



**Final Evaluation IUC
with Nelson Mandela African
Institution of Science & Technology,
Tanzania**

6 February 2024

**Felly Chiteng Kot, PhD
Hezron Makundi, PhD**

Acronyms

BuSH	School of Business Studies and Humanities
CoCSE	School of Computational and Communication Science and Engineering
CREATES	Centre for Research, Agricultural Advancement, Teaching Excellence and Sustainability
CSP	Corporate Strategic Plan
DAAD	German Academic Exchange Service
DANIDA	Danish Agency for International Development
GBIF	Global Biodiversity Information Facility
HEET	Higher Education for Economic Transformations
ICOS	Institutional Coordinator for Development Cooperation
ICT	Information and Communication Technology
IDRC	International Development Research Centre
IITA	International Institute of Tropical Agriculture
IUC	Institutional University Cooperation
LiSBE	School of Life Sciences and Bioengineering
MEWES	School of Materials, Energy, Water and Environmental Sciences
MOU	Memorandum of Understanding
NDV	National Development Vision
NM-AIST	Nelson Mandela African Institution of Science and Technology
OECD-DAC	The Development Assistance Committee of the Organization for Economic Cooperation and Development
PSU	Program Support Unit
SDG	Sustainable Development Goals
SETI	Science Technology Engineering and Innovation
SIDA	Swedish International Development Agency
TCU	Tanzania Commission for Universities
ToC	Theory of Change
ToR	Terms of Reference
TTO	Technology Transfer Office
USAID	United States Agency for International Development
VLIR-UOS	Flemish Interuniversity Council – University Cooperation for Development

Executive Summary

Subject and objective of the evaluation

This end-of-term evaluation examines Phase II of the Institutional University Cooperation (IUC) Program, funded by VLIR-UOS and jointly implemented by the Nelson Mandela African Institution of Science and Technology (NM-AIST) and four Flemish universities: KU Leuven, Vrije Universiteit Brussel (VUB), Universiteit Antwerpen, and Universiteit Hasselt. Centered on "Sustainable Management of Natural Resources to the Benefit of the Local Communities of Northern Tanzania," the program comprised five key projects:

1. Sustainable Smallholder Banana-Based Farming Systems to Improve Livelihoods in Northern Tanzania (P1),
2. Development of Water Purification Technologies (P2),
3. Applied Aquatic Ecology (P3),
4. Institutional Strengthening via ICT and Information Services (P4),
5. Institutional Strengthening through Technology Transfer and Outreach (P5).

This four-year program builds on Phase I of the IUC program, which covered the period between 2013 and 2018. The second phase of the program (the subject of the current evaluation) began in 2019 and was funded with an annual budget of EUR 350,000 for the first three years, and EUR 250,000 for the fourth year. It aimed to enhance institutional capacity building, postgraduate training, multidisciplinary problem-solving, community engagement, incubation management, and infrastructure development, thereby demonstrating its dedication to educational excellence, research, and innovation.

The aim of this evaluation was to assess the overall performance of the program, with a specific focus on its effectiveness, impact, and sustainability. Additionally, the evaluation intended to capture valuable lessons learned and offer recommendations for future enhancements.

Methodological approach

This evaluation is part of a comprehensive assessment covering 8 VLIR-UOS IUC and Network programs, employing a shared evaluation framework aligned with the [6 OECD-DAC criteria](#), complemented by an additional framework to assess five core institutional capabilities. The evaluation commenced with a self-assessment of institutional capacity by key stakeholders at the University, focusing on the changes in maturity levels across five capabilities from 2019 to 2023. It then proceeded to evaluate the program's performance based on the six OECD-DAC criteria, delved deeper into an impact case study, and explored three learning questions. The process involved reviewing a variety of documents from both the Program and the University, as well as additional sources independently identified by the external evaluators. The information, obtained from interviews, focus groups, document reviews, and site visits, was methodologically analysed and synthesized, providing a comprehensive overview of the program's performance.

Execution of the evaluation

In preparation of the field mission, an interview protocol and a self-assessment questionnaire was distributed to chosen stakeholders for initial institutional capacity evaluation before the site visit. The visit began with analysing data from NM-AIST's self-assessment responses and a full-day workshop to refine these results. Subsequently, the evaluators conducted interviews and focus groups with approximately 60 internal and external stakeholders and visited various infrastructures, including farms related to the impact case study. The mission concluded with a hybrid restitution session for synthesizing findings, attended by key NM-AIST and a few Flemish stakeholders. Interviews with the Flemish coordinator and project leaders were also conducted in Leuven and online.

Main findings and conclusions

The program demonstrated a good-to-excellent level of performance relative to the six DAC criteria, even though some limiting factors and needs for consolidation must be acknowledged.

Relevance: The VLIR-UOS program at NM-AIST aligns closely with the institution's goals and Tanzania's development needs, effectively contributing to capacity building in key areas like water quality, agriculture, ICT, and technology transfer. It addresses critical Tanzanian challenges, supporting progress towards several UN Sustainable Development Goals, including environmental sustainability, gender equity, and technological advancement. The program exemplifies the role of higher education in addressing global challenges and fostering sustainable development.

Coherence: The VLIR-UOS program at NM-AIST exhibits strong internal coherence, aligning with the institution's mission and strategic goals, particularly in capacity building, research, and technology transfer. This internal synergy is reflected in the effective integration of various projects, enhancing the program's overall impact. Externally, while there are successful collaborations with local institutions, opportunities exist for deeper and broader engagement with external partners. Strengthening these external relationships could further enhance the program's effectiveness in addressing regional and global development challenges.

Effectiveness: The VLIR-UOS program at NM-AIST has been highly effective, achieving most of its objectives. Key achievements include substantial enhancements in institutional capacity, particularly in education, research, and industry collaboration. The program excelled in promoting impactful research, aligning with both global and national development goals, and notably improved PhD completion rates. It fostered a multidisciplinary approach to sustainable development and significantly exceeded its targets in community outreach and engagement. The establishment of a Technology Park facilitated effective technology transfer, and significant improvements in ICT, library services, and laboratory infrastructure further contributed to the program's success. Overall, the program has largely met its objectives and significantly contributed to NM-AIST's development and strategic goals.

Scientific Quality: The VLIR-UOS program at NM-AIST significantly improved the quality of education and research. The program led to all master's and PhD programs receiving national and some international accreditations, illustrating high academic standards. There was notable progress in PhD completion rates, updates to master's programs, and the implementation of online course evaluations, indicating high student satisfaction. Additionally, there was an increase in qualified lecturers. In research, the program boosted NM-AIST's output, with 26 publications in international peer-reviewed journals in Phase II, surpassing the target of 14, including contributions from both PhD and master's students. This enhancement in scientific quality is further evidenced by NM-AIST's notable rise in global webometrics rankings, underlining its increased academic influence and visibility. Overall, these achievements reflect a substantial advancement in NM-AIST's academic and research capabilities.

Efficiency: The VLIR-UOS program at NM-AIST demonstrated notable efficiency in its execution, benefiting from lessons learned in its initial phase. Key factors contributing to this efficiency included clear role definitions for supervisors, participatory and flexible budget formulation, and thorough needs assessments ensuring resource alignment with objectives. Despite challenges with the local procurement system causing cost-effectiveness issues, the program achieved a positive return on investment, significantly enhancing education, research quality, and institutional capacity. Efficient organizational management and structures, especially the Joint Steering Committee and Programme Support Unit, played a pivotal role in streamlining implementation. Active participation and strategic planning in decision-making, along with a strong commitment from project leaders and team members, further underscored the program's efficient execution.

Impact: The VLIR-UOS program at NM-AIST significantly impacted institutional capacity, research innovation, and community engagement. Between 2019 and 2023, NM-AIST saw marked improvements in core capabilities, enhancing its academic and research profile. The program led to academic staff development, with notable contributions from PhD graduates, and updated several master's programs. It fostered specialized research areas, like banana research, resulting in the proposed establishment of a major research centre. The program also increased research output, evidenced by 26 peer-reviewed

publications, and advanced the development of a Technology Park, boosting technology transfer capabilities. Infrastructure improvements in digitalization, ICT, and labs significantly upgraded NM-AIST's resources and technological capacity. The university's strategic reorientation towards multidisciplinary research groups and updated policies reflected a maturing research ethos. Collaborative initiatives with various stakeholders enriched the university's research and community involvement. The program's impact on the community included empowering farmers with improved agricultural techniques and driving wastewater management innovations. Entrepreneurial initiatives emerged, demonstrating the program's influence on innovation and application. Overall, the VLIR-UOS program at NM-AIST made substantial contributions to institutional development and community empowerment, reflecting its broad and positive impact.

Sustainability: The VLIR-UOS program at NM-AIST has positively influenced institutional, financial, and academic sustainability. Institutionally, NM-AIST's public status and support from the Tanzanian government ensure its continued viability. Financially, the university has shown resilience through diverse funding sources and external partnerships, although it faces challenges in securing sufficient governmental and non-governmental funding for research and innovation. Academically, NM-AIST's integration of trained young scientists into its faculty promotes sustainable brain circulation and continuity in program impact. The establishment of initiatives like the Banana Research Centre and expansion into new research areas demonstrate a commitment to long-term impact. The university's strategic efforts in grant acquisition and expanding collaborations beyond VLIR-UOS contribute to its ongoing academic sustainability and growth potential.

Facilitating factors: The VLIR-UOS program at NM-AIST achieved success through a combination of key facilitating factors. Its innovative design, featuring a collaborative structure with significant local decision-making authorities, fostered a sense of ownership and alignment with the institution's needs. Crucial to this success was the strong commitment and support from both NM-AIST and its Flemish partners, along with effective communication and trust between coordinators and project leaders. The program addressed initial recruitment challenges (but still fell short of the recruitment target due to a small candidate pool), improving student completion rates, and the establishment of a dedicated support unit enhanced coordination and efficiency. Additionally, the program's flexibility in extending its timeline in response to COVID-19 and its ability to integrate lessons learned from earlier phases contributed significantly to its overall effectiveness and continual improvement.

Inhibiting Factors: The VLIR-UOS program at NM-AIST encountered several inhibiting factors, though it achieved significant success. Disruptions due to the COVID-19 pandemic and seasonal changes affected research timelines. Recruitment challenges, particularly in attracting qualified female PhD candidates, impacted the program's gender balance and recruitment targets. Variations in leadership and support quality (especially less engagement from some project leaders), coupled with limited inter-project mobility and communication issues, diverging/conflicting interests in some projects, lack of incentives for non-academic staff, and decreased commitment to sustain the library system resulted in uneven progress across projects. Financial constraints hindered the program's full potential, particularly in transitioning research to marketable products. Additionally, Tanzania's centralized education system and frequent management changes at NM-AIST added to the program's complexities, although effective adaptation to leadership transitions was noted. The relatively small number of students at NM-AIST also raises questions on cost effectiveness and economic viability.

Challenges: Ongoing and future challenges that NM-AIST faces or will (continue to) face in the future include ensuring long-term sustainability and self-sufficiency, particularly in securing consistent funding for research, innovation, and commercialization. The university needs to focus on enhancing diversity in PhD recruitment, especially increasing female participation. Another significant challenge is the effective transition of research into marketable products, requiring adequate funding and impactful strategies for community and industry engagement. This challenge is at least partially linked to the fact that technology transfer processes and mechanisms are still in their early stage, as they were implemented only in Phase II. Further development and consolidation are still needed in this area. NM-AIST must also navigate frequent leadership changes to maintain program continuity and focus and uphold its scientific quality. Effective utilization and maintenance of new infrastructures (particularly the library system), incentives for attracting PhD graduates and enhancing the engagement of non-academic staff, implementation of

strategic policies aligned with institutional goals, strengthening external partnerships, building entrepreneurial and commercialization capabilities, and optimizing student enrolment while maintaining education quality and affordability are also crucial. Addressing these challenges is essential for NM-AIST to sustain and build upon the VLIR-UOS program's successes and advance its mission and objectives.

Overview of recommendations

	Recommendation	Stakeholder
1	Banana Research Centre implementation: NM-AIST should develop and implement a detailed, step-by-step action plan with clear milestones and targets to operationalize the Banana Research Centre, pivotal for sustaining the banana research expertise developed through the VLIR-UOS IUC program.	NM-AIST
2	PhD candidate recruitment strategy: NM-AIST should adopt a recruitment strategy combining open admissions and internal selections to improve PhD candidate diversity and build capacity, integrating initiatives to boost female participation in SETI fields.	NM-AIST
3	Scaling up innovation, entrepreneurial capabilities, and commercialization: NM-AIST needs to develop and implement a clear strategy with specific milestone/targets for using its new capabilities and expertise to turn innovative ideas and research into practical, market-ready solutions. This implies further enhancing and consolidating the Tech Transfer mechanisms and capacities built under the VLIR-UOS IUC program.	NM-AIST
4	Bolster financial sustainability: NM-AIST should clearly define its financial contributions to partnership programs from inception, irrespective of whether donors require a financial match, to enhance follow-up activities and strengthen program outcomes' sustainability.	NM-AIST
5	Strengthening external partnerships: NM-AIST should continue to expand its partnership network and explore new collaborations for continued institutional growth and impact, focusing on enhancing the involvement of currently inactive partnerships.	NM-AIST
6	Recruitment and retention of PhD graduates: To safeguard the continuity of expertise cultivated under the VLIR-UOS program, NM-AIST should establish a well-defined strategy, offering attractive incentives, to recruit and retain PhD graduates.	NM-AIST
7	Non-academic staff engagement: In partnership programs such as this one, NM-AIST, VLIR-UOS and Flemish partners are advised to implement strategies to motivate and incentivize non-academic staff, fostering their full commitment to program goals and institutional development .	NM-AIST, VLIR-UOS, and Flemish partners
8	Student enrolment optimization: NM-AIST should strategically increase student numbers to enhance cost-effectiveness and maintain education quality, while also attracting external scholarships for affordability.	NM-AIST
9	Evaluation and data reporting framework: NM-AIST needs to develop a robust framework for project evaluations and data reporting, focusing on methodological rigor and effective stakeholder coordination for evidence-based decision-making and performance monitoring.	NM-AIST
10	Prioritizing targeted and expedited research Initiatives: NM-AIST should maintain its emphasis on research that addresses specific needs and continue to incorporate short-cycle projects, ensuring quick, relevant, and impactful results that align with immediate societal and academic demands.	NM-AIST
11	East African Universities Coalition: As a follow-up step, VLIR-UOS, NM-AIST, and Flemish partner institutions are encouraged to form a coalition of East African universities, including VLIR-UOS program participants, to foster knowledge exchange, technology transfer, and commercialization.	VLIR-UOS, NM-AIST, and Flemish partners

	Recommendation	Stakeholder
12	Technology Transfer Process Integration: VLIR-UOS, Flemish Partners, and NM-AIST should embed technology transfer in program design from the start to ensure research leads to marketable products and societal benefits.	VLIR-UOS, Flemish and partner institutions
13	Sustainability Integration: VLIR-UOS, Flemish Partners, and NM-AIST should even more integrate sustainability into program designs from inception, focusing on maintaining and scaling achievements without heavy reliance on external resources.	VLIR-UOS, Flemish and partner institutions
14	Recognition of Local Partner Contributions: VLIR-UOS and Flemish Institutions should implement mechanisms (or review existing ones) for fair recognition of local partner institutions and researchers, including registering students from the Global North who conduct research in the Global South as visiting scholars institutions and equitable research credit allocation.	VLIR-UOS, Flemish and partner institutions

Table of contents

1	Introduction.....	1
1.1	Background.....	1
1.2	Context.....	2
1.2.1	Key social, political, economic, demographic contextual factors in the country	2
1.2.2	Higher Education	3
1.2.3	University level.....	3
1.3	Evaluation methodology and process	4
1.3.1	Evaluation framework.....	5
1.3.2	Evaluation process and activities	7
1.3.3	Limitations	8
1.4	Description of impact case.....	8
1.5	Structure of the evaluation report	8
2	Analysis and findings: programme level.....	9
2.1	Overview of programme performance.....	9
2.2	Relevance.....	9
2.2.1	Relevance of Program Objectives/Outcomes	9
2.2.2	Maintaining relevance in face of evolving internal or external context	10
2.3	Coherence	10
2.3.1	Internal coherence	10
2.3.2	External coherence	12
2.4	Effectiveness.....	13
2.4.1	Extent to which programme objectives were achieved	13
2.4.2	Facilitating factors.....	15
2.4.3	Inhibiting factors	16
2.5	Scientific quality	17
2.5.1	Quality of Education	17
2.5.2	Quantity and Quality of Research	18
2.6	Efficiency.....	19
2.6.1	Cost-effectiveness (usage of resources in relation to the achievement of objectives).....	19
2.6.2	Organizational management and structures and efficient programme implementation	20
2.7	Impact	21
2.7.1	Impact on the institution.....	21
2.7.2	Impact on the community.....	22
2.8	Sustainability	24
2.8.1	Institutional sustainability	24
2.8.2	Financial sustainability.....	24
2.8.3	Academic sustainability	26
3	Brief assessment per project.....	28
3.1	Project 1: Sustainable Smallholder Banana-Based Farming Systems to Improve Livelihoods of Communities in Northern Tanzania.....	29

3.2	Project 2: Development of Water Purification Technologies	29
3.3	Project 3: Applied Aquatic Ecology	30
3.4	Project 4: Institutional Strengthening via ICT and Information Services	30
3.5	Project 5: Institutional Strengthening through Technology Transfer and Outreach	31
4	Impact case.....	32
4.1	Introduction and approach	32
4.2	Performance Story of the Project	32
4.3	Project Activities.....	33
4.4	Overview of Changes.....	34
4.5	Project's Impact	35
4.6	Conclusions.....	37
5	Findings on the learning questions.....	38
5.1	How to support PhD trajectories, with a focus on optimising diversity/inclusivity (gender and Leave No One Behind)?	38
5.2	What factors and measures, at VLIR-UOS/IUC level and/or at partner institute level, support effective coordination of programmes?	39
5.3	How to ensure uptake of research results or new educational practices by political and societal actors and end-users?	41
6	Conclusions.....	43
7	Recommendations	47
8	Annexes.....	49
8.1	List of documents consulted	49
8.2	Field visit programme	51
8.3	List of people consulted/interviewed	52
8.4	Ratio of male to female students among newly admitted/enrolled PhD students	56
8.5	Rubric used to assess change	56

Acknowledgements

We extend our gratitude to the individuals and organizations whose collaboration and support were pivotal in the successful completion of this evaluation. IUC Programme Coordinator Prof. Karoli Njau, Deputy Program Coordinator Prof. Linus Munishi and PSU staff Joyce Rugakingira at the Nelson Mandela African Institution of Science and Technology: You provided a very strong support to our field mission and thus contributed significantly to the success of this assessment. Luc Brendonck, Ellen Verhofstadt, and all team leaders from NM-AIST and Flemish institutions: We express our appreciation for your support, patience and efforts in guiding us through the evaluation and illuminating various aspects and lessons learned during the program implementation. We thank the staff, students, farmers, and agriculture extension officers associated with the Sustainable Banana Farming Systems project for sharing their experiences and insights with us. A special thanks to Professor Rony Swenen, Akida Meya and Lydia Mhoro for your invaluable assistance and guidance during the impact assessment of this project. The substantial volume of impact-related data shared with us presented a rich opportunity for comprehensive impact assessment from a program evaluation standpoint. We sincerely thank all stakeholders who shared their perspectives on the IUC program during the evaluation process. Their input was instrumental in capturing the diverse and nuanced aspects of the IUC program's performance. Our gratitude also extends to VLIR-UOS for providing us with the opportunity to conduct the evaluation visit and for their continuous support throughout the evaluation process. Your insights and meticulous attention to detail significantly enhanced the robustness of our findings.

1 Introduction

1.1 Background

The VLIR-UOS program at the Nelson Mandela African Institution of Science and Technology (NM-AIST) represents a significant initiative aimed at enhancing the institution's capacity and impact in Tanzania and beyond. Founded on the principles of collaboration and knowledge exchange, this program seeks to address multifaceted challenges in education, research, and societal development. With its origins dating back to 2013, the program spans two phases, with Phase II (2019-2023) being the primary focus of this evaluation.

The overarching objectives of the VLIR-UOS program at NM-AIST encompass institutional capacity building, postgraduate training, multidisciplinary problem-solving, outreach and community engagement, incubation management, and infrastructure development. These objectives underscore the program's commitment to fostering excellence in education, research, and innovation while simultaneously strengthening ties with local communities and industries. The program operates within a framework of shared decision-making and strong collaboration between NM-AIST and Flemish partners, ensuring a holistic approach in addressing critical regional and national challenges in Tanzania. To achieve the program objective, VLIR-UOS allocated the program an annual budget of EUR 350,000 in the second phase, except for year 4 which had a reduced budget of EUR 250,000¹.

The overarching theme of the program revolves around "Sustainable Management of Natural Resources to the Benefit of the Local Communities of Northern Tanzania." Under this program umbrella, five projects were developed and executed at NM-AIST, in collaboration with partners from four Flemish institutions, with each project having its unique goals and contributions. The four Flemish partners are: KU Leuven, Vrije Universiteit Brussel (VUB), Universiteit Antwerpen, and Universiteit Hasselt. Table 1 provides an overview of the projects and their objectives.

Table 1. Projects

Phase 2 Project	Project title	Objective
P1	Sustainable Smallholder Banana-Based Farming Systems to Improve Livelihoods of Communities in Northern Tanzania	Sustainably intensify banana-based farming systems in the target region, based on documented soil nutrient budgets, fine-tuned integrated soil fertility interventions, and capitalizing on the fundamental understanding of nutrient-water use efficiency interactions
P2	Development of Water Purification Technologies	Develop water purification technologies for wastewater and water treatment technologies using constructed wetlands and for defluoridation technologies respectively and their implementation in Northern Tanzania
P3	Applied Aquatic Ecology	(1) Strengthen the aquatic research capacity in Northern Tanzania. (2) Increase knowledge on the effects of pollutants on aquatic food webs and ecosystem services. (3) Provide local people access to information about good land and other management practices that can promote good water quality and freshwater ecosystem services
P4	Institutional Strengthening via ICT and Information Services	Institutional strengthening through ICT and information services, with a focus on improving NM-AIST research and education quality through the use of big data, open data and artificial intelligence, all major trends in current and future scientific research, and through the provision of e-resources to support self-learning.

¹ The VLIR-UOS, Nelson Mandela African Institution of Science and Technology Partnership Program 2013-2025. Management Manual

Phase 2 Project	Project title	Objective
P5	Institutional Strengthening Through Technology Transfer and Outreach	Increase technology transfer to society and industry originating from Academic and R & D in the Northern Tanzania through enhanced industrial collaboration and creation of spin-offs. This will be achieved through development of Technology Park comprised of Incubation Centre, Technology Transfer Office and Commercialization Office.

