# Mid-term evaluation of the Institutional University Cooperation for Jomo Kenyatta University of Agriculture and Technology, Kenya
# Final report

vliruos
SHARING MINDS, CHANGING LIVES


January 2021

Corina Dhaene (ACE Europe)
Madara Ogot (University of Nairobi, Kenya)
with support from Eva Wuyts

# Table of contents

# ACRONYMS

| | |
|---|---|
| CIAT | International Centre for Tropical Agriculture |
| COANRE | College of Agriculture and Natural Resources |
| COHES | College of Health Sciences |
| COPAS | College of Pure and Applied Sciences |
| DAC | Development Assistance Committee |
| DGD | Directoraat-generaal Development |
| DFST | Department of Food Science and Technology |
| DHFS | Department of Horticulture and Food Security |
| DHNS | Department of Human and Nutrition Sciences |
| DVC | Deputy Vice-Chancellor |
| IBR | Institute of Biotechnology Research |
| IUC | Institutional University Cooperation |
| KALRO | Kenya Agricultural and Livestock Research Organisation |
| KULeuven | Katholieke Universiteit Leuven |
| JICA | Japan International Cooperation Agency |
| JSC | Joint Steering Committee |
| KALRO | Kenya Agricultural and Livestock Research Organisation |
| KDDA | Kenya Defeat Diabetes Association |
| KEMRI | Kenya Medical Research Institute |
| LCEFoNS | Legume Centre of Excellence in Food and Nutrition Security |
| LSC | Local Steering Committee |
| MoU | Memorandum of Understanding |
| MSc | Master in Science |
| MTE | Mid-Term Evaluation |
| OECD | Organisation for Economic Cooperation and Development |
| PhD | Doctor of Philosophy |
| PSU | Programme Support Unit |
| SCIT | School of Computing and IT |
| SoAES | School of Agriculture and Environmental Sciences |
| SOFNUS | School of Food and Nutrition Sciences |
| SOPH | School of Public Health |
| ToR | Terms of Reference |
| VC | Vice-Chancellor |
| VLIR-UOS | Vlaamse Interuniversitaire Raad – Universitaire Ontwikkelingssamenwerking |
| VUB | Vrije Universiteit Brussel |

# PREFACE

The evaluators feel privileged to have met very committed and enthusiast academic and other staff of Flemish universities and of Jomo Kenyatta University of Agriculture and Technology (JKUAT). The commitment to the execution of the IUC programme and to the objective of realising a centre of excellence on legumes at JKUAT is commendable. The evaluators have enjoyed (online) interaction with JKUAT staff and thank them for the open exchange of perceptions and experiences. This report highlights the results of the IUC as it is halfway its execution and identifies points of attention. We sincerely hope the conclusions and recommendations will contribute to the courage to continue investing in the collaboration and in the consolidation of research findings for the second phase of the IUC.

Corina Dhaene (ACE Europe) and Professor Madara Ogot (University of Nairobi), Mechelen,

December 2020

# EXECUTIVE SUMMARY

**Subject of evaluation**

This report is about the mid-term evaluation of the Institutional University Cooperation (IUC) programme between Jomo Kenyatta University of Agriculture and Technology (JKUAT) and two Flemish universities, Katholieke Universiteit Leuven (KU Leuven) and Vrije Universiteit Brussel (VUB). JKUAT counts 5 colleges of which 3 are involved in the IUC, with the JKUAT College of Agriculture and Natural Resources (CoANRE) as main partner.

The IUC under review aims to establish a Legume Centre of Excellence in Food and Nutrition Security (LCEFoNS) at JKUAT. The programme builds on the expertise gained during a preceding VLIR-UOS funded TEAM project during which the nucleus of the centre was developed. JKUAT counts 5 physical research centres to which LCEFoNS will be added as a virtual centre. In addition to the traditional research outputs of peer reviewed journal articles, LCEFoNS seeks to also produce guidelines for legume producers, processors and users and value-added products that have high consumer acceptability. The focus of this programme is on research and uptake and not on education.

Four projects are implemented. Three are closely connected by design (in a value chain approach taking 'beans' as a case study and looking at production, processing and human intake and health). There is one transversal project hosted by the School of Computing and Information Technology (SCIT) which is on the one hand strengthening capacity for software engineering and on the other hand supporting the three other projects and the whole university. A summary of the projects, indicating the JKUAT colleges and departments that are involved is provided in the introductory section of the report.

The first phase of the IUC started in January 2017 and will end in December 2021 and is allocated with 1.750.000 euro.

Jomo Kenyatta University of Agriculture and Technology (JKUAT) became a fully-fledged University in 1994 and was heavily supported by the Japanese bilateral cooperation. The University has seen a steady increase in the number of students and graduates dropping significantly in 2017 primarily due to staff industrial actions (strikes) that disrupted the academic calendar. In 2018, JKUAT presented its 4$^{th}$ strategic plan 2018-2022 in which the ambition to position the institution as an entrepreneurial university is further developed. The strategy connects the university to the realisation of Kenya's Vision 2030 and the ambition to generate a critical mass of research output addressing the country's major challenges and priorities and closing the so-called 'knowledge-action' gap.

