficacy).

The project budget in FY2023/24 was Ug shs 900,000,000 which was all received in October 2023, but the researcher received permission to spend from STI in April 2024.

By 30th June 2024, the following had been achieved; One comprehensive and amended protocol for in-vitro studies was developed, submitted and approved by the Research and Ethics Council (REC). The sterility testing was done for 12 out of the 13 products received namely, 3 anti-dental medicines, 7 products from AMIREC (2 anti-cancers, 2 Anti diabetes, 2 anti-sickle cell and 1 for haemorrhoids), and 2 products from Clinical Trials of Natural Therapeutics (CONAT). All the products tested were found sterile and the results were shared with the innovators.

In addition, cytotoxicity assays were completed for 10 out of the 13 products received. Two of the products were identified as cytotoxic while the other 8 products passed cytotoxicity stage and were ready for the efficacy assays.

No anti-viral products were received for assessment. The delayed approval to spend led to delayed procurement of reagents and therefore some products are yet to undergo the tests. These include three dental products, two anti-cancers, two anti-diabetes, two anti-sickle cell, one anti-ulcer, and one anti-inflammatory.

The project was affected by the delayed approval to spend, lack of control over some of the facilities being used in the studies and intermittent funding which led to delayed procurement, payments, and implementation of planned outputs.

Given the nature of the intervention (support platform for other innovators) and mode of financing, it was observed that it would be best financed under regular programming for continuity and achievement of objectives as compared to I year project mode financing. This will reduce on the delays in delivering on the test results that inform other processes of therapeutic development by the natural therapeutic products innovators.

5. Clinical Trials for Natural Therapeutics (CONAT)

The project was set up to act as a platform to support clinical trials for natural therapeutics at no cost to the innovators. The platform runs multiple experimental drugs through the protocols. To qualify, the drugs must be notified by NDA and go through the in-vitro study stage, the key objective was to assess the safety, pharmacokinetics, and preliminary efficacy of herbal products for the treatment of common illnesses in Uganda

The project budget was Ug shs 5 billion all of which was released and Ug shs 3.76bn spent by 30th June 2024. Part of the funds were used to renovate a ward in Mulago National Referral

Hospital (NRH) into the clinical trials unit with a five-bed capacity (four high dependency unit beds and one intensive care unit bed). The ward was also equipped with accompanying equipment to monitor, observe, and manage patients, a laboratory, and a pharmacy. Two laboratory technicians, one sample runner and one laboratory fellow were recruited.

A total of nine drugs (two for respiratory viral infections, five for *diabetes melitus* and one for malaria) were undergoing clinical trials and at varying stages of progress. Two drugs namely, TazCoV and Vidicine meant for the treatment of acute respiratory viral infections including SARS-CoV2, RSV and Influenza A/B in Uganda had significantly progressed and were at the stage of preparing final data for the data safety and monitoring board.

Another study commenced in April 2024 involving five drugs for *diabetes melitus* to evaluate their preliminary safety and effectiveness in adult patients. Another study was initiated on malaria drugs to be able to document an inventory and determine safety and efficacy of herbal medicinal products used for malaria prophylaxis and treatment in Uganda among 8-15 years old children. The studies on *diabetes melitus* and malaria were at initial stages.

Additionally, four research fellows were enrolled in pharmacology, laboratory and clinical fields. These were taking part in protocol research and preparation, contributing to the scientific vetting of study protocols, and writing scientific papers based on study findings.

The project was affected by the delayed funds disbursement and approval to spend, delayed approval of protocols by NDA, hesitancy by indigenous scientists to share information about their drugs and inconsistency in investigated projects. It was observed that, the mode of funding the platform as a project instead of a re-current intervention was affecting continuity and completion of trials since funds were not available at some critical times of the studies.

Left: One of the patient beds. Right: an XRF Spectrometer at CONAT, Makerere Lung Institute.

6. *Preclinical evaluation and standardization of antidiabetic herbal prototypes – GLUCOKAT Project*

This project builds on earlier preliminary research that aimed at developing a natural anti-diabetic therapeutic through reformulation of an existing product. The key project objectives were to; 1) evaluate the anti-hyperglycaemic and antidiabetic potential of the formulated prototypes using animal models, 2) assess the toxicity profiles of the most efficacious formulated antidiabetic prototype in cell lines and animal models, 3) analyse the phytochemical composition and contaminants of the most efficacious formulated prototype, 4) assess and optimize the pharmaceutical properties of the of the most efficacious formulated antidiabetic prototype, and 5) establish a GLP facility to support preclinical evaluation of natural therapeutics in Uganda. The STI was therefore funding a prototype into a viable product that could be commercialised.

The budget for the project was Ug shs 1.3bn all of which was disbursed to the grantee and a total of shs 1.169bn (89.9%) was spent by 30th June 2024. The project is an extension to a previous innovation fund that developed a prototype therapy to treat Covid 19 code named Tazcov. The project has two components which are; research, and infrastructure development.

The research component progressed to 72%. Samples were collected and permutation of the five plants (*Tamarindus indica, Aloe vera, Erythrina abbyssinica, Kigelia Africana, and Entada abyssinica*) that were identified at prototype stage was undertaken. This was to enable optimisation of a few without losing the purpose and content. Four prototypes were formulated however, following laboratory investigations, one prototype was prioritised because of its good physicochemical and organoleptic properties.

By 30th June 2024, a benchmarking visit was undertaken in China and the formulation of 100 doses of the prototype-GTK04 was ongoing at 50% progress and the preclinical safety and efficacy studies progressed to 40%. The studies were however affected by the delayed delivery of diabetes melitus inducing agents (STZ and alloxan) and the low conversion of the diabetes states.

The infrastructure component (Construction of a GMP) progressed to 90%. The additional two floors of the GLP facility were substantially complete pending shuttering and final finishes however, the funding did not include equipping the facility. A variation was made to include partitioning on the third floor which was not in the original plan. This led to an increase in the cost by Ug shs 30 million of which only 18 million was available. The Busitema University was sourcing funds internally to cover the difference of Ug shs 12 million.

The lack of clarity in intellectual property (IP) sharing between STI, the Institution and the innovators was still of concern to parities and derailed the submission of an IP application. The delayed approval to spend funds further affected implementation

There was therefore need for the STI secretariat to harmonise the IP rights sharing between the researcher/grantee, host institution and the funder.

L-R: A substantially complete GMP facility at the Natural Products Research & Innovation Centre - Busitema University Mbale Campus. Construction of Laboratories for space science and lithium battery projects at Busitema University Nagongera Campus

7. Fabrication of lithium-ion batteries for electric vehicle and rechargeable batteries for energy storage using locally available materials in Uganda

The project aims at demonstrating the potential for developing electric vehicle batteries from Ugandan lithium and graphite. The objectives of the project were to: 1) characterize the composition of local lithium and graphite ores, 2) establish a small-scale process for purification of lithium and graphite from the ores on laboratory scale, 3) purify the raw lithium and graphite to battery grade materials and test for physical and chemical properties, and 4) evaluate the purified lithium and graphite materials for energy storage ability.

The project has three phases namely, Phase one of ideation and materials processing which is being funded. Other phases are; Phase two for materials analysis and testing, equipment assembly, and establishment of a battery testing laboratory; and Phase three of setting up a lithium processing line, fabrication of different cylindrical battery types, assembly and testing battery packs for different applications.

The project budget was Ug shs 1.75bn. The funds were received by 19th October 2023 and clearance to spend was granted on 09th April 2024. A total of Ug shs 0.81bn was spent by 30th June 2024.

The project progress was estimated at 30% with preliminary sampling and analysis of lithium mines in Mayuge and Buhweju districts undertaken. The samples were being processed and tested in the labs outside Uganda. Protective wear and some sampling equipment such as chizzors, stone hummers, gumboots, pickaxe, grinder, reflector jackets, and rock cutter were procured.

In addition, renovation of the laboratory had progressed to 75% pending final painting electrical and plumbing connections. A contract had been awarded to M/s WAGTECH International for the supply of equipment[3] and materials at a cost of Ug shs 1.2bn.

The project implementation was hampered by difficult in access to the different lithium and graphite mines since many of them were leased to private companies. This was worsened by the inadequate support from the Geological Survey and Mines department of Ministry of Energy and Mineral Development as the licencing agency to access these mines.

8. Formulation and pre-clinical evaluation of herbal toothpaste/ mouth wash for management of oral diseases.

This project was a venture between Busitema University and CDH Herbal solution limited. The focus was on development of herbal toothpaste for complete dental healing. The project objectives were to 1) formulate herbal toothpaste/mouth wash from extracts of selected plants for management of oral disease, 2) evaluate the organoleptic and physical properties of the formulated herbal toothpaste/mouth wash as per specified standards, 3) evaluate the antimicrobial activity of the formulated herbal remedy against selected oral pathogens, streptococcus mutans and staphylococcus aureus, and 4) produce and undertake field testing of one batch of the fully tested herbal remedy.

The project budget was Ug shs 500 million all of which was released and Ug shs 0.375 bn spent by end of June 2024.

By 30th June 2024, the overall project progress was approximately 30%. Collection of the sample materials, sample drying and pulverization, and extraction were completed.

[3] planetary ball mill, slitting machine, rolling pressing machine, coating machine, vacuum oven, grooving machine, glove box and sealing machine among others.

Qualitative phytochemical analysis of plant extract progressed to 40%, while antimicrobial analysis of the extracts and pre-formulation and formulation studies progressed to 10%. The organoleptic and physical properties evaluation of the formulated product, evaluation of antimicrobial activity of the product on oral pathogenic bacteria, and production of batch 1 (150 doses) for field testing had not commenced.

The project was affected by the delayed approval to start spending which affected the timelines and shortage of equipment such as the Liquid chromatography-mass spectrometry (LC–MS) to undertake certain tests leading to loss of time as sample had to be taken to Germany for assessment.

9. *Space Weather Science and Education Project for Disaster Management and Preparedness*

This project intends to develop earth observation products using satellite and geospatial data towards disaster prediction (drought, weather, landslides, among others). It intended to yield the premier product from the Aeronautics and Space Bureau. The objectives of the project were: 1) requirements analysis for 2 earth observation products, 2) product design 3) product development, and 4) validation of product

The project budget was Ug shs 2 billion of which Ug shs 0.316 bn (15.8%) was spent by 30th June 2024. The activity with the highest expenditure was housing costs and the least was raw materials. By the end of FY2023/24, the overall project progress was 25% with base models and a prototype to display the weather parameters developed and ready for validation.

The construction of the laboratory facility progressed to 75% and other ongoing activities included; procurement of weather equipment, data collection, development of a mobile application and validation of a prototype.

It was observed that there were some objectives presented by the innovator but they did not appear in the original project documents from the STI secretariat. The project was affected by the delayed approval to spend by the STI secretariat.

10. *Laboratory scale production of beta propiolactone from cassava for application in the pharmaceutical industrial value chains*

This project aimed to study the chemical conversion of ethanol from cassava to produce a more valuable product, beta propiolactone (BPL) which is an essential ingredient in vaccine development. The key objectives of the projects were: 1) Optimizing production process for beta propiolactone, 2) Synthesize the intermediate chemicals (ethanol, ethylene and ethylene oxide) required for BPL production, 3) Produce beta propiolactone at laboratory scale for inactivation of viruses during vaccine development, and 4) Determine the quality profile of the synthesized BPL.

The project budget was Ug shs 0.450bn and all was released to the researcher and Ug shs 0.129bn (28.8%) expended by 30th June 2024. The project achieved the following; a benchmarking visits made to China, Kakira sugar works and Lugazi sugar corporation alcohol distillation units. Renovation of the lab was ongoing including partitioning. The delivery of the equipment (fermentation Unit, high pressure reactor and ethanol distillation unit) was delayed arising from the delayed approval to spend. Due to the absence of the equipment, the full synthesising and quality assurance of the synthesised chemicals was yet to commence.

The project was behind schedule due to delayed disbursement and the absence of infrastructure.

11. Enhancing learning outcomes through principle and project-based delivery methods in higher secondary schools. (Piloting an Activity Based Learning and Teaching Approach for Advanced Level Science Students)

This project targeted to develop a synergistic capacity development for Science, Technology and Innovation among A-Level student to simplify how science education is delivered with minimal materials. The project had two objectives namely: 1) Develop tools for capacity development and practical skilling among A-Level science students, and 2) Pilot the tools for capacity development and practical skilling among A-Level science students

The project expected outputs were; a principle-project based curriculum for Advanced Level science subjects developed, training materials and resources developed, a group of students trained in a designated secondary school, and educators trained.

The project budget was Ug shs 0.199bn which was all released and Ug shs 0.013bn spent by the end of FY2023/24. The project was behind schedule with teacher training undertaken, Learning Materials partly developed, and 27 students selected for the pilot study. The project however had a mismatch in some of the objectives and outputs that were in the STI documents.

12. Establishment of an Agro-Science Park at Busitema University

This project aimed at establishing a facility that could create an interface between communities and the University. This was to increase offtake of locally produced agro-products as raw materials for high end processing. The facility was to develop research-based solutions that support the efficient productivity by communities. The key project objectives were: 1) Establish the suitability of Arapai campus for the Agro-science Park. 2) To profile basic information to guide on the products development for all the crops. 3) Develop the Agro-science Park project proposal. (Feasibility study, business plan (10 years), financial model (10 years), Pitch Deck), 4) Profile technology for local development and transfer, and 5) Develop the prerequisite human capital for the agro-science park.

