REPUBLIC OF RWANDA

NATIONAL COUNCIL FOR SCIENCE AND TECHNOLOGY

ncst National Council for Science and Technology

Advancements in Science, Technology and Innovation Towards Sustainable Development

NCST Quarterly Newsletter - Issue No: 011 - January - March 2024

PREAMBLE: This edition highlights the convergence of science, technology, and innovation as key drivers of sustainable development. It begins with the celebration of the International Day of Women and Girls in Science, underscoring Rwanda's dedication to promoting gender equality in scientific domains. The achievements of female scientists are applauded, emphasizing their significant contributions to societal advancement. The spotlight then shifts to NCST funded projects spearheaded by Rwandan Researchers, aiming to amplify research uptake and societal impact. These initiatives exemplify transformative potential and underscore the indispensable role of continuous support in shaping a sustainable future.

INSIDE THIS ISSUE:

Group photo of awardees, speakers and panelists during the 9th celebration of IDWGS 2024 with the Guest of honor Hon. Minister Dr. Uwamariya Valentine

UR VC interacting with FAWE Girls School students showcasing their STEM projects

Panel discussion led by Dr. Umunoza Gasana Emelyne during the 9th celebration of IDWGS

Dr. Sylvie Mucyo receiving the Female in STEM Leadership Award

NCST team during M&E visit to RAB Muhanga

9th Celebration of International Day of Women and Girls in Science 2024

Louis Sibomana[1], Marie Chantal Cyulinyana[1], Felly Kalisa[1] Anselme Sano[1], Jean Louis Niragire[1], Vicky Ghafi KONDI AKARA[2], Marie Sagesse Uwurukundo[3], and Jeniffer Batamuliza[4]

[1]National Council for Science and Technology, Rwanda (NCST)

[2]African Institute for Mathematical Sciences (AIMS) | Research & Innovation Centre

[3]Rwandan Association for Women in Science and Engineering (RAWISE)

[4]University of Rwanda (UR)

Background

On 9th February 2024, The National Council for Science and Technology (NCST), in collaboration with its stakeholders including Ministry of Gender and Family Promotion (MIGEPROF), Rwandan Association for Engineering (RAWISE), MasterCard Foundation Scholars program at the University of Rwanda (UR), Rwanda Polytechnic (RP), African Institute of Mathematical Sciences (AIMS) in Rwanda, Rwanda National Commission for UNESCO (CNRU), Organization of Women in Science for Developing World (OWSD) Rwanda Chapter, and other partners, celebrated the International Day of Women and Girls in Science (IDWGS) under the theme: **"Rwanda's Journey to Advancing Women and Girls in Science for Sustainable Development"**. The event took place at Kigali Serena Hotel and was officiated by the **Hon. Dr. Valentine Uwamariya**, Minister of Gender and Family Promotion, who highlighted Rwanda's commitment to advancing women and girls in science for sustainable development.

The International Day of Women and Girls in Science, established by the United Nations in 2015, aims to recognize and boost the role of women and girls in science worldwide. It seeks to close the gender gap in STEM fields and inspire more females to pursue careers in science, technology, engineering, and mathematics. The day celebrates the accomplishments of female scientists and advocates for gender equality in all aspects of life, including in scientific disciplines. Despite progress, global disparities persist, with women representing only 33% of researchers globally and facing underrepresentation in fields like engineering and computer science. In Rwanda, although there are encouraging signs of increased female enrollment in STEM subjects at the secondary school level, disparities become more pronounced when it comes to higher education and technical programs.. Furthermore, women make up only 35.73% of research and development personnel. These challenges highlight the need for continued efforts to support women and girls in science, technology, research, and innovation. Thus, the celebration aimed to foster meaningful discussions and advocate for equality in science, technology, and innovation to drive socio-economic sustainability.

