



Innovation, Technology Development and Transfer Programme

Semi-Annual Budget Monitoring Report

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ABBREVIATIONS

BIRDC	Banana Industrial Research and Development Centre
BMAU	Budget Monitoring and Accountability Unit
COVAB	College of Veterinary Medicine, Animal Resources and Biosecurity
COVID-19	Corona Virus Disease
cDNA	Complementary DNA
DNA	Deoxyribonucleic acid
DLG	District Local Government
EAC	East African Community
ELISA	Enzyme-linked Immunosorbent Assay
GoU	Government of Uganda
HIG	Human Immunoglobulin
ITDT	Innovation Technology Development and Transfer
ISO	International Organization for Standardization
JCRC	Joint Clinical Research Centre
KMC	Kiira Motors Corporation
LGs	Local Governments
MUST	Mbarara University of Science and Technology
MDAs	Ministries, Departments and Agencies
MFPED	Ministry of Finance, Planning and Economic Development
MSTI	Ministry of Science, Technology and Innovation
NDP	National Development Plan
NRIP	National Research and Innovation Program
NSTEI-SEP	National Science, Technology Engineering, Innovation and Skills Enhancement Project
NSTEIC	National Science, Technology Engineering, Innovation Centre
OP	Office of the President
PRC	Polymerase Chain Reaction
PRESIDE	Presidential Scientific Initiative on Epidemics
PIAP	Programme Implementation Action Plan
RT-PCR	Reverse Transcription PCR
RNA	Ribonucleic acid
TIBIC	Technology, Innovation and Business Incubation Centre
TSC	Technical Service Company
SARS-CoV-2	Severe acute respiratory syndrome coronavirus 2
URI	Uganda Industrial Research Institute
UNCST	Uganda National Council for Science and Technology
USD	United States Dollar
VIN	Vehicle Identification Number

FOREWORD

The Government is implementing programmatic planning and budgeting which harnesses synergies from a number of previously independent sectors and avoids duplication of resources, thus enabling us attain efficiency in our development investments.

The Budget Monitoring and Accountability Unit (BMAU) is now undertaking Programme-Based Monitoring to assess performance of the targets and outcomes set in the Programme Implementation Action Plans (PIAPs) of the third National Development Plan (NDPIII), Ministerial Policy Statements, plus the Programme and Sub-Programme work plans.

These BMAU findings are the first Programme assessments we have conducted and I urge you to embrace the findings therein, and fully adopt the recommendations as we strive to ensure compliance to Programme-Based Budgeting.

A handwritten signature in blue ink, consisting of several loops and a long horizontal stroke extending to the right.

Ramathan Ggoobi

Permanent Secretary/Secretary to the Treasury

EXECUTIVE SUMMARY

Introduction

The Innovation, Technology Development and Transfer Programme (ITDTP) seeks to increase the application of appropriate technology in the production and service delivery processes across the country through the development of a well-coordinated Science, Technology, Engineering and Innovation (STEI) eco-system.

The programme activities were to be coordinated by the Ministry of Science, Technology and Innovation (MoSTI-Vote 023), however, at the start of the FY2021/22 the Vote was disbanded and its activities transferred to the Office of the President (Vote 001) in September 2021. Between 1st July and 22nd December 2021, no funds were released to the STI subvention. The programme has three sub-programmes, namely: Research and Development; STI Ecosystem Development, and Industrial Value Chain Development. The highlights in this report give the half-year performance of the planned interventions under the two sub-programmes: STI Ecosystem Development, and Industrial Value Chain Development.

Highlights of Performance

Under the STI Ecosystem Development Sub-programme, the design works and software for Printed Circuit Boards (PCB) machines were installed and test run at the Manufacturing, Machining and Industrial Skills Centre-Namanve (MMISC). A total of 35 trainees were undergoing training in computer-aided design, mechatronics, machining, welding and woodworks at the facility. The meat plant section at Nakawa was remodelled and the mango juice extractor and coding machine repaired. The Uganda Industrial Research Institute (UIRI) supported nine (9) incubatees in the dairy section and trained 678 people in fruits and vegetables, dairy, bakery processing, computer applications, and paper and briquette processing.

Civil works at the Technology Innovation and Business Incubation Centre (TIBIC)–Namanve were at 22% against time progress of 48%, whereas civil works at the National Science, Technology, Engineering and Innovation Centre (NSTEIC)-Rwebitete were at 25% against time progress of 27%. A total of 110 additional units of construction equipment for the Technical Service Company (TSC) were delivered and registered. It was observed that the equipment was delivered ahead of schedule before completion of the civil works as had been anticipated; moreover, the institution had not developed management and operational guidelines for the TSC.

Over 95% of the interventions related to the development of sericulture stalled due to lack of funding. The operationalisation of the pilot plant at the Banana Industrial Research Development Centre (BIRDC) was ongoing at a rather small scale due to delayed budgetary releases during the period under review. The core interventions were differed to the second half of FY 2021/22.

The National Research and Innovation Program funded 40 research projects at the end of FY 2020/21 and the projects received 65% of year one funding, the grantees carried out preliminary research activities like ethical clearance, mapping and sample collection, purchase of consumables in anticipation that the remaining funds would be disbursed in FY2021/22. Most of the projects stalled due to the disbandment of the funding Ministry in July 2021.

The performance of the Presidential Scientific Initiative on Epidemics (PRESIDE) funded projects aimed at developing tools, therapeutics and vaccines to combat the COVID-19 pandemic, was fair. Some of the monitored projects had a prototype in place, however, none had an approved ready for use diagnostic, vaccine or therapeutics. The projects experienced cash flow constraints in the first two quarters of FY2021/22 and activities were halted. It was observed that three projects were unobtainable and resources were re-prioritised to other projects.