1.2 Context

1.2.1 Key social, political, economic, demographic contextual factors in the country

Tanzania, known for being one of Africa's fastest-growing economies, has demonstrated robust economic growth with a nominal GDP of \$71 billion and a purchasing power parity (PPP) GDP of \$218.5 billion, according to the International Monetary Fund (IMF)². The country's per capita GDP (PPP) stands at \$3,574. In the wake of the global pandemic, Tanzania has experienced a strong recovery, outpacing its East African counterparts with a GDP growth rate of 4.7% in 2022 and an anticipated increase to 5.1% in 2023³. This pace, however, remains lower than the pre-pandemic period, and it is likely to be further slowed down by emerging challenges, including the Russia-Ukraine war and climate change.

Based on the 2022 Population and Housing Census, Tanzania's population is 61,741,120, with 59,851,347 people residing in Mainland Tanzania and 1,889,773 in Zanzibar⁴. The country's linguistic landscape is dominated by Kiswahili as the national language, while English is commonly used as a second language.

In 2020, Tanzania transitioned from a low-income to a middle-income country, fuelled by sustained macroeconomic and political stability, a wealth of natural resources, and strategic geographic positioning⁵. Tanzania's recent growth has been largely concentrated in sectors with fewer employment opportunities particularly for low-income households, thus resulting in a weak impact towards poverty reduction. The national poverty rate has seen a significant decrease, falling from 34.4% of the population in 2007 to 26.4% in 2018⁶. Tanzania has achieved notable progress in key areas such as life expectancy, infant mortality reduction, and the enhancement of primary and secondary school enrolment rates, alongside strides in gender equality and improved access to health, electricity, water, and sanitation. However, despite these advancements, statistical data reveals that since 2012, the country's impressive GDP growth has not been as inclusive as desired, characterized by a relatively slower rate in poverty reduction and a rise in inequality.

The provision of quality education is essential for Tanzania to meet its National Development Vision (NDV) 2025 and other development objectives, and to cater to the regional and global labour market demands. The country's labour market, however, is characterized by a skill gap, with 40% of Tanzanian firms identifying inadequate and mismatched workforce skills as a major business constraint⁷. This skill shortage is particularly acute in the health sector, where there is a 52% shortfall in human resources.

Tanzania's labour force is undergoing a transition, with a noticeable shift from agriculture to industry and services. This evolution underscores the need for enhanced education and training systems to equip the workforce with relevant skills, supporting the country's continued economic growth and development.

² <https://www.imf.org/en/Publications/CR/Issues/2023/04/28/United-Republic-of-Tanzania-Selected-Issues-532917>

³ <https://www.worldbank.org/en/country/tanzania/overview>

⁴ <https://dailynews.co.tz/tanzania-population-passes-61-7million/>;
<https://link.springer.com/article/10.1186/s12884-023-06076-5>

⁵ <https://www.ajol.info/index.php/tjags/article/view/234455>

⁶ <https://www.nbs.go.tz/index.php/en/census-surveys/poverty-indicators-statistics/other-poverty-related-statistics/475-tanzania-mainland-poverty-assessment-report-executive-summary>

⁷ <https://www.nacte.go.tz/wp-content/uploads/2020/12/MAPPING-SKILLS-GAP-AND-SKILLS-NEEDS-FOR-TECHNICIAN-GRADUATES.pdf>

1.2.2 Higher Education

As of March 2023, the academic landscape in the United Republic of Tanzania comprised 30 fully-fledged universities and 17 university colleges, totalling 47 university institutions. This recent uptrend in the number of university institutions necessitates focused and collective efforts from all stakeholders to ensure that the quality and sustainability of the services provided by these institutions are maintained. The Tanzania Commission for Universities (TCU), tasked with overseeing university education in the country, regulates these higher learning institutions in accordance with the Universities Act, Chapter 346 of the Laws of Tanzania.

In Tanzania, the Gross Enrolment Rate (GER) for higher education was recorded at 5.2% in the 2014/2015 academic year. This rate has remained relatively low over the past decade compared to other sub-Saharan African countries. By 2018, the proportion of female students in higher education had risen to 40.3%, a significant increase from just 12.7% in 1987. However, in Science, Technology, Engineering, and Mathematics (STEM) programs, female representation is considerably lower: 33.6% overall, with even smaller percentages in specific fields like Engineering (19.6%), Mining and Earth Sciences (25%), and ICT (27.7%)⁸.

Contrasting with the rise in student enrolment in Tanzanian higher education is the decreasing government funding relative to the demand. This disparity between enrolment and budgetary allocations signifies a growing mismatch, impacting the education sector's sustainability. Tanzania has not met the Global Partnership for Education (GPE) target of allocating 20% of its budget to education, with the current figure standing at 15%⁹. The introduction of a fee-free education policy in 2016 for primary and secondary government schools has further pressured tertiary education institutions to expand their enrolment rates without proportional increases in funding.

The quality of post-secondary academic programs in Tanzania has been consistently low, often inadequately preparing university graduates for formal employment or self-employment. This issue is compounded by infrastructural limitations, including inadequate laboratory spaces, insufficient internet bandwidth, and limited access to electronic journals. The Tanzanian higher education system also faces a significant challenge due to a shortage of well-trained lecturers. This shortage has been exacerbated by a wave of age-related retirements and the recent transition of many talented academics into governmental positions.

According to the Tanzania Commission for Universities (TCU)¹⁰, the regulatory body overseeing higher education in Tanzania, 51.6 percent of the academic staff possess a master's degree, and those with a PhD constitute just 32.6 percent of the total teaching staff. These constraints within the higher education institutions have catalysed various efforts in University Development Cooperation, aimed at bridging the existing capacity gaps.

It is against this backdrop that the VLIR-UOS Program supports partnerships between Tanzanian and Flemish academic institutions. The program's objective is not only to enhance capacity within these institutions but also to contribute solutions to global development challenges.

1.2.3 University level

The Nelson Mandela African Institution of Science and Technology (NM-AIST) stands as a research-intensive establishment dedicated to the training of graduate and post-doctoral scholars in Science, Engineering, Technology, and Innovation (SETI). Established in 2009 under Tanzania's University Act of 2005, NM-AIST is part of a broader network of Pan-African Institutions of Science and Technology spanning the continent. Thus, the VLIR-UOS IUC Programme, which dates to 2013, started when NM-AIST was still a very young institution. The concept of African Institutions of Science and Technology (AIST) originated from the visionary late Nelson Mandela, former President of South Africa. Mandela envisioned AIST as a mechanism to cultivate the next generation of African scientists, engineers, and

⁸ <https://documents1.worldbank.org/curated/en/851851616414116600/pdf/Project-Information-Document-Higher-Education-for-Economic-Transformation-Project-P166415.pdf>

⁹ <https://www.thecitizen.co.tz/tanzania/news/national/sh1-67-trillion-education-budget-to-focus-on-five-key-areas-4237610>

¹⁰ <https://www.tcu.go.tz/sites/default/files/VitalStats%202022.pdf>

technologists poised to make impactful contributions to the continent's development through the application of science, engineering, technology, and innovation.

The University's new corporate strategy (CSP)¹¹ highlights the following aspects of the University's vision, mission, values, goal, and moto:

Vision: to be a centre of excellence in science, engineering, technology and innovation for humanity's sustainable development.

Mission: to create a hub of inventions and innovations, scout and nurture inventors for enhanced value addition to the society and industry for Tanzania, Africa and global sustainable and inclusive growth.

Values:

- Unlocking scholars' transformative potentials
- Cherishing rights, differences and dignity of all.
- Building trust, honesty, integrity and respect.
- Excellence and Productivity
- Innovation and accountability

Goal: to be a world-class research-based University fostering leadership in science, engineering, technology and innovation; promoting entrepreneurial spirit; and commercialising impactful innovations.

Moto: Academia for Society and Industry

NM-AIST offers master's and PhD degree programs in its four schools: School of Life Sciences and Bioengineering (LiSBE), School of Computational and Communication Science and Engineering (CoCSE), School of Materials Energy Water and Environmental Sciences (MEWES), and School of Business Studies and Humanities (BuSH). The University has 139 academic staff (38.9% female), 143 administrative staff (55.9% female) and 21 technical staff (38.1% female)¹². According to university statistics, during the 2022-2023 academic year, NM-AIST admitted and enrolled 168 new students (53% master's and 47% PhD). Females accounted for 32.5% of new master's and 31% of new PhD students. Overall, the total number of students studying at NM-AIST during the academic year 2022-2023 was 593 (342 master's and 251 PhD) students, with female students accounting for 29.3% of the student body (32.2% at the master's and 25.5% at the PhD level)¹³. Although the University is designed to have a strong focus on research, innovation and technology transfer, the relatively small student population raises questions on the economic viability and cost-effectiveness of its programs¹⁴. It may be beneficial for the university to strategically increase its student enrolment numbers (without compromising on quality). This expansion could enhance the cost effectiveness and overall value of the investment in the institution.

1.3 Evaluation methodology and process

The evaluation of the VLIR-UOS program was structured around a comprehensive framework based on the six OECD-DAC criteria, ensuring a thorough and systematic assessment. A concise summary of this framework, as delineated in Table 2, served as a guiding tool for the evaluation process. This

¹¹ The Corporate Strategic Plan of The Nelson Mandela African Institution of Science and Technology (NM-AIST) 2021/22-2025/26. This strategic plan was approved by NM-AIST Council on September 24, 2021.

¹² Counts extracted and percentages computed from the *Gender Committee Report August 2023*

¹³ Although still very low, female representation is broadly similar to representation in many other institutions globally. Nevertheless, increasing gender balance should remain a key priority.

¹⁴ With 593 students for 139 academic staff, the student to faculty staff ratio is 4.3. For comparison, the evaluators analysed Times Higher Education Rankings data reported by 2672 academic institutions globally (<https://www.timeshighereducation.com/world-university-rankings/2024/world-ranking>) and found that only 2% of the institutions have a student to academic staff ratio of less than 5; around 14% of institutions had a ratio less than 10. So, NM-AIST is among the institutions with the lowest student to academic staff ratio. Although a low ratio can be indicative of quality education and good instructional support, it also suggests high per-student staffing costs and underutilization of academic staff capacity. Within the context of institutions struggling financially, such a low ratio raises questions about cost effectiveness.

framework informed various aspects of the evaluation, including the conduct of interviews and focus group discussions during fieldwork and the extensive review of documents both prior to and following the field activities in October 2023.

The evaluation team consisted of a well-balanced mix of international and local expertise. An international evaluator from the American University of Sharjah in the United Arab Emirates was paired with a local evaluator from the University of Dar es Salaam in Tanzania. Neither evaluator had prior involvement in the design, implementation, or mid-term evaluation of the VLIR-UOS program, ensuring an objective and unbiased review. The core evaluation team, responsible for executing the fieldwork in Tanzania, was further supported by a consultant from C-lever.org (consortium lead for the 8 end of program evaluations). The evaluation team leveraged its prior experience of working with the evaluation framework along with general understanding of university development cooperation supported by the VLIR-UOS. C-lever.org played a pivotal role in facilitating interviews with Flemish actors, adding an additional layer of depth and perspective to the evaluation process.

1.3.1 Evaluation framework

The evaluation framework employed for assessing the VLIR-UOS program was structured around the six OECD-DAC criteria, each linked to a specific evaluation question. This approach helped to ensure a comprehensive and targeted analysis of the data gathered during the evaluation phase. For every evaluation criterion or question, two to three judgment criteria were utilized to gauge the program’s performance. This detailed and methodical framework was instrumental in guiding various aspects of the evaluation process.

Primarily, the framework informed the selection of stakeholders for engagement during the evaluation, ensuring a diverse and representative sample. It also guided the development of tailored interview questions and focus group discussions, aimed at eliciting in-depth responses and insights. Additionally, the framework was crucial in determining the necessary documents and additional resources that the evaluators needed to review and explore, providing a broader understanding of the program’s performance. The evaluators employed a four-point scale (ranging from 1=Poor to 4=Excellent) to rate the program’s performance across each criterion. This was based on data obtained through various methods, including interviews, site observations, and desk reviews. The comprehensive evaluation framework, including all its components and the detailed methodology, is available in the appendix.

Table 2. Evaluation framework¹⁵

Criterion	Evaluation Question	Judgement criteria
1. Relevance	EQ1. To which extent are the objectives of the programme/project consistent with beneficiaries’ requirements, country needs, global priorities and partners’ and donors’ policies?	1.2. What is the relevance (ex- ante) of the formulated outcome(s) and objectives?
		1.2. Extent to which changes in the external context or within the organisation influenced the relevance of the intervention, and how this was handled?
2. Coherence	EQ2. To which extent is the partnership programme coherent, internally and externally? What is the level of synergy and complementarity with other relevant (Belgian) actors?	2.1. Internal coherence
		2.2. External coherence
3. Efficiency	EQ3. To which extent resources/inputs (funds, expertise, time, etc.) are converted to results in an economic manner?	3.1. The cost-effectiveness (the usage of resources in relation to the achievement of objectives)
		3.2. The extent to which organisational management and structures of the

¹⁵ For more information about the evaluation framework, the inception report of the framework assignment can be requested for consultation at the level of VLIR-UOS.

Criterion	Evaluation Question	Judgement criteria
		programme/project are conducive for efficient implementation.
4. Effectiveness	EQ4. To what extent are the programme's objectives (expected to be) achieved, taking into account their relative importance?	4.1. The extent to which the programmes outputs and outcomes have been achieved and the likelihood that the predetermined outcomes will be achieved by the end of the implementation period.
		4.2. Inhibiting and facilitating factors and actors
		4.3. Scientific quality
5. Impact	EQ5. To what extent are (potential) positive and negative, primary and secondary long-term effects generated by the programme, directly or indirectly, intended or unintended.	5.1. Changes (intended and unintended, positive and negative) in stakeholders' lives and contexts contributed to by the programme
		5.2. Fostering 'collective impact'
6. Sustainability	EQ6. To what extent will the programme results continue after the programme is completed?	6.1. Level of institutional sustainability
		6.2. Level of financial sustainability
		6.3. Level of academic sustainability

In conjunction with the DAC framework, the evaluators utilized the framework of five core capabilities, collaboratively developed by VLIR-UOS and C-lever.org, to assess institutional capacity. These five capacities encompassed:

- The capacity to achieve coherence
- The capacity to deliver results
- The capacity to relate to external stakeholders
- The capacity to act and commit
- The capacity to adapt and self-renew

Each of these capacities was subdivided into several specific components or domains, totalling 18 in all. The evaluation process involved assessing each domain to ascertain NM-AIST's maturity level both at the commencement of Phase II (2019) and at the program's conclusion (2023). A six-point scale was employed for this institutional assessment, as follows:

- Level 1: Extremely weak - Totally absent - Not started yet
- Level 2: Very weak - Only initial implementation
- Level 3: Still weak - Some results achieved but still insufficient
- Level 4: Acceptable - Partial good results - Still to improve
- Level 5: Good - High level of implementation
- Level 6: Very good - Role model - Top level of implementation

This detailed evaluation of the capacities provided a nuanced understanding of the institution's developmental trajectory over the course of the program.

During the evaluation phase, the evaluation team adopted a participatory approach, allowing NM-AIST significant leeway in shaping the evaluation process. The university was entrusted with the responsibility of choosing the members who would assess its institutional capacity, as well as determining the internal

and external stakeholders to be interviewed and the sites for field visits. While the evaluation team did provide suggestions for including additional stakeholders or sites as necessary, the final decision rested primarily with NM-AIST. Furthermore, the university, in consultation with their Flemish partners, was afforded the flexibility to select a specific impact case for evaluation. The above however does not reduce the evaluation team’s capacity as an independent external evaluator.

Data collection encompassed a multifaceted approach: it included a thorough review of relevant documents, conducting interviews and focus group discussions with a range of internal and external stakeholders, holding an institutional capacity assessment workshop, and organizing a restitution session. This final session was particularly crucial, as it provided an opportunity to share preliminary findings with the University and solicit additional input, ensuring a comprehensive and collaborative evaluation process.

1.3.2 Evaluation process and activities

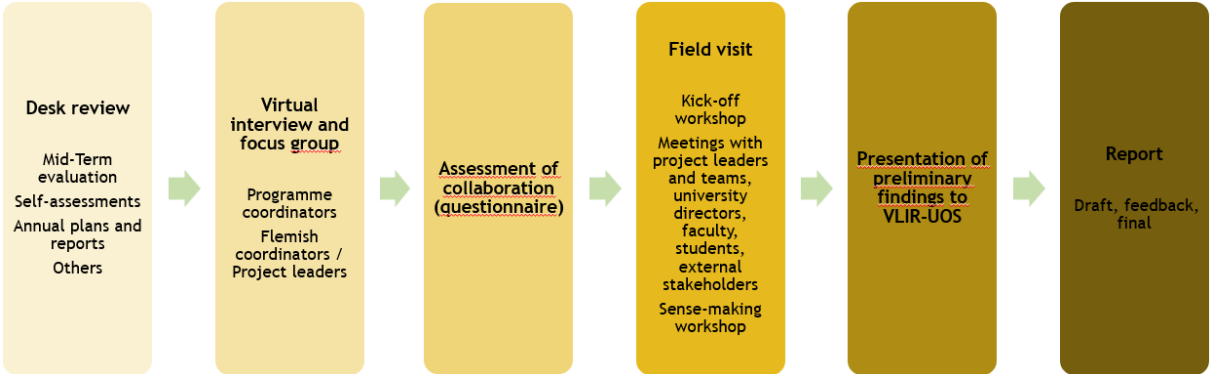


Figure 1. Evaluation process (Network)

Activities

Before the field mission: The evaluation team liaised with the Program Coordinators, Manager and relevant Flemish actors, setting the field mission’s timeline and choosing an impact case for evaluation. They created an interview protocol aligned with the evaluation framework and, in close collaboration with the Program Support Unit (PSU), finalized the list of interviews and focus group participants, planned site visits, and outlined a comprehensive daily schedule for the evaluation activities. In addition, they formulated the methodology for the impact case study.

A key component of their preparatory work involved developing a questionnaire for institutional capacity self-assessment. The questionnaire was distributed to 10 stakeholders, selected by NM-AIST in consultation with the evaluation team, a week before the field mission. The selection of participants aimed to strike a balance in terms of gender, academic and non-academic staff, and also between stakeholders of the IUC and those who were more independent from interventions. These stakeholders independently assessed the institution’s capacity for both 2019 and 2023 ahead of the field mission, with the evaluators analysing the data before the institutional workshop.

During the field mission: The evaluation team began with a visit to the Vice-Chancellor, followed by a kick-off meeting with the Program Coordinator and team to discuss the evaluation plan. On the first day, a comprehensive workshop with the institutional self-assessment team reviewed and validated their institutional capacity development ratings for 2023 and 2019, discussing justifications and factors affecting progress. Through discussions, consensus was reached on each capability/domain, with minor adjustments made to the final scores based on participant feedback.

The evaluation team conducted interviews and focus group discussions with a diverse range of internal and external stakeholders. They also visited campus facilities, farms and companies/organizations proposed by the program management in order to reinforce the various components of the programme’s and impact case performance. During this period, evaluators requested and reviewed documents and processed data as time permitted. On the final day, the team presented their assessment’s preliminary findings in a hybrid format, with NM-AIST stakeholders attending in person and Flemish partners participating virtually.

After the field mission: The evaluation process involved data analysis, additional document review, and report writing. Furthermore, to complement the data gathered at NM-AIST, an additional evaluator from C-lever.org conducted in-person interviews with Flemish stakeholders in Leuven. The schedule details and a comprehensive list of all stakeholders involved in this evaluation are included in the appendix. Overall, during the field mission, the evaluation team conducted individual interviews and focus group discussions with around 60 individuals.

1.3.3 Limitations

The evaluation of institutional capacity at NM-AIST faced certain limitations, particularly concerning the assessment of progress expressed in maturity levels in key areas of institutional capacity. Lacking a baseline assessment at the program's inception, this evaluation measured maturity concurrently at the program's start and end, raising concerns about potential bias. To mitigate this, the external evaluators instructed workshop participants to independently assess the maturity levels for both 2019 and 2023 before the field mission. The evaluators then analysed this data, checking for consistency across stakeholders' responses. During the workshop, they facilitated discussions about these maturity levels, encouraging stakeholders to reach consensus and articulate their rationale for the selected performance levels for 2019 and 2023. These discussions sometimes led to adjustments in the maturity levels, either upward or downward.

Additionally, the evaluation encountered logistical challenges during the field visit. An unforeseen public holiday disrupted the planned schedule. However, the team, with the Program Support Unit's (PSU) assistance, adapted by organizing site visits to multiple farms outside the NM-AIST campus and engaging with farmers on the holiday. Another challenge arose from a concurrent external government audit at NM-AIST and a gathering (on campus) of academic leaders from various Tanzanian institutions, which limited access to several key stakeholders particularly the top university management and some program stakeholders. Despite these obstacles, the evaluation team is grateful for the efforts of NM-AIST's Local Coordinator and Program Manager, who diligently ensured access to the main stakeholders, facilitating the evaluation's overall progress.

1.4 Description of impact case

The "Sustainable smallholder banana-based farming systems to improve livelihoods of communities in Northern Tanzania" was selected as the impact case from among the five projects under the NM-AIST IUC. Focusing on professional development through PhD research in collaboration with NGOs and extension services, the project sought to improve banana yields across 21 trial plots in Kilimanjaro and Arusha regions. The initiative targeted improved soil nutrient management and water use, along with advanced banana plantlets, aligning with SDGs 2, 5, and 8. It sought to help address the economic and food security challenges faced by smallholder farmers, who constitute about 80% of the population and have been impacted by falling coffee prices. (See section 4 for a detailed discussion the impact case.

1.5 Structure of the evaluation report

The next section (chapter 2) of this report presents an analysis and findings at programme level focusing on the criteria to be evaluated (structure of the evaluation framework). This is followed (*in chapter 3*) by a brief assessment of the five projects of the IUC-program, based on the self-assessments by project teams and their review by the evaluation team. Subsequently the report presents the analysis and conclusions related to the impact case (*chapter 4*), followed by the presentation of information collected in relation to the learning questions (*chapter 5*). The conclusions (*chapter 6*) are based on the analysis at programme level combined with the institutional analysis, impact case and learning questions. Recommendations follow at the end (*chapter 7*) and address the different stakeholders (IUC and VLIR-UOS).

2 Analysis and findings: programme level

2.1 Overview of programme performance

The following table presents a summary of the program performance ratings assigned by the evaluation along each DAC criterion. These ratings were assigned based on analysis of interview data and a thorough review of program-related documents.

Table 3. Programme performance along DAC criteria

Criterion	Excellent (4)	Good (3)	Weak (2)	Poor (1)
Relevance	4			
Coherence		3+		
Effectiveness		3+		
Efficiency		3		
Impact		3+		
Sustainability		3		

2.2 Relevance

2.2.1 Relevance of Program Objectives/Outcomes

The VLIR-UOS program implemented at the Nelson Mandela African Institution of Science and Technology (NM-AIST) demonstrates a high degree of relevance in multiple dimensions, aligning closely with the institution's context, needs, and priorities, as well as Tanzania's development objectives and global priorities, including the United Nations Sustainable Development Goals (SDGs).