**Objectives, approach and execution of the evaluation**

The Terms of Reference (ToR) formulated 3 evaluation purposes: learning, steering and accountability. The evaluators chose to focus on the steering function of this evaluation in order to inform decisions for the second phase of the IUC programme. Next to the evaluation questions related to the 5 OECD Development Assistance Committee (DAC) criteria (with focus on efficiency and effectiveness and attention for scientific quality), the ToR specified a question related to the added value of the interconnectivity and multidisciplinary nature of the four research projects. Interconnectivity was understood as the multidisciplinary design of the IUC projects (along a specific value chain). The sustainability of the feature of interconnectivity, the relevance, efficiency, effectiveness and potential for impact were assessed separately at programme level.

This evaluation was executed by a team with an evaluator from Belgium (Corina Dhaene from ACE Europe) and a consultant from Nairobi (Professor Madara Ogot from the University of Nairobi). Methodological support was provided by Eva Wuyts. The evaluation was implemented in three phases: an inception phase, a phase of data-collection and a phase of analysis and reporting.

The design of the evaluation approach and evaluation framework took into account the effects of COVID19. The evaluation framework presented evaluation questions related to 4 of the five OECD DAC evaluation criteria (disregarding the criterion of impact) at project level and two key questions at programme level. An overview of questions is presented in the introductory section of the report.

For each of the judgement criteria an appreciation scale was developed as requested in the ToR. A four-point qualitative scale was used.

| Excellent | Good | Low | Poor |
|---|---|---|---|
| 4 | 3 | 2 | 1 |

The main methods used in this evaluation were desk study and semi-structured interviews (either individual or in small groups), site visit and outcome harvesting. Briefing and debriefing sessions with the stakeholders concerned were envisaged as opportunities to discuss findings and to learn from them. Outcome harvesting amongst academic staff that was not directly involved in the programme was used to confirm and enrich understanding of the effects of interconnectivity approach of the programme.

Due to the COVID-19 pandemic, all interviews were organised online, with majority of the interviews conducted in the presence of the two evaluators. The data collection was organised between November 2nd and 16th 2021. A one day on site visit on November, 10th 2021 was organised to meet lab assistants and to see the lab infrastructure and equipment.

The main limitation was the absence of interactive physical set-up of meetings that stimulate participation of all stakeholders, that allow for observation and that would help to move quicker to the main issues and to have a joint and creative reflection about conclusions and recommendations.

**Main findings and conclusions**

Overall, the evaluation presents a positive picture of the IUC according to the DAC criteria (translated in specific questions).

| **Evaluation Question at programme level related to the interconnectivity** | **Score at programme level** | | | |
|---|---|---|---|---|
| EQ 1.1. Relevance for the legume/bean value chain can be confirmed from various perspectives. | 4 | | | |
| EQ 1.2. The programme management is aligned with the design of interconnectivity (efficiency – this is elaborated more on under efficiency). | 4 | | | |
| EQ 1.3. The interconnectivity adds value to the effectiveness and scientific/educational quality of the programme. | 4 | | | |
| EQ 1.4. Sustainability of the feature of interconnectivity in the development of the centre of excellence. | 3 | | | |
| EQ 1.5. The approach of interconnectivity has the potential to contribute to impact. | 3 | | | |
| Evaluation Questions related to relevance | Project 1 | Project 2 | Project 3 | Project 4 |
| EQ 1.1. Responding to needs | 4 | 4 | 4 | 4 |
| EQ 1.2. Efforts for synergy | 3 | 4 | 3 | 3 |
| EQ 1.3. Coherence | 3 | 3 | 4 | 3 |

| Evaluation Questions related to efficiency | Score at programme level | | | |
|---|---|---|---|---|
| EQ 2.1. Management of the execution of the IUC is done in an efficient way. | 4 | | | |
| EQ 2.2. Role division is clear | 4 | | | |
| EQ 2.3. Transparent financial management and support to execution of procurement | 4 | | | |
| | Project 1 | Project 2 | Project 3 | Project 4 |
| EQ 3.1. Intermediate results have been delivered | 3 | 4 | 4 | 3 |
| EQ 3.2. Support to the quality of research | 4 | 4 | 4 | 4 |
| EQ 3.3. Relationship between means and results | 3 | 4 | 3 | 4 |
| EQ 3.4. Conducive project management | 4 | 4 | 4 | 4 |
| Evaluation Questions related to effectiveness | Project 1 | Project 2 | Project 3 | Project 4 |
| EQ 2.1. Realization of objective related to research | 4 | 4 | 4 | 4 |
| EQ 2.2. Realization of objective related to uptake | 4 | 4 | 3 | 4 |
| Evaluation Questions related to sustainability | Project 1 | Project 2 | Project 3 | Project 4 |
| 4.1. Level of academic and institutional sustainability | 3 | 4 | 3 | 4 |
| 4.2. level of financial sustainability | 3 | 4 | 3 | 3 |

**Assessment of interconnectivity** - The evaluation confirms the relevance of the interconnectivity approach along the value chain. It is fully in line with and supportive of the JKUAT 2018-2022 strategic plan. Despite the challenges, interconnectivity has brought a vibrancy among the participating departments and post graduate students at the university, and developed a better understanding of each other's interests, needs, and capabilities.

Although the LCEFoNS was not yet specifically mentioned in the 2018-2022 strategy, it now prominently features on the JKUAT-website as one of the Vision 2030 projects of the university, which clearly positions it within the university. The interconnectivity of the programme has thus given visibility (within the university and beyond) to and has shaped the image of the legume centre as a multidisciplinary virtual centre that can call upon researchers and labs situated in various departments. The data from the outcome harvesting and the interviews provide evidence that the programme acts as a catalyst and role model for other multidisciplinary research projects to be developed (either or not along a specific value chain) by academic staff not involved in the IUC programme.