The project budget was Ug shs 0.3bn all of which was released and Ug shs 0.078bn spent by the end of the FY. However, the Principal Investigator was implementing a different project named Strengthening the orange fleshed sweet potato value chain in Uganda through an agro-science park at Busitema University – Arapai Campus with different objectives and expected outputs with a very small component of the original project as stated in the STI documents.

The STI secretariat should harmonise the project concept and the one being implemented by the principal investigator to ensure that the funds are spent on the approved project objectives and expected outputs. The science park concept was found so big for the competencies of the Investigator and available funding.

13. Direct Reduction Technology for Metallization of Ugandan Iron Ore

The project aimed at establishing capacity for value addition to iron ore using eco-friendly gas reduction technology using hydrogen or ammonia. The first level is a prototype with capacity of 1 tonne per cycle. The project had three objectives: 1) Process design, 2) Protype fabrication, 3) Prototype testing and validation.

The project budget was Ug shs 0.8bn all of which was released and Ug shs 0.118bn spent by end of June 2024. The poor absorption was because the resources are for the procurement of a fixed bed reactor and raw materials such as hydrogen and ammonia which have not commenced. By the end of the financial year, the project team had mapped out the different sectors in the iron ore utilisation, made visits to iron ores mines in Kigezi and Tembo industries and characterised the samples to determine the shatter, tumbler and abrasion index.

The project acquired aspen simulation software and computer simulations were undertaken. The process designs were completed, and procurement of a laboratory scale fixed bed reactor (FBR) and iron ore pelletizer was initiated and due diligence on the company was ongoing in India. The prototype design was dependent on acquisition of the FBR. The project, however, faces a risk in terms of location of the facility. This is because the equipment and the hydrogen to be used in iron ore reduction process poses safety threat to humans in case of exposure. This is likely to delay the completion of the project since the available space is within Makerere University with high student population which may endanger the production facility.

The project encountered prolonged procurement by the university which has delayed the development of the prototype.

14. Establishment of a common user packaging facility

The aim of the project was to establish a government owned common user facility for packaging at NSTEI-SEP, Namanve targeting value-added food products. This would address lack of affordable and quality packaging materials for the food manufacturing ecosystem. The objectives were: 1) To Conduct value chain mapping and analysis of the flexible packaging value chains, 2) To develop prototypes and manufacturing processes for flexible packages, and 3) To set up and commercialize a packaging manufacturing facility for affordable and quality flexible packages. The project is implemented by Makerere University with NSTEI-SEP (UNCST) playing oversight and financial control roles.

The project budget was Ug shs 2.7bn. The funds were received in October 2023 and clearance to spend was given in April 2024 of up to Ug shs 0.231bn and as of 30th June 2024, Ug shs 0.230bn was spent.

The expenditure was on salaries, allowances and undertaking a value chain survey, mapping and analysis of flexible packaging value chain from raw material procurement to the delivery of finished packaging products to end-users. The value chain mapping provided a clear understanding of the current state of the packaging sector in Uganda and highlighted the critical areas where the new packaging facility could make the most impact.

The software team completed the initial phases of platform development, designed to support data collectors, administrators, and project stakeholders. The platform consists of several modules, developed in phases, to provide comprehensive data collection, management, and visualisation capabilities accessed at https://packagingprobe.com/.

The commencement of the other two objectives of the project was dependent on completion of the first objective of the value chain survey, mapping, and analysis of the flexible packaging value chain. The project was therefore behind schedule.

15. Transforming Uganda into a global electronics powerhouse

The project aimed at establishing a state-of-the-art surface mount technology (SMT) manufacturing line for electronics providing subsidized services to the local electronics development ecosystem. The project objectives were: 1) To establish infrastructure for a world standard local surface mount technology (SMT) facility in Uganda with a capacity of 2,000 units per month, 2) To undertake contract manufacturing for other players in the electronics development industry in Uganda and across the region, 3) To undertake research and development targeting niche products such as Electronic Control Units (ECUs). The project is implemented by a private company called M/S Innovex Limited based in Ntinda.

The budget for the project was Ug shs 0.899bn which was all released and Ug shs 0.709 spent by 30th June 2024. The project had initiated the production and assembly of 60 units of solar powered irrigation pumps for Ennos a South African company. The innovator was also working on a cooling component for koolbox solar freezer for a Nigerian company. The company was also assembling smart meters for solar pumps and network switches. In addition, 19 standard operating procedures (SOPs) were developed.

The setup of the manufacturing facility in Namanve was ongoing with partitioning of the facility ongoing in preparation for the installation of the equipment. This was however, behind schedule arising from the delayed conclusion of an MoU with the UNCST on usages of the facility. The project was hampered by inability to take contracts for bulk production since it was using entry level machinery with limited capacity. Additionally, there were difficulties in accessing some input materials which was delaying delivery.

L-R: some of the equipment procured at Innovex and samples of the electronic and solar control units undergoing factory tests

16. Local Electronics Design and Hardware Enterprise Incubation

This project intends to support local electronics innovators to develop electronics products such as those used in consumer, industrial, medical, avionic, and automotive applications, by designing, prototyping, testing, and assisting in certification. The main objectives of the project were to; 1) establish electronics design facility, 2) provide seed funding for prototyping, and 3) human capital development for local electronics design and prototyping ecosystem. This project was implemented by a private company- Lwera electronics.

The project budget was Ug shs 1.15bn which was all released and Ug shs 0.825bn was spent by 30th June 2024. M/s Lwera Electronics had procured and delivered most of the equipment and materials at the space that was provided at the TIBIC in Namanve, and the set-up of the electronics design facility was in the final stages pending a few equipment that were yet to be delivered by the supplier.

L-R: Installed equipment, and Workstations at Lwera Electronics workspace at TIBIC-Namanve

On the objective of human capital development, Lwera electronics was training potential employees in electronics manufacturing at the National ICT hub-Nakawa. Additionally, the unspent funds were earmarked to support the training of additional human resource at the University level in the electronics manufacture ecosystem.

17. Animal Research Services for Enhancing Shared Efficiency and Effectiveness

The project was to act as a common user laboratory animal facility to support animal studies for vaccine and therapeutics research. The project objectives were; 1) Continuous breeding and maintenance of humanized ACE2 mice, 2) Design humanized mice for diseases of interest (cancer, malaria, among others), 3) Complete refurbishment of lab animal house facility into a BSL-3 facility, and 4) Conduct animal studies for Covid vaccines. The project is located at the College of Veterinary Medicine, Animal Resources and Bio-security (COVAB).

The budget was Ug shs 1 billion all of which was released and Ug shs 0.484bn (48%) spent by 30th June 2024. The facility continued with the breeding of mice up to 5,000 mice by end of FY 2023/24 and ready to sell off 1,000 mice. A draft curriculum for the preclinical trials at the facility was designed awaiting approval by the University, and five staff were trained on approaches to preclinical trials.

The transformation and refurbishment of the Lab animal house into a bio security level 3 laboratory (BSL-3) was ongoing with the incinerator completed and tested, pending handover.

Other ongoing activities include; painting, fixing of five tight doors and five aluminium doors with glazed glass, air conditioning and installation of the Heating, Ventilation, and Air Conditioning (HVAC) system. The Standard Operating Procedures (SOPs) for BSL-3 and BSL-2 lab facility were also developed.

Fifty individual ventilated cages for the mice were procured and installed, and studies were being carried out on cloning of the design of humanised mice for other diseases although the cloning requires specialised laboratories and processes.

The project was affected by the delayed approval to spend, delayed procurement especially by the University Estates Department and delayed acquisition of inputs and lab consumables due to price changes.

L-R: A new smoke free incinerator, and Some of the ventilated cages housing the humanised ACE2 mice at the animal research facility at COVAB-Makerere University

18. Establishment of a Biomarker Research Facility

The aim was to put in place a common user facility to support identification and isolation of biological molecules found in body fluids or tissues that are signs of a normal or abnormal

process, or of a condition or disease. These molecules are used in development of drugs, diagnostics and other biotechnology products.

This is a continuation from the first phase of funding under the Presidential Scientific Initiative on Epidemics (PRESIDE) where the project acquired equipment for the BSL-2 laboratory for biomarker discovery, developed a biomarker panel for Rapid Diagnostic Tests (RDT), generated a lateral flow prototype and expressed antigens and monoclonal antibodies.

The key objectives under second phase of funding were to: 1) Finalize the establishment of the biomarker research facility at Makerere University, 2) Make in-house monoclonal antibodies against the biomarker antigens to be used in lateral flow assay testing, 3) Clinically evaluate the performance of the newly assembled rapid diagnostic test prototype for monitoring SARS-COV2 patients, and 4) Evaluate the stability and usability of newly assembled diagnostic test for monitoring SARS-COV2 patients.

The project budget was Ug shs 1.5bn all of which was released and Ug shs 0.459bn (30%) spent by end of June 2024 with much of the funds committed to equipment purchase and no expenditure made on materials.

By the end of June 2024, equipment was procured but not installed due to unavailability of the facility. Space for the biomarker facility at the Centre for Global Health and Biosecurity had been allocated, architectural plan and bills of quantity from the estates department had been acquired and solicitation of bids for the remodelling of the facility was ongoing. A manuscript had been developed and was a waiting the guidance of the STI Secretariat to enable the registration of intellectual property rights. An evaluation of the biomarker was ongoing to test its validity, stability and usability.

The project was behind schedule arising from the delayed procurement of a contractor to remodel the biomarker facility. The project was affected by continued focus on COVID-19 whose cases had significantly dropped, delays in procurement and laboratory re-modelling, and delayed IP registration due to un harmonized guidelines by STI and host institutions.

19. Developing a National Network of STI Excellence as a Foundry for Transformative Human Capital Development

This project aimed at developing national human capital for STI, by identifying, nurturing, skilling and deploying industrial scientists. The project objectives were; 1) Establish institutional framework for the National Network, 2) Develop training curricula, and 3) Train 18 protege scientists.

The project budget was Ug shs 2 billion of which 0.339bn (16.9%) was released and Ug shs 0.330bn (97.3%) spent by 30th June 2024. The project developed the curriculum, a website, e-learning tool, a mobile tool for learning and initiated an online inventory for scientist which was continuously updated.

By the end of the FY2023/34, the project established a Foundry Network for Science Technology and Innovation excellence (FONSTI) with its offices at the STI secretariat. A board was instituted, staff were recruited, and the first draft of the internship program was developed with an aim of skilling, mentoring and re-orienting young graduates to participate in various STI industrial value chains. A five-year development program implementation plan and the draft for the five-year strategic plan were developed.

Five new protégés (industrial scientists) were recruited (in addition to the 15 recruited last year) in five industrial value chains of pathogen economy, industry 4.0+, Aeronautics and space, infrastructure, innovations and support services. The recruited protegees were to undergo two years of training.

20. Productivity Acceleration Support Service

The project aimed at developing a sustainable solution to household productivity through capacity gap diagnosis and empowerment of households to produce efficiently. This would lead to the transitioning of subsistence households into the cash economy with or without PDM funding. The project objectives were: 1) Develop the productivity acceleration support service, 2) Develop a distribution model for the productivity acceleration support service, and 3) Establish a cooperation that will drive the commercialization of the productivity acceleration support service.

The project annual budget was Ug shs 2.4 billion all of which was disbursed and Ug shs 0.772bn (32.2%) was spent by 30th June 2024. Most of the budget (56.5%) was allocated to trainings and nurturing followed by allowances (20%). Five districts were selected as a pilot to the project and these were; Kamuli, Butebo, Budaka, Kakumiro and Nakapiripirit.

By the end of June 2024, the following were completed; community engagement was initiated in the selected communities of the five project districts and project sensitisation was completed in four districts save for Nakapiripirit. A project office was secured and the recruitment and retooling of industrial instructors was completed. The design of operations and procedures manuals, implementation plan, produce survey tool, and farm record book was completed. The capturing of the skills gap and profiling of fish community innovators was also completed. Three out of four community development learning and coordination centers were established and fairly equipped.

The ongoing activities included; data collection on household socioeconomic dynamics, enterprise productivity, market analysis for the respective areas of implementation, skilling of at least 2,000 participants, establishing of household enterprises, and raw data collection on profitability of swamp fishpond and rice farming.

The pending activities were; data entry and analysis for the comparative study on productivity and profitability of nutritious fishponds and rice farming in wetlands, skilling of 150 fish farmers, design of the fish farm data capture tools, and supporting the development of status of the clusters around each innovator. The project progress was affected by delayed approval to spend, political interference, and socio-cultural barriers. The project also lacked regional representation in the selection of the pilot beneficiary districts.

21. ICT Platform for the Pathogen Economy project

The focus of the project was to develop Artificial Intelligence (AI) enabled diagnostic tools for cancer, and support for AI-in-health incubation for the ecosystem. The key project objectives were: 1) Clinical validation of cervical cancer screening platform, 2) Establish common user facilities and resources (data, computer resources), and 3) Develop a framework to support incubation.

The one-year project budget was Ug shs 1.150 bn. By 30th June 2024, all the money was released to the project however, there were no expenditures. This was attributed to the delayed approval to use the funds from the STI. Whereas the funds were disbursed on 10th October 2023, the permission to spend was granted on 30th June 2024 eight months after the disbursement.

By the time of monitoring (July 2024), implementation was behind schedule with the following preliminary processes completed; budget discussions and agreements on fund distribution among the various projects to be supported by the hub, business development partners for the commercialization initiative of the hub's supported projects were contracted, and the drafted call for applications for AI in Health projects was under review. The progress was affected by the delayed approval to spend by the STI Secretariat.