First and foremost, the program defined its key objectives as follows: “The objectives of this IUC are institutional capacity building, enabling the university to fulfil its role in the society in terms of education, research and strengthening the university-industry linkages and technology transfer. This will be achieved through training of academic staff, collaboration, integration and synergies with other stakeholders within and outside the institution”¹⁶. These objectives are in harmony with NM-AIST's institutional context and aspirations. NM-AIST was established with the goal of nurturing the next generation of African scientists, engineers, and technologists to drive sustainable development through science, engineering, technology, and innovation. The VLIR-UOS program, which focuses on institutional capacity building, directly relates to this vision. It targets NM-AIST's capacity to provide high-quality education, research, and technology transfer, aligning perfectly with the university's mission to be a centre of excellence in science, engineering, technology, and innovation for sustainable development.

Furthermore, the program addresses the specific needs and priorities of NM-AIST. By focusing on areas such as water quality, agriculture, ICT, and technology transfer, the program aligns with NM-AIST's 5D Model, which emphasizes research and innovation, postgraduate training, community engagement, incubation management, and commercialization. This ensures that the program is directly responsive to the university's strategic objectives outlined in its Corporate Strategic Plan (CSP) 2020/21-2025/26. The thematic areas of the five projects under this IUC, including the institutional capacity building and infrastructural support, are altogether aligned to the agenda of NM-AIST research and postgraduate training.

¹⁶ The VLIR-UOS IUC, Nelson Mandela African Institution of Science and Technology, Partnership Program 2013-2025 Management Manual (February 21 version, page 6).

The relevance of the VLIR-UOS program extends beyond the institutional level to meet the broader needs and priorities of Tanzania. The program's emphasis on sustainable management of natural resources, including water and agriculture, directly addresses critical issues facing Tanzania. Water quality and sanitation, agricultural productivity, and environmental preservation are pressing concerns in the country, and the program's projects actively contribute to finding sustainable solutions. This not only aligns with national development needs but also supports Tanzania's progress toward the UN SDGs, including Goal 6 (Clean Water and Sanitation) and Goal 2 (Zero Hunger).

Furthermore, the program's focus on strengthening ICT and information services, along with technology transfer and outreach services, directly supports Tanzania's development in the digital era. These efforts contribute to enhancing the country's technological capabilities and align with the broader SDG 9 (Industry, Innovation, and Infrastructure) and SDG 17 (Partnerships for the Goals), as they involve collaboration with various stakeholders, including industry and local communities while contributing to the use of technology in promoting other international research collaborations.

On a global scale, the program's emphasis on environmental sustainability, gender equity, and cultural sensitivity underscores its alignment with the UN SDGs. The program's commitment to protecting and conserving the environment, as well as its consideration of gender in project leadership, community outreach and institutional policies¹⁷, reflects a broader commitment to global priorities. These actions resonate with SDG 5 (Gender Equality) and SDG 13 (Climate Action), among others.

In summary, the VLIR-UOS program at NM-AIST demonstrates a remarkable level of relevance at multiple levels. It is well-aligned with NM-AIST's institutional context and priorities, contributes directly to Tanzania's development needs, and addresses global development priorities outlined in the UN SDGs. By focusing on pressing issues such as water quality, agriculture, ICT, and technology transfer, the program stands as a model of how higher education institutions can actively engage in addressing the world's most pressing challenges while building local and regional capacity for sustainable development.

2.2.2 Maintaining relevance in face of evolving internal or external context

Despite several external factors hampering scheduled programme activities, the relevance of the program remained intact. Notably, the COVID-19 pandemic had a global impact, disrupting various aspects of daily life and higher education. While it did affect the timing and frequency of mobility activities, the program showed resilience by extending the implementation of some activities to accommodate the challenges posed by the pandemic. Seasonal changes, including delays in rain, impacted data collection and research project completion but did not diminish the program's overall relevance. Tanzania's Presidential elections and the introduction of a new Government accounting system imposed administrative changes but did not alter the program's alignment with NM-AIST's and Tanzania's development needs.

These external factors underscored the program's adaptability and commitment to maintain its relevance in the face of unforeseen challenges, reinforcing its value in addressing critical development issues.

2.3 Coherence

2.3.1 Internal coherence

Coherence within the VLIR-UOS program at the Nelson Mandela African Institution of Science and Technology (NM-AIST) is evident across multiple dimensions, reflecting a well-integrated and synergistic approach that aligns with the institution's mission, vision, and policies. This internal coherence extends to the university's corporate strategic plan, research and innovation policy, and broader initiatives undertaken by NM-AIST.

First and foremost, the program exhibits strong alignment with NM-AIST's institutional context, as reflected in its mission and vision. NM-AIST was established with the aim of becoming a centre of excellence in science, engineering, technology, and innovation for sustainable development. The VLIR-

¹⁷ See VLIR-UOS Gender Policy

UOS program's focus on institutional capacity building, research, and technology transfer perfectly aligns with this mission. It contributes to enhancing NM-AIST's ability to fulfil its role in society through education and research, strengthening the university's ties with industry, and facilitating technology transfer.

The program's coherence is further underscored by its alignment with NM-AIST's corporate strategic plan. The initial version of the plan (2013-2027), as noted in the current strategic plan, emphasized three key dimensions: teaching and learning, research and innovation, and community engagement. Subsequently, the revised edition (2020/2021-2025/2026) introduced the 5D model, encompassing research and innovation, postgraduate training and skills development, outreach/community engagement, incubation management, and commercialization (technology transfer)¹⁸. The program's primary objective of institutional capacity building to enhance NM-AIST's role in education, research, and industry collaboration is exceptionally consistent with this revised corporate plan. In essence, the VLIR-UOS program bolsters the university's commitment to these strategic goals.

Moreover, the program aligns closely with NM-AIST's research and innovation policy, which emphasizes principles such as a multi-sectorial approach, responsiveness to societal and industrial needs, alignment with national development objectives, gender equity, and private sector involvement. These principles closely mirror the program's objectives and approaches, reinforcing the internal coherence between the program and the university's policies.

The evidence of internal coherence extends beyond policy alignment to practical implementation. For instance, there is a clear connection between Project 1 (Improving Sanitation, Water Quality, and Agricultural Productivity in the Upper Pangani Basin) and Project 2 (Development of Water Purification Technologies). The water treated by the wetland constructed under Project 2 is purposefully utilized to irrigate the banana farm established under Project 1. This approach not only demonstrates a commitment to environmental conservation but also exemplifies the synergy achieved by aligning projects to achieve broader objectives.

Furthermore, Project 4 (Institutional Strengthening through ICT and Information Services) serves as a bridge linking all other projects within the program. Its aim to enhance research activities and knowledge sharing through ICT facilitates the exchange of information and practices among researchers and local communities, enhancing the impact of Projects 1, 2, and others. However, a critical observation made by an interviewee highlighted that during the final year of Project 4, several stakeholders at the project level (which involved three components, three teams, and three responsible parties) became focused on their own interests and that aligning interests with the broader objectives of the project and the program and the core mission of NM-AIST became challenging.

Beyond the VLIR-UOS program, a cursory review of 42 other funded projects active during the evaluation period reveals a striking complementarity with the program's objectives. These projects encompass diverse themes such as higher education and capacity building, agricultural advancement, technology and innovation, sustainable energy and environment, water and sanitation, educational infrastructure, and health and epidemiology. The existence of these complementary initiatives underscores NM-AIST's holistic approach to addressing institutional and regional challenges through a mosaic of efforts. The VLIR-UOS program, in this context, emerges as a pivotal initiative that seamlessly integrates with and enhances the overall coherence of NM-AIST's development endeavours.

In conclusion, the VLIR-UOS program at NM-AIST exhibits a remarkable degree of internal coherence. It aligns harmoniously with the university's mission, strategic plan, research and innovation policy, and broader initiatives. The strategic integration of projects within the program and their complementarity with other ongoing initiatives reflect a comprehensive and synergistic approach to address development challenges at both institutional and regional levels. This internal coherence enhances the effectiveness and impact of the program, positioning NM-AIST as a driving force for sustainable development in Tanzania and beyond.

¹⁸ The Corporate Strategic Plan of the Nelson Mandela African Institution of Science and Technology (NM-AIST) 2021/22-2025/26

2.3.2 External coherence

External coherence and complementarity with external actors connected to the VLIR-UOS program at the Nelson Mandela African Institution of Science and Technology (NM-AIST) displayed both strengths and areas for improvement. While there were notable instances of collaboration and partnerships with external institutions, there appeared to be room for deeper and more extensive engagement with external actors.

One of the instances of external coherence was the collaboration between NM-AIST and Mzumbe University IUC on the development of fluoride filters. This collaboration reflects a shared commitment to address water quality issues, demonstrating an alignment of objectives between NM-AIST and external partners. Similarly, the partnership with Ardhi University IUC on water sanitation technologies underscores the program's efforts to pool resources and expertise to tackle critical challenges in Tanzania, enhancing external coherence.

Additionally, NM-AIST's collaboration with Saint Joseph Sustainable (SJS) Organic Farm, facilitated by VLIR-UOS, highlights the program's proactive approach to foster academic and research cooperation with external actors. This partnership aims to promote conservation agriculture and scale up sustainable organic farming practices among small-scale farmers in Tanzania. While this initiative demonstrates external coherence, there may be opportunities to further expand such partnerships to amplify the program's impact.

NM-AIST's engagement with libraries in the Arusha and Kilimanjaro regions to promote the use of the ABCD library management system is another positive example of external collaboration. These periodic meetings among institutions to address common challenges and work on solutions reflect a cooperative approach to enhancing library services and knowledge sharing. Also, through P5, the program collaborated with organizations such as the African Development Bank through research projects including CREATES¹⁹ and WISE-Futures²⁰ in equipping the Technology Transfer Office. The limited level of uptake for the programme's research output is an important area for improvement.

However, despite these instances of external coherence, the evidence of external synergies arising from the program appeared relatively weak. The evaluation suggests that NM-AIST should explore deeper collaborative engagements with external actors to maximize the program's effectiveness and reach. Strengthening partnerships with both local and international organizations could lead to more comprehensive and impactful solutions to the development challenges addressed by the program.

Furthermore, while NM-AIST has successfully collaborated with external institutions within Tanzania, there was limited information available regarding synergies with Flemish actors or other international partners beyond the collaborative engagements already integrated into the program. Exploring and fostering such collaborations could provide opportunities for knowledge exchange, resource sharing, and a broader perspective on addressing development issues.

In conclusion, while NM-AIST's VLIR-UOS program exhibited strong internal coherence and some signs of external coherence through partnerships and collaborations with various institutions, there is potential for further development on external partnerships. Strengthening external synergies and deepening collaborative engagements, both within Tanzania and with international partners, could enhance the program's impact and contribute to more holistic solutions to the development challenges it addresses.

¹⁹ The African Centre for Research, Agricultural advancement, Teaching Excellence and Sustainability (CREATES) in Food and Nutrition Security is an African Center of Excellence, which was established at NM-AIST in January 2017 through the facilitation of the World Bank's African Centers of Excellence (ACE II) initiative.

²⁰ Water Infrastructure and Sustainable Energy Futures (WISE – Futures) is the African centre of excellence funded by the World Bank and hosted by NM-AIST.

2.4 Effectiveness

2.4.1 Extent to which programme objectives were achieved

Our discussion with relevant stakeholders and analysis of program and project documentation suggests that the objectives of this program²¹ could be classified into seven categories. Furthermore, discussion with stakeholders and review of various documents provided strong evidence that the program has largely achieved these objectives.

A. Institutional Capacity Building

The program sought to enhance NM-AIST's institutional capacity to effectively fulfil its role in society by strengthening its capabilities in education, research, and industry collaboration. This includes bolstering its role as a hub for inventions, innovations, and technology transfer. Institutional capacity was enhanced during the program, particularly with respect to the five core domains: achieving coherence, delivering results, relating to external stakeholders, acting and committing, and adapting and self-renewing. The evaluators found that in 2019, NM-AIST's capabilities across these domains ranged from a score of 3, indicating a stage of "Still weak – Some results achieved but still insufficient," to 4, representing an "Acceptable – Partial good results – Still to improve" stage. By 2023, however, the maturity levels advanced to a range between 4 and 5, the latter signifying a "Good – High level of implementation" status. Figure 2 below summarizes NM-AIST's maturity levels in 2019 and 2023, respectively.

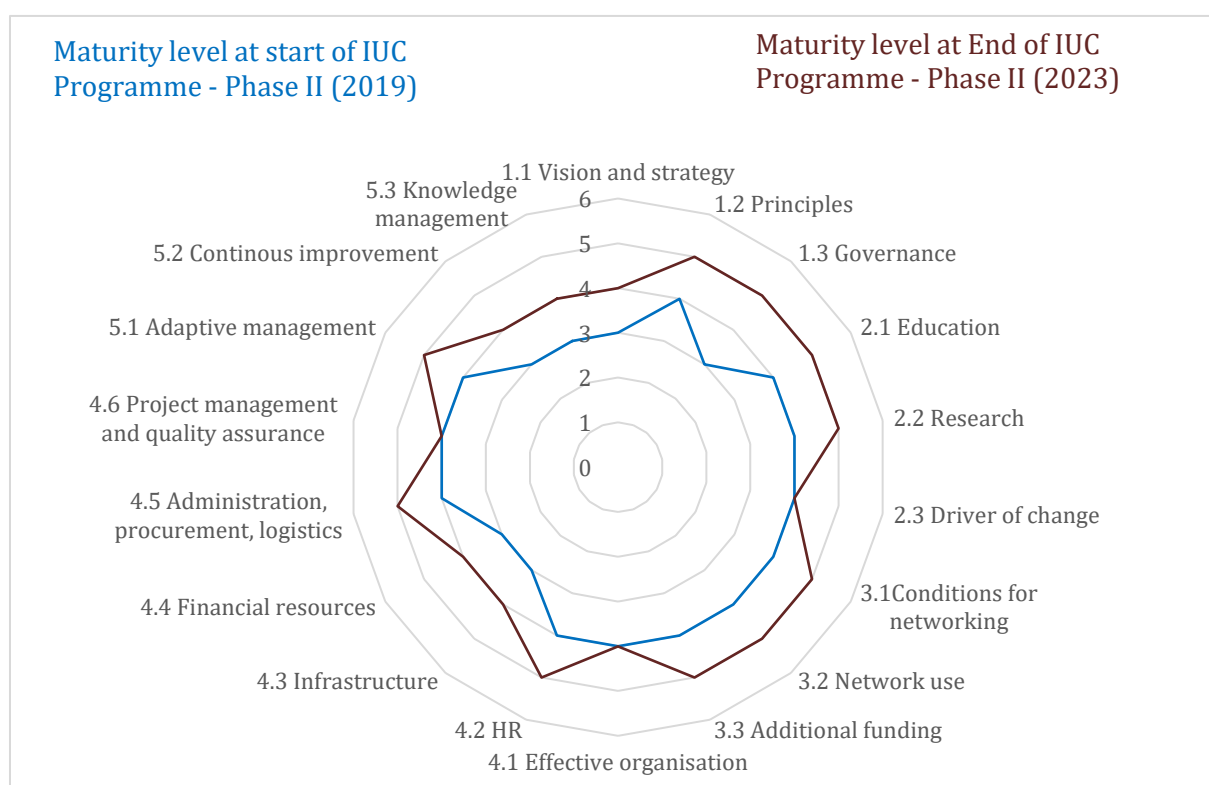


Figure 2. Institutional capacity maturity level at the start and end of Phase II of the IUC program

Significantly, out of the 18 domains assessed, 15 (or approximately 83%) demonstrated an improvement of at least one maturity level. Notably, the capability to achieve coherence, encompassing shared vision and strategy, simple operational principles, and effective governance and management structures,

²¹ Key program objectives focused on: (1) The training and research capacity of NM-AIST in areas of sustainable management of natural resources to improve food security, safe water and ecosystem services; and (2) the capacity of NM-AIST to collect and share big data and valorise research results for industries and agriculture to the benefit of the people of northern Tanzania.

showed the most substantial improvement. This was closely followed by enhancements in the capability to relate to external stakeholders, evidenced by improved networking and the ability to attract additional project funding, and in the capability to adapt and self-renew, marked by advancements in adaptive management, continuous improvement, and knowledge management. In each of these three capabilities, every domain improved by at least one full maturity level. While most domains in the remaining two capabilities also saw improvements of at least one maturity level, three domains — perception of the university as a driver for change, ability to make and implement decisions, and effective project management — did not exhibit clear signs of advancement.

It is important to recognize that the initial phase of the IUC program (2013-2018) began when NM-AIST was a relatively new institution, having been established just a few years earlier. Overcoming the challenge of building capacity was largely achieved through the dedication of leadership at both NM-AIST and the Flemish partner institutions. This foundational work in institutional capacity building was further solidified and expanded upon during the program's second phase.

This improvement, however, cannot be credited exclusively to the VLIR-UOS IUC program, as it may be due, at least in part to a variety of other contributing factors (including other non-VLIR-UOS partnership programs, internal institutional initiatives, etc). However, there was wide consensus among stakeholders that the IUC program played a significant role in institutional capacity building in various ways: education, research, community outreach, etc. According to program records, at least 30 academic and non-academic staff were trained under the program between 2019 and 2022. For instance, returning PhD graduates and existing academic staff benefited from training in research data management, remote access to library resources and writing systematic literature reviews under the umbrella of the IUC program. An in-house training and staff development program was also developed and implemented for support staff²².

B. Research and Innovation

The program sought to promote impactful scientific research and innovation at NM-AIST, focusing on areas such as water quality, agricultural productivity, environmental conservation, and ICT utilization. It encouraged and fostered research that aligns with global and national development objectives and societal needs. We will discuss research under scientific quality. However, it should be noted that the university exceeded the number of international peer-reviewed journal articles that had been set as the target. In addition, there has been a conscientious effort to align research conducted under the program with national developmental objectives and societal needs. In fact, research conducted under the program has resulted in innovative practices that have had direct application in society and within communities (e.g., Wetland water treatment, banana and corn research experiment stations).

C. Postgraduate Training and Skills Development

The program sought to strengthen postgraduate training programs to produce highly skilled and knowledgeable graduates capable of developing innovative solutions to societal and industrial problems in the Science, Engineering, Technology, and Innovation (SETI) fields. We will discuss this aspect in some detail under Scientific quality. Suffice it to note that during Phase II, PhD completion was better than it was in Phase I. Although three of the seven PhD students who started their program in Phase II are yet to complete, there is assurance that they will complete their studies by the end of the VLIR-UOS program. It is important, however, to note that the program did not manage to meet the target PhD recruitment in Phase II. Whereas the plan was to recruit 8 PhD students in this phase; only seven students began their doctoral program. The eighth candidate never started the PhD program, as he/she was not accepted for admission at the Flemish institutions.

D. Multidisciplinary Problem-Solving

The program sought to foster a multidisciplinary approach to address critical regional and national challenges in Tanzania, particularly in the areas of sustainable management of natural resources, technology innovation, and socio-economic development. Under the VLIR-UOS program NM-AIST has developed a strong multidisciplinary orientation. At the institutional level, this is evidenced by the creation of research groups that involves researchers from multiple fields. Also, as noted, in the section on internal cohesion, there is strong collaboration across projects, within the VLIR-UOS program, a strong tendency for problems related to sustainable development to be tackled from different angles.

²² Self-Assessment IUC Partnership: Programme Level (NM-AIST IUC)

This multidisciplinary approach is now enshrined in the University Corporate Strategic Plan and in the Research Strategy. It finds its ultimate realization in the Banana Research Centre project that is currently under development.

E. Outreach and Community Engagement

The program sought to increase the university's engagement with the broader community, including local industries, through outreach programs that promote the dissemination of research results and knowledge sharing. It encouraged the application of research outcomes for the benefit of society. By April 2023, the University had organized 40 non-academic extension/outreach activities (presentations, trainings, sensitisation activities) through support from the program, exceeding the overall target of 21 activities set at the beginning of the program. Overall, 1467 individuals had been reached through these activities, exceeding the 480 targets with a mixed balance across the five projects. Three training module packages had been developed through the support of the program, compared to a target of 5.

F. Incubation Management and Commercialization

The program sought to establish and manage a Technology Park that includes an Incubation Centre, Technology Transfer Office, and Commercialization Office. It sought to facilitate the transfer of technology and innovations to society and industry, thus contributing to economic growth and sustainability. The Incubation Centre, Technology Transfer Office and Commercialization Office have been launched with support from the program, nevertheless there were no records of incubates who had commercialized their products. Also, a number of policies related to these areas (the Intellectual Property policy, for instance) have been developed and put into practice.

G. Development of infrastructure

The program aimed to enhance the quality of research and education by fortifying the ICT, library, and laboratory infrastructures. Notably, a new library information management system known as ABCD was successfully implemented at the university. This implementation involved the acquisition of software, books, and subscriptions to journals and databases. A significant rise in library users was observed, with the number increasing from 58 users in the baseline year to 205 in the first quarter of 2023. During our evaluation, questions were raised regarding the relevance and utility of certain textbooks procured during the program, as well as the suitability of the ABCD system for storing electronic books. With respect to the latter, a technical staff member at the NM-AIST library questioned the suitability of the ABCD software for e-books. However, a Flemish expert confirmed that the software is capable and suitable but requires proper management and utilization by NM-AIST technical staff to function effectively. The IUC program also successfully established and equipped various laboratories, including water and soil labs, with the necessary research and analytical tools. Our evaluation team visited these laboratories and confirmed the acquisition and operational use of a diverse range of equipment with support from VLIR-UOS. A notable observation with state-of-the-art laboratory facilities and equipment is the limited investment on maintenance and repair. While the laboratories were highly supportive to the current postgraduate research activities at NM-AIST, the envisaged application of such facilities to offer consultancy services that would enhance the industrial linkage and revenue generation for the institution would certainly require some expansions.

In summary, the program objectives have been largely achieved.

2.4.2 Facilitating factors

The effectiveness of the VLIR-UOS program can be attributed to several key factors that collectively contributed to its success. Firstly, the program's unique design, characterized by a coordination structure that included representatives from both NM-AIST and Flemish institutions, and yet with a significant degree of decision-making authority vested in the local institution, set it apart from traditional donor-driven programs. Unlike programs often shaped by donor priorities, this initiative was purposefully crafted to address the specific needs of the local institution, as acknowledged by local stakeholders. Moreover, the emphasis on shared or rather bottom-up decision-making further reinforced this tailored approach, fostering a sense of ownership and alignment with the program's goals.

The strong commitment, enthusiasm, and motivation exhibited by both the local institution and the Flemish partner were instrumental in achieving the program's objectives. Support from NM-AIST

management, including their endorsement and engagement with the program, further bolstered its success. The development of a robust and professional relationship between program coordinators at partner institutions, coupled with their adept people management skills, greatly facilitated program implementation. Good communication and trust among team members, especially between coordinators and project leaders, facilitated smooth project execution. Generally, the program did not suffer from any limitations which would be borne from regular changes in the University top management.

Another critical factor was the program's ability to successfully recruit qualified and motivated students during Phase II, overcoming a significant challenge encountered in Phase I. This recruitment achievement translated into improved overall and timely completion rates for PhD students. Additionally, the establishment of a dedicated program support unit played a pivotal role in coordinating activities, monitoring progress, and ensuring effective reporting, enhancing the program's efficiency.