Successful further development will largely depend on the team carrying on with the current momentum into Phase II of the IUC programme, the continued drive by the schools to seek additional complementary external research funds, and the capacity to maintain strong leadership (at university and programme level). The JKUAT strategic plan convinces in terms of its commitment to ensure effectiveness and sustainability of its (physical) research centres but is not yet clear on how the university intends to manage and position a virtual structure.

This evaluation was requested to identify some lessons learned from the interconnectivity based on a value chain approach. The lessons identified (including an overview of key competences and conditions that need to be ensured) are described in the concluding chapter of the report. They appear to be useful for other inter-university collaboration programmes (to be considered by them when designing and executing multi-disciplinary programmes along a value chain approach or otherwise.

A point of attention is the fact that the stakeholders did not, as yet, invest in a systematic or explicit gender sensitive analysis of the value chain on beans/legumes in order to assess, anticipate and take into account the possible different effects of research results, outputs and new technologies on the lives of the men and the women that are working in or are concerned by the legume value chain.

**Relevance of the programme and the projects** - The programme and the projects are highly relevant for the society, the schools involved and the university as a whole. The programme responds to national challenges in the field of food security, nutrition and health and is designed in such a way to allow input from societal stakeholders in responding to research focus and results. This creates a win-win situation for all and offers good prospects for uptake. The programme responds to a context in which schools at JKUAT have seen a rise in students, putting pressure on time to be allocated to research in combination with poorly equipped labs. More in particular for the schools involved in P1 and P2, the programme has significantly boosted the lab facilities; overall, focus on research has been strengthened. The programme and the JKUAT strategy are strongly connected: the preparation of the IUC has, next to other influences, inspired the formulation of goals in the strategy and is now developing alongside and as such supporting the execution of the strategy.

Coherence and synergy were strengthened by the interconnectivity approach, management of the programme, the transversal project and by the practice to connect the IUC post graduate students to each other's' research topics, engaging them in exchange during scientific days and joint meetings and connecting them to research teams outside of the IUC programme (when in the North and stimulated by the team leaders in the North).

The choice of indicators to measure progress at the level of the specific objectives calls for particular attention: it is not always clear what exactly is measured and how and the chosen indicators do not seem to instigate reflection and discussion about strategies to be strengthened or adapted within the IUC (limited added value for strategic orientation).

**Efficiency** - Overall, all projects have realised great value for money. The programme will be able to realise almost all planned intermediate results during Phase I, except for the realisation of the graduation of some students and the scientific publications due to Covid19 (some foreseen to be realised in 2022). The 2020 planning document for activities to be executed in 2021 demonstrates attention for the delays and addresses these to ensure that most intermediate results will be obtained by the end of Phase I of the IUC.

Overview of main outputs related to postgraduate students (PhD and MSc) and their research is presented in a table in the report. It should be noted that all project stakeholders demonstrate sensitivity to gender (in terms of equal access to opportunities) and have ensured a gender balance in identification of scholarships. This is evidenced in the balance of male and female post-graduates supported by the IUC.

The organisation of support to research and students was excellent, team leaders and the transversal project have played their role in supporting the quality of research. Promotors show-cased what 'mentoring' should look like, involved the students in the programme at different levels and ensured that they were really part of the IUC research teams. Easy access to labs and high-end equipment (and support of lab assistants on how to use equipment), availability of consumables and facilities, support for organising field work, … were highly appreciated by the respondents (including those that were not part of the programme). A particular feature of the IUC, contributing to quality is the connection made between PhD research topics and MSc students. It connected MSc more closely to the research which is another stated goal in the current JKUAT Strategic Plan.

There was strong evidence that IUC was efficiently and transparently managed at programme and at project level, demonstrating flexibility and addressing challenges timely and adequately. The regular IUC steering committee meetings provided a frequent platform for discussions on the aspects related to

the interconnectivity of the programme thus providing the mechanisms to make the interconnectivity work. Procurement challenges, mentioned in several progress reports were increasingly managed, for example, by the creation of a research desk in the procurement department, partly inspired by the IUC programme.

A point of attention is related to the recruitment of suitable Master students and the lack of stipends (covering living costs of students) making it difficult to ensure recruitment of the best students and ensuring their timely graduation.

**Effectiveness** - When looking at the indicators to monitor and assess research culture and performance (as mentioned in the logframes per project), the evaluators find that the programme has made good progress, more in particular in: increased use of lab facilities, efforts of research teams to write grant proposals for external research funding, strengthened research teams that connect various academic departments; writing scientific papers (progressing though with some delay due to Covid), development and strengthening of regional and international connections and networks. These outcomes were confirmed by various sources. Some points of attention in ensuring effectiveness are related to the continuous offer of specific training on data collection, management and statistics and underlying techniques of the new equipment and the access of P3 to capacity for blood analysis.

As already stated in the above, the interconnectivity approach contributed a lot to this effectiveness.

A **number of unplanned results** merits to be highlighted because they are seen to strengthen the capacity of the university as a whole. First there is the establishment of a Grants Management Directorate in 2018, inspired by the IUC and stakeholders from the North which is now playing its role to ensure training on grant writing and providing support in writing multi-disciplinary research proposals. Already more research proposals are going out and already 4/5 applications for external funding are rewarded with the school of agriculture leading. Secondly, the programme experience with ICT has supported the university in managing the COVID pandemic. Thirdly, an effect on academic education is already visible and will strengthen the practice of providing research-based education.

