



CONCEPT NOTE

Research and Innovation Grants Award Launch and Scientific Networking Meeting 04th February 2021

1. Background

The National Council for Science and Technology (NCST) is organizing a virtual event to launch and award successful research project beneficiaries on 04th February 2021, and to provide an opportunity for Scientific Networking Meeting. The NCST manages the Government of Rwanda National Research and Innovation Fund (NRIF) that provides merit-based funding to support public and private sector research, and research and development (R&D) performing institutions. The NRIF funding supports and promotes basic and applied research programs aligned with the national priority areas in the National Research and Innovation Agenda (NRIA).

The NCST published request for applications (RFA) for project proposals under three (3) funding schemes: *a) Rwanda Innovation Challenges; b) Special Collaborative Research Grants to address Covid-19 Pandemic; and c) Academia-Industry Collaboration Grants*. Eligible innovators, scientists and researchers from public and private Higher Learning Institutions (HLIs), research institutions, and not-for-profit organizations in Rwanda submitted their proposals in partnership with globally renowned experts. After extensive external and internal peer review process, a number of projects were recommended for funding through a competitive-merit based process:

- **Rwanda Innovation Challenges**– 36 projects: selected for funding.
- **Special Collaborative Research Grants to address Covid-19 Pandemic**– 17 projects: selected for funding.
- **Academia-Industry Collaboration Grant**– 19 projects: selected for funding.

The Government of Rwanda through The National Strategy for Transformation-1 (NST-1) and the National Vision 2050 underscores the need for promoting R&D and innovation as key drivers of science, technology and industrial development for economic transformation. Rwanda's vision is to strengthen the capacity for research and innovation funding as important avenue to boosting national effort towards achieving a globally competitive knowledge-based and innovation-led economy. Thus, the Government of Rwanda through the NCST established and operationalized the NRIF since June 2018. The goal is to support scientists, researchers and innovators to develop and accelerate research output and productivity under key priority areas as delineated in the NRIA. These include *Sustainable Energy, Food Security and Modern Agriculture, Life and Health Sciences, Local Production and Value Addition, Digital Services products and lifestyle, and Resilient Environment and Natural resources*.

The NRIF research schemes provide competitive funding opportunities towards fostering research uptake in Rwanda and to support research activities that address societal and industry needs. Through collaboration between academia and industry and other stakeholders, the NCST continues to ensure that these grants fuel R&D and innovation for the national development and economic growth.

2. Participants

The event will gather different stakeholders including research institutions, High learning institutions, public institutions involved in research and development, Principal Investigators (PIs) and co-investigators of the successful projects, key note speakers, and other invited dignitaries. There will be invited international speakers on key topics on 'Global Status of COVID-19 Pandemic: Strengthening Collaborations and building Research Capacity' and 'Promoting Agriculture through Science, Technology and Innovation in Africa'.

AGENDA

LAUNCH CEREMONY AND SCIENTIFIC NETWORKING MEETING

Thursday, February 4, 2021: Research Grant Award Launch and Scientific Networking Meeting