Under the Industrial Value Chain Development, the construction of the Kiira Motor Corporation (KMC) manufacturing and assembly infrastructure (phase 1) contracted to National Enterprise Corporation (NEC) at the Jinja Industrial and Business Park stood at 96% against a time progress of 100% as at 31st December, 2021. Completion of phase 1 works was behind schedule due to lack of funding from July to December 2021 arising from the merger of the STI and governance programmes. The contractor was given a no-cost extension of six months to complete the pending works. Phase II civil works were initiated and the progress was estimated at 5% by 31st December 2021.

Conclusion

The performance of the ITDT Programme during the period under review was poor as all interventions planned to be implemented by MoSTI did not take off. The NSTEI-SEP and KMC registered substantial progress on the civil works components despite the funding constraints during the period under review. The research projects funded under the NRIP and PRESIDE frameworks stalled due to lack of resources during the first half of the year. The key challenges that hampered implementation included the delayed transfer of work plans under Vote 023 to Vote 001 created cash flow constraints to the subventions and ongoing projects, lack of governance board for BIRDC, COVID-19 disruptions of transport and logistics systems, lack of management and operational guidelines for the TSC.

Recommendations

1. The Office of the President (OP), the Ministry of Public Service, and the Ministry of Finance, Planning and Economic Development (MFPED) should expedite the transition process of the disbanded Vote 023 and its subventions therein.
2. The OP should track the approval of a governance and management framework for the BIRDC.
3. The NSTEI-SEP steering and technical committees should ensure that the planned activities are executed according to the work plan and expedite the development of the operation guidelines for the Technical Service Company under UNCST for efficient deployment of received equipment.

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 mobilisation, 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 its 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, indicators and targets (how things are working). The BMAU work is aligned to budget execution, accountability, service delivery, and implementation of the Domestic Revenue Mobilisation Strategy (DRMS).

Starting FY 2021/22, the BMAU is undertaking Programme-Based Monitoring to assess performance against targets and outcomes in the Programme Implementation Action Plans (PIAPs) of the third National Development Plan (NDPIII). Semi-annual and annual field monitoring of government programmes and projects is undertaken to verify receipt and application 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 reviews the coherency in implementing the PIAP interventions; the level of cohesion between sub-programmes; and the challenges of implementation.

The monitoring covered the following Programmes: Agro-Industrialisation; 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; 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 budget execution period from July to December 2021.

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 to:

- (i) To develop requisite STI infrastructure;
- (ii) To build human resource capacity in STI;
- (iii) To strengthen 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 Innovation, Technology Development and Transfer Programme is implemented through the following sub-programmes:

- i) Research and Development
- ii) STI Ecosystem Development
- iii) Industrial Value Chain Development

1.4 Programme Outcomes

According to the third National Development Plan (NDP III), the ITDT Programme seeks the following outcomes:

- 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 utilisation of appropriate technologies
- v) An enabling environment for STEI 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 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 report is based on selected sub-programme interventions under the ITDT Programme that are contributed to by the following votes, subventions and projects: Vote 110: Uganda Industrial Research Institute (UIRI); Kiira Motors Corporation (KMC), Banana Industrial Research and Development Centre (BIRDC), Presidential Scientific Initiative on Epidemics (PRESIDE); National Science, Technology Engineering and Innovation Skills Enhancement Project (NSTEISP), and National Research and Innovation Programme (NRIP) projects.

Five of the 24 interventions under the ITDT Programme Implementation Action Plan (PIAP) were monitored. These include: design and conduct practical skills development programmes; develop strategic local and international partnerships and cooperation on technology transfer and adoption; increase investment in R&D in key priority sectors like; agriculture, Oil & Gas, Energy, Health, and Transport; support the establishment and operations of Technology & Business incubators and Technology Transfer centres; and support the establishment and operations of Science and Technology Parks to facilitate commercialization. The selection of areas to monitor is based on several criteria:

- Outputs planned for and undergoing implementation in the year of review.
- Significance of the budget allocations to the sub-programmes within the programme budgets, with the focus being on large expenditure interventions. Preference is given to development expenditure.
- The votes that had submitted Q2 progress reports for FY2021/22 were followed up for verification.
- Multi-year projects that were having major implementation issues were also visited.
- Potential of interventions to contribute to the programme and national priorities.

2.2 Approach and Methods

Both qualitative and quantitative methods were used in the monitoring exercise. Physical performance of interventions and outputs was assessed through monitoring a range of indicators and linking the progress to reported expenditure and/or planned targets. The purposive sampling method was used in selecting sub-interventions and outputs from the Programme Implementation Action Plans (PIAPs), Ministerial Policy Statements (MPS) and progress reports of the respective Ministries, Departments, and Agencies (MDAs) for monitoring.

To aid monitoring, mapping was done of the PIAP interventions and outputs to the actions and outputs of programmes and projects in the Vote MPS and progress reports. Multi-stage sampling was undertaken at three levels: i) Sub-programmes ii) Sub sub-programmes and iii) outputs.

2.3 Data Collection and Analysis

Data collection

Both primary and secondary data was collected from the sources and by the means that are indicated below:

- i) Literature review: Ministerial Policy Statement FY2021/22; National and Programme Budget Framework Papers; PIAPs, NDP III, quarterly progress reports and work plans

- for the respective implementing agencies, Budget Speech, Public Investment Plans, Approved Estimates of Revenue and Expenditure, project reports.
- ii) Review and analysis of data from the Integrated Financial Management System (IFMS); Program Budgeting System (PBS); Budget Website; and Quarterly Performance Reports.
 - iii) Consultations and key informant interviews with project managers and activity implementers.
 - iv) Field visits to various project sites for primary data collection, observation and photography.
 - v) Callbacks in some cases were made to triangulate information.

Data analysis

Qualitative approaches were used to analyse the data and classified in terms of constructs, themes or patterns to explain events among the beneficiaries (interpretation analysis). Reflective analysis was applied where the monitoring teams provided an objective interpretation of the field events.