The mid-term evaluation confirms that **uptake** is prepared from the beginning by engaging with stakeholders. Halfway the programme, advice based on research results and experience of staff is already provided to various types of stakeholders through bilateral interactions. There is no doubt that this will lead in the second phase to translation of research results into useful and usable formats for societal stakeholders. It may well be that these take different forms: collaboration in spin offs, policy advice, exchange and networking (to be looked at in the final evaluation of the IUC).

As yet, the concept of ‘platform’ does not refer to any kind of physical entity, but to the practice of regularly bringing together stakeholders around the same topic through workshops (organised by P4).

**Sustainability** - Overall, the assessment of sustainability was rather positive for both dimensions (institutional and financial sustainability). The programme and university leadership both initiated strategies that will ensure the sustainability of the centre of excellence beyond the life of the IUC programme. This includes working towards institutionalisation of some key IUC activities and outputs (such as training and lab equipments); and creating new units within the university that respond to the needs of the IUC and the university at large (for example, creation of the Directorate of Grants Management, the research desk at the procurement unit and the equipment maintenance unit.

The evaluators found that the IUC management team are currently drawing up plans to have a research budget in the next phase to support post-doctoral researchers, enabling the current PhD students to

continue their research work thus ensuring a smooth transition from their study phase to work and contributing to sustainability. The retainment of PhD students is however an issue, despite the strong commitment of JKUAT leadership and there is no easy answer: at institutional level, absorption of 5/7 PhD students graduating from the IUC programme as staff members remains a challenge primarily due to the on-going hiring freeze across public universities in Kenya (except for replacement of staff who leave employment). Three PhD students are not yet staff members of JKUAT, 2 other PhD students are coming from another university. Strong commitments are, however, being made by university leadership to retain them.

The IUC research teams have been actively engaged in seeking additional sources of external funding. This is essential as sustainability of a centre of excellence is primarily based on the ability to continually attract external funding in support of the centre's research. Obtained external funds (1 big project for 4 M EUR and three smaller projects for a total of 340.000 EUR) and new proposals will build on the results that continue to be generated by the current IUC activities and leverage on the human capacity being developed as part of the programme.

Nevertheless, financial sustainability remains the biggest challenge, especially as industry in Kenya is still not yet in a position to co-finance research. As such, a third avenue for sustainability is tied to uptake of the research-based products and IP. Discussions are underway across all projects on which outputs can (and should be) commercialised either directly (for example, establishing JKUAT as a seed company) or indirectly through licensing (the products and processes developed in support of developed legume-based food products). These deliberations are being informed by the expectations of various funders who support the research, the JKUAT strategy for 2018-2022 and the university's experience with successfully commercialising banana tissue cultures.

**Recommendations** - In response to the conclusions related to interconnectivity and the DAC criteria, the evaluators have formulated 11 recommendations that are aimed at the stakeholders. Recommendation 1 and 11 entail a call for action by VLIR-UOS.

| **Summary of recommendations in relation to the** | | **JKUAT and partners** | **VLIR-UOS** |
|---|---|---|---|
| Interconnectivity | i. VLIR-UOS, when having a dialogue with universities developing an IUC could use the lessons learned with regards to developing stronger interconnectivity of projects in assessing programme proposals and providing guidance to applicants | | x |
| | ii. Ensure a **gender sensitive analysis** of the legumes value chains in order to take into account the possible different effects of research results and outputs + new technologies on the lives of the men and the women that are working in or concerned | x | |
| | iii. Clarify **what is behind the concepts of a *virtual* centre of *excellence*** and operationalise | x | |
| Relevance | iv. **Redefine the indicators** at the **level of the specific objectives** and align them with indicators the JKUAT strategic plan where possible | x | |
| Efficiency | v. **Ensure outscaling** to cover additional legume value chains | x | |
| | vi. Have a **discussion over why and how to use the administrative budget for stipends** for MSc students | x | |
| Effectiveness | vii. Clarify the **functions and management of a 'stakeholder' platform** | x | |
| | | x | |

| | | | |
|---|---|---|---|
| | viii. Continue to offer **courses on data analysis and statistics** (ensure institutionalisation through hosting and connection to P4 database on data collection and analysis tools)<br>ix. Ensure **further training on underlying (new) techniques** made possible by up end lab equipment<br>x. Discuss **conditions for purchasing equipment for blood sample analysis** | x<br>x | |
| Sustainability | xi. Focus more on how to **commercialise in order to strengthen sustainability** | x | x |

# 1. Introduction

## 1.1. Background

### 1.1.1. What is an IUC?

The ToR for this assignment (in annex 1) clearly describe what an Institutional University Cooperation (IUC) programme is. It is defined as a long-term (12 years) institutional partnership between a university in the South and Flemish universities and university colleges. The programme supports the partner university in its triple function as provider of education, research and extension (also identified as 'societal services'/'outreach'). It aims at empowering the local university to better fulfil its role as a development actor in society.

The objectives and content of an IUC partnership between one partner institution in the South and Flemish universities and university colleges in the North are outlined in a partner programme (technical and financial file). All IUC programmes combine objectives of institutional strengthening and strategic thematic capacity building (linked to both institutional priorities and developmental priorities in a specific country). Each partnership consists of a coherent set of interventions (projects) geared towards the development of the teaching and research capacity of the university, as well as its institutional management.