Clear processes and procedures for accountability were established, ensuring transparency and effective resource utilization. The willingness of VLIR-UOS to extend the program's implementation timeline by eight months in response to disruptions caused by the COVID-19 pandemic demonstrated flexibility and adaptability. Lastly, the integration of valuable lessons learned from Phase I into Phase II contributed to the program's overall effectiveness, enabling continuous improvement and refinement of its strategies and approaches.

2.4.3 Inhibiting factors

Although the program was very successful in reaching its objectives, several factors also inhibited (to one extent or another) its effectiveness. Firstly, external factors such as the COVID-19 pandemic and seasonal changes disrupted the timing of program activities, particularly research endeavours by doctoral students, leading to extensions in project timelines.

Additionally, there was a significant challenge in recruiting a sufficiently large pool of qualified PhD candidates, especially female candidates, which impacted the program's ability to meet recruitment targets while at the same time striking a gender balance. Disagreements regarding the qualification of a PhD candidate, accepted by NM-AIST but rejected by the Flemish institute, created a further hurdle in student selection and admission. Seven out of eight PhD students entered the program. Also, in the perception of one Flemish stakeholder, some PhD fellows became overly involved in project management and administrative activities during their studies (when back in Tanzania), diverting their focus away from academic work²³. Some PhD students also noted they were not fully relieved of their duties as academic staff during their study leave. A local stakeholder observed that some students struggled with adapting to the Belgian academic system, leading to a decrease in their academic engagement compared to their participation levels at NM-AIST. Interviews with doctoral candidates and graduates revealed that most of them did not reach their total period allocated to stay in Flanders²⁴. Nevertheless, schedules were mutually planned with both promoters and were considered to be favourable to the candidates' overall performance.

Another inhibiting factor was that limited communication and variations in the quality of leadership and support from different project leaders (with some being less engaged than others) contributed to uneven progress across projects and or to fragmented execution of some of the activities (including the execution of self-assessments). There was limited mobility at project level and interaction was mostly limited to joint meetings, which further restricted the program's collaborative potential. Interviews with local program participants highlighted that Flemish students conducting research in Tanzania through the IUC program, as part of projects involving NM-AIST students, were not formally registered at NM-

²³ A NM-AIST reviewer of the draft report contested this finding. The evaluators note that since PhD students were not all recruited from MN-AIST, it is possible these additional responsibilities were also in connection with their home institution and not necessarily with NM-AIST.

²⁴ The duration of the stay in Flanders was determined based on schedules mutually agreed upon by candidates and their supervisors, considering the project's allocated resources and specific tasks, such as lab analyses. Some candidates expressed a preference for maximizing their stay at home. A reviewer of this report commented that this situation was also due to the COVID situation and to long-term fieldwork periods spent in Tanzania.

AIST as visiting students or scholars, nor assigned a local faculty advisor²⁵. The Evaluators believe that registering Flemish students as visiting students/scholars and assigning them a local faculty advisor will enhance and strengthen the partnership.

One project leader noted that there was sometimes a divergence of interests among stakeholders. Aligning these interests with the project/program objectives was sometimes difficult. Divergence in stakeholder interests can potentially undermine the achievement of project and program goals. Additionally, a decrease in motivation and engagement levels among technical and administrative staff, often due to a lack of clear incentives²⁶, may have influenced the program's effectiveness and overall impact.

Financial constraints and over-reliance on external support for research and innovation hindered the program's ability to transition research findings into tangible, marketable products for societal benefit. This was exemplified by the lack of funding to test and commercialize prototypes developed by students. Tanzania's centralized and highly regulated higher education system, while not severely impeding NM-AIST's mission and program implementation, added to the complexities faced by the program.

Frequent changes in top management at NM-AIST could have potentially acted as an inhibiting factor to the program's progress. For example, there was an instance where the program lost a project car due to such management transitions. These leadership shifts necessitated program leaders to invest additional efforts in acquainting new leaders with the program's details and objectives, ensuring their buy-in and support. Despite these challenges, it's noteworthy that during Phase II, the level of management support at NM-AIST was described as exceptionally high, indicating effective adaptation to leadership changes.

2.5 Scientific quality

2.5.1 Quality of Education

Under the VLIR-UOS program, notable improvements in the quality of education have been achieved at NM-AIST. Firstly, all master's and PhD programs offered at the university have received national accreditation from the Tanzanian Commission for Universities (TCU), demonstrating compliance with rigorous academic standards. Moreover, certain programs have attained international accreditation, exemplified by the Master and PhD programs in Materials Science and Engineering accredited by the Agency for Quality Assurance through Accreditation of Study Programme (AQAS) in Germany. These international accreditations underscore the sound and robust processes followed in program development. It is unclear how the VLIR-UOS program impacted these accreditation outcomes. Nevertheless, it is worth noting that 27 out of the 29 programs accredited had their accreditation or re-accreditation occurring during the second phase of the VLIR-UOS program.

PhD training and completion rates have notably improved, with four out of seven PhD students completing their degrees in Phase II of the program and the remaining three students aiming to complete their degree by the end of the VLIR-UOS program. No sponsored PhD student dropped out of their study program during Phase II; whereas in Phase I, two students (or 33.3%) dropped out of the program. Delays in the completion of degrees for the remaining students, as noted earlier, were attributed to factors such as rain delays affecting field experiments. Similarly, the program supported the training and

²⁵ This finding was disputed by a Flemish reviewer of the draft evaluation report. The evaluators therefore recommend that participating institutions review and discuss student mobility from the Global North to the Global South to clarify the principles that govern or should govern these exchanges.

²⁶ Interviews commented that unlike academic staff, who find fulfilment/motivation in publication outputs (a tangible recognition of their work and contribution), non-academic staff typically do not have such a tangible incentive. Academic staff are excited/motivated/incentivized with the possibility or opportunity to contribute to knowledge/scholarship in their field and with other outcomes that are connected to research (e.g., promotion, commercialization, etc.). Motivation for non-academic staff is more challenging as the incentives for participation aside from financial compensations are not always clear. Hence it may be helpful for partner institutions and funders to consider ways that would make the experience/participation or career pathways for non-academic staff more rewarding.

completion of twelve (12) master's students, contributing to the overall enhancement of education quality.

Furthermore, the program has led to the development or substantial update of seven master's programs, significantly exceeding the original target of two programs. This initiative has benefited 36 students who actively participate in these newly enhanced programs. According to university records, three courses were also developed with support from the program. Additionally, the implementation of online course evaluations has become a mandatory practice, enabling the university to monitor teaching and learning effectiveness, identify areas for improvement, and facilitate curriculum reviews and academic staff promotion. These evaluations have consistently yielded high student ratings, reflecting student satisfaction with course structure, delivery, assessment, and learning outcomes. For instance, a review of course evaluation performance for a sample school (School of Materials, Energy, Water, and Environmental Sciences) revealed high student ratings overall, along the dimensions of course structure, delivery and assessment and student learning, with an overall average rating of 3.53 out of 4.0. More recent data on 131 students who completed course evaluations across three schools show an average student satisfaction level of 78%. Clarity of course objectives and learning outcomes received the highest rating (85.5%), with none of the 17 other dimensions receiving a satisfaction level less than 75%.

Lastly, the program has significantly augmented the number of lecturers at NM-AIST in critical areas such as agriculture, water, ecology, and environmental sciences, increasing from 14 in the baseline year to 43 by April 2023. Furthermore, the number of lecturers holding PhD and master's degrees has surged from 19 in the baseline year to 81 by April 2023, reflecting a substantial enhancement in the university's academic staff capacity. These achievements collectively contribute to the substantial improvement in the quality of education at NM-AIST under the VLIR-UOS program.

It is important to note that given the relatively small size of the NM-AIST student population (593 students overall, as reported to the evaluation team), it may be essential for the University to strategically consider how to produce more graduates even with the current level of inputs and resources and without compromising quality. Currently, the university has a ratio of around 2 students for every academic, technical, and administrative staff and a student-academic staff ratio of 4.3, which suggest that the cost for producing a single graduate is significantly high. Strategically increasing the number of students while ensuring the quality of education is maintained.

2.5.2 Quantity and Quality of Research

The VLIR-UOS program has played a pivotal role in helping to enhance the quality of research at NM-AIST, as evidenced by significant improvements in research output and publication quality. Notably, the university has achieved a remarkable increase in the number of publications in Scopus-indexed journals, which surged from 100 in 2018 to 254 in 2022, marking a substantial 154% growth²⁷ in four years. Furthermore, the quality of research has been notably high, demonstrated by the proportion of Scopus publications in top-tier (Q1) journals. In 2022, a noteworthy 60% of the publication output fell within the top 25% of journals, representing a significant milestone for a relatively young institution. Although there was a temporary downward trend in the share of articles in top-tier journals from 2018 to 2020, this trend has been effectively reversed since 2021.

While the increase in research output can be attributed to various factors, including support from other partnership programs and internal initiatives, the VLIR-UOS program has made a substantial contribution. By April 2023, the program had facilitated the publication of at least 26 articles in international peer-reviewed journals across its projects, surpassing the target value of 14 articles²⁸. Publication records suggest that Phase II PhD students contributed 13 publications and Phase II master's students two publications²⁹. This achievement underscores the program's significant impact on research productivity. One factor contributing to the program's research success was the decision by

²⁷ Publication statistics reported in this first paragraph were computed by the external evaluation team based on data they directly extracted from Scopus.

²⁸ Annex 2_NM-AIST IUC_Standard Indicators_April 2023.

²⁹ Based on information provided by NM-AIST Program Support Unit. However, during the process of finalizing this evaluation report, a reviewer noted that an additional paper had been published after the evaluation, resulting in a total of 27 papers (with 16 papers involving students).

several projects to concentrate on short-cycle research initiatives. These projects, though expedited in nature, resulted in swift publications that maintained high relevance and impact. Moreover, the cumulative number of Web of Science publications in the areas aligned with the program's objectives, such as sustainable management of natural resources to enhance food security, safe water, and ecosystem services, witnessed substantial growth, rising from 42 in the baseline year to 212 by April 2023. This growth reflects the tangible contributions made by the VLIR-UOS program to research in critical domains. Additionally, the recognition of NM-AIST researchers through top awards from the Ministry of Education further underscores the program's role in fostering high-quality research and academic excellence.

In addition to the substantial advancements in research output and quality, NM-AIST has also made remarkable progress in its webometrics ranking. The university's webometrics ranking witnessed a significant improvement over the course of the VLIR-UOS program. Starting from a baseline position of #8412, the university's ranking surged to #7424 in the first year of the program and continued to climb, reaching #4281 by the fourth year, as of April 2023³⁰. This impressive ascent in the webometrics ranking reflects the institution's commitment to enhancing its global visibility and recognition, underscoring the positive impact of the VLIR-UOS program on NM-AIST's overall academic standing and influence in the research community.

2.6 Efficiency

2.6.1 Cost-effectiveness (usage of resources in relation to the achievement of objectives)

The program was perceived as highly efficient during its second phase, with stakeholders reporting no major efficiency issues. This effectiveness was partly attributed to the incorporation of lessons learned from Phase I into Phase II's design. A notable improvement was the clearer definition of supervisors' roles and responsibilities between the local institution and its Flemish partners, contributing to a higher timely graduation rate in Phase II. Another factor enhancing efficiency was the considerable emphasis on meticulous activity planning.

Budget formulation within the program was viewed as highly participatory, adhering strictly to the guidelines set by the Management Manual. Yet, there was a notable degree of flexibility afforded to NM-AIST for budget allocation and reallocation decisions, subject to approval by the Joint Steering Committee. According to the Program Management Manual, budget reallocations between lines for personnel costs or investments could reach up to 30% of the initial line budget, a provision that was greatly valued by the local institution.

The needs assessment process was consistently thorough, following a bottom-up approach. Needs were initially identified at the project level by the local institution, then communicated by the local coordinator to Flemish counterparts to justify and rationalize resource allocation. Upon consensus at the project level, the case would escalate to the program level for final agreement and subsequent resource allocation based on established principles. This transparent process ensured that resource allocation was consistently aligned with the achievement of objectives. However, it was noted by an interviewee that there were instances where expenditures were made on costly tools preferred by project leaders, despite the availability of more affordable yet adequate alternatives.

The VLIR-UOS program at NM-AIST demonstrated a highly positive return on investment, significantly enhancing the quality of education and research, and bolstering institutional capacity, as evidenced by the production of seven doctoral degree holders. The program's societal impact through knowledge exchange, local community benefits, and addressing vital issues is noteworthy. Infrastructure enhancements in ICT, libraries, Incubation Centre, and laboratories have furthered academic excellence, underscoring the efficient utilization of resources in achieving program objectives. Overall, there was broad agreement among NM-AIST and Flemish stakeholders on the program's value as an investment.

³⁰ Tanzania Top 3000 Scientists: "AD Scientific Index 2024" World Scientist and University Rankings 2024 (<https://www.adscientificindex.com/pdfs/toplists/tanzania-top-scientists.pdf?v1685530284>)

However, the local institution faced challenges in cost-effectiveness due to the centralized Tanzanian procurement system. This system was often cumbersome, subject to government regulations that impeded processes and led to price inflation by local vendors, particularly for government-involved purchases. Consequently, some goods were acquired at higher costs than anticipated. To mitigate this, NM-AIST sometimes procured equipment directly from Flanders, a process deemed more efficient by stakeholders. While this approach was efficient, it inadvertently limited financial flow into the local community, presenting a dilemma: purchasing locally at inflated prices to support the local economy or procuring through Flemish partners at lower costs but without benefiting the local economy directly.

Moreover, there were delays in the procurement system, attributed to both the central government system and operational inefficiencies at the local institution. Stakeholder opinions varied, with some attributing issues to NM-AIST's procurement processes and others to customers' failure to provide complete or timely information. Despite these challenges, the Procurement Department was commended for effectively collaborating with the PSU team.

2.6.2 Organizational management and structures and efficient programme implementation

The organizational management and structures of the VLIR-UOS program, particularly the integration of the Joint Steering Committee (JSC), Local Steering Committee (LSC), Flemish Steering Committee, and the Programme Support Unit (PSU), played a pivotal role in fostering efficient implementation. The JSC, led by the Local Coordinator (LC) and co-chaired by the Flemish Coordinator (FC), was instrumental in ensuring cohesive and well-coordinated efforts. This structure facilitated a clear division of responsibilities and provided a platform for effective decision-making and strategy formulation. The inclusion of members from both LSC and the Flemish Steering Committee within the JSC ensured diverse perspectives and a balanced approach to program management.

The establishment of the PSU, as noted in the 2022 progress report, was a key factor in enhancing the efficiency of the program. It served as a crucial interface among different stakeholders, streamlining coordination, implementation, monitoring, and reporting processes. This unit's role was particularly significant in maintaining the program's focus and alignment with its objectives. The program's adherence to regular quarterly monitoring and reporting, in line with VLIR-UOS's deadlines, further underscored its commitment to efficiency and timely delivery of outcomes.

Meetings and decision-making processes within the program were characterized by active participation, inclusivity, and strategic planning. Both the LSCM and FSCM, chaired by their respective coordinators, played a crucial role in the regular tracking and expediting of program goals. The participatory nature of these meetings, involving key participants such as Project Leaders (PLs), post-docs (particularly PhDs who had been trained in Phase I), and PhD students, fostered a culture of active engagement and collective responsibility. Prior consultations before meetings ensured that all relevant stakeholders, especially PLs, were involved, allowing for comprehensive discussions on project progress, plans, and challenges. This approach, combined with the strong commitment of project leaders and team members, including post-docs who often took up leadership roles, contributed significantly to the program's overall efficiency as well as to the program's overall performance as discussed under other evaluation criteria (e.g. coherence, effectiveness, scientific quality). The preparation and conduct of these meetings, marked by close interaction between coordinators, program manager, and ICOS, resulted in well-informed strategic choices and open discussions, further enhancing the program's efficiency. In sum, the overall structure and management approach of the VLIR-UOS program were highly conducive to its efficient implementation.

2.7 Impact

The following discussion focuses on themes that emerged from our investigation into the impact of the VLIR-UOS program on both the institution and the community. Drawing from extensive interviews with a diverse array of stakeholders, including both internal and external participants, and site visits to multiple facilities and infrastructures across the campus and within the community, the external evaluation team has substantiated the claims made by the two partner institutions. These claims highlight the program's substantial impacts, spanning both the institutional and societal levels, thereby validating its influence and effectiveness.

2.7.1 Impact on the institution

The VLIR-UOS Program has exerted a significant impact on NM-AIST. This impact spans multiple dimensions of institutional development, research innovation, and stakeholder engagement. Through interviews, document reviews, and site observations, the external evaluators can categorise institutional impacts into the following themes.

Academic Enhancement and Staff Development: The program's contribution to academic staff empowerment is evident. The University currently has three PhD graduates from Phase I and one PhD graduate from Phase II on its academic staff. Another Phase II PhD graduate who is about to complete the degree is already an academic staff at the University. Academic staff trained under the program confidently assume authoritative roles in their respective fields and are contributing to NM-AIST's research productivity in meaningful ways. One PhD graduate interviewed highlighted that career advancement for new PhD graduates has been notable thanks to critical skills and outcomes skills developed during the program, including writing, data analysis, independent research, and student supervision (among others). These graduates have taken on roles as lecturers and researchers, enriching the academic fabric of NM-AIST. Academic enhancement has also occurred through program revisions: at least seven master's programs were reported to have been updated substantially thanks to the program, thus resulting in better academic offerings. In addition, the program also contributed to the professional development of technical and support staff (though contribution in this area appeared to be rather limited), thus enabling them to support the University in more meaningful ways.

Research and Development Initiatives: One of the most important impacts of the program is the development of specialized research domains, notably in banana research. The initiative to develop high-yield banana varieties and technologies for enhancing banana productivity has culminated in the University Council approving a plan to establish a major banana research centre at NM-AIST. This centre, which has already been allocated land, aims to encompass the entire banana value chain, from agronomy to packaging, positioning Tanzania as a key banana exporter in the region. Furthermore, the program catalysed the emergence of research initiatives in aquatic ecology, sustainable mosquito control, and ecotoxicology, areas where NM-AIST previously lacked capacity.

Enhanced Research Productivity and Technological Innovation: The program has played a significant role in increasing NM-AIST's research productivity in areas related to sustainable development. As noted earlier, by mid-2023, the program had facilitated the publication of at least 26 articles in international peer review journals (surpassing its initial target of 14 publications). Challenges in tracking publications at NM-AIST persist and it was unclear who is responsible to monitoring research productivity. It is possible that the program has also had an additional direct or indirect contribution to research outputs not captured in these statistics. The development of new technologies, such as a prototype for treating water from textile companies and an app for disseminating information / knowledge with researchers and the community, highlights the university's growing focus on research and innovation. The construction of a wetland on campus, funded by VLIR-UOS, has not only served as an educational and research resource but has also contributed to environmental conservation by treating wastewater from student accommodations.

Technology innovations in general, however, still require additional resources to bring them to the market. In addition, VLIR-UOS program has played a pivotal role in the development of a Technology Park at NM-AIST. This includes the establishment of an Incubation Centre, Technology Transfer Office (TTO), and the Commercialization Office. These components, which are essential for the transfer of

technology and innovations to industry and for fostering economic growth and sustainability, are now in initial stages of effective embedment into the University's structure.

Digitalization, ICT, and lab Infrastructure Enhancement: The program significantly upgraded NM-AIST's library, ICT, and lab facilities. The digitalization of the library, equipped with a new management system (ABCD) and enhanced with computers and Wi-Fi, improve access to educational resources for students and staff substantially. This transformation not only improved the library's functionality but also contributed to a more digitally literate campus community. However, a key project stakeholder also perceived that during the latter half of Phase II, the institutional commitment to sustain and continually improve the library system waned. This decline in support was particularly notable in the absence of clear institutional incentives for local technical and administrative staff who are not on an academic career path. The ICT infrastructure saw substantial improvements, including server support, expanded Wi-Fi access, and the acquisition of various devices, thereby elevating the University's technological capabilities. Similarly, the program endowed the University with water and soil analysis labs that support both teaching and research.

Policy Formulation and Strategic Reorientation: NM-AIST witnessed significant shifts in internal policies and strategic focus due (at least in part) to the program. One key impact (described by some stakeholders as a direct and by others as an indirect impact) in this area has been the reformulation of the research strategy, transitioning from a school-based and department-based approach to one centred on multidisciplinary research groups. This strategy revision, coupled with policy developments like the Research and Innovation Policy, the Intellectual Property Policy, Data Management Policy, and Anti-Plagiarism Policy, suggest that NM-AIST is increasingly maturing in its research ethos and moving towards a more structured approach to innovation and intellectual property management. Several projects adopted shorter research cycles, concentrating on rapid yet meaningful and impactful research outcomes—an important trend that needs to continue. Additionally, there was a strong emphasis on conducting needs-based research and utilizing replicable research methodologies, tools, and technologies. This approach is crucial to ensure the continuity and applicability of research efforts beyond the IUC funding period, especially when NM-AIST transitions to rely more heavily on its own resources.

Collaborations, Networking, and Stakeholder Engagement: The program fostered enhanced collaboration among diverse stakeholders - academics, researchers, students, NGOs, other academic institutions, community members, and local farmers. This collaborative approach has enriched research, extended knowledge sharing, and promoted community involvement, contributing to sustainable development. For instance, initiatives involving community engagement, such as wetland and water sanitation projects and innovative practices to increase banana and maize productivity, have demonstrated the program's positive influence on the well-being of local communities. This collaborative environment will find its ultimate realization in the Banana Research Centre which the University plans to develop.

Institutional Sustainability and External Funding: NM-AIST's efforts in attracting external funding, as seen in its engagement in various research projects, reflect a strategic approach towards institutional sustainability. The VLIR-UOS program began at a very early stage of NM-AIST's development and has been described by university stakeholders as its most important partnership. There is no doubt that the University's ability to attract funding and manage projects has improved, reflecting a growing maturity as a development actor.

2.7.2 Impact on the community

The VLIR-UOS Program at NM-AIST has exerted a notable yet moderate impact on the community. While the program has initiated several promising research and innovation projects, a more substantial deployment of resources is necessary for these initiatives to evolve into widely adopted community solutions. For instance, strategies for solutions like wetland systems have been developed, but broader resource allocation and project implementation are required to amplify their impact. Similarly, other innovations, such as the water treatment prototype designed for textile companies, require additional resources for comprehensive testing and community implementation. The community impact of the VLIR-UOS Program can be categorized into several key themes:

Community Empowerment Engagement: Community members interviewed indicated that the program has empowered and equipped them with knowledge, training, resources, and tools to boost productivity. For instance, smallholder farmers, particularly those involved in banana and maize production, indicated that they benefited from improved crop production techniques, access to clean plant materials (such as in vitro banana plants and maize seeds), and sustainable farming practices. This empowerment has enabled community members to enhance their agricultural productivity and overall well-being. Empowerment has occurred through active engagement with the local community through mutually beneficial relationships. The university takes knowledge to the community through outreach programs, presentations, and dissemination of information in churches and community gatherings. Moreover, it brings the community to campus for mentoring, coaching, and incubation of ideas. This collaborative approach has resulted in the transfer of valuable agricultural knowledge and practices from researchers to small-scale farmers. The positive rapport between farmers and NM-AIST researchers has led to knowledge sharing and adoption of innovative techniques, significantly impacting agricultural practices in the region. The evaluation team met and discussed with a number of small-scale banana and maize farmers, the vast majority of whom indicated the transfer of knowledge from the University to small-scale farmers has resulted in a significant boost in agricultural production.