22. Improved UBV-01N Product for Management of Viral Respiratory Infections

The aim was to establish a Good Manufacturing Practices (GMP) pilot plant for natural therapeutics at the Natural Chemotherapeutics Research Institute (NCRI) and support reformulation of UBV-01 for viability as an anti-breast cancer natural therapeutic. The project objectives were; 1) cGMP establishment, and 2) Reformulation of UBV-01 as an anti-carcinogen.

The annual project budget was Ug shs 1 billion all of which was released and Ug shs 0.258bn expended by end of June 2024. This project builds on the initial funding under PRESIDE that started in 2021.

The reformulation of the UBV-01 was undertaken and was awaiting the conclusion of in-vitro studies to inform the next steps. The registration of the IP was delayed by URSB's lack of some process to deal with natural therapeutic products IP registration, however STI secretariat was engaging the URSB for a solution.

To establish a cGMP facility, appropriate survey for ground space was carried out, structural drawings were completed, and the National Drug Authority (NDA) inspection was conducted and an evaluation report generated. This however hit a snag when the STI Secretariat advised that the cGMP be stayed, and funds be repurposed for setting up a production facility for *"Pombe guard"*. Subsequently, the project stalled awaiting further guidance from the STI secretariat. It was observed that there was lack of coordination at STI where funds are repurposed mid-way of project execution.

23. Development of solar water pumps

This project intends to result into local manufacture of a Solar-powered water pump through reverse engineering. The objectives were to; 1) design pump components and systems, 2) assemble the pump component into working prototypes, and 3) undertake field validation studies to assess pump performance.

The project budget was Ug shs 0.6bn, all of which was released and Ug shs 0.219 bn spent by 30th June 2024. The design of pump components and assessment of the required infrastructure for the production of solar pump parts was undertaken and MoUs were signed with the partners such as Luwero Industries, Innovex and UIRI on use of their facilities to produce some of the parts.

Subsequently, the development of pump components was initiated. These include prototype parts such as Computer Aided Design models, blanking and lamination dies for the pump motors were produced from Luwero industries and modification was ongoing. Machining of moulds for casting and injection moulding of pump parts, refining of machine tools for production, and the development of production systems and subassembly was ongoing.

The development of the pump power inverter and pump controller was to be done by M/s Innovex. The third objective of undertaking field validation studies to assess pump performance was dependent on the assembly of the solar pump which was not completed.

The project implementation encountered difficulty in coordination of the different teams that were working on the different pump parts. Moreover, it was expensive and time consuming since the equipment was being shared with other partners and therefore not readily available at all times.

24. COVID-19 Biobank

The aim of the project was to establish and maintain a biobank for COVID-19 bio samples to support drug, vaccine and diagnostics development.

The key project objectives were to; 1) support the continued running of the COV-BANK including replenishment of COVID-19 bio-specimen stocks as well as continued specimen distribution to qualifying researchers and research groups in Uganda's pathogen economy, 2) Position the biobank's human resources and infrastructure to test and evaluate new biotechnology innovations, prototypes and products in support of accelerated regulatory approvals and commercialization in Uganda and the regional market, and 3) Position the Biorepository's preparedness to efficiently respond to re-emerging epidemics and pandemics including communicable and non-communicable diseases.

The project budget was Ug shs 0.3bn all of which was released and Ug shs spent by 30th June 2024. The funds were used to procure reagents and the maintenance of the Covid bio bank including remuneration of staff such that the integrity of the samples is maintained, and samples are availed to researchers/investigators. The procurement of a liquid nitrogen generator was initiated.

The project was affected by the reducing samples due to decline in COVID-19 new infections. The patent application was delayed by the un-harmonized policies on registration of IP and the clause in the MoU between STI and Makerere University Biomedical Research Centre Limited (MakBRC) that mandates the STI to initiate the registration of the IP with URSB.

25. PCR and Antibody Diagnostic Kits Factory

The focus of the project is on Research and Development (R&D), and pilot production and commercialization of PCR and Antibody Diagnostic Kits. The objective of the project was to construct and equip a pilot plant for production. The key performance indicators were; a masterplan, factory design, factory construction, ecosystem masterplan, stakeholder engagement framework, bio-containment bank design and graduate institute training designs.

The project budget was Ug shs 7 billion all of which was released and Ug shs 0.179bn spent by 30th June 2024 mainly on personnel costs, bioscience park consultancies and indirect costs.

By the end of June 2024, the project team had obtained access to the land at Katuugo, Nakasongola district with the survey, mapping and topographic studies undertaken. Plus, the geo-technical soil investigation and environmental impact assessment was undertaken waiting for the final report from the consultant.

A masterplan for the PCR and antibody diagnostic kits factory was drafted and approved by the STI and the preliminary masterplan for the entire bioscience park was completed. A benchmarking visit was carried out in Cuba and Georgia to learn from the best practices within the science and innovation ecosystem.

The project was delayed by the change of factory site from Namigavu in Mityana district to Katuugo in Nakasongola district and change from establishing a diagnostic kits factory to establishing a bioscience park. Whereas the establishment of a science park is critical in achieving the objective of the programme, implementation is spontaneous. It was observed that the implementers of the PCR antibody diagnostics kits factory did not have the necessary requirements (financial, human and technical) to establish a science park as required by the changes. Projects of this magnitude require thorough planning and budgeting to achieve meaningful results.

26. Improved Indigenous Chicken Line

This project aims at identifying and preserving the best performing local chicken breed lines in the country. This was intended to develop a commercial duo purpose chicken breed line from locally indigenous chicken. The objectives were to; 1) evaluate on-farm performance of the improved indigenous chicken line, 2) Stabilize and mass produce the improved chicken line, and 3) Set up a market-oriented supply chain platform for the improved indigenous chicken line.

The project budget was Ug shs 0.2bn and was all released and Ug shs 0.019bn (10%) spent by 30th June 2024. The project had a stock of 300 improved local chicken breed and were at different growth stages. Some chicken feeds or assorted ingredients were acquired and incubation, brooding, selection and breed fixation, fabricating of feeders and drinkers was ongoing.

On-farm performance evaluation of the improved indigenous chicken line was initiated with selection and evaluation of host farmers. The development of training materials for the selected farmers was initiated. Animal production officers were engaged to actualise set-up of market-oriented platforms for the improved indigenous chicken line.

The project was affected by the theft of nine (9) breeding cocks and lack of incubator technicians in the region to repair incubators when they breakdown, which interrupted breeding.

27. Medicinal Plants for Sickle Cell Disease and Respiratory Tract Disorders

This project was intended to yield a prototype for sickle cell disease from ethno-medicinal plants in Northern Uganda. The key objectives were to: 1) conduct an ethnobotanical survey, 2) formulate a prototype against sickle cell, 3) phytochemical analysis, and 4) undertake toxicity analysis of the promising prototype.

The project budget was Ug shs 0.35bn and the funds were received in October 2023, however, the permission to spend had not been granted by end of June 2024 (eight months after). It was reported that the use of funds was not granted because there were disparities between the STI Secretariat and the Researcher on the project title, objectives and approach to implementation.

However, the researcher had completed literature review and was finalising the data collection tools. The research teams were constituted and were undertaking virtual community engagement with the hope that the permission to spend would be granted once the areas of disagreement had been resolved. The situation pointed to release of funds to projects that had not been properly screened and approved by the STI.

28. Operationalizing the Cassava Processing Plant Business in Gulu University

The focus was on amplifying the efforts to develop the high-end value addition products from cassava value chain aimed at reducing imports for wheat into the country. The project objectives were to:

(1) Streamline the commercialization process to articulate the roles of the different operational staff independent of academic duties and responsibilities, (2) Fix and operationalize the existing infrastructure utilizing the existing capacity of about 4000 kg per day to commercialize starch and High-Quality Cassava Flour (HQCF), (3) Develop a realistic business plan for cassava processing based on prevailing economic conditions and parameters, and (4) Extend the value chain to make laboratory grade ethanol, animal feeds, cassava/millet and cassava/sorghum composite flours, briquettes and blended foods using the existing equipment, packaging and funding generated from proceeds of scaled production to generate income and create jobs without additional funding.

The STI funding builds on a support from the African Development Bank (AfDB) through Ministry of Education and Sports that procured equipment, however, the equipment was never utilised and the business plan expired. The funding from the STI was to enable the plant become operational.

The project budget is Ug shs 0.588bn however no resources had been disbursed to the implementer as at 30th June 2024. On the other hand, the Board of Trustees to oversee the operations of the processing plant was established and all relevant papers required by STI and Uganda Development bank (UDB) were submitted by the venture lead.

29. Development of a Uganda-single-source-origin high altitude grown and roasted coffee product for International Market through coffee processing hub system. (Coffee Investment Consortium Uganda (CICU)

The project focus was on amplifying efforts towards coffee value addition from earning just US$ 2.5 to US$ 15 per kilogram with an intention of improving incomes from coffee beans.

The objectives were to; 1) Strengthen the management of coffee eco-hub-system under the Coffee Investment Consortium Uganda (CICU) by 2024, 2) Empower CICU members to process and aggregate at least 1,147,236 kgs of medium to high quality green coffee beans annually by the end of 2024, 3) Establish a tertiary hub for making standardized quality Uganda single source origin high altitude roasted coffee products at the Ntungamo hub under Inspire Africa Coffee Limited by the end of 2024, 4) Promote the Uganda single source origin high altitude roasted coffee products on the international market by the end of 2024, and 5) Support the innovation process for the chocolate coffee, ready to drink coffee and coffee dispensing machine.

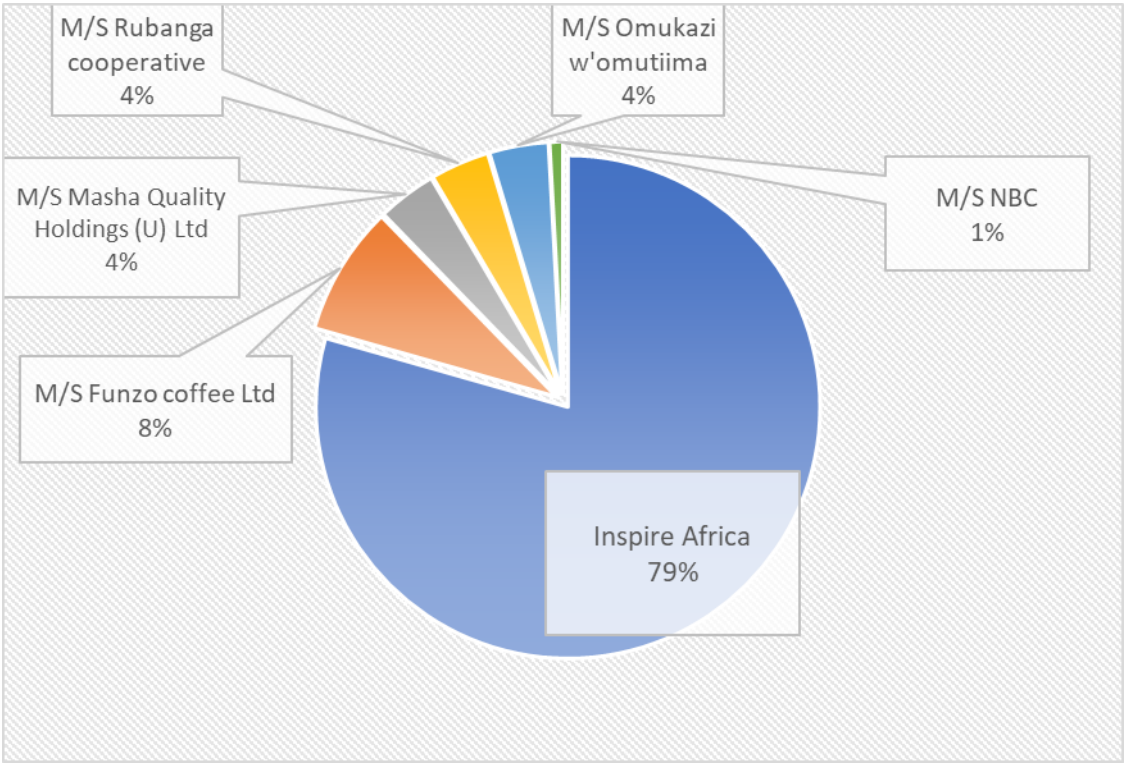
The grant budget was US$10 million all of which was disbursed to the CICU by 30th June 2024. The CICU has 17 members of which six directly benefited from the grant. The funds were released in three tranches as follows;

Tranche 1 was US$ 1 million (approximately Ug shs 3.7bn) disbursed in May 2023 which was meant for innovative infrastructure for coffee value chain, marketing and distribution for export.

A hub was established in Belgrade Serbia and stocked with coffee, five coffee brand prototypes were developed and documented, and a coffee roaster, grinder and water treatment plant were procured. The market data validation was behind schedule while the product and process optimisation and mass production had not commenced.

Tranche 2 was US$ 8.5 million (approximately Ug shs 31.45bn) disbursed in September 2023 meant for development of a Uganda single source-origin high altitude grown and roasted coffee products for international coffee marketing through coffee processing hub system. The funds were disbursed to six CICU members as shown in figure 1 and a total of Ug shs 0.31bn was for the CICU operations.

Figure 1: Distribution of Tranche 2 funds among the six beneficiary members of the Coffee Investment Consortium Uganda.



Source: ***CICU progress report May 2024***

The funds supported the registration, formation of a secretariat and recruitment of staff for the CICU. Five secondary coffee processing hubs were facilitated to improve on their storage and aggregation of coffee to be supplied to the tertiary hub in Ntungamo as raw material.