Figure 1: *Group photo of awardees, speakers and panelists during the 9th celebration of international day of women and girls in science 2024 with the Guest of honor Hon. Minister Dr. Uwamariya Valentine*

Celebration Proceedings

Students Exhibition

The event included an exhibition highlighting the innovative projects developed by female students from various secondary schools, including Rwanda Coding Academy, College Saint André, Maranyundo Girls School, FAWE Girls School, and Agahozo Shalom. Additionally, undergraduate students from the University of Rwanda, who are part of the Mastercard Foundation Scholar Program, and their colleagues from Rwanda Polytechnics also participated and showcased their projects.

Figure 2: *Students presented their projects to various guests in attendance at the IDWGS2024 event during the exhibition*

Panel Discussion

As shown in figure 3, an interactive panel discussion comprised of high school students and Rwandan female scientists was organized to delve into the theme of Rwanda's progress in empowering women and girls in science for sustainable development. This panel discussion aimed to foster dialogue by sharing diverse perspectives and personal experiences on the subject.

Figure 3: *Panel discussion led by Dr. Umunoza Gasana Emelyne during the 9th celebration of International day of Women Girls in Science*

Awarding Ceremony

Figure 4: *The Female in STEM Leadership Award is being presented to Dr. Sylvie Mucyo by the Honorable Minister, Dr. Valentine Uwamariya.*

A significant highlight of this IDWGS2024 celebration was the Women in Science Awards, which recognized outstanding contributions of women in science. These awards included the Science Leadership Award, Female Researcher Award and Rising Star Award. The aim of each award category is to recognize women who have shown leadership, excellence in research, innovation, and advocacy for science.

Female Science Leadership Award:

Dr. Sylvie Mucyo, Vice-Chancellor of Rwanda Polytechnic – RP **(Figure 4),** received this prestigious award for going above and beyond her duties to champion women and girls in STEM across Rwanda. Alongside her regular responsibilities, she has demonstrated remarkable commitments to advancing gender equality in the field. The award, which includes a cash prize of eight million Rwanda Francs, a certificate, and a trophy, recognizes her outstanding efforts in fostering inclusivity and excellence in STEM education and leadership.

Figure 5: *The Female Researcher Award is being presented to Dr. Bellancile Uzayisenga*

Rising Star Award:

Dr. Marie Sagesse Uwurukundo, from Kepler-Rwanda **(Figure 6)**, has been honored with this prestigious award for her innovative creation, providing a practical and tangible solution beneficial to society. Recognizing her ingenuity, this accolade comes with a prize of five million Rwanda Francs, along with a certificate and a trophy. Dr. Uwurukundo's dedication to developing impactful solutions highlights her commitment to making a positive difference in the world.

Female Researcher Award:

Dr. Bellancile Uzayisenga, a researcher at the Rwanda Agriculture and Animal Resources Development Board – RAB **(Figure 5),** has been honored with this prestigious award in recognition of her outstanding research contributions and remarkable productivity, which have had a significant impact. Alongside her exceptional achievements, this accolade comes with a prize of six million five hundred thousand Rwanda Francs, a certificate, and a trophy, celebrating her dedication and excellence in the field.

Figure 6: *Female Rising Star Award was bestowed upon Dr. Marie Sagesse Uwurukundo.*