Connect via: <http://www.ncst.gov.rw/grant-launch/join>

Chair and Moderator: Dr. Esperance Munganyinka

1:45-2:00 p.m.	Connections set up, Registrations and online Logistics: <i>By Mr. Jean Paul Turikumwe</i>
2:00-2:15 p.m.	Opening Remarks: Progress, journey key facts, gaps and solutions: <i>By Dr. Eugene Mutimura, Executive Secretary, NCST</i>
2:15-2:30 p.m.	Leveraging Research Grant Opportunities at NCST: <i>By Mr. Ernest Mpundu, NCST</i>
Introduction of the Guest Speaker by: Dr Sabin Nsanzimana DG RBC	
2:30-3:00 p.m.	Global Status of COVID-19 Pandemic: <i>Strengthening Collaborations and building Research Capacity:</i> <i>By Prof David Kelvin, Dalhousie University, Nova Scotia, Canada</i>
3:00-3:15 p.m.	Q/A Session (Interactive Session with Participants)
Theme: Special Collaborative Research Grant to Address COVID-19 Pandemic	
3:15-3:25 p.m.	Production of Molecular Based Point-of-care Protocol for SARS-CoV-2 Detection Among Humans, and Comprehensive Atlas of Possible Coronavirus Immune Response Differences Between Humans, and Non-Human Primates. <i>By Dr. Pacifique Ndishimye, Rwanda Biomedical Center (RBC)</i>
Introduction of the Guest Speaker by: Dr Patrick Karangwa, DG RAB	
3:25-3:55 p.m.	Promoting Agriculture through Science, Technology and Innovation in Africa: <i>By Prof Jean Jacques Mbonigaba Association for Strengthening Agricultural Research in Eastern and Central Africa (ASARECA)</i>
3:55-4:10 p.m.	Q/A Session (Interactive Session with Participants)
Theme: Academic-Industry Collaboration Grants	
4:10-4:20 p.m.	Capitalizing on Marigold Bio-Pesticide Properties to Leverage the Output of Natural Products Made in Rwanda: <i>By Dr. Marguerite Mukangango, University of Rwanda</i>
Theme: Rwanda Innovation Challenge Grants	
4:20-4:30 p.m.	Solar Electric Car for Goods Mobility <i>By Mr. Ndayisaba Wilson, PI STES group Ltd</i>
4:30-4:40 p.m.	Vote of Thanks! <i>By Dr Thierry Habyarimana, Ines Ruhengeri University</i>
4:40-5:00 p.m. Launch of Research Grants Awards of Certificate of Achievement	
<i>The Guest of Honour: Hon Minister of Education Officially Launches Research Grant Awards to following Awardees: Presentation of Certificates of achievement to three (3) Representatives of all Awardees:</i>	
<i>36 Project Beneficiaries (Rwanda Innovation Challenge); 17 Project Beneficiaries (Special Collaborative Research Grant to Address COVID-19 Pandemic); 19 Project Beneficiaries (Academia-Industry Collaboration Grant).</i>	
5:00 p.m.	Group Photo and Adjourn

Production of Molecular Based Point-of-care Protocol for SARS-CoV-2 Detection Among Humans, and Comprehensive Atlas of Possible Coronavirus Immune Response Differences Between Humans, and Non-Human Primates

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ABSTRACT

Background: Covid-19 has spread to almost all countries of the world and caused massive losses both in health and economic viewpoints. The population testing for COVID-19 is crucial in order to understand the spread of the pandemic and respond appropriately. A part from humans, scientific evidence also shows that primates are very sensitive to human diseases. Mountain gorillas for instance are prone to some respiratory illnesses that afflict humans. A common cold can kill a gorilla. Several scientific experts are indicating that primates, including mountain gorillas, are likely susceptible to complications arising from the COVID-19. However, the adequacy of immunological defense mechanism in gorillas has not been tested yet. In addition to this, many primate populations are already endangered and a spread of COVID-19 could put them in even more danger. More than 600 mountain gorillas live in Virunga massif where Volcanoes National Park is located. While tourism is an important source of revenue, and the government of Rwanda has prioritized their protection during Covid-19 with restrictive measures, no scientific evidence is available about any potential transmission of COVID-19 from humans to gorillas or vice-versa.

Objectives: The goals of this study are two-fold; first. First, to test the veracity of covid-19 in non-human primates. Secondly, to produce a molecular based point-of-care protocol for SARS-CoV-2 detection. The non-human primates (chimpanzees, mountain gorillas, baboons, golden monkey, African green monkeys) testing regime will include: The scientific proof of respiratory infections among the non-human primates' routes of transmission. A functional comparison of SARS-CoV-2 immune responses pathways (transmission, pathogenicity and susceptibility, protective immunity) between humans, and non-human primates; and possible epidemiology of SARS-CoV-2 in different selected non-human primates reservoirs.

Methods: The detection protocol will include the use of a molecular diagnostic approach for COVID-19 diagnosis using real time loop mediated isothermal amplification (RT-LAMP). This is a specific method that when combined with TokaBio's platform (Axxin T16 instrument), the IT software for instant reporting can be utilized as a point-of-care detection protocol. The total technology would be suitable for contact tracing and instant testing on-site with only a secondary sample taken to the laboratory for confirmation where necessary. One of laboratories' partners (TokaBio) Ltd has in the past developed RT-LAMP assays for the detection of Foot-and-mouth disease which can perform POC real time detection within 15 minutes. The laboratory has developed a protocol for assay development that include design of positive standards for field testing. These standards are designed to cover the expected concentration range of the virus concentrations in field/clinical samples. The laboratory has furthermore developed IT backup software that can relay results from the POC to the central command station for immediate analysis.