The construction and equipping of the tertiary hub at Inspire Africa Coffee in Ntungamo - Rwashamire progressed to 63%. The warehouse for the roastery, grinder was substantially complete. The warehouse for the cosmetics machine, coffee cup machine, and storage were completed. The refacing of the warehouses for the coffee huller and the wet mill were also completed. All equipment (two coffee roasters, grinding set, packaging equipment, capsule machine, wet mill, huller and sorter) were procured and installed by 09th August 2024. Additionally, some packaging materials were procured and delivered.

Ongoing works included final partitioning, tiling and shuttering of the office block, road works, landscaping and embankment walls.

Some of the equipment installed at Inspire Africa Coffee factory at Rwashamire-Ntungamo district.

Tranche 3 was US$ 500,000 (approximately Ug shs 1.85bn) disbursed in May 2024 to continue support the work of CICU and its members, and the completion of the tertiary hub.

The construction of the tertiary hub had exceeded the original budget due to excavation works on the steep terrain and ground stabilisation, works on the retainer walls, land compensation, and additional equipment.

3.4.3 Increase investment in R & D in key priority sectors like; agriculture, Oil & Gas, Minerals, Energy, Health, Transport

The intervention contributes to the objective of strengthening research and development capacities and applications. The planned out puts for FY2023/24 included; industrial skills development and infrastructure development and management, and research and development. The performance of the intervention was fair.

Industrial Skills Development: The plan was to support the banana pilot plant in Bushenyi to commercialise through purchase of equipment, installation and production of 1,840 tonnes of banana products to generate at least Ug shs 5 bn in sales. The detailed performance of the Banana Industrial Research Development Centre (BIRDC).

The planned outputs for FY2023/24 under the Banana Industrial Research Development Centre included; operationalizing the BIRDC model; the banana pilot plant and research laboratories commercialized; upscale and automate the primary processing for commercialisation so as to increase the daily output capacities from 1.4MT to 14MT; warehousing facility and the cold room expanded; five collection centres for the Greater Bushenyi constructed; and global supply chain developed and operationalized.

The approved budget to BIRDC was Ug shs 78.109bn inclusive of Non-Tax Revenue from the sales of *Tooke* products (Ug shs 5bn), supplementary budget of Ug shs 45.74 and balance brought forward from FY2022/23 of Ug shs 21.109bn). By 30th June 2024, Ug shs 37.289bn was released (47.7%) and Ug shs 28.549bn spent (76.6%). The poor absorption was attributed to the prolonged procurement of some equipment.

The BIRDC generated sales revenue amounting to Ug shs 2.57bn against an annual target of Ug shs 5 billion as at 30th June 2024, representing 51.4% of the forecasted annual target. The fair financial performance was attributed to the delayed acquisition of a 2-ton all weather delivery truck and limited advertising campaigns.

A total of 813.3tons of fresh bananas were purchased from farmer's cooperatives against a target of 3,600 tons and processed 81.3tons of chips against a target of 360 tons representing 22.6% of the planned annual performance. The poor performance was attributed to increase in banana prices and delayed funding.

The re-certification for raw and instant flour for halal was attained. The preparation for International Standards Organisation (ISO) product certification continued with the first audit undertaken during the period under review, and the second audit was scheduled for July 2024.

Under the quality control and assurance, the microbiology laboratory received 1,921 samples and analysed 1,842 samples, thus achieving 96.1% performance with sample integrity at 85.71% while the physio- chemistry lab received 896 samples, and all were analysed with a 41% sample integrity. The microbiology laboratory received 358 samples and analysed all with 95% sample integrity. The Sensory lab received 743 samples and analysed all with sample integrity of 100%.

The contract for the supply, delivery, installation and testing of the drum dryer was signed and 50% was paid, while the cookie machine was procured and installed. The LCD Screens and public address system for the conference hall were delivered and installed. The laboratory equipment procured in the previous FY were delivered and installation was ongoing.

The construction of one out of the planned three hubs to support product distribution and franchising was ongoing in Jinja at 50% progress. The bills of quantities (BOQs) and design consultancy for the warehousing expansion, and Central Processing Unit (CPU), were initiated. The phased construction of 5 collecting centres for the greater Bushenyi to support the supply chain and the civil works of a base for the biogas plant were not undertaken.

Three double cabin pickups, a marketing van, one tractor and trailer were delivered, the procurement of two 10-ton trucks was at Solicitor General's office for clearance, while the procurement of three single cabin pickup cars was in the initial stages of procurement. The procurement of tools of trade (1-5ton truck, 15-1ton trucks and 13 tricycles to support distribution) were differed to FY2024/25 due the delayed release of the supplementary funds. It was observed however that some of these procurements have been ongoing for more than two financial years.

The number of Tooke farmer cooperatives registered increased to 24 from 22 at half year, with a total membership of 6,543 members. A total of 252 farmers were registered and trained in the Trainer of Trainers (TOT) in commercial banana production and quality standards in Rubindi-Mbarara and Bunyaruguru Modern Cooperatives.

The delayed approval of the institutional framework that was developed by the defunct Ministry of Science Technology and Innovation (MoSTI) was affecting the effective operationalisation of the BIRDC model.

Infrastructure development and management:

The plan was to operationalise the National Science, Technology, Engineering and Innovation Centre (NSTEIC) in Rwebitete-Kiruhura and the Technology Innovation and Business Incubation Centre (TIBIC) in Namanve both under the National Science Technology Engineering Innovation-Skills Enhancement Project (NSTEI-SEP)

The NSTEI-SEP is a multiyear project implemented by the Uganda National Council for Science and Technology (UNCST) that started on 1st July 2019 with an end date of 30th June 2024. The project was funded through a loan from the Government of the People's Republic of China and counterpart funding by the GoU.

The FY2023/24 GoU approved budget for the NSTEI-SEP was Ug shs 21.8bn, which was revised downwards to Ug shs 20.02bn and all released. Ug shs 18.04bn was spent by 30th June 2024 representing 90.1% absorption. Overall project progress was 98% against a time progress of 100%. The detailed performance of the project is presented hereunder.

The National Science, Technology, Engineering and Innovation Centre- Rwebitete, Kiruhura district: The NSTEIC is being established to enhance the technological and innovative base of Ugandans through *a flexible factory learning and infrastructure model*. The overall progress at the NSTEIC was at 98% against 100%-time progress. The civil works were completed and all equipment was delivered, installed and tested. The pending works included addressing the snags and supply of additional furniture. The start-up raw materials

(steel and aluminium) for trial production and skills development in machining were procured and delivered and those that did not pass the tests were rejected.

Light ICT hardware (office equipment-printers, desktops, laptops and shredders), other machinery and equipment including furniture and fittings for offices, hostels, conference hall, guest house, kitchen, dining hall, library, and the villas was ongoing with some delivered. A framework for the industry led training and capacity development programs was established while the operational management framework was developed to 50%. The supply and installation of an additional transformer for NSTEIC Site in Kiruhura was initiated.

The Technology Innovation and Business Incubation Centre: Located at Kampala Industrial and Business Park-Namanve. It is to act as a platform for technology development via the process industry learning factory model, including common user facilities and shared workspaces for scientists and innovators.

The civil works for the TIBIC and equipment installation and testing in the maintenance workshop at TIBIC was complete and it was handed over to the UNCST by the contractor. An integrated TIBIC incubation strategy was developed to guide the allocation of incubation space to the aspiring innovators. As a result, two innovators namely, M/s Lwera electronics and M/s Innovex that were allocated workspaces were setting up their equipment to commence work.

The ongoing procurements include; smart conference hall (sound audio systems, smart display and video capture and assistive listening system), smart video conferencing meeting rooms (five 75" and flexible 85" interactive touch display), reception multiple display and booking pads, light ICT hardware, office equipment such as printers, desktops, laptops and shredders, office furniture and fittings, kitchen and gym. Others include, physical and virtual innovation spaces and infrastructure; natured and nucleated innovation-driven start-ups; and specialised finished leather processing training workshop.

The supply of TIBIC equipment for textile processing and design workshops, and the development of the five-acre piece of land that was acquired in Namanve for the planned equipment parking yard was not undertaken. It was noted that the procurements were behind schedule albeit lack of funding for operations and maintenance.

Technical Service Company established and operationalized: The project was expected to establish a Technical Service Company with engineering machinery and equipment for hire to enhance capacity of local and other contractors. By 30th June 2024, the contractor delivered all engineering machinery, equipment, and spare parts. All the equipment were tested and accepted by the client.

A functional equipment leasing, and machinery rental program was implemented through the operationalization of the Memorandum of Understanding (MoU) between UNCST and National Enterprise Corporation (NEC) for the rental of some units of engineering machinery and equipment to generate revenue. A total of thirty (30) officers of the UPDF under NEC were trained in Lyatonde as machinery and equipment operators.

By the end of June 2024, 60% of the equipment were rented out mainly to M/s National Enterprise Corporation. The rest of the equipment remain parked at Courtyard Hotel-Lyantonde, unused. The rented equipment generated a total of Ug shs 6.4 billion in non-tax revenue as at 30th March 2024. It was however reported that M/s NEC was not remitting the invoiced amounts to UNCST in time thus affecting the NTR targets.

NSTEI-SEP operationalization: A phased recruitment of 40 technical staff for the NSTIEC commenced and as of 30th June 2024, a total of 25 staff (one architect, one Surveyor and 23

agricultural engineers, research and design engineers, machinists, and machine operators) were recruited and had completed their training in China. In addition, five administrative staff were recruited, however, the recruitment of the first 15 machine operators and other administrative staff was not undertaken. By 30th June 2024, the engineers that were taken to China had returned and were undertaking hands on training at the NSTEIC.

Some of the Engineering trainees undergoing hands on skilling, in one of the classrooms. Right: The electronics training centre at Rwebitete Kiruhura district

The Engineering Development and Innovation Centre (EDIC) website was developed and deployed. It is aimed at showcasing innovation and products, acting as a valuable resource repository, and facilitation of networking and collaboration. The integration with the TIBIC business intelligent system was ongoing. In addition, a general curriculum was developed for the NSTEIC, and the operational plan and guidelines were drafted and were under review.

To establish 2 partnerships with professional bodies, the STI was in the process of developing a memorandum of understanding with the Production Technologies of South Africa to support STI in operationalising the engineering development centres. The support was in the areas of curriculum development, training of trainers, establishing industry linkages and connection with the international tool making companies and countries.

On the other hand, the identification of industries and areas for industrial training as well as the support to students to undertake industrial training was not undertaken because the engineering development centres in Rwebitete and Namanve were not operationalised.

Project Risk: The absence of technical staff in the initial stages of the project points to poor project readiness which led to acceptance of equipment not suited for the facility, and this required renegotiations to have the error corrected. In addition, the absence of a budget for operations and maintenance creates a risk of equipment breakdown thus a white elephant in the long run.

Research and Development; Under the Uganda Industrial Research Institute (UIRI), the plan was to analyses 1,000 samples in edible and non-edible products through the microbiology, chemistry and textile labs to improve export quality to global market standards, conduct at least two demand driven research for development of technologies, and value-added products and production processes undertaken.

By the end of the FY, the microbiology, chemistry and textile labs analyzed 1280 samples in edible and non-edible products to improve export quality to global market standards. This was against a target of 1,000 samples. In addition, ten samples of herbal sunscreen creams were formulated and submitted to chemistry laboratory for analysis, partial evaluation and

SPF computations were on-going in comparison with the standard (4-Amino benzoic acid) with an aim of preventing Albinos from getting skin cancer.

Samples of the analyzed products include; packaged and potable water, alcoholic beverages, soft drinks, animal feeds, poultry feeds, dairy products, meat and its products, grain and pulses and good grain snacks. Others were; food spices and additives, Kombucha, laundry soaps and liquid detergents, cosmetic products and toiletries, herbal products, and waste water.

Table 3.6: Performance of the Industrial Value Chains Development Sub-programme as at 30th June 2024

Outputs Performance								Remark
Intervention	Out put	Financial Performance			Physical Performance			
		Annual Budget (Ug shs Million)	% of budget received	% of budget spent	Annual Target	Cum. Achieved Quantity	Physical performance Score (%)	
Design and implement special programmes for Nano technology, space exploration, nuclear technology, bio sciences, ICT, and engineering;	Technology and Innovation	18,481	91.9	97	100	50	54.43	A satellite training platform was acquired for education purposes and additional equipment for the ground station
Strengthen the function of technology acquisition, promotion as well as transfer and adoption	Model Value Addition Services	45,566	100.0	100	100	82	82	Good performance
	Infrastructure Development and Management	3,676	100.0	100	100	90	90	Good performance
	Research and Development	754,131	99.7	100	100	50	50.13	29 innovators were monitored and their average performance was fair due to delayed funds release
	Technology and innovation	51,112	100.0	100	100	23.12	23.12	One dermatological product mosquito repellent under the Mrepel brand was ready for commercialization

Outputs Performance								Remark
Intervention	Out put	Financial Performance			Physical Performance			
		Annual Budget (Ug shs Million)	% of budget received	% of budget spent	Annual Target	Cum. Achieved Quantity	Physical performance Score (%)	
Increase investment in R & D in key priority sectors like; agriculture, Oil & Gas, Minerals, Energy, Health, Transport	Industrial Skills Development	100	100.0	80	100	35.1	35.1	The generated 50% of the annual planned revenue.
	Infrastructure Development and Management	24,617	100.0	92	100	80	80	Civil works for TIBIC and NSTEI was complete, and furnishing was ongoing
	Total	873,069	99.6	99.9				
Overall sub-program Performance							**55.8**	***Fair performance***

Source: Field Findings

Challenges

1. Lack of Good Manufacturing Practices (GMP) Facilities in Uganda: which are necessary for producing GMP-certified product for use in human clinical trials.
2. Discontinuous Funding Structure: The mode of funding, often disbursed in quarterly instalments and no cost extensions, disrupts project continuity; structure interrupts critical processes, delays milestones, ignores staffing considerations and increases the risk of project overruns.
3. Limited Access to High-Containment Laboratories (BSL-3) in Uganda: required for handling and inactivating live pathogenic viruses. This restriction poses a significant bottleneck for safely conducting crucial inactivation steps in vaccine development.
4. Insufficient Immunology skilled workforce: The limited skilled workforce hampers the speed and quality of vaccine development efforts, necessitating additional training and capacity building.
5. Procurement difficulties especially for some sensitive equipment and reagents that required certain international clearances and Institutional bureaucracies in procurement also delayed research
6. Poor planning and coordination at STI secretariat as demonstrated by disbursement of funds and permission to utilise them issued after several months and significant changes in grant objectives
7. Delayed agreement on sharing intellectual property proceeds by the funders, host institutions and innovators.