Innovations in Wastewater Management and Industrial collaboration: The program has led to innovations in wastewater management, and NM-AIST's expertise in constructing wetland systems for wastewater treatment has been applied to address environmental challenges faced by five companies and organizations. The system also has great potential for wider adoption, if the University can develop and implement a solid commercialization strategy. The evaluation team visited a meat processing company that had adopted this technology. The company representative indicated that the system had not only resulted in a substantial reduction in operational costs for waste treatment and in significant improvement in environmental sustainability but also generated significant interest from other companies. Moreover, public authorities, as the meat processing company representatives had noted, were highly satisfied with the waste treatment system in place. Industrial collaboration in this area is still limited; however, there is great potential for expanding this collaboration in the future.

Entrepreneurial Initiatives and Innovation: The program has inspired entrepreneurship among students, leading to such initiatives as the creation of Agtech Innovation and Solutions for Africa (AISA), by a PhD student. AISA focuses on agricultural supply chain optimization for banana farmers and illustrates the program's role in fostering innovation and practical application of research. This startup is in the process of being incorporated and the student has received a grant from the prestigious Global Food Venture program to finance in-depth market research on agricultural supply chain for banana farmers. Although the startup is still in its initial stage, it has the potential to develop innovative tools and technologies and provide farmers with expert advice for enhancing harvest sustainability and optimizing marketing strategies and supply chain capabilities.

Incubation and Intellectual Property Development: NM-AIST has incubated 11 projects, managed 10 intellectual property rights, and created four spinoffs³¹. Furthermore, an app is in its final stage of development and is intended to facilitate the sharing of knowledge with the community. Although most of these initiatives are yet to result in a concrete impact on the community, they demonstrate the program's contribution to innovation and technology transfer.

Influencing Policy and Decision-Making: The program aims to drive positive change by developing policy briefs, flyers, and other communication materials. These resources are intended to convey science-based messages to decision-making bodies, encouraging evidence-based policy and practice, thereby ensuring that the program's results have a lasting impact on broader policies and societal outcomes. Furthermore, participation in international conferences has not only enhanced knowledge sharing but also contributed to skills development among staff and students.

³¹ Annex 1_NM-AIST_IUC-Network Monitoring Matrix_April 2023

2.8 Sustainability

2.8.1 Institutional sustainability

Institutional sustainability is a critical aspect of NM-AIST's journey, particularly as it navigates the post-program landscape. NM-AIST possesses the structures, processes and staffing (with more staff joining its ranks) needed to continue to operate over the long term. The University operational continuity has been affirmed by its University Council and in external audits. However, the small size of the student population raises questions on the cost effectiveness and economic viability of the overall institutional investment – an issue that the University may need to consider strategically.

Crucially, NM-AIST exhibits strong coherence between its program, interventions, and activities, and those supported by other development partners. Despite VLIR-UOS being a primary partner over the past decade, NM-AIST has successfully attracted diverse support for capacity building, research, and innovation. This ability to draw support underscores the university's strong sense of ownership and agency. A notable example is the creation of a banana research centre, a strategic integration of program results into the university's structure and strategy, and a testament to its commitment to sustaining the program's outcomes. The alignment of the program's focus with the university's strategic direction in research, innovation, and university-industry linkages further cements this integration.

Moreover, the program was integrated within the organizational framework of NM-AIST, receiving substantial administrative support. This support manifested in the allocation of dedicated human resources, such as an accountant, a secretary, and a procurement manager, whose positions were financed by the university itself. This arrangement exemplifies the program's deep embedment within the university's structure.

One challenge to this sense of ownership and agency stemmed from changes in university management, which have been relatively frequent. Such shifts in leadership can potentially alter priorities, posing a risk to the continuity and focus of the program. This concern was highlighted by a stakeholder in a self-assessment report, which noted a perceived decrease in ownership from Phase I to Phase II under new management, exemplified by the loss of a project car due to these management changes. Furthermore, there were instances of leadership challenges in some projects, where certain project leaders were perceived as being less supportive, less effective, and less engaged than expected. Despite these challenges, however, there is currently a prevailing sense of strong ownership at the highest levels of the university, as evidenced by the approval and development of the Banana Research Centre. This significant step indicates not only the program's alignment with the university's strategic goals but also its potential for long-term impact and sustainability. This high-level endorsement and concrete action towards institutionalizing program outcomes demonstrate a commitment to maintain and build upon the program's achievements.

International and interuniversity cooperation are also critical for NM-AIST's institutional sustainability. The university has been proactive in expanding its network, as evidenced by its collaborations with industry and agricultural sectors and the financial support received from various development partners, amounting to approximately six million dollars in the 2022 fiscal year. These efforts demonstrate the university's commitment to nurture its academic and research activities through diverse partnerships.

Moving forward, maintaining these networks active is vital. The University has a diverse set of academic and industrial partners (<https://www.nm-aist.ac.tz/index.php/ourpartners>). However, it is unclear how many of these partnerships are truly active. The observation by some NM-AIST workshop participants that only a small fraction of the created networks is active indicates a potential area for improvement. Ensuring the continuity and activation of these networks, irrespective of individual faculty members' involvement, is crucial for sustaining the momentum and leveraging these partnerships for ongoing institutional growth and impact.

2.8.2 Financial sustainability

The University's financial viability has been affirmatively assessed by its University Council and external audits. The National Audit Office's report from February 2023 highlighted that NM-AIST possesses the necessary resources for its foreseeable future operations, with no known material uncertainties casting doubt on its sustainability. Nevertheless, NM-AIST's journey towards financial sustainability post-VLIR-

UOS program is marked by a mix of challenges and promising opportunities. As a public institution, NM-AIST benefits from governmental support, which is expected to continue. However, the university's ambitious mission and vision, particularly in research, innovation and commercialization, face a significant hurdle due to the inadequacy of government funding. A member of the institutional self-assessment team emphasized that the institution's survival, especially in achieving distinct aspects of its mission and objectives, will hinge on its ability to attract external funding. This sentiment was echoed by a senior leader who expressed uncertainty about the university's strategies for raising necessary financial resources. Financial sustainability, as per program and program coordinators, is a major concern, reflected in an average rating of around 2 out of 4 in self-assessment reports, indicating performance with problems.

The challenges are multifaceted. Financial stability, especially for research, innovation, and commercialization, remains uncertain. Current funding levels are insufficient for the complete and sustainable execution of required steps, including technology scale-up and commercialization. The university lacks an internal research budget, relying solely on external funds for research activities and student support. Although financial data provided by NM-AIST showed an increase in research funding over the years, there is a clear recognition by the University that "much more efforts are needed to attract more funds to enable the institution to meet its set research obligations as set out in its Charter"³². Operational costs are also constrained, with the university receiving only around 150 million Tanzanian Shillings (approximately USD 60,000) from the government per quarter.

On the flip side, there are several opportunities that NM-AIST can leverage. The university has witnessed a notable increase in externally funded projects, particularly in sustainable management of natural resources. The number of externally funded projects in this area almost doubled from 23 in the baseline year to 44 by April 2023. Graduates of the program, who maintain contact with their supervisors, are actively involved in expanding their networks and participating in partnership programs, which could lead to more funding opportunities. Additionally, the university's expertise on areas such as in wetland technology, has potential for immediate financial benefit, provided the University develops a clear and strong marketing strategy. The external evaluation team visited one company that had adopted this technology. Overall, five companies/organizations have adopted this system.

A significant hope for financial sustainability is the proposed centre for banana research, which has already been approved by the University Council. Its realization and operational success could become a major income source for the university, considering bananas are a staple in the region. However, the challenge lies in securing the initial funding required to make this a reality.

Encouragingly, NM-AIST is proactively engaged in proposal writing to secure funding, with ambitious targets set in its current strategic plan. These targets include:

- Supporting a higher percentage of postgraduate students through various projects (a target of 95% by June 2023, compared to 80% currently).
- Producing a significant number of patents, copyrights and trademarks (a target of 40 by 2025).
- Increasing the number of faculty and non-faculty members attracting funding for research, innovation, and IP related projects from less than 20% in 2021 to 50% or more in 2026.
- Generating substantial revenue from commercialized intellectual property (a target of 4 billion Tanzanian Shillings, or around USD 1.6 million) in fiscal year 2024/2025.

These targets are ambitious, and their achievement will be a major challenge. However, if achieved, they will contribute to NM-AIST's financial sustainability in significant ways. The university's efforts to establish Nelson Mandela Investment and Nelson Mandela Consultancy, focusing on selling innovations and providing consultancy services, respectively, also signal a strong commitment to financial sustainability.

³² Statement from a document, "Finances Flow at NM-AIST", provided by NM-AIST.

Nevertheless, it should be noted again that it is vital for the University to strategically increase its student numbers to hence the return on investment. A higher enrolment will generate more revenues. However, to make education more affordable, it will be essential for the University to attract externally funded scholarships.

2.8.3 Academic sustainability

Academic sustainability at NM-AIST is characterized by several promising developments, alongside areas where further progress is needed. The incorporation of trained young scientists and scholars into the program, especially PhD graduates from Phase I and II who have joined the NM-AIST faculty, is a significant achievement. According to University records, all graduates from Phase I have been incorporated into the NM-AIST faculty. In Phase II, two of the four graduates have already been incorporated, and an additional prospective graduate is expected to join the University. This step fosters sustainable brain circulation, as these individuals are now actively involved in teaching and research at the university. The commitment of these graduates to see the program's effects continue beyond its implementation period is a testament to their dedication and the program's success in instilling a sense of purpose and belonging. Senior administrators and faculty members were confident that these young scientists will continue to be actively engaged in teaching, research, innovation, community outreach, and fundraising through proposal writing.

The establishment of the Banana Research Centre, a direct outcome of the program, will play a crucial role in perpetuating its impact. This centre, along with other significant initiatives like wetlands and water sanitation projects, holds significant potential for community adoption and is instrumental in sustaining the program's effects. Moreover, NM-AIST has successfully expanded its research capabilities into areas such as aquatic ecology, sustainable mosquito control, and ecotoxicology. These new research initiatives, once beyond the university's capacity, have now evolved into robust projects. To support and expand these initiatives, NM-AIST is actively seeking additional and complementary funding from various sources, including VLIR-UOS. This strategic approach to develop new research areas and securing necessary funding underscores NM-AIST's commitment to academic sustainability and the ongoing impact of the program.

Given that NM-AIST's faculty and staff are public servants, akin to their peers in other Tanzanian public higher education institutions, the university's distinctive mission and vision primarily incentivize staff retention. Although specific mechanisms for ensuring staff retention are not explicitly outlined, NM-AIST's unique institutional identity seems to be a significant motivational factor. However, NM-AIST faces the challenge of developing more concrete and tangible mechanisms to enhance staff retention. The University Research Regulation can play a pivotal role in this regard by providing financial incentives to research groups that secure funding successfully. According to this regulation, the university levies a 15% administrative fee on grant amounts. This fee is supposed to be used to incentivize the Principal Investigator (PI) and Co-Principal Investigators (Co-PIs) of award-winning proposals, with 2% of the grant award going to them. Additionally, 2% of the grant award supports the group's department, and 5% contributes to the school. This incentive structure, if properly implemented, could not only motivate researchers to seek more funding but also act as a pull factor, potentially aiding in staff retention.

Intensification and formalization of interuniversity cooperation (both with the Global South and the Global North) is also an important factor in academic sustainability. This area, however, needs improvement at NM-AIST. While there are anecdotal examples of interuniversity cooperation developed outside the VLIR-UOS framework, the lack of comprehensive data/statistics indicating the strength of these cooperations suggests that more structured efforts may be necessary. Nevertheless, further development of collaborations and exchanges outside the VLIR-UOS program is underway. NM-AIST is actively seeking partnerships with various organizations, including DAAD, USAID, the Bill and Melinda Gates Foundation, DANIDA, IDRC/SIDA, Crop Trust (Bonn-Germany), Kirkhouse Trust, Erasmus Plus, and others. This proactive approach in building relationships beyond VLIR-UOS not only diversifies the university's collaboration portfolio but also strengthens its academic sustainability.

Another aspect contributing to academic sustainability is that NM-AIST has demonstrated capability in producing joint proposals and attracting funds for research and projects. The university's academic staff have been successful in securing competitive national and international research grants, indicating a strong potential for future fundraising and research funding. Notable achievements in early 2023 include substantial grants from Sapiens Labs USA USD (1.5 million), DAAD (EUR 100,000), and the Bill and Melinda Gates Foundation (USD 60,000). The University's website lists 63 active projects (<https://www.nm-aist.ac.tz/index.php/rni/projects>). These successes highlight the university's growing research capacity and its ability to engage in competitive grant writing at both national and international levels.

3 Brief assessment per project³³

An in-depth analysis of the performance of each project was beyond the scope of this final evaluation (which focused on the program itself and on an impact case selected by partner institutions). This section therefore only summarizes each project based on the information gleaned from project self-assessment reports. Generally, these reports were too brief and lacked detail in several areas, leading to an insufficiently comprehensive understanding of each project's performance for the evaluators. Therefore, this brief assessment may not provide a very accurate picture of each project performance (except for P1, which was the subject of the impact case reported in section 4).

Additionally, some scores in these reports appeared overly optimistic, with a lack of clear justification or rationale. This tendency towards high self-assessment ratings was also pointed out by two Flemish stakeholders interviewed, who noted that the self-assessment process was predominantly driven by NM-AIS partners. In some cases, Flemish partners reported that they were not given adequate time to contribute to the self-assessment. Generally, the evaluation team observed that the self-assessments lacked the required methodological rigor and depth, leading to superficial reports with insufficient information and evidence for self-ratings. Project 1 was an exception, providing a relatively comprehensive self-assessment. The evaluation team advises that future self-evaluations adopt a more robust methodology and ensure close coordination among all involved stakeholders. Table 2 below presents the ratings for various performance aspects of the projects as directly extracted from the self-assessment reports.

Table 4. Scores by project based on self-assessments³⁴

	P1	P2	P3	P4	P5
Sustainability (Q3)					
Finance/economic sustainability	3	2	3	2	2
Level of ownership	3	4	4	3	4
Results will continue	4	3	4	3	3
Partnership (Q3)					
Quality of comm within the project/programme	4	4	4	4	4
Academic interest and commitment	4	4	4	4	4
Project management (Q5)					
Value for money	3	3	4	?	4
Working relations with PSU	4	4	4	3	4
Active involvement	4	3	4	4	4
Mutual trust and joint decision making	4	4	4	4	4

³³ To avoid duplication of information, this section focuses on the specificities of each project. Other findings that cut-across the programme level are addressed in the section that discusses findings at programme level.

³⁴ These scores correspond to projects in Phase II. In this section, the focus is on Phase II.

3.1 Project 1: Sustainable Smallholder Banana-Based Farming Systems to Improve Livelihoods of Communities in Northern Tanzania

The project presented the most detailed self-assessment and was recognized as one of the most successful across the IUC at NM-AIST, leading to its selection for the impact case study. Similar to the other four projects, the evaluators observed that the scores given by the project team were occasionally more favourable than the actual performance warranted. For instance, the projected continuity and sustainability of the project's impacts might be more accurately rated as 3 instead of 4. This adjustment is suggested because the establishment of the Banana Research Centre of Excellence is still in the early stages, having only received approval in concept. The realization of this centre is contingent upon securing adequate funding from donors and the Tanzanian government to make the plan operational.

Regarding relevance, as highlighted in the impact case, the research focus of the project closely aligns with the developmental challenges faced by farmers in the Pangani basin area and across Tanzania, reflecting the significance of agriculture in the national economy. Moreover, bananas and maize, being crucial crops for many farmers, underscore the project's importance. Consequently, the high scores awarded in this domain are well justified.

P1 is among the projects whose local project leader concurrently holds significant institutional administrative roles (such a dean position) at NM-AIST. Such dual responsibilities may have somewhat hindered the project's performance/progress due to the leader's busy schedule and conflicting time demands, despite efforts to mitigate challenges. The effectiveness of the project was hindered by a number of factors, some of the most significant of which were outside the team's control. For instance, the graduation timeline for PhD candidates was negatively affected by seasonal rains and climate change challenges, reluctance of farmers to allocate land for trial plots, theft of demonstration crops, and inconsistent seedling supplies from contracted companies. However, the project excelled in areas of partnerships, project management, and synergies between partner institutions, contributing to its overall good performance.

The project successfully established a strong network of collaborators ranging from private sector (Maua Mazuri), NGOs (IITA, FLORESTA), and Government institutions (TARI Maruku, District Extension Officers). It is further proposed that the anticipated partnerships with Flemish institutions, such as TRIAS and VECO, be strengthened in the future. The impact of the project is visible across the demo plots, but its full potential relies on increased efforts and investment in disseminating results, an area that requires further strengthening. A more detailed discussion of the project performance can be found in section 4.

3.2 Project 2: Development of Water Purification Technologies

The self-assessment report for this project was observed to be quite brief, lacking detailed explanations or justifications for the scores assigned. The project encountered challenges, notably the changes and dropout of team members from Phase I, including local promoters for doctoral candidates. Despite these hurdles, a significant achievement of the project was the production of seven publications, almost doubling the original target of four publications set in the project plan. Additionally, Project 2 positively contributed to curriculum development at NM-AIST (four programs), where existing courses were revised and new ones designed, benefiting from the expertise developed within the project.

The constructed wetland at NM-AIST stands as a prominent feature on the campus, attracting the interest of many visitors who are keen to explore the model and understand the underlying science. This project significantly enhances the visibility of VLIR-UOS and the IUC. Key benefits of this project include the reduction of mosquito breeding environments and the provision of cost-effective technology for recycling wastewater, including industrial and sewage waste. This technology has been adopted by various entities, such as Meat King, which the evaluation team visited, and by several individuals for residential use. Additionally, major manufacturing industries like A To Z Textile Mills have upgraded their water treatment systems, drawing on advice and technical support from the project team, which was informed by research supported by the IUC.

Part of the project design includes research on technologies for removal of Fluoride on water, which could save communities. However, efforts to disseminate such technologies need to be improved in order to have a more meaningful and visible impact.

Synergies were noted between this project and non-IUC initiatives within the same hosting school (MEWES), such as the CREATES project. However, connections with Project 5, focusing on incubation and technology commercialization, have remained underdeveloped. Some of the self-assessment scores for this project appeared to be overly optimistic. This perception was also echoed by the Flemish collaborators involved in the project, as they conveyed in their responses to this evaluation.

3.3 Project 3: Applied Aquatic Ecology

In Phase II of the IUC, the open and competitive recruitment of doctoral candidates was designed to attract individuals outside of NM-AIST's existing staff, with the intention of potentially hiring them in the future. This approach was successful, as exemplified by the recruitment of trained external professionals like Dr. Mataba, who has since become an integral faculty member at NM-AIST and actively contributes to both the program and his respective school.

The effectiveness of Project 3 was notably influenced by the turnover of researchers from Phase II. This issue largely stemmed from the departure of staff members from the institution. For instance, one of the project's doctoral candidates in Phase II transitioned from NM-AIST to another institution for employment. Such changes presented significant adaptation challenges for Flemish promoters and candidates, particularly when a local promoter departed. This highlights the need for careful consideration of these risks in the design of IUCs, especially when involving younger institutions.

Outreach initiatives engaging farmers in the Lake Manyara region on best agricultural practices and land use in river systems significantly contributed to the project's impact. The project reached out to 318 farmers, surpassing its target of 250.

The project demonstrated sustainability through various external collaborations, including some opportunities linked with VLIR-UOS. Notably, these included Dr. Grite Nelson's involvement in the Short Initiative, Global Minds, and short visits to Flanders. However, tracing other external collaborations, particularly those directly related to the project, proved challenging. Many of the reported connections are associated with the project's team members. An example of such a linkage is the collaboration with the Global Biodiversity Information Facility (GBIF). The project's scientific contribution to the program was substantial, including 8 publications (twice its target value and slightly more than any other project) and four master's programs that were developed or substantially upgraded.

3.4 Project 4: Institutional Strengthening via ICT and Information Services

This project played a pivotal role in enhancing NM-AIST's ICT infrastructure. The advancements included acquiring essential hardware and software to boost internet connectivity and other ICT-driven services on campus. In addition to internal capacity enhancement, the project extended its impact by training other local institutions in establishing library management systems using the ABCD open-source application. Furthermore, the project established strong connections and synergies with a concurrent IUC Project at Mzumbe University in Tanzania, fostering joint training, experience sharing, and capacity building. This collaborative effort has expanded to include five other academic institutions in the Arusha and Kilimanjaro Regions, which have adopted the ABCD system for their library services.

The project aimed to enhance capacity building by training two PhD candidates. However, its effectiveness faced a setback as only one candidate was recruited instead of the planned two. The project contributed with four publications (doubling its initial target of two). Regarding internal coherence, there was a challenge in discerning the thematic or conceptual connection between the institutional capacity building in Library and ICT management and the research theme designated for the PhD training.

This project involved non-academic Flemish and Tanzanian experts, an approach that was both innovative and relatively rare across VLIR-UOS programs, offering valuable lessons in this type of collaboration. However, aside from the overall positive effect of the system, evaluators noted that a technical staff member at NM-AIST expressed strong preference for alternative systems over the ABCD System, potentially undermining the sustainability of the project's investment. Therefore, it is crucial for NM-AIST management to safeguard this investment by rallying support from staff, students, and other stakeholders.

The specifics of applying ICT to teaching and learning, including the adoption of e-learning in curriculum delivery were, unfortunately, not thoroughly addressed in the project self-evaluation report. However, various plans, complementary initiatives, projects, and proposals involving external collaborators indicated promising opportunities for enhancements in this domain in the future.

Nevertheless, as reported earlier, a key project stakeholder perceived that during the latter half of Phase II, the institutional commitment to sustain and continually improve the library system diminished. This decline in support was particularly notable in the absence of clear institutional incentives for local technical and administrative staff who are not on an academic career trajectory³⁵. Consequently, it's essential for NM-AIST to act decisively to ensure the ABCD system's full potential is realized. This includes implementing strategies for its ongoing maintenance, enhancement, and continuous operation.

3.5 Project 5: Institutional Strengthening through Technology Transfer and Outreach

In the second phase of the IUC, the project focusing on Technology Transfer and Outreach Capacity Strengthening was initiated. This project successfully established a Technology Transfer Office (TTO) at NM-AIST, complete with institutional policies, guidelines, dedicated staff, and physical infrastructure, all facilitated by the project's support and capacity-building efforts. This project aligns closely with NM-AIST's 5D strategic institutional pillars, demonstrating strong coherence with the university's broader objectives.