The overall programme performance is an average of individual sub-programme performance assessed. The performance of the programme and sub-programme was rated based on the criterion in table 2.1. However, the weighting and assessment of the ITDT Programme differed due to the late disbursement of funds (first release for planned outputs under the disbanded vote 023 was made on 20th December 2021). In addition, the UIRI administration did not disclose the full financial performance as required.

Table 2.1: Assessment Guide to Measure Performance in FY 2021/22

Score	Comment
90% and above	Very Good (<i>Achieved at least 90% of outputs</i>)
70%-89%	Good (<i>Achieved at least 70% of outputs</i>)
50%- 69%	Fair (<i>Achieved at least 50% of outputs</i>)
49% and below	Poor (<i>Achieved below 50% of outputs</i>)

Source: Author's Compilation

2.4 Limitations

- i) The FY2021/22 budget and work plans were prepared in sector mode with an old Chart of Accounts and Output Codes and were not in sync with the PIAP interventions.
- ii) Lack of reliable and real-time financial data on donor financing as this aspect is not accessible on the IFMS.
- iii) Lack of disaggregated financial information for some outputs that contribute to several interventions.

2.5 Structure of the Report

The report is structured into four chapters, namely: Introduction, Methodology, Programme Performance, and Conclusion and Recommendations respectively.

CHAPTER 3: PROGRAMME PERFORMANCE

3.1 Introduction

The ITDT Programme contributes to objective four of the NDPIII – to enhance the productivity and social well-being of the population. The programme activities were originally coordinated by the then Ministry of Science Technology and Innovation (MoSTI), however, the ministry was disbanded at the beginning of the FY2021/22 and coordination of the programme moved to the Office of the President (OP) at end of quarter two (Q2). Therefore, weighting and assessment of the programme were not done due to delayed settlement of the transfer of vote 023 to OP and inadequate financial disclosure from UIRI.

Two of the three sub-programmes were monitored: STI Ecosystem Development, and Industrial Value Chain Development. The sub-programmes are contributed to by Vote 110-UIRI and the subventions - KMC, UNCST and BIRDC were monitored.

3.2 Overall Programme Performance

The programme budget for FY2021/22 is Ug shs 395bn, however, during the period under review the lead ministry responsible for the ITDT Programme was abolished (MoSTI Vote 023), therefore Vote 023 and the subventions therein did not receive funding from the government not until 22nd December 2021 through the Office of the President. Therefore, at the time of the monitoring in January-February 2022, some agencies and projects were in the process of receiving funding for the previous two quarters. However, Vote 110 –UIRI received funds promptly. The FY2021/22 budget for UIRI is Ug shs23.42bn, of which Ug shs 11.649bn (49.7% of the budget) was released and Ug shs 9.971bn (85.6% of the release) was spent by 31st December 2021.

The design works and software for Printed Circuit Boards (PCB) machines were installed and test run and remodelling of the meat section at UIRI-Nakawa was done for adherence to good manufacturing and hygienic practices. Civil works for the National Science Technology Engineering Innovation- Skills Enhancement Project (NSTEI-SEP) were ongoing at both sites of Namanve-Mukono and Rwebiteete in Kiruhura District and physical progress was 22% and 25% respectively. A total of 110 additional units of construction equipment for the technical service company were delivered and registered. Over 95% of the interventions related to the development of sericulture stalled due to a lack of funding.

The performance of the 40 projects funded under the National Research and Innovation Program was fair and the grantees had carried out preliminary research activities. Performance of the PRESIDE funded projects was at varying levels of progress and most interventions monitored had a prototype in place, however, none had a ready for use diagnostic, vaccine or therapeutics. It was observed that three projects were unobtainable and resources were re-prioritised to other projects. The construction of the Kiira Motor Corporation (KMC) manufacturing and assembly infrastructure (phase 1) stood at 96% against the time progress of 100% as at 31st December 2021. The projects experienced cash flow constraints in the first two quarters of FY2021/22 and some activities were put on hold.

3.3 STI Ecosystem Development Sub-programme

The sub-programme contributes to the five ITDT Programme objectives, and it had 19 interventions, of which four were funded and as well monitored. The performance of the monitored interventions is given in detail hereafter.

3.3.1 Design and conduct practical skills development programmes (UIRI, STI-OP)

The intervention contributes to the programme objective - to build institutional and human resource capacity in STI and has three output deliverables to be achieved over the NDPIII period. These include: Skilling and production centre operationalised; internship, apprenticeship and exchange program in the prioritised strategic areas within STI development and transfer program both within and between countries established; and informal sector artisans and technicians in STI application skilled.

The planned outputs for FY2021/22 include: Purchase of additional machinery, equipment, software and accessories for the manufacturing, machining and industrial skills development centre-Namanve (MMISDC) and analytical laboratories at the Nakawa campus; phase II of solar power installed at MMISDC; and existing buildings renovated and maintained. Below are the findings:

The UIRI recruited seven (7) staff for MMISDC and procured computer accessories and workshop consumables for the centre. The design works and software for Printed Circuit Boards (PCB) machines were installed and test run. A total of 35 trainees were undergoing training in computer-aided design, mechatronics, machining, welding and woodworks at the facility. Remodelling of the meat section plant to adhere to good manufacturing and hygienic practices at Nakawa was ongoing.

3.3.2 Develop strategic local and international partnerships and cooperation on technology transfer and adoption

The intervention aims at increasing the development, transfer and adoption of appropriate technologies and innovations and during the NDPIII period, one deliverable of Joint Ventures, partnerships & off-take agreements for the KMC vehicles is anticipated to be achieved.

The planned outputs under this intervention are: One technology transfer agreement implemented, Kayoola Electric Vehicle (EVS) and Coach Space Frames localised. The intervention performance is stated hereafter:

The KMC through a Technology partnership with China High-Tech Corporation (CHTC) developed two bus platforms: The Kayoola EVS, a fully electric city bus with a range of 300km on a single charge, and the Kayoola Coach (ICE and Electric Platforms). The KMC received and verified over 600 Files from M/s CHTC to Support Technology Transfer for the Kayoola EVS and Coach Platforms. Localisation of the coach space frame at Luweero Industries Nakasongola, and EVS Space Frame at Victoria Engineering, Bugolobi Industrial Area was ongoing.