Conclusion

The overall sub programme performance was fair as demonstrated by the disbursement of funds to innovators and implementing institutions though behind schedule arising from the delayed granting of permission by the STI secretariat to spend. Additionally, the TIBIC and the NSTEI centres were completed but were not yet operational arising from staff shortages, lack of operations and maintenance budget among others. The clinical trials for three vaccines candidates was not achieved due to the absence of a cGMP facility in the country. The establishment of a tertiary processing hub for coffee registered good progress with most of the equipment procured and final installation ongoing.

3.5 STI Ecosystems development sub-programme

The sub-programme contributes to the five ITDT Programme objectives. The sub-programme has nineteen (19) interventions, of which six were funded and monitored. The sub-programme performance was fair at 66.19%. The interventions of design and conduct practical skills development programmes, and create capacity on application of drones, satellite imagery through GIS, posted very good performance while the intervention of support to the establishment and operations of technology & business incubators and technology transfer centers performed poorly. The summary performance of the monitored interventions is given in Table 3.7.

Table 3.7: Performance of Interventions under the STI Ecosystem Development Sub-programme by 30th June 2024

No	Intervention	Colour Code	Remark
1	Create capacity on application of drones, satellite imagery through GIS, real- time disaster modelling, and widespread connectedness, improve emergency response and production	90	Very good performance
2	Support the establishment and operations of Technology & Business incubators and Technology Transfer centers	46.02	Poor Performance
3	Increase investment in R & D in key priority sectors like; agriculture, Oil & Gas, Minerals, Energy, Health, Transport	59.55	Fair performance
4	Develop a framework for promotion of multi-sectoral and multilateral collaborations	78	Good performance
5	Support the establishment and operations of Science and Technology Parks to facilitate commercialization	50	Fair performance
6	Design and conduct practical skills development programmes	98	Very good performance

Source: Authors' Compilation

The detailed performance of the sub-programme interventions and outputs is presented here under;

3.5.1 Create capacity on application of drones, satellite imagery through GIS, real-time disaster modelling, and widespread connectedness, improve emergency response and production

The intervention contributes to the programme's objective of strengthening R&D capacities and applications. The planned outputs for the FY2023/24 were: A national aerospace policy and strategy in place. The performance of the intervention was good.

By 30th June 2024, the national aerospace space strategy was completed. In addition, the first draft of the national aerospace policy and business model were developed. These are aimed at ensuring a profitable aerospace ecosystem through national business opportunities, investment, and an enabling private sector for the emerging young innovators. Five (5) engineers were supported to receive training in Egypt and two of the engineers were recruited to the aerospace project.

A think tank on aeronautics and space science was instituted and a concept to inform the study on the ecosystem in Uganda was developed. The study is aimed at mapping all stakeholders in the aerospace industry, their activities and mandates and identify gaps that need to be filled. This was expected to result into the development of an aerospace administrative structure.

3.5.2 Support the establishment and operations of Technology & Business incubators and Technology Transfer centres

The intervention contributes to the ITDT Programme's objective: to develop the requisite STI infrastructure. The planned and monitored budgeted outputs for FY2023/24 under the interventions are: Model Value addition services provided, Industrial skills developed and Infrastructure development and management. The intervention performance was poor.

Industrial Skills Development: The UIRI, trained 200 Micro Small and medium Enterprises (MSMEs) and University students in modern state of art technologies such as engineering, machine maintenance, operation and modern welding at the UIRI's Machining, Manufacturing and Industrial Skills Development Centre in Namanve. In addition, 10 special trainings in value addition and textiles were conducted targeting the marginalised groups of people such as elderly, disabled and women.

Model value addition: An online and physical support facility for technology development and innovations advancement was developed and it is operational under the STI. The UIRI also conducted research and development on 37[4] food products. There was a15% increase in the number of incubatees supported by UIRI from 114 in FY2022/23 to 132in FY2023/24. Two cosmetic business incubatees (Itoto and Amagara) graduated from the incubation program successfully and exited the incubation centre.

Infrastructure Development and Management; The planned outputs were to up-grade both physical and technological bi-model centre in Lira and Nakawa that add value value to agricultural produce, and a fully operational vehicle manufacturing plant.

Under the upgrade of incubation centres, the plan was to renovate UIRI incubation centres at Nakawa and Lira. By the end of June 2024, the upgrade and renovation of Lira and Nakawa incubation centre was on going and estimated at 30%. The renovation included; replacing of the pipes, supply of additional new equipment, replacement of doors, partitioning and repair of the perimeter wall and recasting building walls.

[4] chocolate, flavoured popcorns, Tamarind drink, composite flour, candies, Tamarind Hibiscus drink, Gummy sweets, natural vinegar, mustard sauce, banana powder, Moringa Green Tea, Beef jerky, Choco-peanut, Mango-Whey beverage, Yacon syrup, Yacon powder, Yacon beverage, Mayonnaise, BBQ sauce, curry sauce, improved soft sweet and salt bread, pineapple wine, pineapple-ginger drink, pineapple-coffee drink, soy milk, date juice drink, sugar cane & mango juice, mango-sugar cane juice drink, pineapple-orange juice drink, flavoured juices, tea masala, curry powder, soft maize snack, banana snacks, sweet potato crisps, Hibiscus juice, and chili sauce.

L: Renovation of the floor at UIRI incubation centre in Lira. R: Some of the procured equipment in the Micro-biology laboratory at UIRI-Nakawa

Kiira Vehicle manufacturing plant fully constructed: The construction, equipping, and furnishing of the Kiira Vehicle Plant (KVP) progressed to 95% with the anticipated commissioning slated in October 2024. The initial installed capacity is 11 buses off the line per day translating into 2,500 buses per annum which is upgradable to 22 buses per day translating into 5,000 buses per annum.

Phase 1 of the Kiira vehicle plant was completed (100%) with facilities such as an assembly shop, research and development, general offices, biological wastewater treatment plant, 1.75km master drainage channel, water tank, perimeter fence, gates and 3.5km road constructed.

Phase II of the facility constitutes the production facility, principal access road, paved yard, solar plant 6MW substation, wastewater treatment facility, watchtower and landscaping. The completed works under phase II include; warehouse and logistics structures with nine stations in place; Quality, inspection and Testing facility completed with the initial ten stations out of the planned 23 stations in place, and the 6MW substation established.

The ongoing works were in the body shop with 163 stations and were in the final stages of installation. The paint shop with the initial eight stations was being finalised pending installation of the chimneys. The chassis line with ten out of the initial 16 stations were installed. The trim and final assembly station was at 63% progress pending final installation, testing and training of trainers. The construction of the principal access road was at 80% completion pending final layer of asphalt and the construction of the 25m watchtower was at 60% progress.

The production and assembly of 28 buses (23 electric and 5 diesel buses)[5] which were started in the previous financial year was completed at Luweero Industries Limited (LIL) in Nakasongola. The assembled buses were either sold, leased, rented out, or being used by KMC for the campus tours and under the e-bus skilling program. The leasing and renting out of buses generated a total of Ug shs 3.2bn out of the contacts signed worth Ug shs 22bn. Uganda was allocated the very first World Manufacturing Identifier (WMI) and eventually

[5] Eight fully electric10.5-meter city Kayoola buses, 10 units of 8.5-metre fully electric Kayoola city buses, 3 units of 6.7-metre electric bus, 2 units of 10.5-metre Kayoola electric coach, 5 units of 10.5-metre diesel Kayoola coach.

the first Vehicle Identification Number (VIN). As of 16th July 2024, a total of 28 vehicle identification numbers had been issued to Uganda.

The electric bus operator skilling program was completed with the first cohort of 101 e-bus drivers passing the final tests out of the 105 trained. The KMC recruited 15 of these drivers. The establishment of the mobility infrastructure progressed with the procurement of an additional nine electric chargers bringing the total to fifteen with assorted capacities (60KW, 240kw, and 360kw). Four chargers were deployed, one at each of the following locations: Bugolobi, Nakasongola-Luwero industries, Kiira vehicle plant in Jinja and at the Judiciary offices in Kampala. The rest were still stored at the KMC premises in Jinja.

Some of the 28 buses that were assembled at Luwero Industries Ltd in Nakasongola parked at the Kiira Vehicle plant at Jinja

The overall progress on the development of the 3-1 trike for mobility (one tone payload), Irrigation (6,000 litre per hour) and power generation (6kW) stalled at 49% due to administration and management disagreements with the innovators.

The performance of the Kiira Vehicle plant activities was affected by manpower shortages[6] for the initial production stage coupled with high turnover as the trained workers left for greener pastures. The intervention was further affected by delays by the technology partners to deliver some parts and equipment in time, and power outages at the Luwero Industries in Nakasongola which affect timely production of buses.

[6] There are 172 workers against the required 900 for the initial production phase of 2,500 buses per year

Top left to left bottom: Paint shops nearing completion, Installed bus assembly stations, High density Computer Numerical Control machine. Left: Watch and communication tower under construction at Kiira Motors Plant in Jinja District

3.5.3 Increase investment in R & D in key priority sectors like; agriculture, Oil & Gas, Minerals, Energy, Health, Transport.

The intervention contributes to the objective of strengthening R&D capacities, and applications. The planned outputs for FY2023/24 include; industrial skills development, R&D, and infrastructure development and management. The performance of the intervention was fair.

Research and development: The UIRI in collaboration with the University Ghent, Belgium conducted a Quantitative Microbiological Risk Assessment (QMRA) study on the presence of listeria monocytogenes in raw and boiled milk sold at informal milk retail centers in Kampala. The aim of this research was to improve quality and mitigate the harmful impacts of spoilt milk, thus contributing to improved public health in Uganda.

The UIRI initiated research on the development of medical textiles from Ugandan fibers, including the back-cloth fiber, rattan fiber, harnessing bagasse fiber, and sisal to produce bioplastic film. A total of 20 prototypes were developed.

Technology and innovation: The UIRI developed a drone prototype through the instrumentation unit. This project aimed at locally developing and utilizing unmanned aerial vehicles (UAVs) for various purposes such as aerial photography, surveillance, agriculture. mapping, road construction surveying and delivery services among others. An FM radio was also assembled using locally grown bamboo casings and available technology.

Industrial skills development: The plan was to complete plans for the automotive park development and land for construction prepared, complete plans for the STI park development, a fully operational vehicle manufacturing plant-Phase I and II, and equipment purchased and installed.

Land was acquired in Kayunga district for the development of an automotive park and a masterplan and a ten-year strategic plan for the park was completed and approved. However, no activity was undertaken on the land during the period under review because there was no allocation to development of the park. Under the development of an STI park, 50 acres of land were secured in Nakasongola, a masterplan was developed for the STI park. One of the factories to be set up in the STI park is the diagnostics pilot plant and by end of the FY preparation of the detailed designs for the plant were completed.

Left: A prototype of a drone under development by the instrumentation unit of UIRI. Right: Students undergoing training at the machining centre at UIRI-Namanve.

3.5.4 Develop a framework for promotion of multi-sectoral and multilateral collaborations

The overall intervention performance was good with one planned output of administrative and support services. Under this output, eight Think Tanks were established and facilitated. These included: Mobility, Pathogen Economy, Infrastructure Innovations, Industry 4.0+, Import Substitution (2), Aeronautics and Space, and the National Think Tank.

In addition, 19 initiatives were formed to facilitate collaborations in the different areas of STI, including sourcing for funding for innovation and technology development. These were with Uganda Development Bank (UDB), Nexus Green, Private Sector Foundation Uganda (PSFU), Presidential Advisory Committee on Exports and Industrial Development (PACEID), National Council for Traditional Healers and Herbalists Association (NACOTHA), Uganda Cancer Research Foundation (UCRF), Inter-Ministerial Taskforces (e-mobility, Space, Sericulture), CONAT, Serbia, Zimbabwe, Russia, South Africa, Cuba,

Ministry of energy and mineral Development (MoEMD), Ministry of Works and transport (MoWT), Ministry of Agriculture, Ministry of Health, National Planning Authority (NPA), and M/s Alfasan Uganda Limited.

The framework for 'UgInnovate,' an outreach programme for STI in schools was developed. The intention was to reach out to schools with various activities that are tailored towards promoting STI among the young generation. Input was also provided to Education Review Commission on streamlining STI in the curricula, focusing on value chains of national importance.

3.4.5 Support the establishment and operations of Science and Technology Parks to facilitate commercialization

The intervention contributes to the programme objective of the development of requisite STI infrastructure. The annual planned outputs for FY2023/24 include: Model value addition services, and industrial skills development. The overall intervention performance was fair.

Model Value Addition Services: The plan is to secure one contract manufacturing for Global Vehicle Manufacturers, e-mobility strategy developed and establish three mass mobility solutions for public transport by KMC.