The project facilitated the establishment of an Intellectual Property (IP) Management and commercialization system at NM-AIST, including the development of guidelines and the setup of an IP Management office and incubation centre, staffed appropriately. However, the effectiveness of these offices hinges on NM-AIST's commitment and investment in supporting incubation and commercialization projects. The prospects for a fully functional system are contingent upon robust outreach and industry linkage operations, which are anticipated to be strengthened in the near future with support from the World Bank-funded HEET project.

NM-AIST has developed and launched new research units focusing on entrepreneurship and innovation within its Business School (BUSH). This initiative includes the design and implementation of relevant Master's and PhD programs, anticipated to foster connections between scientific research and commercialization. However, the self-assessment report provided limited evidence of the valorisation of research outcomes resulting from this project. Enhanced results from the project are expected through synergies with other innovation-supporting projects at NM-AIST, including those funded by the World Bank's HEET project and CREATES, which will contribute to more robust outcomes.

³⁵ See section 2.4.3 for a note on the challenge with incentives for non-academic staff in partnership programs such as this one.

4 Impact case

4.1 Introduction and approach

The “Sustainable smallholder banana-based farming systems to improve livelihoods of communities in Northern Tanzania” was designed to promote a sustainable smallholder banana-based farming system that contributes to improvements in livelihoods of targeted farmers’ communities. Central to this initiative was the training of NM-AIST students through PhD research, conducted in close cooperation with NGOs and extension services. The project's ultimate goal was to position NM-AIST as a leading contributor to regional development through sustainable agricultural practices.

Before the field mission, the evaluation team faced challenges in understanding the impact claimed by the IUC team and in having the team clearly articulate the impact claim. During their visit, they held discussions with the program management to clarify and refine the impact assessment. The evaluators ultimately focused on the potential impact of the action research, which included scientific experiments across 21 trial plots in banana farms across Kilimanjaro and Arusha regions. The aim was to assess the impact based on evidence of enhanced banana yields, achieved through improved soil nutrient management, efficient water use practices, and the adoption of advanced (tissue cultured) banana plantlets/seeds.

The project aimed to support three key Sustainable Development Goals: SDG 8 (Promote inclusive and sustainable economic growth), SDG 2 (End hunger, achieve food security and improved nutrition, and promote sustainable agriculture), and SDG 5 (Achieve gender equality and empower all women and girls). By boosting banana productivity, the project hoped to contribute to poverty alleviation, economic advancement, and food security in northern Tanzania. This is especially significant as about 80% of the population relies on agriculture for their livelihood. Additionally, the project's importance is underscored by the recent decline in market prices for coffee, a major crop for smallholder farmers in the targeted regions.

For this project, the impact claim evaluated was defined as: *The research-led increase in banana yield, through integrated soil fertility and water management, has contributed to enhancing the livelihoods of communities in Northern Tanzania.*

Data collection and limitations of the impact case

Data collection for the impact case was conducted during the IUC program's evaluation field mission. This process involved engaging a variety of stakeholders, such as beneficiary farmers, researchers, and partner institutions, to gather evidence of impact while efficiently utilizing fieldwork time. Activities included seven interviews, two focus group discussions, and a daylong farm/field visit, involving interactions with five maize and banana farmers and a district agricultural extension officer. The focus groups consisted of project researchers in one group and farmers in the other, with a total of thirteen individuals participating in the evaluation, including four women.

The evaluation field mission took place after the implementation of the banana research interventions, with farmers and extension agents spread across four remote districts in two separate regions of Tanzania. Because of time and resource constraints, the evaluators were only able to visit two project trial farms. They also interacted with farmers from a nearby village, who came to the NM-AIST campus for a focus group discussion. Given this limited scope of field mission and interactions, there is a possibility that the mission results in a somewhat limited understanding of the impact of this project.

4.2 Performance Story of the Project

In line with its Theory of Change (ToC), the project aimed to sustainably intensify banana-based farming systems in the Upper Pangani Basin. This goal was pursued by assessing soil nutrient levels to refine integrated soil fertility interventions and enhancing nutrient-water use efficiency through experimental research. Researchers worked in tandem with strategic stakeholders, such as NGOs, farmer communities, and public extension services in the study areas, to encourage the adoption of improved banana agronomic practices among farmers. This collaboration aimed to boost banana yields, thereby enhancing farmers' incomes and livelihoods. The ToC is depicted in the figure below.

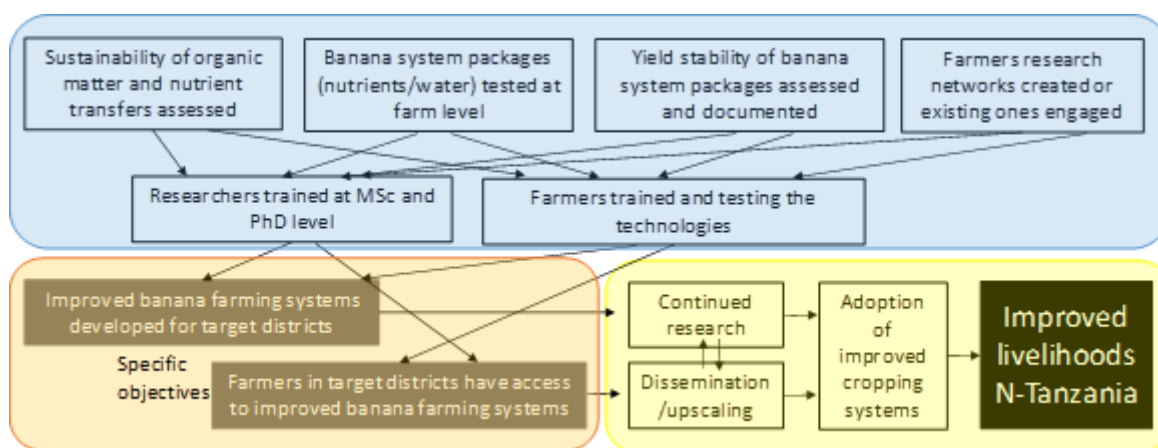


Figure 3. Theory of change with spheres of control (blue/grey), influence (orange) and interest (yellow)

In summary, the project's impact centered on the broad improvements in community extension services through training, workshops, and the Community Information Centre at NM-AIST. This aspect of the project was meant to empower a wider community of farmers in the upper Pangani Basin area to enhance their farming practices and protect soil nutrients, which was expected to result in an improved income and livelihoods. The approach was developed based on evidence from experimental research conducted by PhD and MSc candidates supported by the project. The project's intermediate results included enhanced institutional capacity of NM-AIST and its collaborators, evident in trained staff, improved research facilities, and strengthened networks and collaborations.

Table 5. Overview of project mechanisms, collaborative mechanisms, and contextual elements

Mechanisms	Description
Project mechanisms	<ul style="list-style-type: none"> - The action research approach developed within the project involving demonstration of enhanced banana yield through improved farming practices - Training of PhD and Masters students to manage soil nutrients and efficiently use water for banana irrigation -
Collaborative mechanisms	<ul style="list-style-type: none"> - Interactions and farmers linkages with key sector actors, including researchers, banana plantlets suppliers, extension officers and NGOs - Synergy with other IUC projects on the use of digital technologies to disseminate the evidence and information on improved banana farming systems -
Contextual elements	<ul style="list-style-type: none"> - Delay in delivery of planting materials by the contracted private companies - Theft of trial banana plants (resulting in unintended expenditures on security guards) and of banana produce - Negative effects of climate change including, lack of rainfalls (resulting in delayed research results)

4.3 Project Activities

The project's team, comprising doctoral and master's candidates along with their supervisors and support staff, successfully identified and reached agreements with farmers for demonstration farms in the Upper Pangani area, covering Meru, Hai, Rombo, and Moshi Rural Districts. In total, twenty-one (21) trial plots across these four districts were secured, fulfilling the research design's requirements.

Soil testing and analysis were conducted on the demonstration plots to verify that they met the required research conditions. Subsequently, trial plants were deployed, and experiments were conducted focusing on soil nutrient application and water management practices. These experimental activities were facilitated through collaborations with private firms, including Crop Biosciences and Maua Mazuri, which were contracted to supply banana plantlets.

As research results indicated enhanced banana yields through improved farming practices, researchers planned to engage extensively with farmers and stakeholders, showcasing these results to encourage adoption of the new farming system. The project design incorporated various interventions to facilitate this process:

- Training farmers through various platforms including designated training sessions and through religious gatherings
- Establishment of farmers research networks composed of 50-100 farmers
- Organization of workshops on aspects of banana farming systems with involvement of relevant NGOs, policy makers, researchers and other stakeholders
- Organization of farmers' field days to showcase the research activities in the target districts
- Dissemination of information to farmers and extension agents through leaflets, posters, brochures, and other media tools such as radio and television
- Development of knowledge dissemination tools in collaboration with the Community Information Center at NM-AIST (CIC) to deliver useful information related to banana-based farming systems to researchers, extensionists, NGO's and farmers

The expectation was (and is) that community-based interventions and the dissemination of evidence from the action research will motivate a significant number of banana farmers in the Upper Pangani area to adopt these findings, with the aim of boosting their yields and thereby enhancing their livelihoods.

4.4 Overview of Changes

Table 4 synthesizes key changes enacted through the project, including the identification and evaluation of the strength of the evidence, the significance of the impact, and the project's contribution to these changes. Notable changes enacted through this project include the following:

- The project established synergy with Project 2 of the IUC, utilizing treated wastewater from constructed wetlands for irrigating banana fields.
- Substantial evidence indicated that improved farming practices led to significantly higher banana yields, tripling in some instances. Among the varying results, Rombo District exhibited the highest yield increase, with the best combination of interventions yielding up to 70 kg of banana per plant, compared to the average 15 kg typically harvested using traditional methods.
- The implementation and expansion of demonstrated improvements in banana varieties, soil nutrient management, and water management practices led to better livelihoods for participating farmers and their neighbours. Farmers interviewed reported that the increased income from higher yields, coupled with savings from reduced production costs, was utilized to cover school fees, enhance their housing, and reinvest in additional income-generating activities. Two out of the four farmers visited had replicated the trial model in other parts of their farms, influencing their neighbours to adopt the system as well. However, evaluators could not determine the total number of farmers who adopted these practices. An extension officer indicated that adoption rates were limited, primarily due to weak dissemination mechanisms, the high cost of organic fertilizers, and limited access to tissue-cultured banana plantlets.
- Analysis of the project reports showed a reduction in budget allocations for dissemination-related interventions. Funds initially earmarked for creating farmer research networks, workshops, and training were redirected to research activities. Additionally, the development of a dissemination app, in collaboration with another IUC project, had not produced results by the time of the evaluation. The evaluators learned that the app was still in the trial phase and was scheduled to be tested during the week of the evaluation mission.

4.5 Project's Impact

In this section, the evaluators identify and analyse changes related to the impact claim. These changes are organized by sphere of control, sphere of influence and sphere of interest.

Impact within sphere of control

Evidence strongly indicates the project's impact within the scope of the researchers and NM-AIST as an institution, with a clear link to the action research-based project intervention. However, the significance of these changes at the institutional and researcher levels is more limited, as they are not directly connected to the impact claim at the farmer level. Notable changes, for which evidence is available, are particularly highlighted.

- Evidence within the trial plots on a three-fold increase in harvest of banana in terms of weight
- A good track record of PhD and Masters candidates' academic progress identified through retention, graduation and academic outputs such as publications
- Strong linkage between NM-AIST and relevant local NGOs working in the similar domain of agriculture and banana farming across the intervention areas, with possibilities of enhancing synergies with relevant Flemish NGOs as stipulated in the project design
- The NM-AIST management demonstrated sustained support towards the project including the approval and resources commitment for establishment of the Banana Research Center of Excellence
- Improvements in research facilities at NM-AIST including ICT tools, laboratories and equipment that contributed to leadership in banana research

Table 6. Overview of changes: Sphere of control

Actor	Change ³⁶ <i>Scale: Green = Strong, Yellow = Moderate, Orange = Weak, Red = Unacceptable</i>	Evidence	Significance	Contribution
Researchers (PhD, Masters and Supervisors)	Researchers and NM-AIST established collaborations with government, Civil Society and government institutions to support banana farmers in the upper Pangani region	Green	Yellow	Green
	Researchers have synergies with other projects within the IUC; this is exemplified by the utilization of constructed wetland on banana irrigation	Green	Yellow	Green
	Researchers disseminate the evidence to farmers through digital technologies, training and workshop. Evaluators could not trace evidence on this intermediate result.	Green	Yellow	Green
Farmers	Many farmers in the Upper Pangani area are more aware of improved banana farming systems	Green	Orange	Green
	Banana farmers are more linked to the relevant private sector (plantlet suppliers) and NGOs actors.	Yellow	Orange	Green
	Banana farmers are more inter-connected and thus able to establish peer support and collaborative learning.	Yellow	Orange	Green

³⁶ See Annex 8.5 for the rubric used to assess change

Impact within sphere of influence

The evidence supporting both intended and unintended changes within the project's sphere of influence is moderate, yet these changes hold fairly significant relevance to the impact claim. The project notably influenced changes among farmers who owned the trial plots, leading to a somewhat limited adoption of the system by neighbouring farmers. Specific changes, for which evidence is available, include:

- Appreciated evidence on higher banana yield across the trial farms and farmers who adopted the system.
- Over 1000 farmers were reached out by researchers through farmers days, and seminars provided by researchers during religious gatherings. However, there was lack of evidence on the total number of farmers who have already adopted these innovative agricultural practices.
- A high level of appreciation of the project by the district extension officers and farmers who interacted with the evaluation team. These included both farmers in the demonstration plots and their neighbours.

Several **contextual factors** could be identified that have impacted the identified changes.

- Farmers identified the limited availability and high cost of improved banana seedlings as a key barrier to adopt the new farming practices. This scarcity was partly due to tissue culture companies being overwhelmed with orders from various programs and large-scale farmers, resulting in an insufficient supply for smallholder farmers in the project villages.
- Climate-related challenges, particularly the reduced rainfall and ensuing water scarcity, hindered the effectiveness and timely demonstration of the project's research findings, impacting the strength of evidence regarding banana irrigation techniques.
- The elevated cost and limited availability of organic fertilizers, crucial for soil nutrient management, curtailed the wider adoption of the nutrient management system advocated by the researchers among the farming community.

Table 7. Overview of changes: Sphere of influence

Actor	Change <i>Scale: Green = Strong, Yellow = Moderate, Orange = Weak, Red = Unacceptable</i>	Evidence	Significance	Contribution
Farmers	Intermediary benefit (1 st level): Farmers receive improved extension services on banana farming	Green	Orange	Green
	Intermediary result (2 nd level): Farmers appreciate and adopt improved banana farming technologies promoted by the project	Green	Yellow	Green
	Impact (3 rd level): Improved banana yield among farmers in the upper Pangani area	Green	Green	Green
	Impact (4 th level): enhanced livelihoods among farmers participating in the demonstrations and their neighbours.	Yellow	Orange	Orange

Impact within sphere of interest

The scope of changes within the sphere of interest extends beyond the immediate reach of the banana research project's action research. The evidence supporting changes in the sphere of interest is still weak. There is a potential for nutritional, water efficiency and drought tolerance enhancement of banana through research and technology, such as bio-fortification, these aspects are anticipated to be to be addressed in future research at NM-AIST. Although the project did not monitor the overall contribution of the innovative banana farming system, field data on adoption rates suggests that the project's impact on improving the livelihoods of a broad population of farmers in the Upper Pangani Basin ranges from weak to moderate at present, as summarized below:

Table 8. Overview of changes: Sphere of interest

Actor	Change	Evidence	Significance	Contribution
	<i>Scale: Green = Strong, Yellow = Moderate, Orange = Weak, Red = Unacceptable</i>			
Environment	Improved nutrition and food security in the region in the region	Orange	Yellow	Yellow
Health	Reduced levels of poverty and improved gender balance	Orange	Yellow	Yellow

4.6 Conclusions

The 'Sustainable Smallholder Banana and Maize-Based Farming Systems in Northern Tanzania' project has had a positive impact for banana farmers, agricultural extension service providers, and private sector actors. It enabled smallholder farmers to adopt new strategies for sustainable crop production. The project engaged with approximately 1000 farmers, the highest number among the five projects under the IUC, though the overall technology adoption rate remains moderate. This moderate adoption rate is partly due to the limited emphasis on research dissemination and the reallocation of resources initially intended for farmer engagement to research activities during the project's final two years. Additionally, the modest dissemination efforts highlight the nascent stage of NM-AIST's commercialization capacity, as supported by the IUC.

In terms of intermediate results, the project has markedly boosted NM-AIST's stature and leadership in banana research within Tanzania. NM-AIST is now well-regarded and collaborates with numerous entities, such as the Tanzanian Agricultural Research Institute (TARI) and various NGOs. The planned establishment of the Banana Research Centre is poised to further elevate the university's academic influence. This centre is expected to focus on improving both the productivity and profitability of banana cultivation, thus contributing significantly to food and nutrition security in Eastern Africa, a region where bananas provide up to 40% of the total caloric intake.

5 Findings on the learning questions

5.1 How to support PhD trajectories, with a focus on optimising diversity/inclusivity (gender and Leave No One Behind)?

Optimizing diversity and inclusivity in PhD trajectories is essential for creating and fostering a vibrant academic environment. In this section we highlight the main measures and practices that emerged from interviews and document reviews.

Gender policy/mainstreaming and Leave No One Behind: In 2019, a comprehensive gender policy/regulation was established to address the systemic challenge of gender inequalities in Science, Engineering, Technology, and Innovation (SETI), alongside tackling other gender-related institutional issues including sexual harassment, imbalanced student enrolment, gender responsive curricular development, gender research initiatives, and gender representation in decision-making roles. This policy acknowledges gender stereotypes, biases, and imbalances, specifically focusing on their detrimental impact on female students. It aims to foster female enrolment in SETI by introducing a range of policy guidelines and operational procedures³⁷. However, the effectiveness of this gender policy in enhancing diversity within university leadership and PhD recruitment remains ambiguous. The institution is currently developing family sized residences for candidates in order to encourage female candidates with children to enrol. External evaluators, using admission and enrolment data from NM-AIST, computed and analysed the gender ratio among PhD students over the last six academic years (see Annex 8.5). Although there was some fluctuation, the data indicates an overall improvement in gender balance among PhD recruits following the policy's implementation, despite a continued underrepresentation of women (a ratio of 2 new male PhD students for every female student in 2022/2023).

However, despite these improvements, Phase II faced challenges in achieving gender balance, as only one out of the seven PhD students (14.3%) was female. This was a significant shift from Phase I, where two-thirds of the PhD candidates (4 out of 6, or 66.7%) were female. This disparity underscores the need for a balanced approach in PhD candidate recruitment that weighs the benefits of an open admission strategy (advertising calls nationally for a wider candidate pool) against the importance of internal capacity building through institutional selections (which may offer a limited pool of qualified candidates, as experienced in Phase I)³⁸.

The PhD candidates selected for the VLIR-UOS program at NM-AIST showcase a mix of backgrounds that aligns with the "Leave No One Behind" principle of the UN Sustainable Development Agenda. Their diverse socio-economic backgrounds, ranging from rural middle-class to modest means deeply rooted in the peasantry class, reflect the program's commitment to inclusivity and diversity. Most PhD students came from families with parents having primary education or below. Most were also married and had children. The candidates' profiles demonstrate that the program reaches individuals from varied socio-economic statuses, offering opportunities for higher education (at the doctoral level in particular) to those who might not have access otherwise. This diversity supports the agenda's goal of ensuring equal opportunities for all, regardless of their socio-economic background, thereby contributing to breaking the cycle of poverty and enabling social mobility.

Research quality and output: To enhance the scientific quality of doctoral research outputs, comprehensive measures were implemented, including meticulous monitoring of thesis progress, diligent proofreading of manuscripts, and the use of tools like Turnitin for plagiarism detection. These steps were instrumental in upholding the integrity of academic work. As a result, PhD students in Phase II successfully published twelve papers in international peer-reviewed journals, significantly contributing to the research productivity and academic standing of NM-AIST. By the time of evaluation 15 papers were published by Phase II students³⁹.

³⁷ NM-AIST Gender Policy (published December 2019); NM-AIST Gender Regulation (published December 2019)

³⁸ The open selection also came with a challenge of harnessing the scholarship opportunities to enhance the staff capacity at NM-AIST with all selected candidates being non-staff, except for one candidate who transferred to the institution after graduation.

³⁹ A reviewer of the draft evaluation report noted that an additional paper had been published by students, after the evaluation (thus resulting in a total of 16 student publications).

Peer mentoring: The implementation of informal peer mentoring, facilitated by advanced PhD candidates, played a pivotal role in helping new students acclimate to their respective doctoral programs. This approach not only fostered scientific engagement (e.g., opportunities like co-authoring publications), but also bolstered students' resilience. While this beneficial aspect of peer mentoring was specifically highlighted by a single interviewee, a PhD graduate, its importance in contributing to progress towards doctoral degrees is well-supported and validated in existing academic literature.

Contingency support: The completion of PhD programs for some students faced significant delays due to unforeseen challenges such as the COVID-19 pandemic and erratic rainfall patterns, which notably hindered field experiments, particularly in agricultural research. These unexpected events affected three out of seven PhD students, impeding their ability to complete experiments and graduate on schedule. To mitigate these disruptions, contingency support mechanisms were established (e.g., extension of timelines for completing milestones and continuous financial support), aimed at ensuring the continuity of progress and eventual completion of PhD programs. This consistent support has enabled the affected students to maintain their course in the program, and they are now on track to complete their degrees by the end of the program, with at least one student anticipated to graduate by the end of December 2023. Unexpected events (such as climate/seasonal disruptions) warrant special consideration and additional support.

PhD student workload and academic adjustment: The evaluation team learned that the progress of PhD students was occasionally hindered by additional responsibilities at NM-AIST, particularly administrative tasks. However, it was not clear how predominant these responsibilities were and how severely they affected progress. Moreover, some PhD students indicated that they were not fully relieved from their duties as academic staff while on study leave. To keep PhD students concentrated on their academic pursuits, it is essential for the program to secure a commitment from the local institution's management to exempt PhD candidates from all non-academic duties. This approach will guarantee that PhD candidates can devote their full attention and efforts to their doctoral research, thereby enhancing the likelihood of their success. The evaluation team learned that some PhD students faced challenges adapting to the Belgian academic environment, exhibiting a more reserved and cautious academic demeanour compared to their engagement at NM-AIST. To address this, partner institutions should develop strategies that assist PhD students in acclimating to and becoming integrated within the Belgian academic system and societal context.

5.2 What factors and measures, at VLIR-UOS/IUC level and/or at partner institute level, support effective coordination of programmes?

Program design: The program's structure was a product of intensive collaboration between Flemish institutions and NM-AIST, characterized by a bottom-up approach where decisions originated at the project level. These decisions were then shared and discussed between/among NM-AIST and Flemish collaborators before being escalated to program management. This approach fostered a sense of ownership among local stakeholders and enhanced synergies. The program demonstrated commendable performance, evident in research outputs, retention of PhD candidates, and the achievement of other targeted results, as highlighted in the self-assessment report. In one specific project, a change in the local project leader posed challenges to synergy and performance. However, the local program coordinator and his Flemish counterpart effectively navigated these changes, ensuring the project's smooth and uninterrupted progression.