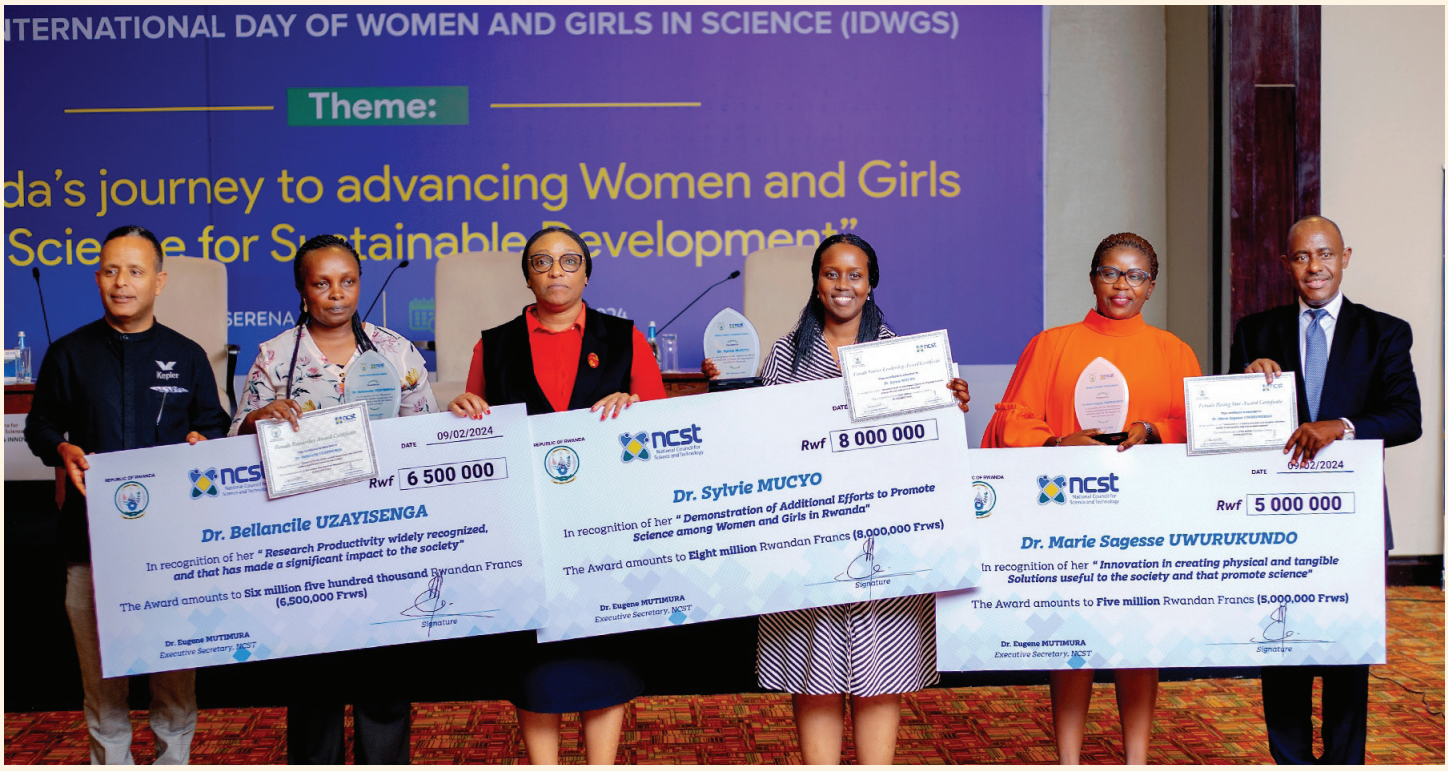


Figure 7: *The three female awardees, each accompanied by a representative from some invited institutions.*

In total, there have been 19 awards presented in this category to outstanding women for their remarkable contributions to science and technology, spanning leadership and implementation efforts since 2018.

Closing Remarks

In her speech, Honorable Minister of Gender and Family Promotion, Dr. Valentine Uwamariya emphasized on Rwanda's commitment to promoting gender equality in science. She highlighted the government's initiatives to address gender disparities in STEM education and research, stressing the importance of collaboration and mentorship in empowering women and girls in STEM.

The 9th Celebration of the International Day of Women and Girls in Science in Rwanda stands as a powerful reminder of the nation's commitment to promoting gender equality in STEM. Through acknowledgment, motivation, and teamwork, this event illuminates the pathway to a future where every woman and girl enjoys equal chances to excel in science, technology, engineering, and mathematics. As Rwanda progresses towards sustainable socio-economic development, the invaluable contributions of women and girls in science will be instrumental in crafting a better tomorrow for everyone.

Figure 8: *Hon . Minister Dr. Uwamariya Valentine addressing the audiance during the celebration IDWGS2024*

Inspire me talk

The afternoon session featured an "Inspire Me" talk, generously supported by the Mastercard Foundation Scholar Program in collaboration with the University of Rwanda. The discussion revolved around Rwanda's efforts to promote the advancement of women and girls in science for sustainable development, focusing on the experiences of inspirational female figures for young students. The panelists included Dr. Peace Bamurigire, a lecturer and researcher at UR, Mrs. Collette Utetanase Ganza from the Mastercard Foundation Scholars Program at the University of Rwanda, and Mrs. Ange Cynthia Umuhire, an international consultant of the World Bank Group (WBG) and an early career researcher of the African Astronomical Society (AfAS). They shared their career journeys in the field of science with the audience, particularly high school students.