A **generic Theory of Change for all IUC programmes** is developed, which summarizes the expected output, outcome and impact of the supported change processes and which highlights the importance of the partnership and collaboration between the educational institutions concerned and the interaction between sub-projects. Output refers to deliverables related to education improvement, research deliverables, strengthened research or education capacities, improved infrastructure and equipment, and deliverables related to extension (level of efficiency). These outputs are assumed to contribute to outcomes related to improved research practices, improved education practices and new knowledge, applications or services that are also taken up by relevant stakeholders (level of effectiveness). In the long term, the IUC partner programme aims at contributing to development changes.

IUC programmes are managed by local steering committees and a joint North-South steering committee in which VLIR-UOS is also participating. North and South coordinator are managing the programme with the support of a programme manager in the South, and an administrative support, both in North and South. Each project is managed by two project team leaders (North and South) who are taking part in the steering committees.

### 1.1.2. The IUC with JKUAT

**Description of the IUC with JKUAT** – This IUC aims to establish a Legume Centre of Excellence in Food and Nutrition Security (LCEFoNS) at JKUAT. In addition to the traditional research outputs of peer reviewed journal articles, LCEFoNS seeks to also produce guidelines for legume producers, processors and users, value added products that have high consumer acceptability and are environmentally friendly. The IUC seeks to strengthen the role of JKUAT in agricultural development and strengthen its linkage with target stakeholders from government, community and industry.

The first phase started in January 2017 and will end in December 2021 and is allocated with 1.750.000 euro for the first phase.

The IUC is based on a collaboration of two Flemish universities, Katholieke Universiteit Leuven (KU Leuven) and Vrije Universiteit Brussel (VUB) with the JKUAT College of Agriculture and Natural Resources (CoANRE) as main partner. The IUC programme is an integral part of the CoANRE of which two-thirds of its schools are involved. The coordinators of the IUC are also team leaders of project 2. Four projects are implemented. Three are closely connected by design (in a value chain approach taking 'beans' as a case study and looking at production, processing and human intake and health). One transversal project hosted by the School of Computing and Information Technology (SCIT) which is one the one hand strengthening capacity for software engineering and on the other hand supporting the three other projects and the whole university. These are summarised in Table 1.

| School and Department | Project | Other depts involved |
|---|---|---|
| School of Agriculture and Environmental Sciences (SOAES) and the Department of Horticulture and Food Security (DHFS) - under COANRE | **P1: Legume breeding for improved quality**<br><br>The project seeks to develop improved bean varieties that are easy to cook. This is to be achieved with the support of post-graduate students (Masters and PhD) and improvements in the laboratory and other supporting infrastructure. The specific objectives were (i) to develop bean varieties with improved cooking and nutritional quality and (ii) to improve research practice at the Department of Horticulture and Food Security (DHFS) and IBR. | Institute of Biotechnology Research (IBR) |
| School of Food and Nutrition Sciences (SOFNUS) and the Department of Food Science and Technology (DFST) - under COANRE | **P2: Storage and processing of legumes for convenient products of high nutritional value**<br><br>The aim of the project is to increase the diversity of legume-based value added products with high consumer acceptability. The overall goal captures the inter-connectivity of the programme in that it takes into account the bean varieties offered by P1 and uses the nutritional data obtained from P3. The specific objectives were to (i) improve the research and dissemination practices in legume processing in DFST and (ii) generate knowledge and guidelines on legumes processing that would be made available for uptake by stakeholders. | None |
| School of Food and Nutrition Sciences (SOFNUS) and the Department of Human Nutrition Sciences (DHNS) – under COANRE | **P3 : Legumes in nutrition and health**<br><br>The main objective of the project is to improve the zinc status of children and diabetic patients in line with the Scaling-Up-Nutrition movement in Kenya. The specific objectives are to (i) improve the research practices in the field of human nutrition at | School of Public Health within College of Health Sciences |

| School and Department | Project | Other depts involved |
|---|---|---|
| | JKUAT, and (ii) create conditions for uptake by communities and the government of the newly created knowledge. | |
| School of Computing and Information Technology (SCIT) - under the College of Pure and Applied Sciences (COPAS). | **P4 ICT support for legume research**<br><br>The general objective of P4 is to have JKUAT's data science research performance recognised internationally. The specific objectives are to improve: (i) JKUAT's research performance in software technologies for data gathering and data analytics and (ii) JKUAT's research in the area of food and nutrition through the application of software technologies for data science in research. The second objective underlines the transversal character of P4 in the IUC, strengthening capacity for the whole university and supporting execution and effectiveness of the other 3 projects in the IUC. | none |

*Table 1: Programme Overview - Legume Centre of Excellence for Food and Nutrition Security (LCEFoNS)*

The above four projects are supported by the Programme Support Unit (PSU) which coordinates all administrative issues including procurement, mobility, technical and financial reporting, publicity, among others.

The programme and the centre build on the expertise gained during a VLIR-UOS funded TEAM project (The hard-to-cook defect in common beans: towards food security and sustainability in sub-Saharan Africa, Project ZEIN2011PR385). Other VLIR-UOS initiatives ongoing within JKUAT are presented in the Table 2 below.

| Title of project | Academic partner in Belgium |
|---|---|
| Team project on using the edible insect, *Ruspolia spp*, to enhance food security in East Africa | KULeuven |
| Team Project on capacity building network in biostatistics for public health innovation in Kenya | University of Hasselt |
| Joint project on directed breeding programmes for improved poultry livestock by genetic bioinformatics research and development | University of Hasselt |

*Table 2: Overview of other VLIR-UOS initiatives involving JKUAT teams*

### 1.1.3. Terms of Reference of the Evaluation

The Terms of Reference (ToR) formulated following evaluation purposes: (1) **learning** - what worked well, what didn't and why? (ii) **steering** - supporting decision making processes, more in particular, this mid-term evaluation should support the actors concerned in the formulation of the second phase of the IUC and (iii) **accountability** - assessing performance of the programme and validating or complementing monitoring data. The evaluators chose to focus more on the steering function of this evaluation in order to inform decisions for the second phase of the IUC programme.