By the end of June 2024, the National E-mobility strategy was developed and published. The fiscal incentive package for E-Mobility was instituted and the draft EV charging guidelines were developed. The draft E-mobility data bank was also developed and a model electric public transport system for urban center was under development. In addition, the e-public transport system was developed and yet to be piloted in Jinja City by Kiira Motors Corporation (KMC).

Industrial Skills Development: The establishment of two well-furnished laboratories in research and academic institutions was at the planning stages. The laboratories were envisaged to support the pathogen economy, Industry 4.0, and STI infrastructure. A total of nine laboratories were furnished as follow: Four laboratories at Makerere University - COVAB, one at UVRI, one at MAK-BRC, one at Mbarara University of Science and Technology (MUST), and two laboratories at Busitema University. The facilities enhanced the available testing capacity in the country.

3.5.6 Design and conduct practical skills development programmes

The intervention performance was very good. The planned outputs under the intervention were Industrial Skills Development and research and technological awareness. The UIRI planned to train at least 5 MSMES and University in modern state of the art technologies such as engineering, machine maintenance, operation, and modern wielding at UIRI's Machining, Manufacturing Industrial Skills Development Centre - Namanve.

By 30th June 2024, a total of 517 interns and apprenticeships were skilled in disciplines that included but not limited to; machine workshop practice, electrical installation and maintenance, laboratory analysis, Computer Numerical Control (CNC) machining, welding, material testing, hydraulics and pneumatics, printed circuit board (PCB) production, programmable logic control (PLC), wood technology, and textile product design, production and quality management. In addition, hands-on training of 144 Ugandans in the production of a variety of products was conducted. These included; production of bathing soap, liquid detergents, shampoos, hand washes, laundry soap, hair products, lotions/creams, and herbal jellies.

Table 3.8 shows the overall sub programme performance.

Table 3.8: Performance of the Industrial Value Chains Development Sub-programme as at 30th June 2024

Outputs Performance								Remark
Intervention	Out put	Financial Performance			Physical Performance			
		Annual Budget (Ug shs Million)	% of budget received	% of budget spent	Annual Target	Cum. Achieved Quantity	Physical performance Score (%)	
Create capacity on application of drones, satellite imagery through GIS, real- time disaster modelling, and widespread connectedness, improve emergency response and production;	Technology and Innovation	500	100	99	100	90	90	30 Ugandans were trained in satellite development, global navigation, and geospatial analytics and Space weather.
Support the establishment and operations of Technology & Business incubators and Technology Transfer centres	Industrial Skills	8,474	100	100	100	52	52	The UIRI carried out 10 special trainings in value addition and textiles
	Industrial and technological Incubation	1,540	100	99	100	0	0	Activities were not clear in the progress report
	Infrastructure Development and Management	4,200	58.1	101	100	50	86.05	Lira and Nakawa incubation centres were being renovated
Increase investment in R & D in key priority sectors like; agriculture, Oil & Gas, Minerals, Energy, Health, Transport;	Model Value Addition Services	22,219,	88.4	100	100	30	33.93	The UIRI also conducted research and development on 37 food products
	Administrative and Support Services	22,190	100	98	100	98	98	Administrative function executed
	Research and Development	1,124	98.7	97	100	95	96.28	Research on medical textiles from Ugandan fibers was undertaken

Outputs Performance								Remark
Intervention	Out put	Financial Performance			Physical Performance			
		Annual Budget (Ug shs Million)	% of budget received	% of budget spent	Annual Target	Cum. Achieved Quantity	Physical performance Score (%)	
	Technology and Innovation	1,112	100	94	100	0	10	Money was not spent on designing a solar dryer as planned but other post-harvest equipment.
Develop a framework for promotion of multi-sectoral and multilateral collaborations	Administrative and Support Services	2,482	100	98	100	78	7	UgInnovate,' an outreach programme for STI in schools was developed
1. Support the establishment and operations of Science and Technology Parks to facilitate commercialization; 2. Develop and implement a National Science and Technology Innovation Strategy;	Policies, Regulations and Standards	800	100	75	100	50	50	The national E-mobility strategy was developed and published
Design and conduct practical skills development programmes	Research and Technologies Awareness	10	100	99	100	100	100	Good performance
	Industrial Skills Development	930	100	100	100	100	100	Interns and apprenticeships were trained in various fields at the UIRI centre in Namanve
Average Outputs Performance							**66.19**	***Fair performance***

Source: Field Findings

Sub-programme challenges

i. Delayed approval to grantees to spend the funds by the STI secretariat which hindered achievement of targets.
ii. Delayed release of funds for continuing research projects in FY2022/23.
iii. Absence of a budget under the NSTEI-SEP for servicing and maintenance of the equipment under the TSU and O&M.

Conclusion

The overall sub programme performance was fair (66%). The National E-Mobility Strategy was developed and a masterplan for the automotive park was completed and approved. The final draft of the National STI Strategy and a draft STI Policy were completed. In addition, the first drafts of the national aerospace policy and business model were developed with an aim of ensuring a profitable aerospace ecosystem.

The upgrade and renovation of Lira and Nakawa incubation centres was on going at varying levels while the equipment installation at the Kiira vehicle plant under phase 2 was nearing completion with an expected commissioning month of October 2024. Twenty-eight buses were assembled and provided with their corresponding vehicle identification numbers. The UIRI skilled interns through the apprenticeships in the disciplines of machine workshop practice, electrical installation and maintenance, laboratory analysis, CNC machining, welding, and material testing among others.

CHAPTER 4: CONCLUSION AND RECOMMENDATIONS

4.1 Conclusion

The overall ITDT Programme performance was fair at 52.4%. The STI eco systems development, and Industrial Value Chain Development Sub-programmes performed fairly, whereas the research and development sub-programme registered poor performance.

The development of the STI infrastructure registered considerable progress as the construction and tooling of the NSTEIC in Rwebitete, TIBIC in Namanve and Kiira Vehicle Plant in Jinja were nearly complete. The upgrade and remodelling of the laboratories at COVAB to BSL-3 was also ongoing with the required equipment delivered and some installed. However, all these were behind schedule occasioned by the delayed and piecemeal funding.

There was a considerable increase in the human resource capacity in preparation for the STI programme as witnessed with the recruitment of 25 technical staff in various engineering fields as part of the plan for operationalisation of the NSTEIC. In addition, 15 protégés as well as several masters' and PhD students enrolled under the various research and innovation projects. The institutional framework including several policies, regulations and strategies were initiated albeit behind schedule.

The pre-clinical studies for the three human vaccines were not completed as planned due to the absence of the requisite Good Manufacturing Practice facilities. The programme registered fewer Intellectual Properties (IPs) against the annual target. This was due to the lack of harmonized IP policies and the non-readiness of the URSB for the STI related patenting. Moreover, the Innovators, host institutions and STI secretariat had not agreed on the IP sharing framework.

There was misalignment between the Programme Implementation Action Plan (PIAP) interventions and the work plan for the year under review. The STI was taking on many grantees in spite of inadequate resources. Therefore, some projects were not receiving sufficient funding to actualise the objectives for which they were conceived.

Over 90% of the grantees (innovators) were behind schedule partly due to the delay by the STI Secretariat to authorise use of funds and difficulties in acquiring some critical equipment. It was observed that STI amended some project objectives without revising the funding that made achievement of targets difficult.

The absence of a budget for equipment servicing under the Technical Support Unit of UNCST poses a risk of grounding the equipment.

4.2 Recommendations

1. The STI Secretariat should accelerate the establishment of common user GMP facilities for vaccines and therapeutic at selected collaborating institutions to support clinical trials.
2. The STI Secretariat should timely authorise grantees to spend the funds disbursed to facilitate timely achievement of set objectives.

3. The STI should review the conditions on sharing of proceeds from the Intellectual Property Rights to adequately cover the innovator, host institutions and funders to avoid the possible impasse in future.
4. The STI should streamline communication of next steps to innovators whose research has successfully progressed beyond prototyping and ready for commercialisation. These will serve as catalysts for innovation.
5. The STI secretariat together with MFPED and NPA should align the outputs in the work plan to the respective programmes implementation action plan.
6. The STI should harmonise the project objectives and titles to ensure achievement of agreed upon targets.
7. The STI should clarify roles between innovation and upscaling processes for innovators. The scientists should be externally supported with administrative and management services to enable them focus on the core as compared to undertaking the entire spectrum from bench research to industrial application which weakens efficiency and effectiveness.
8. The STI Secretariat should review the portfolio of grantees and identify those for funding as projects through the Public Investment Management modality and those for continuous financing through normal programming. These include grants that act as platforms and play a supportive role for other innovations such as the CONAT, In-vitro studies, establishment of science parks, and animal research facilities.

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Annex 1: List of Grantees funded by STI during the FY2023/24

Venture Title/Project	Grant Amount (Ug shs)	Brief description of Grant and Key Objectives
Establishment of a common user packaging facility	2,700,000,000	This project will establish a Government owned common user facility for packaging at NSTEI-SEP, Namanve targeting value-added food products. This will address lack of affordable and quality packaging materials for our food manufacturing ecosystem. Objectives: 1) To Conduct value chain mapping and analysis of the flexible packaging value chains 2) To develop prototypes and manufacturing processes for flexible packages; 3) To set up and commercialize a packaging manufacturing facility for affordable and quality flexible packages
Direct Reduction Technology for Metallization of Ugandan Iron Ore	800,000,000	This project aims to establish capacity for value addition to our iron ore using eco-friendly gas reduction technology. The first level is a prototype with capacity of 1 tonne per cycle. Objectives: 1) Process design 2) Protype fabrication, 3) Prototype testing and validation
Fabrication of lithium and sodium ion batteries for electric vehicle and rechargeable batteries for energy storage using locally available materials in Uganda	1,750,000,000	This project will demonstrate the potential for developing electric vehicle batteries from our lithium and graphite. Objectives: 1) To characterize the composition of local lithium and graphite ores, 2) To establish a small-scale process for purification of lithium and graphite from the ores on laboratory scale 3) To purify the raw lithium and graphite to battery grade materials and test for physical and chemical properties, 4) To evaluate the purified lithium and graphite materials for energy storage ability.
Development of a solar water pump	600,000,000	This project will result in local manufacture a Solar-powered Water Pump through reverse engineering. Objectives: 1) To design pump components and systems, 2) To assemble the pump component into working prototypes, 3) To undertake field validation studies to assess pump performance.
Development of Technology for Application of Iron Oxide Nanoparticles in Wastewater and Drinking Water Treatment	350,000,000	This project aims to develop novel technology for treatment of industrial effluent and domestic water using nanoparticles. It is being funded for a second year. Objectives: 1) To optimize the performance of the water treatment system based on IONPS, 2) To design a water treatment system that uses iron oxide nanoparticles (IONPs) as treatment medium, 3) To develop scaling plan for mass production of IONPs based water treatment systems.
Solar-powered egg incubator	250,503,600	This project will fabricate high quality, high capacity solar-powered egg incubators for commercial poultry farming. Objectives: 1) To fabricate an engineering Prototype, 2) To establish a production line for the egg incubators, 3) To produce three (3) 120 egg incubators and three (3) 240 egg incubators, 4) Field validation

Venture Title/Project	Grant Amount (Ug shs)	Brief description of Grant and Key Objectives
Transforming Uganda into a global electronics powerhouse	899,000,000	This project will establish a state-of-the-art SMT manufacturing line for electronics, which will provide subsidized services to the local electronics development ecosystem. Objectives: 1) To establish infrastructure for a world standard local Surface Mount Technology (SMT) facility in Uganda with a capacity of 2,000 units a month, 2) To undertake contract manufacturing for other players in the electronics development industry in Uganda and across the region, 3) To undertake research and development targeting niche products such as Electronic Control Units (ECUs).
Local Electronics Design and Hardware Enterprise Incubation	1,153,470,000	This project will support local electronics innovators to develop electronics products such as those used in consumer, industrial, medical, avionic, and automotive applications, by designing, prototyping, testing, and assisting in certification. Objectives: 1) Establish electronics design facility, 2) Provide seed funding for prototyping 3) Human Capital Development for local electronics design and prototyping ecosystem.
Silicon Wafer Manufacturing in Uganda	500,000,000	Project will conduct a feasibility and viability assessment of converting Uganda's silica sand into wafers, potentially tapping into the global USD 20 bn wafer industry. Objectives: 1) Lab characterisation of Uganda's silica sand, 2) Techno-feasibility study for the sand to wafers value chain in Uganda, 3) Industrial process design for pilot plant.
The MDA Technology Support Project	600,000,000	The project will establish human capital and enterprise competitiveness for local technology companies to develop software solutions for Government MDAs. Objectives: 1) Needs Assessment for 2 MDAs, 2) Identify competent tech companies to undertake development, 3) Develop and pilot the software.
Commercialization of Academic Research Initiative	300,040,000	The project will create a pathway for prototypes in universities to enter the market by providing technical and business support to budding innovators thus addressing the limited translation of research into commercial products. Objectives: a) Characterise Uganda's Science, Technology and Innovation ecosystem for incubating academic research products/services into viable businesses; b) Sensitize universities on policies, processes and commercial benefits of commercialising research and innovation outputs; c) Support commercialisation of at least five (5) research-based products or services deploying fourth industrial revolution technologies in agriculture and education, and d) Document the experiences and lessons learnt from the support of the five enterprises to guide larger scale national programmes in the translation of academia to business research
Enhancing the Efficiency and Accessibility of Public Transportation through the Deployment of Contactless Card Payment Technology	433,000,000	The project aims to develop and deploy Uganda's first cashless ticketing system for mass transit. This will lead to formalization of the Public Transport Sector with streamlined ticketing and revenue collection mechanisms; Enhanced efficiency and accessibility of Public Transportation and Improved revenues from Public Transport Objectives: 1) Develop a secure contactless ticketing and payment system for public transportation in Uganda, to facilitate revenue sharing among key stakeholders and minimize cash transactions. 2) Pilot the contactless ticketing and payment