Expected results: At the end of project, the technology would allow for safe testing of Covid-19 testing anywhere within a dedicated field box that can use battery power. The combination of the TokaBio portable testing platform, the LAMP Covid-19 assay and the phone application will bring about the most accurate and fast turnaround specifically for contact tracing purposes.

Capitalizing on Marigold Bio-Pesticide Properties to Leverage the Output of Natural Products Made in Rwanda

Marguerite Mukangango¹, Christian Nkurunziza², Alexandre Rutikanga³, Gabriel Bizimungu⁴

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ABSTRACT

Background: Agriculture is a key economic sector in Rwanda. Agriculture contributes 33% to the national GDP and about 80% of the population depends on agricultural activities. However, reference made to the Government of Rwanda targets, the agricultural productivity remains low. Pests and diseases, both at field and storage level, have been reported among factors that hinder the achievement of optimum and stable crop yields. As one of the measures for the management of crop pests and diseases, synthetic pesticides are commonly used. Nevertheless, besides the side effects of the latter, Rwanda spends a lot on imports of such agro-chemical inputs. To date, only one factory (i.e., HORIZON SOPYRWA) can locally manufacture and export pesticides from plants. HORIZON SOPYRWA produces a diversity of pesticide products from pyrethrum for both local and international markets.

Objectives: The proposed project attempts to contribute to the diversification of made in Rwanda bio-pesticide products from plants. The project will capitalize on the pesticidal properties of Marigold (*Tagetes species*) to develop two insecticides, one fungicide and one antibacterial product for the control of both storage pests (e.g.: maize weevils), field pests (e.g.: fall armyworm) and a number of crop fungal and bacterial diseases. The project will mainly focus on pests and diseases of three priority crops viz., maize, beans and Irish potato across key hot spots.

Methods: The project activities will upgrade the current knowledge and use of *Tagetes* crude extract and its major components to commercial formulations via a series of laboratory bioassays and field trials. The methodology and approach include identification and collection of *Tagetes* species; testing various extraction methods to determine the best yielding in terms of chemotypes from *Tagetes* sp; establishing bioassays involving insect, fungal and bacterial pests for assessing the mode of action, efficacy and safety of the chemotypes from *Tagetes* sp; Establishing multi-location trials to evaluate suitable agronomic and edapho-climatic conditions as well as the compatibility for the production of *Tagetes* sp . within existing farming systems; refining formulations of bio-pesticides from *Tagetes* sp. into commercial products with appropriate packaging; establishing field trials to test the efficacy of successful chemotypes from the bioassays; and undertaking certification process to commercially avail bio-pesticides from *Tagetes* sp. Furthermore, the implementation of the project will be through a consortium composed of the University of Rwanda, College of Agriculture, Animal Sciences and Veterinary Medicine (UR-CAVM), the University of Technology and Arts of Byumba (UTAB), Horizon/Sopyrwa and the Rwanda Agriculture and Animal Resources Board (RAB). The consortium will be supported by an expert in pesticide formulations from the Institute of Plant Protection-Chinese Academy of Agricultural Sciences (IPP-CAAS). All the local institutions, have a strong background on the proposed project topic. For example, UTAB has already made a commendable step in testing the efficacy of crude liquid extract from *Tagetes* for the control of maize weevils (*Sitophilus zeamais*) under storage conditions. The results have shown that *Tagetes* extract can control maize weevils as the synthetic insecticide, Malathion can do. Similarly, Horizon/Sopyrwa has developed reliable methods for the extraction of essential oils from *Tagetes*.

Expected results: The output of the project is a developed and certified prototype of bio-pesticides from *Tagetes* sp following international standards as well as commercial formulations of bio-pesticides and diversification of bio-pesticide products for both local, regional and international markets.

Solar Electric Car For Goods Mobility

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ABSTRACT

Background: Transportation costs highly affects the revenue of farmers in Rwanda. Considering Nyagatare district in the Eastern part of Rwanda farmers pay 20% of sales for transportation of milk to the Milk Collection Centers and sometimes no available transport means.

Objectives: The project presented here is an innovative project aiming to making solar electric cars for transportation of agriculture produce and targeting to reduce the cost of transportation to 50% and improving the revenue of farmers up to 64% from 40%.