Establishment and functioning of the program support unit: The creation and implementation of the Program Support Unit (PSU) significantly contributed to the program's efficiency. It fostered effective internal and external communication and ensured stakeholders had a clear understanding of the program requirements. This positive impact of the PSU was frequently mentioned in interviews and was evident through the support it provided to the evaluation team. The PSU functioned as a pivotal point for facilitating interactions among stakeholders and interpreting program requirements. It is important to note that the official who spearheaded the PSU is not a permanent employee of NM-AIST. This position is directly supported by the VLIR-UOS program. In the absence of a subsequent program to maintain this staff member, the valuable knowledge and experience accumulated through the IUC program risks being lost to NM-AIST in the future, unless proactive measures are taken to retain this key staff member.

Quarterly monitoring and reporting: Implementing a system of quarterly monitoring and reporting proved to be instrumental in maintaining the momentum and focus of all stakeholders. This regular update on progress ensured that activities were aligned with the set requirements and were on schedule for timely completion. It also provided a crucial mechanism for identifying and addressing any issues or unexpected challenges promptly. Furthermore, this measure guaranteed that both planning and reporting were consistently completed in adherence to VLIR-UOS guidelines and deadlines, thus facilitating efficient and effective program management.

Well-organized steering committee meetings: The well-structured organization of steering committee meetings played a pivotal role in streamlining decision-making processes and ensuring the timely achievement of intended outputs and targets. Evidence gathered from interviews and document reviews indicates that activities were not only completed, but also that targets were met within the designated timelines. The efficiency and success in reaching these outcomes can be largely attributed to the effective organization and planning of these committee meetings.

Strategic inclusion of stakeholders in steering committee meetings: The decision to involve a wide range of stakeholders, including PhD students, in Steering Committee Meetings had a significant impact. It ensured that all parties had an opportunity to contribute their perspectives and insights. This inclusive approach was repeatedly emphasized in interviews and was also noted in the self-assessment report, highlighting its effectiveness in fostering a collaborative and participatory environment.

Flexibility in fund reallocation granted to local institution: Allowing the local institution the autonomy to reallocate funds (with the Steering Committee's approval) had a multi-faceted impact. It fostered a sense of ownership, trust, and transparency within the institution. This flexibility also enabled the provision of research support to NM-AIST PhD and master's candidates working on topics aligned with project objectives. The details of the students who benefitted from this support were documented and included in the program reports.

Flexibility and adaptations in response to changing contexts: The primary outcome of this approach was the enhanced capability of partner institutions to manage unexpected disruptions (notably the disruption caused by the COVID-19 pandemic) effectively. According to the 2022 Progress Report, VLIR-UOS adapted its implementation schedule for AP2021, extending it to 20 months instead of the usual 12. This shift inevitably impacted AP2022 as well. The extension of the program by 8 months was a strategic response that allowed the Program to effectively navigate and mitigate the challenges posed by these disruptions.

Trust, transparency, and respect: These three fundamental elements — trust, transparency, and respect — play a crucial role in shaping collaborations between organizations. Interviewees consistently highlighted that the program was distinguished by a culture of mutual trust, respect, and transparency. A notable strength was the participants' ability to actively listen, comprehend each other's backgrounds and contexts, and collaborate effectively as a unified team. This conducive environment fostered a heightened sense of ownership, commitment, awareness of progress, and an eagerness to collaborate. Furthermore, it significantly bolstered the partnership, leading to enhanced accountability and overall performance. Nevertheless, although trust was an overall strength of the program and its projects, there were instances where it was less robust in certain projects and at certain times, thus hampering the project's performance. This particularly occurred in situations marked by diverging interests, diminishing motivation and engagement, and less supportive project leadership support.

Effective internal and external communication (horizontal and vertical): Efficient communication, both within and outside the organization and across all levels, enabled a clearer understanding of requirements and heightened awareness of progress, thereby enhancing the visibility of program outputs and outcomes. This aspect was repeatedly emphasized in interviews with various stakeholders. Effective communication plays a crucial role in clarifying expectations and resolving any issues or ambiguities that may arise.

Highly committed and supportive coordinators and project leaders: The consensus among participants was that the project coordinators were exceptionally committed and supportive. Similarly, the project leaders were generally perceived as very supportive and engaged, though there were a few exceptions where the level of support and engagement was seen as lacking. The tangible evidence of this strong support is reflected in the program's substantial achievement of its objectives and outcomes,

with most of the original targets being exceeded. Such a high level of accomplishment underscores the critical role played by the dedicated support from both program coordinators and project leaders. Notable synergies were evident between the local program coordinator and support office and their Flemish counterparts, significantly contributing to the effectiveness of program management. Additionally, the IUC at NM-AIST was characterized by a robust bottom-up approach in defining the program and project agendas, further reinforcing its strengths.

Strong institutional support and recognition: Institutional support and recognition facilitated the integration of program outcomes into the institutional framework and policies of NM-AIST. Notable developments included the establishment of new structures such as the Technology Transfer Office, and amendments to the University's Corporate Plan and Research Strategy, influenced by the program outcomes. Despite frequent changes in top management during the IUC's lifespan, these transitions did not significantly impact the management's support for the program, though they might have had some implications for the overall institutional performance. The program and project management teams proactively engaged in rallying management support for the program. NM-AIST, being in its nascent stages during the first phase of the IUC, provided a unique context for the program. The strong embedding of the VLIR-UOS program within the institution offers valuable insights that could be beneficial when compared with other young academic institutions.

For the Flemish program coordinator and project leaders, institutional support and recognition were not as frequently cited as enabling factors. There was rather a sense in which Flemish academics' involvement in this partnership programme was not driven by external incentives, but by an intrinsic motivation and satisfaction for being able to contribute to the programme's ambitious goals, the success of the partner institution, and the empowerment of a new generation of academics at the NM-AIST. The continuity and sustainability of the networks established through this partnership held significant value for the Flemish stakeholders.

5.3 How to ensure uptake of research results or new educational practices by political and societal actors and end-users?

Establishment of a technology transfer structure and outreach policy: NM-AIST has implemented a structured process for technology transfer and developed a comprehensive outreach policy, including the formulation of technology and intellectual property (IP) policies, guidelines, and regulations. The anticipated impact is to ensure that knowledge, innovation, and technology effectively reach society and the market, creating meaningful impacts. While evidence of success in this area is still emerging, with more work required, notable achievements include the incubation of 11 projects, management of 10 intellectual property rights, and the creation of four spinoffs as of April 2023.

However, there is yet to be significant evidence of products or innovations being tested in the market or commercialized. The program has successfully established a platform for the protection and potential commercialization of knowledge and innovation generated by the University. The forthcoming phase, which requires further investment, should focus on attracting funding and support for the actual commercialization of these innovations.

Strengthening cooperation and collaboration with external institutions and organizations: This strategy plays a crucial role in facilitating the adoption of knowledge and practices. Notably, such collaborations have led to the adoption of the ABCD library system by five academic institutions in the Arusha and Kilimanjaro regions. There is also evidence of successful collaboration with IITA and TARI on Banana Research. The number of institutional collaborations is on the rise, as indicated by the growing number of Memorandums of Understanding (MoUs) and joint grant proposals. However, these partnerships are still in their nascent stages, with the challenge of securing funding to finance the associated activities remaining.

Engaging in action research to address real development problems: This approach has been instrumental in generating knowledge with direct applications and relevance to community challenges. For example, the wetlands system has been adopted by various companies and organizations, and farmers have begun to embrace innovative agricultural practices that enhance productivity, albeit currently on a small scale. Stakeholders have recognized a direct link between the knowledge and innovative practices developed by the University and the real-life challenges they encounter.

Additionally, there is a notable alignment between the goals of the IUC and both National Development Strategies and the Sustainable Development Goals (SDGs), further highlighting the relevance and impact of this research.

Community Engagement: This aspect encompasses a range of activities such as workshops, seminars, and the distribution of brochures/guidelines, all aimed at disseminating knowledge and practices in a simple, locally comprehensible manner. These efforts have succeeded in reaching a broader audience, raising awareness among community members about innovative practices, and contributing to increased agricultural productivity. Small-scale farmers, particularly those involved in banana and maize cultivation, have provided positive testimonials regarding the impact of this engagement. Such measures play a crucial role in making knowledge and innovation easily accessible to community members, thereby facilitating its adoption.

Conversion of Scientific Results into Policy Briefs and Flyers: This approach is designed to elevate awareness of scientific research findings and foster their integration into decision-making and policy development processes. Researchers from the IUC have actively participated in the formulation of National Plans pertinent to their areas of study. A notable example includes the involvement of a professor in the development of the National Water, Sanitation, and Hygiene (WASH) strategy. Such initiatives underscore the practical application and influence of academic research in shaping national policies.

6 Conclusions

The current evaluation assesses the performance of the VLIR-UOS Phase II of the IUC Program at the Nelson Mandela Institution of Science and Technology during its implementation from 2019 to 2023. Employing the DAC **evaluation** framework, and after thorough interviews and document reviews, the external evaluation team concluded that the program demonstrated a good-to-excellent level of performance. This performance varied across different aspects, with the program excelling particularly in relevance. It also showed strong coherence, effectiveness, and impact, while sustainability was identified as the area with comparatively less strength compared to the other areas. Inhibiting factors and challenges also emerged and will be summarized in separate sections.

Relevance: The VLIR-UOS program at the Nelson Mandela African Institution of Science and Technology (NM-AIST) is highly relevant on multiple fronts, aligning seamlessly with NM-AIST's institutional goals, Tanzania's development objectives, and the United Nations Sustainable Development Goals (SDGs). It resonates with NM-AIST's mission to develop African scientists, engineers, and technologists and directly contributes to institutional capacity building, especially in master's and PhD training. The program's focus areas - water quality, agriculture, ICT, and technology transfer - are in sync with NM-AIST's strategic objectives and Tanzania's critical needs, particularly in natural resource management and technological advancement. These areas address key Tanzanian challenges and align with several SDGs, including Goals 2, 6, 9, and 17. Additionally, the program's commitment to environmental sustainability, gender equity, and cultural sensitivity mirrors global priorities like SDG 5 and SDG 13. Overall, the VLIR-UOS program exemplifies how higher education institutions can tackle global challenges while fostering local and regional sustainable development capacity.

Coherence: The VLIR-UOS program at NM-AIST demonstrates significant internal coherence, aligning well with the institution's mission, vision, strategic plan, and policies, particularly in its focus on institutional capacity building, research, and technology transfer. This coherence is evident in the synergy of various projects under the program, such as the integration of water treatment and agricultural projects and the bridging role of ICT enhancements in facilitating research and knowledge exchange. Additionally, the program's alignment with NM-AIST's holistic approach to development challenges, as seen in its complementarity with other funded projects, underscores its effectiveness in addressing both institutional and regional development goals. Externally, while there are instances of effective collaboration and partnership with local institutions and organizations, such as the development of fluoride filters with Mzumbe University and water sanitation technologies with Ardhi University, there is room for deeper engagement with external actors. NM-AIST's involvement with projects like CREATES and WISE-Futures through the African Development Bank, and the promotion of the ABCD library management system, illustrate some external coherence. However, the program could benefit from more robust external synergies and partnerships, both within Tanzania and internationally, to maximize its impact and address development challenges more comprehensively.

Effectiveness: The VLIR-UOS program at NM-AIST has successfully achieved the vast majority of its objectives, significantly bolstering the institution's capacity in various key areas. The program has notably enhanced NM-AIST's capabilities in education, research, and industry collaboration, aligning with its mission to be an innovation hub. It exceeded its targets in impactful scientific research, particularly in critical areas like water quality, agriculture, and ICT, and aligned these efforts with both global and national development goals. The program also improved PhD completion rates, though it fell short of the recruitment target in Phase II. A strong multidisciplinary approach was fostered, integrating sustainable development strategies across various institutional projects. In terms of outreach and community engagement, the program surpassed its targets, effectively extending its reach and impact beyond the academic community—although more work is needed to scale up this impact. Additionally, the establishment of a Technology Park, including an Incubation Centre and Technology Transfer Office, has facilitated the transfer of technology and innovation to society and industry—though there is still a lot of room for improvement in this area. Infrastructure enhancements, particularly in ICT, library services, and laboratory facilities, further underscore the program's comprehensive impact. Overall, the program has largely met its objectives and has made substantial contributions to the university's development and strategic goals.

Scientific Quality: The VLIR-UOS program at NM-AIST has markedly enhanced both the quality of education and research. Educationally, all master's and PhD programs have received national and at

least one program international accreditations, demonstrating adherence to high academic standards. There has been a notable improvement in PhD training and completion rates, with substantial updates to several master's programs and the introduction of online course evaluations, reflecting high student satisfaction. The increase in qualified lecturers further underscores this growth. On the research front, the program contributed to boosting NM-AIST's research output and publication quality, as demonstrated by achieving 26 publications in international peer-reviewed journals during Phase II, exceeding the initial target of 14. This achievement includes a notable contribution of 13 publications from PhD students and 2 from master's students. Achievement in scientific quality is complemented by NM-AIST's substantial rise in global webometrics rankings, showcasing its growing influence and visibility in the academic community. Collectively, these accomplishments under the VLIR-UOS program demonstrate a profound improvement in NM-AIST's academic and research capacity.

Efficiency: The VLIR-UOS program at NM-AIST has demonstrated high efficiency in its second phase, attributed to well-integrated lessons from Phase I. Key improvements include a clear definition of supervisors' roles, contributing to higher graduation rates, and meticulous activity planning. The budget formulation was participatory and flexible, allowing effective resource allocation. The needs assessment process followed a thorough bottom-up approach, ensuring alignment of resources with objectives. The program yielded a positive return on investment, enhancing education and research quality, and increasing institutional capacity. However, challenges in cost-effectiveness arose due to the centralized Tanzanian procurement system, leading to higher procurement costs and delays locally. However, NM-AIST was able to address such challenges effectively (and in some instances with the assistance of Flemish partners). Organizational management and structures, including the Joint Steering Committee and the Programme Support Unit, significantly contributed to efficient program implementation. Active participation and strategic planning in meetings and decision-making processes, coupled with the commitment of project leaders and team members, further boosted the program's efficiency.

Impact: The VLIR-UOS program at NM-AIST has had a significant impact on institutional capacity, academic enhancement, research and development, technological innovation, and community engagement. From 2019 to 2023, there was marked progress in NM-AIST's capabilities across five core domains (achieve coherence, deliver results, relate to external stakeholders, act and commit, and adapt and self-renew), with notable improvements in 83% of the 18 assessed domains. Academically, the program empowered staff and updated several master's programs, contributing to research productivity. In research and development, it notably advanced specialized domains like banana research, leading to plans for a major banana research centre. The program significantly increased NM-AIST's research output, with 26 peer-reviewed publications, and facilitated the development of a Technology Park, enhancing technology transfer and innovation.

Infrastructure enhancements in digitalization, ICT, and labs have notably improved educational resources and technological capabilities. Strategic shifts in policies and a focus on multidisciplinary research groups have matured NM-AIST's research ethos. Collaborative efforts with various stakeholders have enriched research, knowledge sharing, and community involvement. The program's impact extends to the community, empowering local farmers with improved agricultural techniques and driving innovations in wastewater management and industrial collaboration. Entrepreneurial initiatives and intellectual property development have also emerged, showcasing the program's role in fostering innovation and practical application of research. Lastly, the program's contributions to policy and decision-making emphasize its role in driving evidence-based practices and broader societal outcomes.

Sustainability: The VLIR-UOS program at NM-AIST has significantly contributed to institutional, financial, and academic sustainability. Institutional sustainability is assured due to NM-AIST's status as a public institution and its support from the Tanzanian government (and potential future support from the East African Community). Financially, the university is viable and operationally continuous, with diverse (though still insufficient) support for capacity building, research, and innovation. NM-AIST has successfully attracted various development partners and external funding, demonstrating a strategic approach towards sustainability. However, challenges remain in securing sufficient government and non-government funding for research and innovation. In terms of academic sustainability, NM-AIST has incorporated trained young scientists into its faculty, fostering sustainable brain circulation and continuity of the program's impacts. Initiatives like the Banana Research Centre and expanded research capabilities in new areas demonstrate NM-AIST's commitment to sustaining and expanding the program's effects. Staff retention is motivated by the university's unique mission and vision, with financial incentives provided for successful grant acquisition. Additionally, NM-AIST is actively seeking

partnerships beyond VLIR-UOS, diversifying its collaboration portfolio and strengthening its academic sustainability. The university's ability to produce joint proposals and attract research funding, evidenced by substantial grants, underscores its growing research capacity and potential for future sustainability.

Facilitating and inhibiting factors

Facilitating factors: The success of the VLIR-UOS program at NM-AIST can be attributed to several facilitating factors. The program's design, featuring a coordination structure with representatives from both local and Flemish institutions and substantial decision-making authority for the local institution, distinguished it from traditional donor-driven initiatives. This approach, focused on the specific needs of NM-AIST, fostered a sense of ownership and alignment with program goals. The commitment and motivation of both NM-AIST and the Flemish partner, along with strong support from NM-AIST management, were crucial in achieving the program's objectives. Effective communication, trust between coordinators and project leaders, and adept people management skills facilitated smooth project execution. The program overcame initial recruitment challenges, resulting in improved student completion rates in Phase II. The establishment of a dedicated program support unit enhanced coordination, monitoring, and reporting, thereby increasing efficiency. Clear accountability processes and transparent resource utilization, coupled with VLIR-UOS's willingness to extend the program timeline in response to COVID-19 disruptions, showcased its flexibility and adaptability. Importantly, integrating lessons learned from Phase I into Phase II significantly contributed to the program's effectiveness, enabling ongoing improvements and refinements.

Inhibiting factors: The VLIR-UOS program at NM-AIST faced several inhibiting factors despite its success. External factors like the COVID-19 pandemic and seasonal changes disrupted research activities, especially for doctoral students, leading to extended project timelines. Challenges in recruiting a sufficient pool of qualified PhD candidates, particularly female candidates, impacted recruitment targets and gender balance. Lack of agreement about a PhD candidate's qualifications between NM-AIST and the Flemish institution resulted in the program falling short of the recruitment target of 8 PhD students. Over-involvement of some PhD fellows in project management and administrative work diverted focus from academic work. Communication issues, conflicting interests, variability in leadership quality (with some project leaders being less engaged compared to others), limited mobility across projects, lack of incentives for non-academic staff, and decreased commitment to sustain the library system, led to uneven progress and fragmented execution of activities, including self-assessments. Disparities in treatment between local and Flemish students and supervisors raised concerns about equitable treatment. Financial constraints and reliance on external support limited the program's capacity to transition research findings into marketable products, with insufficient funding for testing and commercialization. Tanzania's centralized higher education system added complexity to the program, though it did not severely impede progress. Frequent changes in NM-AIST's top management posed challenges, requiring additional effort from coordinators to acquaint new leaders with program details. However, the high level of management support during Phase II indicated effective adaptation to these leadership changes. Finally, the relatively small number of students at NM-AIS raises questions of cost-effectiveness and economic viability.

Challenges (ongoing and future challenges)

Based on the evaluation of various aspects of the VLIR-UOS IUC Program at NM-AIST, the external evaluation team has identified the following key challenges that NM-AIST faces and is likely to continue to face in the future:

- (1) *Sustainability:* While the program has been effective, maintaining its momentum and benefits in the long term remains a challenge. This includes securing consistent funding, especially for research, innovation, and commercialization, and managing the transition from external funding to self-sufficiency.
- (2) *Diversity in PhD recruitment:* The program faced difficulties in recruiting a diverse pool of PhD candidates, particularly female candidates. Continued efforts are needed to attract and retain a more diverse student body, addressing gender imbalances and broadening inclusion.
- (3) *Uptake of research results:* Transitioning research findings into tangible, marketable products for societal benefit is a significant challenge. This includes finding adequate funding for testing and

commercialization, and developing effective strategies to ensure that research outputs have a practical impact on the community and industry.

- (4) *Program coordination amidst leadership changes*: Frequent changes in top management at NM-AIST could disrupt program continuity and focus. Ensuring consistent leadership and a stable institutional vision is crucial for ongoing program success.
- (5) *Balancing academic and administrative duties for PhD students*: Managing the balance between academic work and project management responsibilities, especially for PhD students involved in international collaborations, will be important to ensure that their primary focus remains on academic achievements.
- (6) *Maintaining scientific quality and global standing*: Continuing to improve and maintain high standards in education and research, including enhancing the university's global webometrics ranking, will be a challenge, particularly in an increasingly competitive academic landscape.
- (7) *Effective utilization and maintenance of new infrastructure*: Ensuring that the enhanced digital, ICT, and laboratory infrastructures are utilized and maintained effectively to maximize their impact on education and research.
- (8) *Strategic policy implementation*: Implementing strategic policies and ensuring they align with NM-AIST's goals, particularly in areas like multidisciplinary research, intellectual property management, and data management.
- (9) *Strengthening External Partnerships*: Activating and leveraging the network of partnerships beyond the VLIR-UOS program to ensure ongoing institutional growth and impact.
- (10) *Building entrepreneurial and commercialization capabilities*: Developing strategies and resources to support entrepreneurship and the commercialization of innovations, to translate academic research into practical, market-driven solutions.
- (11) *Student enrolment and cost of education*: Enhance cost-effectiveness and economic viability by strategically increasing student numbers, while simultaneously ensuring education remains affordable and maintaining its quality.
- (12) *Attracting and retaining PhD graduates at NM-AIST and motivating non-academic staff*: Offering incentives to attract and retain PhD graduates and implement strategies to motivate and fully engage technical and administrative staff who are not on an academic career path.
- (13) *Methodological rigor in project evaluations*: Ensuring more robust approaches and better stakeholder coordination in project evaluation.
- (14) *Developing a more robust structure for statistics reporting*: Enhance the capacity for generating, presenting, and disseminating data effectively to facilitate evidence-based decision-making and the monitoring of institutional performance.

Addressing these challenges will be key for NM-AIST to sustain and build upon the successes of the VLIR-UOS supported IUC program and to continue advancing its mission and objectives.

7 Recommendations

Based on the overall results of this evaluation, the external evaluators have formulated the following 14 recommendations.