Next to the evaluation questions related to the 5 OECD Development Assistance Committee (DAC) criteria (with focus on **efficiency and effectiveness and attention for scientific quality**), the ToR

specified a **question related to the added value of the interconnectivity and multidisciplinary nature of the four research projects**.

The evaluation had to take into account the effects of the COVID-19 pandemic. The consultant was invited to share a document highlighting how the effects of pandemic would be managed in terms of the organisation of the evaluation mission and in defining the evaluation questions.

## 1.2. Context

**General Background** - Kenya is a country of 47.6 million (census 2019), a 26 per cent increase in 10 years from a population of 37.7 million in 2018.[1] The country is currently on its third Medium Term Plan of its development blue print, Vision 2030, which has the objective of transforming Kenya into a newly industrialising, middle-income country, providing high quality life for all its citizens, by 2030. As stated in Vision 2030, this objective will be realised through transformation of the Kenyan economy into an innovative one driven by **technological innovation**, a shift from knowledge-reproduction to **knowledge-production**, while also ensuring the availability of a critical mass of **well-qualified human resource** to spur development. The heart of this transformation will be the **university education system that is expected to be "focused, efficient and able to create knowledge, and deliver accessible, equitable, relevant and quality training to sustain a knowledge economy that is internationally competitive**."[2]

The current Medium Term Plan (2018-2022) focuses on four main initiatives: increasing the manufacturing share of GDP from 9.2 per cent to 15 per cent and **agro-processing** to at least 50 per cent of total agricultural output; providing affordable housing by building 500,000 affordable houses across the country; enhancing Food and Nutrition Security through construction of large-scale multi-purpose and smaller dams for irrigation projects, construction of food storage facilities and implementation of high impact **nutritional interventions** and other FNS initiatives; and, achieving 100 per cent Universal Health Coverage. The plan seeks to achieve real GDP growth of 7 per cent by 2022.[3] This against a backdrop of real GDP which was estimated to have grown by 6.3 per cent in 2018 and 5.4 per cent growth in 2019. The growth was spread across all sectors of the economy, especially the service-oriented sectors. Nominal GDP increased from KES 8,892.1 Billion in 2018 to KES 9,704.4 Billion in 2019.[4]

Kenya promulgated a new constitution in 2010 that prescribes national values and principles of governance. These include sharing and devolution of power to provide a basis for Kenya's system of devolved government primarily through the establishment of 47 county governments. The devolved system of government has been implemented since 2013 with a significant level of success, including transfer of functions to county governments, preparation of a devolution policy and alignment of sectoral laws to the Constitution.[5]

---

1 Kenya National Bureau of Statistics *Economic Survey 2020*. Nairobi, 2020.
2 Ministry of Education *Sessional Paper No. 14 of 2012*, Nairobi, 2012.
3 The National Treasury and Planning, *Third Medium Term Plan 2018-2022: Transforming Lives -Advancing socio-economic development through the 'Big Four.'* Nairobi, 2018.
4 Kenya National Bureau of Statistics *op. cit.*
5 The National Treasury and Planning, *op. cit.*

**State of Higher Education** – The University sector experienced **significant growth** in the past five years as measured by the number of universities (public and private) and in student enrolment. For example, student enrolment grew by 64 per cent from 316,379 in 2013/14 to 564,507 in 2016/2017. Despite the significant growth, **challenges to access remain**. These include inadequate capacity to cater for the growing demand from secondary school leavers; mismatch between skills acquired by university graduates and the industry demands; significant imbalance between students enrolled in arts and in science-based courses; gender and regional disparities in terms of admissions and in subjects and courses undertaken; and lack of programmes suitable for learners living with disabilities.

Other challenges include inadequate facilities; appropriate teaching and learning environment; inadequate numbers of staff; weak collaboration with professional accreditation bodies; lack of external quality assurance in public universities; large class sizes; weak linkage between the competences acquired in some programmes and the demands of the market; and inadequate research funding.[6]

**Situating University Research in National Development** - Key to realisation of Vision 2030 is the generation of a critical mass of research output addressing the country's major challenges and priorities, proposing strategies, policies and solutions, and enabling the actualisation of the delineated flagship projects and programmes. Research carried out within universities can be broadly categorised as **basic or applied research.** Basic research aims at generating new knowledge that may not necessarily be directly associated with a particular practical challenge or problem. On the other hand, applied research seeks to find solutions and recommendations to problems and improve practices. Both contribute to a nation's development agenda with basic research taking on a more long-term view and applied research a shorter horizon time horizon.[7]

The role that research plays in development has been widely recognised.[8] According to Calma,[9] "achieving social relevance and economic benefit from research is the goal of universities and governments in many parts of the world." (p. 2). Much of the knowledge generated, however, and especially in developing countries, is not being translated into changes in policies, technologies and strategies for development, the so-called **'knowledge-action' gap**.[10] While the latter can be addressed through various interventions, the basic premise still remains that **relevant localised knowledge must be generated** in order for a nation to develop, a role that universities and other research institutions should play. As a result, research from African universities and higher education institutions are increasingly being challenged for not contributing effectively enough to the improvement of policy and practice for African development.