Figure 9: *A group photo with some secondary students who attended inspire me talk*

RTV Live Talk on 11th February 2024

On February 11th, 2024, a high-level RTV discussion was held featuring Belancille NYIRAJYAMBERE, President of the National Women's Council; Dr. Eugene MUTIMURA, NCST Executive Secretary; Dr. MUCYO Sylvie, Vice-Chancellor of Rwanda Polytechnics; and Dr. BATAMURIZA Jennifer, a lecturer at UR and Vice President of RAWISE. The discussion reflected on the theme of the International Day of Women and Girls in Science (IDWGS), emphasizing the government's efforts to advance women in STEM and highlighting achievements over the past 30 years. Once more, the acknowledgment of the exceptional accomplishments of women and girls in science has reinforced our nation's dedication to forging a world that is more inclusive and fairer for the generations to come.

Figure 10: *A group photo of all guests who attended the 9th celebration of international day of women and girls in science 2024*

Figure 11: *Students showcasing their STEM projects during the exhibition*

An overview of NCST funded Projects with potential to transition to Scale (TTS)

Didacienne Mukanyiligira[1], Theogene Kayumba[1], Benjamin Nabaana[1] and Esperance Munganyinka[1]

[1]National Council for Science and Technology, Rwanda (NCST)

The Government of Rwanda is committed to funding research and technology development through the National Research and Innovation Fund (NRIF) that was launched in June 2018 to enhance opportunities for data-driven innovations and the integration of research findings into practice or policy to improve the wellbeing of Rwandan citizens. The Rwanda National Council for Science and Technology (NCST) manages the National Research and Innovation Fund (NRIF), and since its establishment, one hundred fifteen (120) research and innovation projects have been funded, with over 4.5 billion Rwandan Francs invested. Currently, the supported projects are at different stages: completed, nearing completion, midway, and a few grant schemes have just been established. The desired impact for the supported projects is to establish quality research output that directly addresses socio-economic challenges, fostering research performance and productivity, technology development and uptake, and boosting the capacity of scientists and researchers, especially in line with gender inclusion and private sector engagement.

In this regard, the National Council for Science and Technology (NCST), in collaboration with the African Centre for Technology Studies (ACTS), is supporting Implementation Research of previously NCST-funded projects that have shown proof of concept and demonstrated potential to transition to scale for new products and services. Five (5) projects in three priority areas, namely **Food Security and Modern Agriculture, Resilient Environment and Climate Change,** and **Local Production and Value Addition,** have been selected based on their potential for commercialization of innovative products and services. These projects are supported for implementation research aimed at enhancing research uptake, scaling up, and commercialization.

Projects Spotlight:

Project 1. Improve livelihoods of citizens through the development of biocontrol products based on local beneficial insect-killing nematodes

The government of Rwanda aims to promote 'Made in Rwanda' products for the country's ambitious industrial growth. In this regard, the country is investing in research activities for the development of research-based solutions that will provide sustainable solutions to Rwanda's challenges.

The research team from RAB, led by Mrs. Joelle Kajuga Nsamira, In collaboration with Agripy Ltd., developed a biopesticide that will be used without harm to humans. the research team members are testing and validating the developed product and transitioning it to scale for commercialization.

Project 2. Rwanda Cricket farming to fight against malnutrition

This project addresses the issue of malnutrition and stunting. Around 54% of Rwandan households are low-income earners; thus, they cannot afford to buy meat at 4,500 or 5,000 Rwf per kilogram weekly as their protein supply. Consequently, the percentage of malnourished newborns and mothers has increased by more than 34%. The innovator, Musabirema Alex from Nutri Farm, and the research team have introduced smart technology for cricket farming and have produced cricket flour, which is now being tested, validated, and prepared for scaling up to the market. The cricket flour will address the issue of food insecurity and provide an alternative source of protein that is innovative, nutritious, tasty, affordable, and sustainable, being sold at only 2,000 Rwf a kilo, a low price compared to other sources of protein such as soy, algae, fish, eggs, and meat. This will also promote 'Made in Rwanda' products.