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

The intervention contributes to the programme objective of strengthening R&D capacities and applications. The intervention key deliverables during the NDPIII period are: food, fibres, pharmaceuticals, processing machinery and equipment produced; apparel products from indigenous materials produced; beauty and dermatology products from indigenous materials

produced; technology for commercial extraction of mineral salts from national brine deposits generated; an assembly line for engine technology and solar water pumps setup; 4 types of circuit boards produced; vaccines for humans, animals or plants developed; and *acaricides*, pesticides, and insecticides developed.

The planned outputs under this intervention for FY2021/22 are: COVID-19 PPE manufactured, UIRI laboratories and processing facilities accredited, laboratory samples tested and analysed, hybrid solar dryer optimised, wood workshop at MMISDC equipped, mushroom production facility operationalised, MUTIMA phase two project implemented, operationalisation of the banana pilot at BIRDC and ISO certification; implementation of the NRIP projects and COVID-19 research (PRESIDE). Performance of outputs under the intervention for the period under review are given hereafter:

Research and development under UIRI

The UIRI Chemistry Unit analysed over 141 locally produced products and certificates issued. Samples of sunscreen lotions for albinos were developed and taken to the chemistry laboratory for analysis. Design and optimisation of a portable neonate warmer to safely transport and provide necessary warmth to neonates with hypothermia seeking clinical care was ongoing. Research on the design improvement of a hybrid solar dryer for postharvest loss reduction was ongoing.

A total of 75 persons were trained in making hair products (hair shampoo and hair food), petroleum jelly, creams, lotions & liquid detergent in Kisoro District.

Research and Development in Agriculture

The research and development in agriculture is funded under the BIRDC, Sericulture Project and the National Research and Innovation Programme Framework (NRIP). The monitoring covered outputs under the BIRDC and NRIP.

1. Banana Industrial Research Development Centre (BIRDC)

The planned outputs for FY2021/22, operationalise the BIRDC Model, recruit the staff, commercialise the banana pilot plant and research laboratories, continuous product development, establish a secure IP portfolio, Global supply chain development and operationalisation, continuous local and international market development, optimise the banana value chain benefits to rural farmers.

The FY2021/22 budget allocated to BIRDC is Ug shs 35,771,366,892 and by 31st December 2021, Ug shs 16,412,625,000 was released (47.8% of the budget approved on 22nd December 2021) and Ug shs 3,773,310,395 spent (23% of the release). The poor financial absorption was due to the late release of quarter one and two funds in the last week of Q2. The agency's Non-Tax Revenue (NTR) performance was poor with Ug shs 189,377,000 generated representing 13% of the annual target. This was attributed to cash flow constraints from Government that caters for working capital.

The operationalisation of the pilot plant at the BIRDC in Bushenyi District was ongoing at a rather small scale due to delayed budgetary releases during the period under review. A total of 301,305.2kgs of raw bananas were processed against an annual target of 680,000kgs. This yielded 28,265.9kgs of both chips and flour. The BIRDC sold 8.84MT of *Tooke* products worth Ug shs 189,377,000 during the period under review. Research on the development of other

products from the banana value chain like banana flakes, pharmaceutical starch, bio-gas and model dryers was ongoing. Most of the planned activities were not implemented and differed to Q3 and Q4 of FY 2021/22. Delayed budgetary releases and the lack of a governing board were cited as impediments to implementation.

2. Value Addition to Borassus Aethiopum Mart (Tugu) fruit products as a food supplement for children and the elderly with malnourishment conditions in Uganda

The project is being implemented at Gulu University Faculty of Science, to increase consumption of Tugu Fruit through value addition to reduce malnutrition in children and the elderly in Northern and Eastern Uganda. The first-year project deliverables are: Project awareness, ethical approval and nutritional and phytochemical profile of the Tugu fruit from selected districts of Northern and Eastern Uganda.

The total project financing is Ug shs 196m, of which Ug shs 48,260,000 was disbursed and Ug shs 26,109,200 spent by 31st December 2021. The following was achieved: Awareness creation about the project in the districts of Gulu, Pader and Kitgum, ethical clearance from Gulu University Research Ethics Committee, and an acre of land was rented in Loyo Alero Village Patiko Sub-county, Gulu District to grow hypocotyls. Ethical clearance from the Uganda National Council of Science and Technology and Tugu Fruit profiling were yet to be achieved. Implementation of planned project activities seemed to move at a slower pace. The key challenges hindering implementation were the seasonality of the fruit and the uncertainty of disbursements from the government.

3. The upscaling of online marketplace service to enhance agribusiness marketing in northern Uganda

The project goal is to contribute to the development and promotion of a viable and sustainable e-commerce experience in Eastern and Northern Uganda. The project deliverables are: Provide reliable e-commerce services (online shopping) to 1,000,000 clients, employment for 300 and 1,200 youth directly and indirectly respectively created, and a platform to link producers, entrepreneurs and consumers developed.

The three-year project (FY2020/21 to 2022/23) received 65% of its first-year budget (Ug shs 179m) and Ug shs 174m was spent by January 2022. The following was achieved: A website and mobile application design, market launch and community sensitisations were done, office space was hired and office equipment procured. The project created direct and indirect employment for 12 and 80 youth respectively, and provided an online shopping platform for 800 clients since its inception in July 2021.

The overall project performance was fair although achievements on clientele and employment creation were poor. The online shop was operational with a distribution centre in Lira City, and the pending activities include: expanding the coverage to other districts in Northern and Eastern Uganda and restructuring the mobile App to be compatible with iOS phones. The key notable challenges for the project included cyber security threats to the developed system and the slow uptake of online shopping services by the targeted clientele.