Poor technology development, transfer and management have also been barriers to achievement of sustainable development in sub-Saharan Africa. Whereas in the face of limited local resources, research

---

6 Ministry of Education *Sessional Paper No. 1 of 2019 on A Policy Framework for Reforming Education and Training for Sustainable Development in Kenya*, Nairobi 2019.

7 M. Ogot, G.M. Onyango, R. Muriuki, "Is the Research Agenda of Kenyan Universities aligned to realising Vision 2030?," *1st Biennial Status of Higher Education Conference*, Commission for University Education, Nairobi, Kenya, August 22-26, 2016.

8 Nyangaga, J., Smutylo, T., Romeny, D., and Kristjanson, P. (2010), "Research That Matters: Outcomes Mapping for Linking Knowledge to Poverty-Reduction Actions.", *Development in Practice,* Vol. 20, No. 8, pp. 972-984.

9 Calma, A. (2011), "Postgraduate Research Training: Some Issues." *Higher Education Quarterly*, Vol. 65, No. 4, pp. 368–385.

10 Kristjanson, P., R. Reid, N. Dickson, W.C. Clark, D. Romney, R. Pusjur, S. MacMillan and D. Grace (2009), "Linking International Agricultural Research Knowledge with Action for Sustainable Development." Proceedings of the National Academy of Sciences of the US, Vol. 9., No. 13, pp. 5047-52.

initiatives are often expected to be aligned to local national strategies to meet numerous challenges including food security and economic growth in order to attract funding.[11]

It is within this context that the IUC programme focussed on the establishment of the Legume Centre of Excellence in Food and Nutrition Security (LCEFoNS) at JKUAT.

**Short description of JKUAT** – Jomo Kenyatta University of Agriculture and Technology (JKUAT) is situated 36 kms North East of Nairobi in Juja, JKUAT traces its origins to a middle level college, Jomo Kenyatta College of Agriculture and Technology started in 1981 with the support of the Japanese Government. In 1988 it was elevated to a University College under Kenyatta University, becoming a fully fledged University in 1994. The University has seen a steady increase in the number of students enrolled growing from 25,083 in 2013 to over 41,000 in 2017. The number of graduates has also steadily grown from 5,403 in 2013 peaking at 8,952 in 2016 and dropping to 6,642 in 2017 primarily due to staff industrial actions (strikes) that disrupted the academic calendar.[12]

JKUAT counts 5 colleges[13] of which 3 are involved in the IUC: Colleges of Health Sciences; Agriculture and Natural Resources, Pure and Applied Sciences, Engineering and Technology, and Human Resource and Development. The schools involved in these colleges have been specified in the above.

JKUAT counts 5 research centres to which LCEFoNS will be added. The Institute of Biotechnology Research (IBR) which is involved in P1 is one of these centres. The centres are expected to develop products that can be patented. The ambition is to have them enhancing non-traditional revenue generation. In the coming years, policies and strategies for the management of the centres will be reviewed and implemented.

11 Ahmed, A. and Newton, D. J. (2005), "Strengthening African Universities' Strategic Role in Knowledge and Technology Development: Policies and Practice from Sudan." International Journal of Learning and Intellectual Capital, Vol. 2, No. 1, pp. 66-80.
12 JKUAT Strategic Plan 2018-2022
13 http://www.jkuat.ac.ke/academic-colleges/


*Figure 1: Map to situate JKUAT*

In 2018, JKUAT presented its 4th strategic plan 2018-2022. This strategic plan gives a good overview of the strengths and weaknesses of the university and its ambitions.

Already with the 3rd strategic plan, JKUAT positioned itself as an entrepreneurial university: '*The strategic goal of universities has moved beyond the tradition of teaching, learning, research and innovation towards the mission of entrepreneurship, which is aimed at addressing the needs of industry towards economic growth and development. The goal adopted in the third Strategic Plan (2018-2022) is to, "establish and institutionalize entrepreneurship and internationalization culture by developing and exchanging knowledge through collaboration with industry and other stakeholders*."[14] The stakeholders mentioned are the public sector, private sector, NGOs, development partners, academia and communities for enhancing economic and social development. The accents are clear from the baseline mentioned at the JKUAT website: 'Setting trends in higher education, research, innovation and entrepreneurship".

In addition, the IUC programme feeds directly into the realisation of several of the University's current strategic objectives including:[15]

- Undertaking applied research along the agriculture and manufacturing supply chains in collaborations with industry players.
- Coordinating resource mobilization programmes between the university and public sector, private sector and development partners.
- Coordinating production and commercialization of technologies from schools/ colleges and research centres in collaboration with industry players
- Developing and institutionalizing inter-organizational arrangement for pursuing collaborative joint research projects with selected industry players
- Ensuring that projects and research studies undertaken by students are based on industry needs for enhancing consumption of results and recommendations.

14 JKUAT (2018) Strategic Plan 2018-2022, pp. 14.
15 Ibid.

- Promoting establishment of modern infrastructure and facilities within the schools/colleges/departments to enhance research and innovation, and
- Promoting collaboration between schools/ colleges/ departments with industry to develop innovative products and technologies.

## 1.3. Evaluation methodology and process

This evaluation was executed by a team with an evaluator from Belgium (Corina Dhaene from ACE Europe) and a consultant from Nairobi (Professor Madara Ogot from the University of Nairobi). Methodological support was provided by Eva Wuyts. The consultants have not been involved in any way in the formulation or execution of the IUC programme, nor did they have any contractual relationship, now or in the past, with any of the partners involved with the project/programme under review.