Venture Title/Project	Grant Amount (Ug shs)	Brief description of Grant and Key Objectives
		system on the Kayoola EVS Buses.
Productivity Acceleration Support Service	2,400,000,000	The project aims at developing a sustainable solution to household productivity through capacity gap diagnosis and empowerment of households to produce efficiently. This will lead to the transitioning of subsistence households into the cash economy with or without PDM funding. Objectives: 1) Develop the Productivity Acceleration Support Service 2) Develop a distribution model for the Productivity Acceleration Support Service 3) Establish a cooperation that will drive the commercialization of the Productivity Acceleration Support Service.
Developing Sustainable Mushroom Agribusiness Support Services (MASS) for improving livelihoods and sparking competitive agro-industrialization in Bukedi sub-region.	900,000,000	The project aims at developing a least cost substrate combination for the growing of mushrooms. This will improve access to optimal substrate/medium for mushroom growing. This will reduce the importation of cotton seed cake for mushroom growing. Objectives: 1) Develop a product of the mushroom agribusiness support-based substrate for mushroom growing 2) Develop a distribution model for the mushroom agribusiness support-based substrate for mushroom growing 3) Establish a cooperation that will drive the commercialization of the mushroom agribusiness support-based substrate for mushroom growing.
Production and commercialization of mosquito repellant lotions from ethnomedicinal plant oils and shea butter	500,000,000	This project aims at utilizing the Shea Nut Butter as a base for the plant extract mosquito repellant. This will contribute to the reduction of imported petroleum-based mosquito repellants into the country. It will also contribute to the increased access of mosquito repellants hence preventing malaria in the country. Objective: 1) To obtain all the necessary licensing and certification for production of mosquito repellents before the viable products are introduced to the market 2) Trial sales of the viable mosquito repellent products 3) To carry out supply chain analysis and optimization.
Improved Indigenous Chicken Line	200,000,000	This project aims at identifying and preserving the best performing local chicken breed lines in the country. This will lead to the development of a commercial duo purpose chicken breed line from our locally indigenous chicken. The objectives: 1) To evaluate on-farm performance of the Improved Indigenous Chicken Line 2) Stabilizing and mass production of the improved chicken line 3) Market-oriented supply chain platform for the improved indigenous chicken line set-up
Sweet Potato Value Chain Development through Technology Transfer and Promotion	1,500,000,000	This project is focused on developing the sweet potato value chain by developing high value products out of the sweet potato plant parts. This will lead to a replacement for wheat for breads. Objectives: 1) To support the development of supply chain and the support activities of producing the bread, sanitizer and spirit, breakfast cereal, beef and chicken flavoured puffed snacks, and baby foods 2) To establish a central processing plant and satellite hubs for piloting the primary activities of the bread, sanitizer and spirit, breakfast cereal, beef and chicken flavoured puffed snack, and baby food value chains 3) Develop a distribution model for the sweet potato high end value added products.

Venture Title/Project	Grant Amount (Ug shs)	Brief description of Grant and Key Objectives
Piloting An Activity Based Learning and Teaching Approach For Advanced Level Science Students	199,509,910	This project targets to develop a synergistic capacity development for Science, Technology and Innovation among A-Level students. This will simplify how science education is delivered with minimal materials. Objective: 1) Develop tools for capacity development and practical skilling among A-Level science students 2) Pilot the tools for capacity development and practical skilling among A-Level science students
Establishment of BU Agro-Science Park	300,000,000	This project aims at establishing a facility that can create an interface between communities and the University. This will increase offtake of locally produced agro-products as raw materials for high end processing. The facility will develop research-based solutions that support the efficient productivity by communities. Objectives: 1) Establish the Suitability of Arapai campus for the Agro-science Park. 2) To profile basic information to guide on the products development for all the crops. 3) Develop the Agro-science Park project proposal. (Feasibility study, business plan (10 years), financial model (10 years), Pitch Deck). 4) Profile Technology for local development and transfer 5) Develop the prerequisite Human Capital for the agro-science park
Science Laboratory Reagents Project (SLaRP)	450,000,000	This project will develop science laboratory re-agents from our local minerals and other inputs. It has high potential for import substitution. Objectives: 1) Map/profile local sources of raw materials for production of school chemicals and reagents, 2) To test, select and optimize appropriate methods-protocols and procedures for productions of products, 3) To produce prototypes of chemical and reagents namely: (NaOH, H2SO4 and HNO3)
Incubating Mbarara ZARDI prototype starter cultures for enhancing productivity and safety of fermented milk products in cottage industries in Uganda	250,000,000	This project will yield locally developed starter cultures for the milk industry, with potential for import substitution and export. Objectives: 1) To determine the properties of the four (4) starter cultures developed by NARO - Mbarara ZARD, 2) To assess the potential of the developed starter cultures in improving the quality and quantity of fermented dairy products in the cottage industries, 3) To evaluate the effects of the Mbarara ZARDI developed probiotic starter culture on the ulcer causing Helicobacter pylori and diarrhoea causing Escherichia coli, 4) Incubate the production of the prototype into commercializable local starter cultures
Pearl Breakfast Cereal	150,000,000	This project will develop and validate a breakfast cereal from Ugandan crops. Objectives: 1) To produce recipes for nutritious instant breakfast cereal from composites of Maize, Cassava and Amaranthus; 2) To evaluate the consumer preference of the formulated recipes of breakfast cereals from composites of maize, cassava and Amaranthus, 3) To produce PEARL CEREALS from maize, cassava and Amaranthus for test marketing , 4) To develop a marketing strategy for market entry of Pearl Breakfast Cereal brand as an alternative Ugandan made breakfast Cereal, 5) To conduct a baseline study for the mass production facility of Pearl Breakfast Cereal brand as an alternative Ugandan made breakfast Cereal

Venture Title/Project	Grant Amount (Ug shs)	Brief description of Grant and Key Objectives
Development of Canned Matooke and Gonja in Retort Pouches: A Proof of Concept for Sustainable and Convenient Agricultural Innovation	600,000,000	This project focuses on value addition to matoke and Gonja, our heritage crops. Novel products for that are ready to eat and packed in retort pouches/cans as well as vacuum sealed matooke shall be explored. Objectives: 1) Characterization of matooke/ gonja products, 2) To optimize ingredient and processing conditions for canned matooke/gonja, 3)To Evaluate Product Quality and Safety, 4) To Assess Market Potential and Consumer Acceptance
Space Weather Science and Education Project for Disaster Management and Preparedness	2,000,000,000	This project will develop earth observation products using satellite and geospatial data towards disaster prediction (drought, weather, landslides etc). It will yield the premier product from our Aeronautics and Space Bureau. Objectives: 1) Requirements Analysis for 2 Earth Observation Products, 2) Product Design 3) Product Development 4) Validation in support of PDM
Laboratory scale production of beta propiolactone (BPL) from cassava for application in the pharmaceutical industrial value chains	450,000,000	This project will study the chemical conversion of ethanol from cassava to produce a more valuable product, beta propiolactone (BPL) which is an essential ingredient in vaccine development. Objectives: 1) Optimizing production process for beta propiolactone, 2) Synthesize the intermediate chemicals (ethanol, ethylene and ethylene oxide) required for BPL production, 3) Produce beta propiolactone at laboratory scale for inactivation of viruses during vaccine development, 4) Determine the quality profile of the synthesized BPL
Preclinical evaluation and standardization of herbal antidiabetic prototypes - GLUCOKAT PROJECT	1,300,000,000	This project aims to develop a natural anti-diabetic therapeutic through reformulation of an existing product. Objectives: 1) To evaluate the antihyperglycemic and antidiabetic potential of the formulated prototypes using animal models, 2) To assess the toxicity profiles of the most efficacious formulated antidiabetic prototype in cell lines and animal models, 3) To analyse the phytochemical composition and contaminants of the most efficacious formulated prototype, 4) To assess and optimize the pharmaceutical properties of the of the most efficacious formulated antidiabetic prototype, 5) To establish a GLP facility to support preclinical evaluation of natural therapeutics in Uganda
Multiple function Neonatal Intensive Care Units (Baby Incubator)	250,000,000	This project will build a reproducible 10-unit neonatal incubator, building on the success of an existing prototype. Objectives: 1) Develop a fully functional neonatal intensive care unit, 2) Design and document the manufacturing process 3) Undertake clinical validation
Improved UBV-01N Product for Management of Viral Respiratory Infections	1,000,000,000	This project will establish a Good Manufacturing Practices Pilot Plant for Natural Therapeutics at NCRI and support reformulation of UBV-01 for viability as an anti-breast cancer natural therapeutic. Objectives: 1) cGMP establishment, 2) Reformulation of UBV-01 as an anti-carcinogen

Venture Title/Project	Grant Amount (Ug shs)	Brief description of Grant and Key Objectives
Innovative re-usable unisex sanitary pads and protective gears for salt miners: Addressing community Health related challenges in Katwe-Kabatooro Town Council, Kasese district, Uganda	300,000,000	The project will yield a unisex pad that reduces occupational health hazards among salt miners. Objectives: 1) Needs assessment 2) Product design and prototyping, 3) Lab validation 4) Field validation
Medicinal Plants for Sickle Cell Disease and Respiratory Tract Disorders	350,000,000	This project will yield a prototype for sickle cell disease from ethnomedicinal plants in Northern Uganda. Objectives: 1) Conduct an ethnobotanical survey, 2) Formulate a prototype against sickle cell, 3) Phytochemical analysis, 4) Undertake toxicity analysis of promising prototype
Animal Research Services for Enhancing Shared Efficiency and Effectiveness	1,000,000,000	This project is in the context of a common user laboratory animal facility to support animal studies for vaccine and therapeutics research. Objectives: 1) Continuous breeding and maintenance of humanized ACE2 mice, 2) Design humanized mice for diseases of interest (cancer, malaria etc), 3) Complete refurbishment of lab animal house facility into a BSL-3 facility, 4) Conduct animal studies for covid vaccines
Establishment of a Biomarker Research Facility	1,500,000,000	This is a common user facility that supports identification and isolation of biological molecules found in body fluids or tissues that are signs of a normal or abnormal process, or of a condition or disease. These molecules are used in development of drugs, diagnostics and other biotechnology products. Objectives: 1) Finalize the establishment of the biomarker research facility at Makerere University, 2) To make in-house monoclonal antibodies against the biomarker antigens to be used in lateral flow assay testing, 3) To clinically evaluate the performance of the newly assembled rapid diagnostic test prototype for monitoring SARS-COV2 patients, 4) To evaluate the stability and usability of newly assembled diagnostic test for monitoring SARS-COV2 patients
Evaluation of nanoscale materials as adjuvants and delivery systems for vaccines	200,000,000	This project is developing a nano-adjuvant for vaccine delivery, but with potential for drug delivery e.g. targeted cancer therapy. Objectives: 1) To formulate a lipid nano-adjuvant delivery system-SARS-CoV-2-complex, 2) To determine the loading and release efficiencies of the delivery system, 3) To determine the immunogenicity (cytokine profiles) induced after vaccination with the lipid nano-adjuvant delivery system-SARS-CoV-2-complex
Smart Post-partum Haemorrhage Volumetric Drape	200,000,000	Focus is on development of a minimum viable product and clinical validation of a Smart Postpartum Haemorrhage Volumetric Drape (SMART-PVD) for Early Detection of postpartum haemorrhage during childbirth. Objectives: 1) To evaluate the usability and acceptability of the SMART- PVD, 2) Develop the Minimum Viable Product of the SMART PVD; 3) To undertake clinical validation for the device

Venture Title/Project	Grant Amount (Ug shs)	Brief description of Grant and Key Objectives
Baby saver device for affordable Neonatal Resuscitation with Intact Umbilical Cord at Birth in Uganda	350,000,000	Focus is on developing a baby saver device: a mobile resuscitation unit that can help every new-born breathe at birth, within the golden minute before clamping the umbilical cord. In Uganda, 1 new-born in every 5 births does not cry immediately at birth (Ditai et al 2023 in press) and is at risk of hypoxic-ischaemic encephalopathy, intrapartum-related death, morbidity, and neurological sequelae (cerebral palsy) in life. Objectives: 1) Develop a minimum viable device, 2) Clinically validate device, 3) Take device through regulatory pathway.
Vitamin D as a therapy for Chronic Conditions	300,000,000	Project has previously shown that the majority of persons in Uganda are Vitamin D deficient. Next step is to build capacity for Vitamin D research, and manufacturing. Objectives: 1) To build and enhance human capacity for Vitamin D Research and its applications. 2) To build capacity for clinical work on Vitamin D, 3) To build capacity for pharmaceutical manufacturing and dosage formulation of Vitamin D as preventative and treatment therapy
Local research and production of a dual vaccine for Lumpy Skin Disease and Foot and Mouth Disease in Uganda	175,000,000	Focus is on development of a dual vaccine for Lumpy skin disease and Foot-and Mouth disease in Uganda. Objectives: 1) Collection of new outbreak viruses for both Foot-and-mouth disease (FMD) and Lumpy skin disease (LSD) in Uganda for virus bank establishment , 2) Sequencing and molecular genotyping of the collected outbreak LSD and FMD viruses to determine alterations in genome sequences, 3)Creation of LSD virus vectors to shuttle and deliver protective proteins of Foot-and-mouth disease viruses., 4) To conduct in-vitro laboratory testing of the LSD-FMD vaccine candidates for protective vaccine properties, 5) To conduct in-vivo testing of the LSD-FMD vaccine candidates for vaccine candidate efficacy properties.
Preclinical studies and GMP Production for Inactivated Vaccine	1,000,000,000	This is one of the pioneer human vaccine projects utilizing Inactivated Vaccine Technology. Objectives: 1) Complete animal trials--preclinical immunogenicity assessment 2) Produce bulk stock for clinical trials in a cGMP facility.
Investigating the Anti-cancer properties of wild Ganoderma Lucidium Mushroom Species	200,000,000	The project aims to develop an anti-cancer therapy from wild Ganoderma mushrooms. Objectives: 1) Develop prototype 2) Undertake phytochemical analysis 3) Undertake preliminary efficacy and safety studies
Formulation and preclinical evaluation of herbal toothpaste for management of oral diseases	500,000,000	Focus is on development of a herbal toothpaste for Complete Dental Healing. Objectives: 1) To formulate herbal toothpaste/ mouth wash from extracts of selected plants for management of oral disease, 2) To evaluate the organoleptic and physical properties of the formulated herbal toothpaste / mouth wash as per specified standards, 3) To evaluate the antimicrobial activity of the formulated herbal remedy against selected oral pathogens, Streptococcus mutans and Staphylococcus aureus, 4) To produce and undertake field testing of one batch of the fully tested herbal remedy