4. Commercialisation of propolis immune-boosting supplements for increased rural health and incomes of youth and women in Lango and Teso sub-regions

The project goal is to commercialise bee propolis immune-boosting supplements for increased rural health and incomes of youth and women in the Lango and Teso sub-regions. The project

deliverables include: Pharmacological profile of bee propolis, 200 beekeepers in Lango and Teso sub-regions trained, draft bee propolis standard developed, fabrication of equipment for propolis harvesting and crushing, and intellectual property registered.

The project budget is Ug shs 284,145,520, of which Ug shs 184,145,520 was disbursed and all spent by 25th January 2022. The project had achieved the following milestones: 200 bee farmers were trained in propolis harvesting; civil works for the mini-processing facility was at 95% completion; two motorbikes for field activities and office equipment were procured, and two products were developed and commercialised (propolis throat spray and bee propolis/venom honey therapy). The pending activities included: the completion of the civil works for the mini processing facility, fabrication of propolis processing equipment, pharmacological profiling of propolis and intellectual property registration.

The project implementation challenges included the lack of clear communication channels with the project funder, COVID-19 lockdown restrictions, and inadequate budgetary releases.

5. *Incubation and commercialisation of high-quality AICA moringa and shea products Innovation*

The project aims at implementing the incubation and commercialisation of Moringa and Sheanut products. It is implemented by TECOMA Uganda in Soroti City covering the districts of Soroti, Katakwi and Amuria. The planned project outputs are: 3,000 farmers engaged to supply the raw materials (Moringa leaves, seed and Sheanut kernels), 2,800 Moringa and 6,000 Shea butter seedlings planted in the region of operation, 5,000 farmers trained in Moringa and Shea butter value chain, two value-added products incubated and commercialised, and a delivery van procured and the processing facility equipped.

The project budget was Ug shs 445,925,000, of which Ug shs 289,851,250 was released and Ug shs 281,231,975 spent. The following were achieved: six inception meetings with district leaders to create awareness were conducted; 2,680 farmers received 28,800 Moringa seedlings and were trained in Moringa and Sheanut value chain management; marketing strategy and business plan were developed; two products were developed and undergoing quality assurance testing at UNBS, UIRI and GAL; the processing facility was improved by procuring two oil press machines, sealing machines. The drying facility was upgraded, and a marketing vehicle procured. It was however observed that the procured “van” did not demonstrate value for money.

The pending activities were the training of farmers, acquisition of a filling/packaging line and development of a digital product traceability system.



L-R: Oil press and delivery “van” acquired by TECOMA, Soroti City

6. *Pyrolysis of sewage sludge for bioenergy soil amendment and wastewater treatment (PYROL Project)*

The three-year project aims at developing alternative applications for wastewater and sewage sludge. The planned FY2021/22 outputs include: sewage sludge characterised and pyrolysed; pyrolysis gas; biosorbent; and organic fertiliser developed.

The FY2020/21 project budget is Ug shs 344,400,000, of which Ug shs 223,484,560 was released and Ug shs 111,200,000 spent by January 2022. Sewage sludge samples were collected from the following sites and characterised; Gulu, Arua, Ntungamo, Lubigi, Bugolobi and Masaka. Samples from Masaka provided more combustible gases whereas Gulu sludge had good char for fertiliser development.

The project team was sourcing a local artisan to fabricate a Pyrolysis Unit and the remaining project funds were committed for that purpose. The project was behind schedule due to lack of funds and uncertainty surrounding the next disbursement.

7. *Development of a rapid aflatoxin detection kit*

The project is being implemented at Soroti University in partnership with Makerere University. The project goal is to develop simple, affordable, accessible but scientifically valid innovations that test for aflatoxins in maize and groundnut samples from locally available food sources in Uganda. The planned project outputs are: Awareness and ethical approval done, research methodology and study design developed, procurement of research consumables, aflatoxin biomarker identified, rapid aflatoxin detection kit and mobile app developed.

The project budget for FY2020/21 was Ug shs 129.2m, of which Ug shs 84m was disbursed and Ug shs 83.7m spent by January 2022. The following outputs were achieved during the reporting period: project inception workshop was held, internal study design approval obtained, project protocol submitted to Mbale Regional Referral Hospital Research Ethics Committee,

and samples of maize grains, peanuts paste and flour collected from the districts of Soroti and Masindi. The procurement of laboratory consumables and rapid testing kits was ongoing.

The pending activities included: sample analysis for biomarker identification and the development of a rapid aflatoxin test kit and mobile App. The project was on track to achieve the set targets amidst budgetary release uncertainty as the funding ministry was disbanded.

Research and Development in the Health Sector

The research is funded through two windows: The Presidential Scientific Initiative on Epidemics (PRESIDE) and NRIP. The PRESIDE is a platform set up to fast-track local research and development to generate products to enable the country to cope with the COVID-19 pandemic and future health security needs. In FY2021/22 the PRESIDE was allocated Ug shs 25bn towards research and development for COVID-19 response tools that were initiated in FY2019/20 and FY2020/21. By 31st December 2021, no funds had been disbursed to the project. It should be noted however that the successful implementation of the PRESIDE projects will build the capacity of Ugandan scientists and create preparedness to manage future epidemics.

The monitored projects were at varying levels of progress with some at the prototype stage, others at the preclinical stage and others having no substantial progress registered. It was observed that three projects were unobtainable and resources were re-prioritised to other projects. However, some of the project deliverables were overtaken by events owing to the development of test kits, procedures; and vaccines by other scientists that are already in the country. The progress of individual projects is given below:

1. PCR based diagnostic assays

The project's main objective is to develop and validate a simple and cost-effective PCR COVID-19 diagnostics tests and platforms that can be deployed as point-of-care tests. The project is being implemented by the Joint Clinical Research Centre (JCRC) with the following as project deliverables: SARS-COV-2-RNA extracted; SARS-COV-2-RNA amplified and detected; ELISA based assay evaluated and developed; performance of the assay through field testing demonstrated and testing kit commercialised. The project budget for operations was Ug shs 617,590,000 which was all received and Ug shs 623,159,500 spent by 30th September 2022.