Project 3. ***Improve agriculture mechanization through Development of Multi-Grain Seeding Machine driven by a Power Tiller Machine***

This project addresses the challenges of limited access to crucial equipment and infrastructure for farmers, especially smallholder farmers in the agriculture field, a major economic sector for the people of Rwanda, employing about 70% of the total population. This sector contributes 31% to GDP. The innovator, Niyonshuti Israel, from Tech Adopter, designed and manufactured an engine-powered tiller, a special two-wheeled agricultural machine fitted with a rotary tiller, providing smooth resistance for all farm activities including tillage, irrigation, seeding, harvesting, and transportation. He is currently conducting implementation research to improve the machine, considering feedback from farmers already using it.

Project 4. ***Development of technologies/systems that contribute in reduction of air pollution and climate change impact eg: Environmentally friendly technologies, use of vehicle Pollution Monitoring systems***

Cars account for 80% of total urban air pollution in developing countries like Rwanda. Due to this pollution, 25% of Rwandans suffer from respiratory ailments, while 90% of the world's population breathes filthy air. Rwandan Technical Vehicle Inspection Centers conduct yearly inspections and can identify excessive CO_2 emissions. The flaw is that each car is only tested once a year, thus there is no real-time monitoring of gas emissions. Mr. Tuyizere Emmanuel from GreenAnalytics, in collaboration with Benoholding, developed a real-time air pollution monitoring device that is installed in cars, monitors air pollution, and provides data to the competent authority for decision-making regarding car pollution. This device has been tested and is now in the final stage of testing at the Rwandan Technical Vehicle Inspection Centers.

Project 5. ***Enhancement of Made in Rwanda Products: e.g.: Production Technology, Quality and Competitiveness of Rwanda Banana Beverage Products***

This project addresses challenges in the Banana value chain (BVC) such as postharvest losses and poor processing technologies. The production technology of local banana beer (Urwagwa) still largely relies on traditional methods, sometimes resulting in poor product quality and limiting the competitiveness of the BVC. Studies show that such non-standardized approaches may have adverse effects on public health. Additionally, there is a lack of local production of starter culture specifically for banana beer. Mr. Emmanuel Munezero, a researcher from NIRDA, developed a starter culture from identified yeast isolates with the best biochemical characteristics.

Evaluation of its performance in banana beer production is ongoing. Currently, in partnership with Institut Catholique de Kabgayi (ICK), the research team is scaling up the product through implementation research, while also improving the final products based on feedback from consumers.

NCST Funded Projects fueling a Positive Impact on Society

Marie Chantal Cyulinyana [1], Marie Goretti Umuhozariho[2,3], Alfred R. Bizoza[2], and Claire D'Andre Hirwa[4]

[1]National Council for Science and Technology, Rwanda (NCST)
[2] University of Rwanda[3], The Sina Gerard's Entreprise Urwibutso Nyirangarama
[4]Rwanda Agriculture and Animal Resources Development Board (RAB)

Background

The National Council for Science and Technology (NCST), operating under the umbrella of the National Research and Innovation Fund (NRIF), plays a central role in fostering developmental progress and innovation. It actively seeks proposals across a wide array of research fields, driving forward the frontier of innovation. These proposals undergo rigorous process of evaluation, with successful ones securing vital funding support. The overarching goal of NRIF is to strengthen the country's research and innovation landscape, thereby facilitating societal and economic advancement in alignment with national transformation objectives.

Currently 120 research and innovation projects have already received funding through NCST serving a catalyst for meaningful change brought by funded projects across various sectors. Tasked with overseeing the progress of these initiatives, NCST adopts a cautious approach. Through particular Monitoring and Evaluation processes, NCST ensures that funded projects stay on track, optimizing their capacity to generate positive societal impacts and guide the nation towards a promising future that is backed with science and innovation.