Venture Title/Project	Grant Amount (Ug shs)	Brief description of Grant and Key Objectives
Ethnobotanical Survey of Medicinal Plants Used in the Treatment of Diseases in the Greater Bushenyi Region	200,000,000	This project aims to conserve common medicinal plants in the Greater Ankole area, and formulate prototypes for clinical trials. Objectives: 1) To propagate seedlings for commonly used and extinct medicinal plant species, 2) Formulate two prototypes for preclinical and clinical trials.
ICT Platform for the Pathogen Economy	1,150,000,000	Focus is on development of AI enabled diagnostic tools for cancer, and support for AI-in-health incubation for the ecosystem. Objectives: 1) Clinical validation of cervical cancer screening platform, 2) Establish common user facilities and resources (data, compute resources, etc), 3) Develop framework to support incubation
Development and evaluation of nanobody based point-of-care diagnostic kit for detection of covid-19 in saliva	400,000,000	Focus is on development of a rapid diagnostic test for covid-19 utilizing saliva. Objectives: 1) Generation of virus specific nanobodies, 2) Develop and evaluate Saliva antigen lateral flow assay, 3) Develop and evaluate Antibody capture Lateral flow assay strip for the detection of antibodies in COVID-19, 4) Develop and evaluate re-purposed Lateral flow assay strip for the detection of Pneumonia causing pathogens (Strep pneumoniae/H. influenza)
In-vitro studies of natural therapeutics of Uganda of Uganda (INVONAT Program)	900,000,000	This is a common user facility for in vivo studies for natural therapeutics as well as vaccines. Objective: Take at least 15 experimental drugs through in vivo studies (safety, efficacy)
Herbal Extract Larvicide	300,000,000	Focus is on development of a herbal extract larvicide for malaria control. Objectives: 1) To analyse the phytochemical and pharmaceutical properties of the formulated mosquito Larvicide products, 2) To assess the larvicidal activities of the formulated Larvicide to kills the mosquito larvae (Anopheles, Culex, Aegypti, Mansonia and Ades, 3) To assess the toxicity profiles and purity of the formulated herbal extract Larvicide, 4) To conduct the Larviciding trail using the formulated herbal extract Larvicide in Arocha Division, Apac district.
Clinical Trials for Natural Therapeutics	5,000,000,000	A platform to support clinical trials for natural therapeutics at no cost to the innovator. The Platform can run multiple experimental drugs at the same time through the protocol. To qualify, the drugs must be notified by NDA and go through in vitro studies.
Commercialization of Phytolacca dodecandra powder- Snailtox	200,000,000	This project aims to standardise PHYTOLACCA DODECANDRA (Snailtox). Objectives: 1) Conduct Phytochemical analysis, 2) Undertake in vitro studies (Bacterial/fungal sterility, in vitro cytotoxicity), 3) Animal studies (in vivo toxicity testing), 4) Aqua ecological safety studies

Venture Title/Project	Grant Amount (Ug shs)	Brief description of Grant and Key Objectives
Formulation of Herbal Products for Treatment of Brucellosis and Osteomyelitis from profiled plants in Kigezi Region	250,000,000	This project will formulate a natural therapeutic against Brucellosis. Objectives: 1) cross-sectional ethnobotanical survey and document traditional medicinal plants used in the management of brucellosis within the cattle corridor of Uganda., 2) Determine the phytochemical constituents of selected medicinal plants used in the management of brucellosis within the cattle corridor of Uganda., 3) Evaluate the in vitro efficacy of extracts and phytocompounds from traditional medicinal plants used in the management of brucellosis in the cattle corridor of Uganda., 4) Formulate and develop a pharmaceutical grade herbal product for treatment of brucellosis, 5) Assess and establish the acute and repeated dose toxicities of the formulated product in the treatment of brucellosis.
Adenovector vaccine: Preclinical immunogenicity assessment and GMP Process Transfer	1,000,000,000	This project developed a candidate Covid vaccine using the Adeno-virus technology. We developed our own indigenous vaccine backbone which we have patented and shall use for other vaccines. Objectives: 1) Complete immunogenicity studies in humanized mice, 2) Produce bulk stock for clinical trials under cGMP conditions.
Development and evaluation of recombinant sub-unit SARS-COV2 Spike Protein-based Sub-unit vaccines	1,500,000,000	This project developed a candidate Covid vaccine using recombinant vaccine technology. Objectives: 1) Establish cGMP for pilot production of subunit vaccine, 2) Produce vaccine for clinical trials
Development of a telemetric shunt system for hydrocephalus treatment	200,000,000	Focus is on development of a telemetric shunt for treatment of hydrocephalus. Objectives: 1) Design and prototype, 2) Take device through regulatory approvals, 3) Undertake clinical validation.
COVID-19 Biobank	300,000,000	Aims to establish and maintain a biobank for covid-19 bio samples to support drug, vaccine and diagnostics development. Objectives: 1) To support the continued running of the COV-BANK including replenishment of COVID-19 biospecimen stocks as well as continued specimen distribution to qualifying researchers and research groups in Uganda's pathogen economy, 2) Position the biobank's human resources and infrastructure to test and evaluate new biotechnology innovations, prototypes and products in support of accelerated regulatory approvals and commercialization in Uganda and the regional market, 3) Position the Biorepository's preparedness to efficiently respond to re-emerging epidemics and pandemics including communicable and non-communicable diseases.
Establishing a two-in-one pharmaceutical and vaccine factory in Uganda	2,000,000,000	This is a partnership with the private sector (Alfasan, Government, Makerere) to establish the first cGMP facility for vaccine production in Uganda, to manufacture anti-tick vaccine and other locally developed vaccines. Objectives: 1) Infrastructural upgrade (civil, electrical) for full certification by NDA as cGMP, 2) Complete anti-tick vaccine production line
PCR and Antibody Diagnostic	7,000,000,000	The focus is on R&D, pilot production and commercialization of PCR and Antibody Diagnostic Kits. Objective: Construct and Equip Pilot Plant for production.

Venture Title/Project	Grant Amount (Ug shs)	Brief description of Grant and Key Objectives
Kits Factory		
Development of a Uganda-single-source-origin high altitude grown and roasted coffee product for International Market through coffee processing hub system	3,700,000,000	The project focuses on amplifying efforts towards coffee value addition from earning just USD 2.5 to upto USD 15 dollars per kilo. This will improve incomes from coffee beans. Objectives: 1) To strengthen the management of coffee eco-hub-system under the Coffee Investment Consortium Uganda by 2024 2) To empower CICU members to process and aggregate at least 1,147,236 Kgs of medium to high quality green coffee beans annually by the end of 2024. 3) To establish a tertiary hub for making Standardized Quality Uganda Single Source Origin High altitude roasted coffee products at the Ntungamo hub under Inspire Africa Coffee Limited by the end of 2024. 4) To Promote the Uganda Single Source Origin High altitude roasted coffee products on the international market by the end of 2024. 5) To Support the innovation process for the Chocolate coffee, ready to drink coffee and coffee dispensing machine
Growing and value addition of mange tout, sugar snaps, baby leaks, baby corn, asparagus	330,600,000	This project aimed at developing an export system for flowers into the Eastern Europe region. This would create a reproducible system to be used by other exporters of flowers and other produce outside Uganda. Objectives: 1) Develop protocols for the multiplication and packaging of the mange tout, sugar snaps, baby leaks, baby corn, asparagus flowers. 2) Develop an export system for the transportation and distribution of fresh flowers to Eastern Europe
Infolistic Ankole Long Horn Beef Branding for export of high value beef products and tourism	798,000,000	This project focuses on developing an export grade beef product from the Ankole Long horn cattle. This will elevate Ankole Long Horn Cattle from just being local cattle but a tourist attraction. Objective: 1) To develop an infolistic Ankole Long Horn beef value added products brand. 2) To develop an Ankole Long Horn beef value added product. 3) To test an Ankole Long Horn beef value added products on Serbia Market.
Establishment of brand-based traceability system for export using a case of fresh vegetable and fruit exports	771,401,500	This project aims at developing a protocol for a traceability system for fresh produce to meet the export demands. This will provide knowledge on how to export fresh produce into sophisticated markets. Objectives: 1) To develop an appropriate traceability system using vegetables and fruits as a case study in international market. 2) To validate the effectiveness of the develop traceability system using vegetables and fruits as a case study in international market
Biodegradable banana fibre hair extensions for hair dressing	450,000,000	This project is undertaking R&D in development of biodegradable hair from banana fibre. Prototype products are promising. Objectives: 1) To undertake product optimization, 2) To perform manufacturing process optimization, 3) Establish a pilot plant for manufacturing, 4) Market validation of products
Local manufacturing of high-quality shoe brushes from cow tail hair	300,000,000	Undertaking R&D in development of high-quality shoe brushes from cowtail hair. Objectives: 1) Construction of the production area and storage room, 2) Establish production infrastructure, 3) Undertake business development towards scaling on the market

Venture Title/Project	Grant Amount (Ug shs)	Brief description of Grant and Key Objectives
Operationalizing the Cassava Processing Plant Business in Gulu University	588,000,000	This project focuses on amplifying the efforts to develop the high-end value addition products from cassava value chain. This will reduce imports for wheat into the country. Objectives: (1) Streamline the commercialization process to articulate the roles of the different operational staff independent of academic duties and responsibilities. This will strengthen the capacity of the University in operationalizing the business incubation centre to complement research and training. (2) Fix and operationalize the existing infrastructure utilizing the existing capacity of about 4000 kg per day to commercialize starch and High-Quality Cassava Flour (HQCF). (3) To develop a realistic business plan for cassava processing based on prevailing economic conditions and parameters. (4) Extend the value chain to make laboratory grade ethanol, animal feeds, cassava/millet and cassava/sorghum composite flours, briquettes and blended foods using the existing equipment, packaging and funding generated from proceeds of scaled production to generate income and create jobs without additional funding.
Silkworm Eggs Production Unit in Uganda	1,671,846,667	This project intends to avail affordable silk worm eggs which are locally produced and viable. This will increase access to viable silkworm eggs in the country and save cocoon producers a lot of losses. Objectives: 1) Establish silk worm egg producing facility 2) Distribute viable silk worm eggs to cocoon producers in the country.
Developing a medicinal product for relief of hangover, alcohol poisoning and pain.	881,800,000	The team has developed a natural remedy for hangover, with potential for analgesia. Objectives: 1) Undertake In vivo studies 2) Establish cGMP pilot production line, 3) Undertake market validation studies (as food supplement), 4) Undertake clinical trials to prove analgesic properties
APOKOR CASSAVA VALUE ADDITION PROJECT (ACAVAP)	300,000,000	his project focuses on amplifying the efforts to develop the high-end value addition products from cassava value chain. This will reduce imports for wheat into the country. Objectives: 1) Develop cassava products brands such as HQCF, Starch among others 2) Develop a distribution model for the cassava products brands.
Developing a National Network of STI Excellence as a Foundry for Transformative Human Capital Development	2,000,000,000	This project aims to develop National Human Capital for STI, by identifying, nurturing, skilling and deploying industrial scientists. Objectives: 1) Establish institutional framework for National Network, 2) Develop training curricula, 3) Train 18 protege scientists

Annex 2: List of interventions monitored during the FY2023/24

Sub programme	Intervention
Research and Development Sub-programme	Strengthen the Intellectual Property (IP) value chain management
Industrial Value Chain Development Sub-programme	Design and implement special programmes for Nano technology, space exploration, nuclear technology, bio sciences, ICT and engineering
	Strengthen the function of technology acquisition, promotion as well as transfer and adoption
	Increase investment in R & D in key priority sectors like; agriculture, Oil & Gas, Minerals, Energy, Health, Transport
STI Ecosystems development sub-programme	Create capacity on application of drones, satellite imagery through GIS, real- time disaster modelling, and widespread connectedness, improve emergency response and production
	Support the establishment and operations of Technology & Business incubators and Technology Transfer centres
	Increase investment in R & D in key priority sectors like; agriculture, Oil & Gas, Minerals, Energy, Health, Transport
	Develop a framework for promotion of multi-sectoral and multilateral collaborations
	Support the establishment and operations of Science and Technology Parks to facilitate commercialization
	Design and conduct practical skills development programmes

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