The following achievements were registered: Virus isolation and amplification platform for SARS-COV-2-RNA was modified and optimised, and ELISA assay developed. The developed assay uses saliva instead of nasal swabs. The assay is laboratory-based but the sample can be self-collected. Version 2 of the assay was developed and field-tested with 88.4% and 99% sensitivity and specificity respectively. The JCR could produce 100 test kits per day with each kit testing a maximum of 48 samples.

The disbursements to the project were only effected in January 2022 and commercialisation of the test kit was postponed to June 2022. The project team cited delays in delivery of research equipment, delayed budgetary releases, lack of reporting structures for the PRESIDE and delayed approval of patents due to binding state agreements on research funding as some of the challenges that have affected project implementation.

2. Immune therapy for COVID-19 using convalescent plasma

The project goal is to evaluate and utilise convalescent plasma with SARS-COV-2 antibodies for the prevention and treatment of COVID-19. The project is being implemented at JCRC. The project deliverables include: convalescent plasma collected using Apheresis System; a biobank of Convalescent Plasma established; nebulised convalescent plasma developed; and a Cohort of post-COVID-19 patients established and followed up for 12 months. The project budget was Ug shs 746,446,800 which was all received in FY 2020/21 and Ug shs 443,009,572 spent by 31st December 2021.

The following equipment was received from the defunct MoSTI: Trima Accel System and accessories; Mirasol PRT system and accessories; and Terumo sterile connection device (TSCD) and accessories. By February 2022, minimal deliverables had been achieved, however, the following preliminary activities were completed: preparatory project meetings and research design; immune therapy protocol development and training; and procurement and delivery of research consumables. The registration of potential convalescent plasma donors was ongoing.

The project is behind schedule mainly due to the withdrawal of the collaborating partner (Emergent Biosolutions) who was supposed to provide a unit for human immunoglobulin concentration and purification from the collected convalescent plasma.

3. COVID-19 sub-unit vaccine

The project seeks to develop a subunit/acellular vaccine to be used in the management of COVID-19 spread. The project is implemented by the College of Veterinary Medicine, Animal Resources and Biosecurity (COVAB)-Makerere University whose main deliverable is a COVID-19 vaccine. The project, whose budget for year 1 was Ug shs 867,200,000, of which Ug shs 754,295,950 was released and spent by 31st December 2021, received equipment in kind from MoSTI worth Ug shs 561,068,848.

Isolation and gene coding of the spike protein was done. The viral DNA amplification and expression were achieved in *E.coli*. The pending activities include expression of the protein in humanised mice and pre and clinical trials (antibody, safety and toxicological studies) before mass production of the vaccine. The project is behind schedule due to delays in the renovation and completion of the central laboratory animal research facility, equipment and humanised mice deliveries.

4. Biomarker Research Facility

The project, implemented by COVAB-Makerere University seeks to develop a diagnostic biomarker test kit for diagnosing and management of COVID-19. The project deliverables include: biomarker research facility established at Makerere University; SARS-CoV-2 biomarkers in saliva, urine and blood with diagnostic/prognostic or therapeutic potential identified; and biomarker panels developed.

The project budget for FY2020/21 for operations was Ug shs 160,074,800 which was all received and Ug shs 160,074,317 spent by 31st December 2021. The following achievements were registered by the project: test samples from COVID-19 patients collected and two markers identified. The pending activities include: evaluation of the biomarkers for diagnosis and

management; designing, assembly and evaluation of a rapid diagnostic test kit; establishing modalities to commercialise the kit.

5. *Central laboratory animal research facility*

The project is implemented by COVAB-Makerere University and seeks to upgrade the infrastructure for the Centre for Global Bio-Security from level one to level two and three. The scope of works includes renovation of the laboratory block to Level Two Bio-Security, the animal house to Level Three Bio-Security, and construction of a perimeter wall around the facility.

The project budget was Ug shs 1,347,000,000, of which Ug shs1,401,000,000 was released and spent by January 2022. Civil works for the laboratory were at 90%, whereas the laboratory animal house and fence had stalled due to design changes that required additional funding. The procurement for the standby generator to ensure redundancy in case of a power outage was ongoing.



Top L-R: Some of the equipment received by COVAB and JCRC; Bottom: Laboratory animals (mice) undergoing safety and toxicity studies for COVID-19 Sub Unit Vaccine and Central Animal Research Facility under renovation at COVAB, Makerere University

6. *Matooke starch as a pharmaceutical excipient in selected medical formulations for use in the treatment of COVID-19*

The project is being implemented by the Banana Industrial Research and Development Centre (BIRDC) and is intended to develop native *matooke* starch to be used in pharmaceutical formulations for the treatment of COVID-19. The main project deliverables are: native *matooke* starch extracted, modified and characterised; toxicological profile of both raw and modified starch established; and *matooke* starch tablet and syrup formulated and characterised.

The project budget is Ug shs 527,802,000, of which Ug shs 343,902,000 (65%) was released in FY2020/21 and there were no releases in FY2021/22. By 31st December 2021, the following were achieved: 79kgs of starch was extracted, characterisation and modification done, and preliminary work on the formulation of the syrup and tablets done. It was observed that the project performance was poor with less than 50% of the intended outputs achieved. The implementers noted the lack of funding in the second year of the project as the key impediment to achieving set targets.

7. *Preclinical Evaluation of three (3) Herbal Drug Products in Uganda for effects against Corona Virus Infection*

The main objective of the project is to establish the safety, toxicity and efficacy of three herbal drugs that have COVID-19 inhibitory effects and are being used in the management of the COVID-19 disease. The project activities are carried out at the Mbarara University of Science and technology and the Pharm-Biotechnology and Traditional Medicine Centre (PHARMBIOTRAC). The three herbal drugs under preclinical studies are; Jena DS xtra, Artemune and Covidex.