In this article, we focus on three projects that exemplify how NCST is driving progress by funding initiatives aimed at addressing societal needs and challenges. These projects are:

1. Comprehensive Assessment of the Nexus between Poverty and Food Insecurity through Innovative Societal University Village Initiative (SUVI) approach in the Kivu Belt, Western Province, Rwanda,
2. Orange Fleshed Sweet Potatoes and Soybeans Blended Instant Flour,
3. Improving indigenous chicken productivity for enhanced livelihood and Food security among the resources limited household in Rwanda.

Each of these endeavors showcases the transformative impact of NCST funding in tackling pressing issues and fostering positive change within our communities.

Learning Progress

1. **Comprehensive Assessment of the Nexus between Poverty and Food Insecurity through Innovative Societal University Villages Initiative (SUVI) approach in the Kivu Belt, Western Province, Rwanda**

Project Goal

The overall goal of the project is to deepening the understanding of the nexus between poverty and food insecurity among coffee and tea growers in the Kivu Belt of Rwanda's Western Province. This project operates within the innovative Societal University Village Initiative (SUVI) approach of the University of Rwanda. The approach enables a participatory and action-oriented research for a critical diagnosis of critical societal challenges but also seeks tangible actions and solutions to address them. The project is led by Professor Alfred R. Bizoza, an agricultural economist from the University of Rwanda.

Project Outcome and achievements

The project outcomes and achievements are twofold: contribution to science and strengthened linkages of science and community.

First, the project has brought impactful insights on the discourse of nutrition and stunting from a perspective of behavioural economics. A key result documented is that under-five years children from coffee and tea farming families are more likely to be stunted than those from non-coffee and tea families. It is therefore concluded that the universality of assumptions for being better off as coffee and tea cash crop producers does not adequately explain poverty, food and nutrition insecurity levels. Societies should recognize untapped potential of non-cash crops, increase agricultural productivity and diversify cropping systems. Food systems must be supported by innovative farming practices such as special agricultural zones, access agri-technologies, and profitable markets in order to ensure food and nutrition security in Rwanda. This suggestion is being considered in the on-going sector strategic planning process by the Ministry of Agriculture and animal resources in Rwanda.

Figure 1: *On-going training of SUVI champions*

The second area of achievement goes on the capacity development of 14 SUVI champions, University graduates recruited in the context of the SUVI approach for a period of 12 months. They undergo a process of capacity building on research methodology and ethics of

action research, and contribute to community services as part of "giving back". capacity gains have allowed them to contribute both in collecting evidence needed to inform the policy discourse and generation of innovative ideas framed through individual business plans. Apart from creation of 12 short term jobs, these business plans are designed through community innovation partnerships and are implemented to address identified pressing challenges in the society while at the same time creating opportunities for their future employment.

Figure 2 : *Data collection by SUVI in the community*

Figure 3: *SUVI engaged in community service. Establishing kitchen garden.*

2. Orange Fleshed Sweet Potatoes and Soybeans Blended Instant Flour

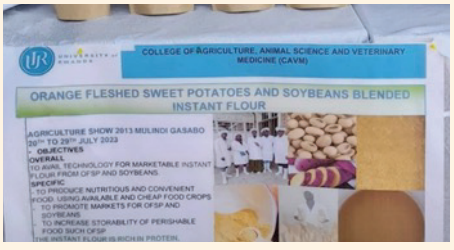
Project Goal

Led by Prof. Marie Goretti Umuhozariho, the Orange Fleshed Sweet Potatoes and Soybeans Blended Instant Flour project will make significant progress towards addressing the malnutrition challenge prevalent in the country. Recognizing the nutritional value of sweet potatoes and soybeans, which are rich in vitamins, minerals, and proteins, the project aims to leverage these crops to improve the overall nutrition status of Rwandans. Despite efforts, malnutrition remains a persistent issue in Rwanda. By formulating a nutritious and easily to prepare food product using locally available crops, the project seeks to combat malnutrition effectively. The goal is to develop a stable, storable, and distributable food solution that can significantly contribute to reducing malnutrition rates in Rwanda.