- (1) *Banana Research Centre Implementation:* NM-AIST is advised to craft a well-defined, step-by-step action plan with distinct milestones to bring the Banana Research Centre into operation, moving it from an idea to a functional entity, while navigating through funding constraints. This centre holds promise in establishing NM-AIST as a preeminent hub for research and innovation within East Africa. It represents the optimal strategy for preserving and sustaining the banana research expertise cultivated through the VLIR-UOS IUC program over an extended period.
- (2) *PhD Candidate Recruitment Strategy:* NM-AIST should develop a balanced recruitment strategy that combines open admissions with targeted internal selections to enhance PhD candidate diversity and capacity building. Concurrently, this strategy should integrate initiatives to enhance female participation in SETI fields. These could include mentorship programs led by accomplished female scientists, designed to support and boost the success of women in SETI; outreach initiatives targeting primary and secondary schools to spark interest in science among young girls; and collaborations with NGOs dedicated to promoting gender diversity in the sciences.
- (3) *Scaling up innovation, entrepreneurial capabilities, and commercialization:* This is a key challenge that NM-AIST will face at the end of the VLIR-UOS IUC program. NM-AIST needs to develop a clear pathway for how it will use the capabilities and expertise gained through the program to translate innovative ideas and academic research into practical solutions ready for consumption by the wider public.
- (4) *Bolster financial sustainability and lessen reliance on external funding:* It is recommended that NM-AIST proactively defines and commits to a specific level of financial contribution at the outset of any partnership program. This commitment should be made irrespective of whether donors require a financial match from the institution. By doing so, NM-AIST can demonstrate fiscal responsibility and investment in the program's success, which may, in turn, attract additional funding and partnerships due to the demonstrated commitment to shared program ownership and sustainability. This matching contribution can be allocated to financing follow-up activities, thereby strengthening the sustainability of the program outcomes.
- (5) *Strengthening External Partnerships:* NM-AIST is advised to continue to actively engage and maximize its existing network of partnerships . The University should also seek out new collaborative opportunities to foster continuous institutional growth and impact. Given that only an estimated 10% of NM-AIST's current network is truly active (as suggested by NM-AIST Institutional Capacity Assessment Workshop participants), there is a need to focus on reinforcing and enhancing collaborations with various institutions and organizations.
- (6) *Recruitment and retention of PhD graduates:* To safeguard the continuity of expertise cultivated under the VLIR-UOS program, NM-AIST should establish a well-defined strategy, offering attractive incentives, to recruit and retain PhD graduates, especially those who are not currently NM-AIST staff members. Given that several graduates came from an open admission process, there's a risk of losing their acquired knowledge and expertise. This is particularly vital for the two PhD students involved in Project 1. Securing their integration into NM-AIST's academic staff is essential for the long-term sustainability of the university's banana research capacity.
- (7) *Enhancing non-academic staff engagement:* In partnership programs such as this one, NM-AIST, VLIR-UOS and Flemish partners should establish effective strategies to motivate and incentivize non-academic staff participants, who are not pursuing academic careers, to fully commit to and actively contribute to program goals and institutional development.
- (8) *Optimizing student enrolment:* NM-AIST should develop a strategy to incrementally increase student enrolment, aimed at improving cost-effectiveness and economic viability. This strategy should include a balanced approach to expand student numbers while preserving the quality of

education, coupled with efforts to secure external scholarships and funding sources to keep education affordable.

- (9) *Strengthening evaluation and data reporting framework:* NM-AIST should establish a comprehensive framework for project evaluations and statistics reporting. This should involve enhancing methodological rigor and stakeholder coordination in project assessments, coupled with developing robust systems for data generation, presentation, and dissemination. The focus should be on creating a cohesive structure that facilitates evidence-based decision-making and effective monitoring of institutional performance, ensuring accuracy, transparency, and utility of the data and evaluations.
- (10) *Prioritize targeted and expedited research Initiatives:* NM-AIST should maintain its emphasis on research that addresses specific needs and continue to incorporate short-cycle projects, ensuring quick, relevant, and impactful results that align with immediate societal and academic demands.
- (11) *East African Universities Coalition:* To capitalize on the advancements made in the program, the external evaluators recommend that VLIR-UOS, NM-AIST, and Flemish partner institutions consider establishing a coalition of East African universities. This coalition should primarily include, but not be limited to, participants from the VLIR-UOS program. The objective of this coalition would be to enhance knowledge exchange, facilitate technology transfer, and encourage commercialization across the participating institutions.
- (12) *Technology Transfer Process Integration:* VLIR-UOS, Flemish Partners, and NM-AIST should ensure that technology transfer is integrated into program design right from the beginning, to ensure research outputs lead to marketable products and societal benefits. There are many reasons why this early integration is crucial, including: allowing for appropriate allocation of resources; encouraging researchers to consider the market potential and applicability of their work throughout the research process; speeding up the process of bringing innovations to market (and hence, accelerating societal and economic impact); and facilitating access to funding thanks to a clear path to commercialization.
- (13) *Sustainability integration:* VLIR-UOS, Flemish Partners, and NM-AIST should ensure that the sustainability of program outcomes is fully integrated into program designs from inception, to ensure research outputs lead to marketable products and/or societal benefits. More particularly, attention needs to be directed to the development mechanisms that will enable the program to maintain and scale up its achievements without too much reliance on external resources. The IUC Program strengthened NM-AIST's institutional and academic sustainability and equipped the University with a Technology Transfer structure. Technology transfer capacity, however, is still in its infancy and its sustainability (and more particularly its ability to scale up innovation outcomes) is uncertain due to financial constraints.
- (14) *Recognition of Local Partner Contributions (VLIR-UOS & Flemish Institutions):* To ensure equitable recognition of collaborative efforts, VLIR-UOS and Flemish Institutions should establish transparent mechanisms that acknowledge the contributions of local partner institutions and researchers. The evaluators advise that students from the Global North conducting research in the Global South (under the program umbrella) be formally registered as visiting scholars. This registration not only enriches the experience for all involved but also strengthens the academic integrity and collaborative spirit of the partnership. Additionally, it is important to implement a system that fairly allocates research credits, recognizing the input of local master's and PhD students in the research achievements of their Flemish counterparts who worked on the same research project. This system would promote a balanced and just academic collaboration, ensuring that all contributions are appropriately valued and credited. The Program Management Manual's authorship policy should be reviewed and potentially revised by all stakeholders to ensure it remains effective and relevant.

8 Annexes

8.1 List of documents consulted

VLIR-UOS Documents:

- The VLIR-UOS IUC, Nelson Mandela African Institution Of Science And Technology, Partnership Program 2013 -2025: Management Manual (February 2021 update)
- The VLIR-UOS IUC, Nelson Mandela African Institution Of Science And Technology, Partnership Program 2013 -2025: Management Manual (February 2019 update)
- IUC Annual Programme (AP): NM-AIST – Phase II – AP2022
- The IUC Programme with NM-AIST Phase II, including annexes related to projects and their narratives and theories of change of all 5 projects
- Wolyn, C. & Masanyiwa. Z. (2018). Mid-term evaluation of the Institutional University Cooperation with the Nelson Mandela African Institute of Science and Technology (NM-AIST)
- IUC Program at NM-AIST VLIR UOS Program Annual Plans and Reports 2022
- NM-AIST Self Assessment IUC Programme – Final Evaluation 2023
- KU-Leuven Self Assessment IUC Programme – Final Evaluation 2023
- Self-Assessment IUC Partnership Project Level: Project 1
- Self-Assessment IUC Partnership Project Level: Project 2
- Self-Assessment IUC Partnership Project Level: Project 3
- Self-Assessment IUC Partnership Project Level: Project 4
- Self-Assessment IUC Partnership Project Level: Project 5
- NM-AIST IUC-Network Monitoring Matrix April 2023 (Excel file with indicators)
- NM-AIST IUC Standard Indicators April 2023 (Excel file with indicators)
- Additional documents shared in VLIR-UOS programme and project folders (SharePoint)

C-Lever.org Documents

- Methodological guide for Institutional Assessment of IUC partner universities Component of the IUC Programme end-term evaluation (Version 16/04/2022)
- Final evaluation of 5 IUC and 3 NETWORK programmes of VLIR-UOS Inception Report – version 5th June 2023
- Institutional Capacity Assessment Scorecard

NM-AIST Documents

- NM Documents/Sources
- The Nelson Mandela African Institution of Science and Technology (NM-AIST) Charter 2013
- The Corporate Strategic Plan of The Nelson Mandela African Institution of Science and Technology NM-AIST) 2021/22 – 2025/26
- NM-AIST Research and Innovation Agenda (April 2015)
- NM-AIST Quality Assurance 4th Quarter Audit Report 2022/2023
- NM-AIST 2023 Accredited Curricula - TCU
- Self-Evaluation Report (SER) for International Programmes Accreditation: NM-AIST Submission for AQAS Accreditation for Masters and PhD in Material Sciences and Engineering
- NM-AIST Intellectual Property Policy (IPP) 2019
- NM-AIST Intellectual Property Implementation Guidelines 2019
- NM-AIST Research and Innovation Policy 2019
- NM-AIST Research and Innovation Regulation 2019
- NM-AIST Report of the Controller Auditor General on the Financial Statements and Compliance Audits for the Financial Year ended June 30, 2022
- NM-AIST Gender Policy 2019
- NM-AIST Gender Regulation 2019
- NM-AIST Gender Commission Report– Staff Disaggregate Statistics August 2023
- NM-AIST Risk Management Policy and Framework

- NM-AIST Gender Committee Report August 2023
- NM Course Evaluation Overview
- NM Course Evaluation Report for Semester I (2022-2023)
- Memorandum of Understanding on Academic and Research Cooperation between The Nelson Mandela African Institution of Science and Technology (NM-AIST) and The Society of Mangladore Africa Mission (SMAM) – April 2022
- NM-AIST List of Funded Projects
- NM-AIST Revenue Budget for 2023/2024 and their Revenue Centres
- Finances Flow at NM-AIST
- NM-AIST sample Policy Brief: Towards Sustainable Management of Freshwater Resources in Northeastern Tanzania (Grite N Mwaijengo, Yusuph A Kafula, Gordian Mataba, Issakwisa Ngondya, Francis Moyo, Linus Munishi)
- NM-AIST sample brochure (in Swahili) for banana farmers: Usimamizi Jumuishi Wa Rutuba Ya Udongo Kwa Tija Bora Ya Kilimo Cha Migomba
- NM-AIST Conservation Agriculture Guide (simple guide in Swahili, intended for local farmers)
- NM-AIST Staff Statistics 2023
- NM-AIST Admission Trends 2013-2023
- NM-AIST Students Statistics by School
- NM-AIST List of Trained Staff Under VLIR-UOS
- List of MS and PhD Students Supported by VLIR
- VLIR-UOS Scholarships (List of Phases I and II PhD Students)
- Proposed Framework for the Establishment of Banana Research Centre at NM-AIST
- NM-AIST website (<https://www.nm-aist.ac.tz/>)

Other Documents

- Tanzania Commission for Universities (TCU) Handbook of Standards and Guidelines for University Education in Tanzania, Third Edition 2019
- The Tanzanian Development Vision 2025 (<http://www.tzonline.org/pdf/theTanzaniadevelopmentvision.pdf>)
- The Higher Education for Economic Transformation Project Information Document (PID), 2021
- OECD (2009). Guidelines for Project and Programme Evaluations
- ALNAP (2023). Review of the OECD DAC Criteria for Evaluating Humanitarian Action: Summary Brief
- Noonan, M.J., Black, R., Ballinger R. (2007). Peer and Faculty Mentoring in Doctoral Education: Definitions, Experiences, and Expectations. *International Journal of Teaching and Learning in Higher Education*, 19(3), 251-262.

8.2 Field visit programme

Day	Activities
Sept 23	Travel Dubai-Zanzibar-Arusha (Felly Chiteng Kot)
Sept 24	<ul style="list-style-type: none"> • Travel Dar-es-Salaam – Arusha (Hezron Makundi) • Analysis of Institutional Self-Assessment survey data and preparation for Institutional Self-Assessment Workshop
Sept 25	<ul style="list-style-type: none"> • Meeting with the Vice-Chancellor • Preliminary meeting with the Local Coordinator, Deputy Coordinator and Program Manager • Institutional Self-Assessment Workshop • Beginning of individual interviews
Sept 26	<ul style="list-style-type: none"> • Focus groups and interviews • Campus infrastructure visit
Sept 27	<ul style="list-style-type: none"> • Impact case • Interviews
Sept 28	Impact case
Sept 29	<ul style="list-style-type: none"> • Impact case • Interviews
Sept 30	Document review and preliminary analysis of interview and focus groups data (both impact case and overall evaluation)
Oct 01	
Oct 02	<ul style="list-style-type: none"> • Interviews • Preparation for restitution
Oct 03	Restitution
Oct 04	Travel Arusha – Dubai (Felly Chiteng Kot) Travel Arusha – Dar es Salaam (Hezron Makundi)

Note: The original schedule was disrupted by an unforeseen public holiday and by a series of other events taking place on campus (e.g., a government audit and a gathering of leaders of various Tanzanian academic institutions)

8.3 List of people consulted/interviewed

Prior to the visit

Name	University	Position
Professor Karoli Njau	NM-AIST	Local Program Coordinator
Prof. Linus Munisi	NM-AIST	Local Deputy Program Coordinator
Joyce Rugakingila	NM-AIST	Programme Manager
Luc Brendonck	KU Leuven	Flemish Program Coordinator
Patrick Stoop	C-Lever.org	Consultant and General Managing Partner

Field visit

Kick-off workshop

Name	University	Position
Dr. Grite Nelson Mwaijengo	NM-AIST	Lecturer
Dr. Janeth J. Marwa	NM-AIST	Lecturer
Sweetbert Mutagurwa	NM-AIST	Head HRM
Prof. Kisangiri Michael	NM-AIST	Leader P4
Daniel Fissoo	NM-AIST	Manager REMOL
Prof. Revocatus Machunda	NM-AIST	Ag. DRI
Julius Lenguyana	NM-AIST	Ag. PDM

*online

Interviews and focus groups

Name	University	Position	Date
Jerome Bidu*		PhD Graduate	25/09/2023
Stanslaus Mtavangu*		PhD Graduate	25/09/2023
Yusuph Aron Kafula*		PhD Graduate	25/09/2023
Dr. Grite Nelson	NM-AIST	Postgraduate Researcher	25/09/2023
Julius Lenguyana	NM-AIST	Manager- Planning and Development	25/09/2023
John Semhando	NM-AIST	ICT	26/09/2023
Nicephory Ngemera	NM-AIST	Librarian	26/09/2023
Theresia Kimario	NM-AIST	Laboratory	26/09/2023

Name	University	Position	Date
Rashid Kiroro	NM-AIST	HR-Officer	26/09/2023
Epafra H Temba	NM-AIST	VLIR Program Driver (attached to the program)	26/09/2023
Kisangiri Michael	NM-AIST	leader P4	26/09/2023
Akida Meya	NM-AIST	Deputy Project Leader P1	26/09/2023
Lydia Mhoro	NM-AIST	PhD Student	26/09/2023 27/09/2023 28/09/2023
Frank Baguma	NM-AIST	Master's Student	26/09/2023
Lwarence Mdegela	NM-AIST	P4- Master's Student	26/09/2023
Emmanuel saiko Lekuyai	NM-AIST	Master's Student	26/09/2023
Dr. Ado Kitalika*	NM-AIST	Supported PhD Graduate	26/09/2023
Godian Mataba	NM-AIST	PhD Graduate	26/09/2023
Dr. Anita Rugaika	NM-AIST	PhD Graduate	26/09/2023
Daniel Deogratias	NM-AIST	Ag. Library Manager	26/09/2023
Dr. Akida Meya	NM-AIST	deputy Project Leader I	27/09/2023
Prof. Kelvin Mtei	NM-AIST	Local Project Leader I	27/09/2023
Dr. Angela Mkindi	NM-AIST	Incubator Officer	27/09/2023
Dr. Michael Haule	NM-AIST	Director, Internationalization	27/09/2023
Dr. Hans Komakech	NM-AIST	PI CREATES	27/09/2023
Dr. Josephine Mkunda	NM-AIST	Gender Coordinator	27/09/2023
Prof. Anthony Mshandete	NM-AIST	DVC-ARI	27/09/2023
Prof. Athanasia Matemu	NM-AIST	Head-Quality Assurance Unit	27/09/2023
Anandmi Peter Lema	Hai District	Farmer	28/09/2023
Deogratius K. Sungare	Hai District	Agricultural Extension Officer	28/09/2023
Innocent L. Mbowe	Hai	Farmer	28/09/2023
Suzana M. Mallya	Hai	Farmer	28/09/2023
Agnes P. Ritte	Hai	Farmer	28/09/2023
Paul O. Mushi	Hai	Mkulima	28/09/2023
Emanuel Silayo	Arumeru	Banana Farmer	29/09/2023
Hamisi Tajiri Ally	Arumeru	Banana Farmer	29/09/2023
Mohamedi Semboja Omari	Arumeru	Banana Farmer	29/09/2023

Name	University	Position	Date
Eng. Harrison Rwehumbiza	NM-AIST	Environmental Manager - A To Z Textile Mills	29/09/2023
Mr. Mushobozi*		Manager- Crop Biosciences	29/09/2023
Prof. Suzana Augustino	NM-AIST	DVC- PFA	29/09/2023
* (Name not collected)		Meat King Distributors Ltd Representative	29/09/2023
Professor Karoli Njau	NM-AIST	Local Program Coordinator	29/09/2023 2/10/2023
Prof. Linus Munishi	NM-AIST	Local Deputy Program Coordinator; Local Project Leader P3	26/09/2023 29/09/2023
Mr. Albert Mrema	NM-AIST	Head-Procurement	29/09/2023
Prof. Kisangiri Michael	NM-AIST	P4 Project Leader and (Director of Research & Innovation?)	29/09/2023
Luc Brendonck	KU Leuven	Flemish Program Coordinator	11/10/2023
Piet Wostyn	KU Leuven	ICOS	11/10/2023
Elke Piessens	U Hasselt	Flemish Project Leader P5	11/10/2023
Anneke Kenens	U Hasselt	Flemish Deputy Project Leader P5	11/10/2023
Jan Diels	KU Leuven	Flemish Project Leader P1	11/10/2023
Roel Merckx	KU Leuven	Flemish team member P1	11/10/2023 *
Rony Swennen	KU Leuven	Flemish Project Leader P1 (former)	11/10/2023
Bram Vanschoenwinkel	VUB	Flemish Project Leader P3	11/10/2023
Egbert De Smet	U Antwerpen	Flemish Project Leader P4	11/10/2023 *
Bart Van der Bruggen	KU Leuven	Flemish Project Leader PL2	12/10/2023 *

*online

Restitution workshop

Name	University	Position
Professor Karoli Njau	NM-AIST	Local Program Coordinator
Prof. Linus Munishi	NM-AIST	Deputy Project Leader P3
Dr. Francis Moyo	NM-AIST	Deputy Project Leader P3
Prof. Shubi Kaijage	NM-AIST	Member P4
Joyce Rugakingila	NM-AIST	Programme Manager
Dr. Grite Nelson Mwaijengo	NM-AIST	Member P3

Dr. Godian Mataba	NM-AIST	Member P3
Nicephory Ngemera	NM-AIST	Librarian
Lawrence Nehemiah Mdegela	NM-AIST	P4- Student
Dr. Anita M. Rugaika	NM-AIST	Member P2
Patrick Stoop	C-Lever.org	Consultant and General Managing Partner
Elke Piessens	U Hasselt	Flemish Project Leader P5
Egbert De Smet	U Antwerpen	Flemish Project Leader P4
Dr. Felly Chiteng Kot	American University of Sharjah	Lead Program Evaluator
Dr. Hezon Makundi	University of Dar es Salaam	Program Co-Evaluator

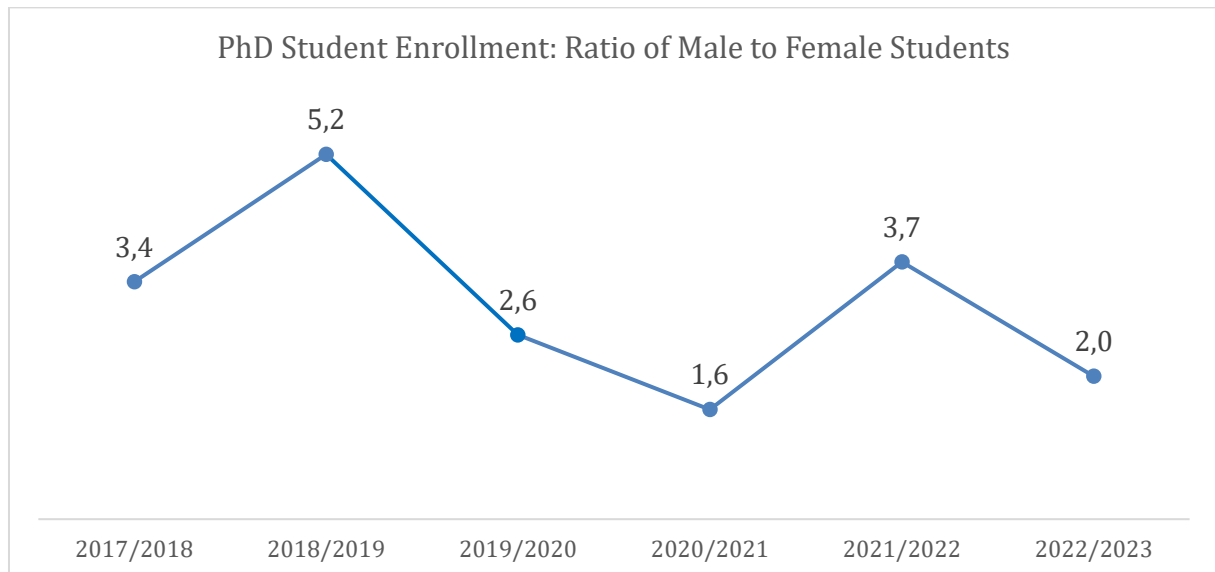
*online

Restitution with VLIR-UOS and Flemish coordinators / project leaders

Name	University	Position
Elke Piessens	U Hasselt	Flemish Project Leader P5
Egbert De Smet	U Antwerpen	Flemish Project Leader P4
Patrick Stoop	C-Lever.org	Consultant and General Managing Partner

Note: A single hybrid restitution session was organized, including in-person participation by NM-AIST stakeholders and virtual participation by Flemish stakeholders. However, due to scheduling challenges, only two Flemish Project Leaders were able to participate.

8.4 Ratio of male to female students among newly admitted/enrolled PhD students



Note: these ratios were computed by the external evaluators based on admission and enrolment statistics received from NM-AIST

8.5 Rubric used to assess change

RUBRICS USED	EVIDENCE	SIGNIFICANCE	CONTRIBUTION
Unacceptable	No evidence of change provided	Signal not logically related to the intended change	Not plausible that the project had any contribution
Weak	Only internal or anecdotal evidence	Lack of clarity how the signal functions as indication or step of change toward the intended change.	Some plausibility of contribution based on reflection of partner
Moderate	References to external evidence, but partial or indirect	Lack of clarity what further steps are required to move toward the intended change	Contribution very plausible based on reflection of partner
Strong	Reference to external evidence, almost undeniable	Clarity how the signal functions in the complete pathway toward the intended change	Contribution evident from reflection of partner and (direct effects of) outputs

VLIR-UOS supports partnerships
between universities and university colleges
in Flanders and the South
looking for innovative responses
to global and local challenges

VLIR-UOS

Julien Dillensplein 1, box 1A
1060 Brussels
Belgium
Tel. +32 (0)2 289 05 50
info@vliruos.be

Publisher: Kristien Verbrugghen, VLIR-UOS, Julien Dillensplein 1, box 1A, 1060 Brussels, Belgium
D/2024/10.960/05

www.vliruos.be