The planned outputs include: safety and immune effects of the herbal drugs determined; quantity, bioavailability, and plasma half-life of the anti-SARCoV-2 compounds determined, clinical trial doses predicted; list of potential and abundant candidate plants with antiviral and immune-modulating effects; antiviral medicinal conservation and germplasm production gardens established; local capacity in herbal medicine discovery built.

The approved project budget is Ug shs 283,312,000 which was all released and Ug shs 281,312,000 spent by 1st February 2022. The following was achieved: safety studies for the three drugs were completed; quantity and bioavailability for two products Covidex and Jena DS xtra done (berberine); potential antiviral plants in the regions of Uganda were collected and propagation was ongoing at the germplasm garden at MUST. Covidex was found to be the most potent herbal drug and recommended for clinical trials.

The pending activities include: The completion of long term animal toxicity and immune effect studies, establishment of germplasm gardens at Mbarara University of Science and Technology (MUST) and Soroti University; and formulation improvement studies for Covidex to cater for the different disease stages. The project encountered some challenges including the death of test animals during the second national lockdown, lack of equipment for identification of the active ingredients like nuclear magnetic resonance (NMR), and legal challenges related to ownership of Covidex.



L-R: Laboratory animals (mice) undergoing long term safety and toxicological studies for Covidex; and germplasm production garden for medicinal (antiviral) plants at MUST

8. *Increasing COVID-19 testing safety and optimizing cost-effective use of personal protective equipment (PPE) and supplies: A CAMTech Uganda study to sustainably respond and decrease the impact of COVID -19 on Uganda's economy*

The project objective was to increase the production efficiency of hand sanitisers and develop a COVID-19 testing booth. The project received Ug shs 559,974,800 for automation of the hand sanitiser production line and establishment of a COVID-19 testing booth. However, by February 2022 procurement of the production and filling line was ongoing and the equipment had been shipped to Mombasa Port. None of the intended deliverables was achieved. The project team cited distortions in shipment and logistics due to COVID--19.

The development of a COVID-19 testing booth was dropped since cheaper and more effective means of testing were developed (antigen rapid test kits) and funds were prioritised for factory design and construction. It was observed that the demand for the intended hand sanitisers was likely to drop as other preventive practices were found. Therefore, the project team should think of modifying the line to produce other highly sought medical and laboratory supplies.

Research and Development in Energy Sector

Potential Small-Medium-Scale production of power from wind energy and design of wind blades from Bamboo for South-Western Uganda

The project, implemented at MUST seeks to produce wind blades from bamboo. Its deliverable is a prototype of a wind blade from bamboo. The overall project budget is Ug shs 199,610,100 of which Ug shs 141,656,000 was disbursed and Ug shs 36,099,059 spent by 31st December 2021.

The following progress was registered: The research was cleared by the MUST Research Ethical Committee and Uganda National Council for Science and Technology (UNCST), and wind assessment of the project site (Kabale) using satellite data was done. The remaining

activities include: wind assessment using historical data and design of wind blades. The project is behind schedule due to delays in securing research ethical clearance from MUST-REC.

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

The intervention contributes to the objective to develop requisite STI infrastructure. Its key deliverables during the NDPIII period are: Engineering and skills enhancement centres established, R & D laboratories and centres of excellence established, Biosciences Technology Development Centres established, and engineering machining, manufacturing and skills enhancement centres established.

The planned and budgeted outputs for FY2021/22 under the interventions are: Upgrade, repair and refurbishment of existing model value addition centres under UIRI; model value addition centres established and operationalised; and targeted capacity-building and trainings conducted; civil works for TIBIC and NSTEIC executed; and technical service company established and operationalised. The achievements of outputs are presented below:

The meat section plant at the UIRI-Nakawa Campus was remodelled and the mango juice extractor and coding machine repaired. The UIRI supported nine (9) incubatees in the dairy section and trained 678 people in fruits and vegetables, dairy, bakery processing, computer applications, and paper and briquette processing. It was observed that the outputs under implementation are not aligned to the PIAP.

National Science Technology Engineering Innovation- Skills Enhancement Project (NSTEI-SEP)

The FY2021/22 approved budget for the NSTEI-SEP under the UNCST is Ug shs 75.105bn, of which Ug shs 20.933bn (27% of the budget) was released and spent by 31st December 2021. The project did not receive the GoU counterpart funding.

The civil works for the National Science Technology Engineering Innovation-Skills Enhancement Project (NSTEI-SEP) were ongoing at both sites of Namanve-Mukono and Rwebiteete in Kiruhura District. Civil works at the Technology Innovation and Business Incubation Centre (TIBIC)–Namanve were at 22% against time progress of 48%, whereas civil works at the National Science, Technology, Engineering and Innovation Centre (NSTEIC)-Rwebiteete were at 25% against time progress of 27%.

The inception report to establish and operationalise the Technical Service Company (TSC) was prepared, approved and the final draft of the management and operational guidelines for the company developed. In FY2020/21, a total of 102 units¹ of construction equipment were delivered and in FY2021/22, an additional 110 units of construction equipment. A total of 84 units are pending delivery as per the contract agreement. The equipment is to be used by the technical service company for civil and road works on hire and operate basis.

It was observed that the equipment was delivered ahead of schedule before completion of the civil works as had been anticipated; moreover, the institution had not developed management and operational guidelines for the TSC. Development of the training and instruction curriculum

¹ Assorted Graders, bulldozers, excavators, compactors, water bowsers, asphalt placers, wheel loaders, trucks, buses, farm tractors, folk lifters, among others.

for the TIBIC and NSTEIC was ongoing. The project management attributed the slow progress to delayed counterpart funding from GoU.



L-R: Some of the construction equipment for the TSC and progress on civil works at NSTEIC-Rwebitete

Over 95% of the interventions related to the development of sericulture stalled due to a lack of funding.