Methods: Nyagatare is a very favorable place for Solar Electric Vehicles as it has enough sunshine and flat roads to increase the efficiency of batteries. The solution STES Group is proposing to manufacture a Solar Electric that will be powered by energy from the sun and supported by energy from the normal grid.

Expected results: The solar electric cars proposed here will specifically be made for goods transportation. The car is run by a high efficiency electric motor that is powered and which is capable to carry a net load of 700Kg of goods. It has a backup battery of 9KW and are charged by solar panels that are mounted on the body of the car and it is provided with a charging facility to support charging on grid in case there is no sun. The car designed can cover a distance up to 108Km on single full charge and this makes it fit for delivering goods on nearby markets. Using solar electric cars for transportation of goods does not only reduce the cost of transportation but also can contribute in reduction of air pollution generated when using gasoline-powered vehicles.

Implementation of a complete green public mobility system by retrofitting of existing petrol- driven motorcycles into electrical motorcycles

Priority Area: Energy, Environment and Climate Change

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ABSTRACT

Background: Motorcycles are by far the reliable and mostly used affordable and fast mode of transportation in Rwanda. This large number of motor vehicles are powered by internal combustion engines that cause an increase of greenhouse gases such as carbon monoxide (CO), carbon dioxide (CO₂) and other polluting emissions that result into serious global warming and health problems such as respiration diseases.

Objectives: The present research project forms a key component of the overall project of retrofitting of petrol driven motorcycles already in circulation into electric motorcycles and the design and implementation of a clean source of energy to power the electric motorcycles battery charging stations. The project also aims to scale up the

existing motorcycle prototypes and start producing some motorbikes to be operational on the Rwandan transport market.

Methods: The project will be executed by Energicotel Ltd in partnership with the University of Rwanda, as the host institution, on one hand and with REM Limited on the other hand. Data on the existing taxi motorcycles operating in Rwanda will be collected and analysed. An assessment will be made on the air pollution of public motorcycles operating under the various cooperatives in Rwanda, and on energy consumption of Internal Combustion motorcycles against proposed electric motorcycles in service in Rwanda. Safety standards for retrofitted motorcycles will be proposed for approval by relevant authorities. An analysis will be done on the incentives possibilities that encourage motorcycles operators to accept changes from motorcycles powered by internal combustion engines to electric motorcycles. Techno-economic assessment of suitable, sustainable, clean and reliable source of energy for motorcycle battery charging will then follow, and possible commercialization of the first batch of electric motorcycles made in Rwanda. An important dimension of the project will be in the area of developing a program to train mechanics with relevant skill sets for the retrofitting of motorcycles and sensitization of public motorcycle operators towards a new electric mobility system. The charging station of these electric motorcycles will be powered by a Solar PV power plant, which is a clean and renewable source of energy.

Expected results: The study will result into a sustainable non-polluting and cost-efficient public transport solution for most Rwandan residents, thereby contributing to the global struggle to combat the accumulation of greenhouse gases in the atmosphere. It will also encourage the promotion of a sustainable, cost-effective clean energy solutions.

4. Proposed list of participants

Institutions	Number	Invited Dignitaries and Participants
• Ministry of Education (MINEDUC)	4	Hon. Minister of Education Director Head of research unit and the team
• Ministry of Health (MoH)	3	Director/Head of research Unit
• Human Resources for Health	3	Executive Secretary
• RBC	4	Director General
• MINAGRI	4	Director/Head of research unit
• RAB	4	Director General
• MINICT	2	Director General, Emerging Technologies
• RISA	1	Chief Executive Officer
• Ministry of Environment (MoE)	1	Director General of research unit
• REMA	1	Director general
• Ministry of Infrastructure	1	Director/head of research unit
• PIs for Rwanda Innovation Challenges Grants	36	PI
• PIs for Covid-19 Pandemic Grants	17	PI
• PIs for Academia-Industry Collaboration Grants	19	PI
• University of Rwanda	8	VC, All Principals of Colleges, Directors
• Rwanda Polytechnique	2	VC and Director of Research and Innovation
• Private HLLs	10	VC and Director of research
• NIRDA	4	Director General and senior staff
• Private sector Federation (PSF)	1	CEO
• Development partners (GIZ, AFDB, World Bank, SIDA, USAID, etc.)	10	To be determined
• Private companies	10	Companies as employers of PIs
• Members of RCC (NCST)	10	All members