Project Outcome and achievements

To date, the project has achieved several milestones, including the creation of a comprehensive processing chart. The research team showcased their products at Agri-show 2023, where it gathered widespread recommendations for improving. The Rwanda Development Board (RDB) has granted TRADEMARK registration for the products under the name **"NKUNGAHARE INSTANT FLOUR"** Additionally, the team has initiated the process of patent application, awaiting certification for their innovative products description.

Two new food products have been developed and the trademark given by RDB is **Nkungahare instant flour.** The two products are Nkungahare instant flour with added sugar and Nkungahare instant flour without added sugar. The technological flow chart for processing the flour is available. The ratios to mix in the blended flour was determined by sensory evaluation study.



Sliced OFSP, Sensory evaluation session, Exhibition of the innovative food products in MINAGRI Agri-show 2023

Furthermore, a sensory evaluation study has been conducted, providing valuable insights into product quality and consumer preferences. Currently, the team is diligently preparing a scientific manuscript to document their findings and contributions to the field. These accomplishments underscore the project's commitment to innovation and its potential to positively impact both the agricultural sector and consumer markets.

Both innovative food products were highly appreciated by 249 respondents. As trademark is now available, the products can be processed and marketed for consumption and reduction of malnutrition, especially protein, vitamin A and iron deficiencies due to their significant nutritional content. The products evaluation panelists recommended that the food products would be available to market as soon as we can.

3. **Improving indigenous chicken productivity for enhanced livelihood and Food security among the resources limited household in Rwanda**

Project Goal

Rwanda Agricultural and Animal resources Development Board (RAB) has started on developing improved local chickens with support from National council for sciences and Technology (NCST). RAB is conducting the research for development on enhanced performance of indigenous chickens (IC) through the selection and breeding of IC for improved growth rate and egg production. This is because the IC, mainly kept on a free-range system, where they scavenge for food all day, are giving in low productivity. However, these are more adapted and tolerant to environmental stressors like diseases (e.g. Newcastle disease) and limited access to quality feeds.

The previous research shown that in Rwanda, we have 4 types of indigenous chicken namely Inshenzi, Sekaganda/Inganda, Imirangi/Umurangi and Indayi.

Figure 4: *Indigenous chickens (hen) (left) and Cock (right)*

Some good achievements

RAB is working on improving the indigenous chickens for improved incomes and food security for smallholder farmers, especially women. RAB collected 2300 IC chicken, were reared under intensive (I) management at Muhanga station and started the selective breeding based on 4 types mentioned above.

Figure 5: *Dwalf chicken (Inganda/ Sekaganda) in experimental room and Feeding of IC chicken*

Figure 6: *Growth measurement of chicken*

The same time, RAB trained 50 women beneficiaries (females: 38 and 12% of youth were trained on Poultry housing systems, poultry health (diseases control, biosecurity and vaccination), feeding and utilization of locally available materials, breeding and selection of best breeds. These made the IC women and youth actors get general insights on poultry management and resulted to their farming improvements

Figure 7: *Trained women and benefeciaries during M&E*

Figure 7: *NCST team during M&E visit to RAB Muhanga*

- The researchers (3females & 5 males) were trained on data collection and methodologies. They have gained more knowledge in conducting research activities.
- The partnership with other researchers from universities, private sector industries, traders help us to share knowledge and implementing researches together.
- Increase in the number of jobs created, whereby 11 casual (6 females & 5 males) labors are involved in management of indigenous chicken at RAB station

WOMEN empowerment: Mukagahizi Sarah story

Mrs Mukagahizi Sarah is a woman beneficiary from Bugesra district, married with two children, she is among the empowered women in terms of knowledge. *She said: "I learnt the best practices of chicken management, housing systems, brooding, grower management, feeding, chicken health, production and culling period. These help me to do chicken farming as business, because I improved the chicken house and bought 50 chicken".* Mukagahizi Sarah and her family most of changes happened in family she testified that, *"as an empowered women, I am able to feed my children an egg per day for improving their nutrition and also I am able of generating an income for my family due to the sale of chicken and eggs*

Linkages with feed industry

Linkages with Mother's trading