Challenges

- i. Delayed release of funds and lack of a clear reporting channel for the projects and subventions under the defunct Vote 023.
- ii. Lack of governance board for BIRDC.
- iii. Lack of management and operational guidelines for the TSC.
- iv. Withdraw of COVID-19 research collaborators.
- v. Disruption of the global transport and logistical systems by the COVID-19 outbreak increased the delivery time for COVID research equipment.

Recommendations

- i. The Office of the President (OP) should expedite the transition process of the disbanded Vote 023 and its subventions therein.
- ii. The OP should track the approval of a governance and management framework for the BIRDC.
- iii. The NSTEI-SEP steering and technical committees should ensure that the planned activities are executed according to the work plan and expedite the development of the operation guidelines for the Technical Service Company under UNCST for efficient deployment of received equipment.
- iv. The project PIs and PRESIDE secretariat should ensure that the collaborations established are sustainable.

3.3.5 Conclusion

The sub-programme performance was poor largely attributed to delayed budgetary releases and in some instances lack of funding during the period under review. Vote 110 is still implementing activities in sector mode with little coherency to the NDPIII and ITDT Programme interventions. It was also observed that a few of the ITDT Programme interventions are funded

and thus executed. The performance of the PRESIDE and NRIP projects was fair with some progressing prototypes while others were still in preliminary stages. It was observed that some of the NRIP projects considered innovations need to be incubated in centres like UIRI, Makerere University, and other innovation and National ICT hubs where the much needed technical support can be provided. Whilst, if implemented successfully, the PRESIDE will build capacity of Ugandan scientists and create preparedness to manage future epidemics.

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 one was monitored.

3.4.1 Support the establishment and operations of Science and Technology Parks to facilitate commercialisation

The intervention contributes to the programme objective of developing the requisite STI infrastructure and has three outputs to be attained over the NDPIII period, namely: Banana Industry Infrastructure Park established; Automotive Industrial and Technology Park established, and functional Kiira Vehicle Plant operationalised.

The planned annual outputs for FY2021/22 are: Phase 1 infrastructure development at KMC Assembly Plant completed; KMC Vehicle Plant Phase 1 production system designed, delivered, installed and commissioned; two Kayoola EVS buses and one Kayoola diesel coach-built; and 10-year strategic investment plan and automotive industrial and technology park master plan developed.

The overall infrastructure development of the Kiira Vehicle Plant at the Jinja Industrial and Business Park stood at 28% as of 31st December 2021. The construction of the Kiira Motor Corporation (KMC) manufacturing and assembly infrastructure (phase 1) contracted to National Enterprise Corporation (NEC) at the Jinja Industrial and Business Park stood at 96% against the time progress of 100% as at 31st December 2021. The Assembly Shop and Warehouse were estimated at 98%, chain link fence at 90%, reservoir tank at 98%, waste treatment plant at 70%, and powerhouse at 100%. Extension of a 33kv dedicated power line to the facility was ongoing and poles were erected up to Mutayi Trading Centre.

The completion of phase 1 works was behind schedule due to lack of funding from July to December 2021 arising from the abolition of the MoSTI and transfer of the STI subvention to the Office of the President. The contractor was given a no-cost extension of six months to complete the pending works. Phase II civil works were initiated and the progress was estimated at 5%. The design and installation of a production system stood at 1% by 31st December 2021. Additional equipment was due for delivery in Q3 of FY 2021/22.

The KMC in collaboration with Luweero Industries Limited (Nakasongola) planned to build two electric vehicles (EVS) buses and one diesel coach. By 31st December 2021 one EVS bus and a diesel coach were substantially built and building of the second EVS bus was ongoing.



L-R: Vehicle assembly shop and waste water treatment plant under construction at KMC-Jinja

3.4.2 Conclusion

The sub-programme performance was fair as the phase 1 infrastructure development for KMC was behind schedule; however substantial progress was registered by the contractor amidst late budgetary releases. The KMC facility at Jinja is anticipated to be operational in June 2022, however, some policy and regulatory guidelines for the automotive industry in Uganda need to be put in place to ensure the smooth running of the facility. There is a need to streamline the motor vehicle registration process to incorporate electric vehicles and other power train technologies, review road designs to accommodate bus transport and provide for charging infrastructure, and regulate the importation of used motor vehicles and spare parts.

CHAPTER 4: CONCLUSION AND RECOMMENDATIONS

4.1 Conclusion

The performance of the ITDT Programme during the period under review was poor as all interventions planned to be implanted by MoSTI did not take off. The NSTEI-SEP and KMC registered substantial progress on the civil work's components despite the funding constraints. The research projects funded under the NRIP and PRESIDE frameworks stalled due to lack of resources during the first half of the year.

The key challenges that hampered implementation included delayed transfer of work plans under Vote 023 to Vote 001 which created cash flow constraints to the subventions and ongoing projects, lack of a governance board for BIRDC, COVID-19 disruptions in regard to transport and logistics, and lack of management and operational guidelines for the TSC.

4.2 Recommendations

1. The OP should expedite the transition process of the disbanded Vote 023 and subventions therein.
2. The OP should track the approval of a governance and management framework for the BIRDC.
3. The NSTEI-SEP steering and technical committees should ensure that the planned activities are executed according to the work plan and expedite the development of the operation guidelines for the Technical Service Company under UNCST for efficient deployment of received equipment.
4. The UIRI and all programme agencies should align the planned outputs to the PIAP.

REFERENCES

Government of Uganda (2020) National Development Plan III, FY 2020/21 to FY2024/25 (NDPIII), National Planning Authority, Kampala

National Planning Authority, (2021) National Development Plan Programme Implementation Action Plan, Kampala

Uganda Industrial Research Institute (2021); Quarterly Performance reports (Q1-Q2) FY2021/22

PRESIDE Magazine, Volume 2, April 202.