In the following, the report highlights the evaluation framework used by the evaluators, the activities undertaken, the limitations of this evaluation and quality assurance.

**Evaluation framework** - The evaluation was implemented in three phases: an inception phase, a phase of data-collection and a phase of analysis and reporting. During the inception phase an evaluation framework (see annex 2) was developed, composed of evaluation questions related to 4 of the five OECD DAC evaluation criteria (disregarding the criterion of impact) at project level and two key questions at programme level. Because of the importance of the specific question on interconnectivity for the stakeholders, the 'how' of organising interconnectivity was looked at under a specific evaluation question (EQ1 at programme level). Interconnectivity was understood as the multidisciplinary design of the projects along a value chain.

The evaluation questions were elaborated based on the evaluation questions formulated in the ToR and the assessment criteria used in the self-assessment reports. The evaluation questions consist of different judgement criteria and guiding questions or points of attention. These points of attention clarified what information would be looked for and as such guided the data-collection and development of interview guidelines. Under these points of attention, the effects of the COVID-pandemic were taken into account (effects on execution, on relevance, on effectiveness).

For each of the judgement criteria an appreciation scale was developed as requested in the ToR. A four-point qualitative scale was used.

| Excellent | Good | Low | Poor |
|---|---|---|---|
| 4 | 3 | 2 | 1 |

This scale is not intended to cover all indicators/guiding questions (as some of them are more important or relevant in the final judgement than others, depending on the project content) but was above all helpful in formulating a balanced judgement in a transparent manner. **The scores are not intended to compare the projects amongst each other, the overview of scores simply helps to reflect upon the overall judgement for this IUC.** Table below presents an overview of the evaluation questions and their judgement criteria at project and at programme level. Attention for scientific quality was integrated

under efficiency at project level as it correlates with the indicators specified at the level of intermediate results in the results frameworks of the projects (see EQ 3.1 and 3.2.).

| Evaluation questions | Judgment criteria programme level |
|---|---|
| EQ 1 – How is the interconnectivity between the 4 projects constructed and executed and what are the first effects? | 1.1. The relevance for the legume/bean value chain can be confirmed from various perspectives |
| | 1.2. The programme management is aligned with the design of interconnectivity (efficiency) |
| | 1.3. The interconnectivity adds value to the effectiveness and scientific/educational quality of the programme |
| | 1.4. Sustainability of the feature of interconnectivity in the development of the centre of excellence |
| | 1.5. The approach of interconnectivity has the potential to contribute to impact |
| EQ 2. What is the level of efficiency at the programme level? | 2.1. Management of the execution of the IUC is done in an efficient way |
| | 2.2. Role division is clear |
| | 2.3. Transparent financial management and support to execution of procurement |
| **Evaluation questions** | **Judgment criteria project level** |
| EQ 1 – To what extent are the projects relevant? | 1.1. The objectives of the project are consistent with country/local needs, the needs of the university, the VLIR-UOS strategy and donor's policies |
| | 1.2. There have been efforts made to ensure complementarity and synergy with other projects/other (Belgian) actors |
| | 1.3. The project is coherent |
| EQ 2 – To what extent have the project's specific objectives been achieved (effectiveness)? | 2.1. Extent to which the specific objectives of the project with regards to research and support to research have been realised |
| | 2.2. Extent to which the specific objectives of the project with regards to uptake have been realised |
| EQ 3 – What is the level of efficiency in the projects? | 3.1. Intermediate results have been delivered |
| | 3.2. Support was provided to ensure the quality of the research and educational processes |
| | 3.3. Relationship between means and results achieved and objectives (qualitative assessment) |
| | 3.4. Project management is conducive for efficient and effective project implementation |
| EQ 4 – To what extent will the project results continue after the IUC programme is completed (sustainability)? | 4.1. Level of academic and institutional sustainability |
| | 4.2. Level of financial sustainability |

*Table 3: Overview of the programme and project level evaluation questions linked to the five OEC /DAC evaluation criteria*

**Activities undertaken and methodology –** The main methods used in this evaluation were desktop study and **semi-structured interviews (either individual or in small groups), site visit and outcome harvesting**. Briefing and debriefing sessions with the stakeholders concerned were envisaged as opportunities to discuss findings and to learn from them. The methods are briefly described below.

The evaluators made optimal use of existing documentation and in particularly of the self-assessment reports. The self-assessment reports were studied and analysed before effective data-collection through interviews took place.

Semi-structured interviews were conducted with a variety of internal and external stakeholders. In case, the respondents were more than three, the evaluators choose to have a focus group discussion on particular topics, proposed by the evaluator. Respondents were in all cases invited to add issues, the evaluators did not ask for but were felt important to them. Key respondents included:

1. IUC coordinators and team leaders
2. IUC programme manager
3. University Leadership:
   (a) Vice-Chancellor
   (b) Deputy Vice-Chancellors: for Academic Affairs and for Research, Production and Extension
   (c) Director of the Directorate of Grants Management
   (d) Chair of Technical Board (provides oversight) of the Directorate of Grants Management (who is also the local coordinator of the IUC).
4. College Principals, Deans/Directors of Schools and Chairmen of Departments involved in the project:
   (a) College of Agriculture and Natural Resources (CoANRE) and participating schools and departments.
   (b) College of Pure and Applied Sciences (CoPAS) and participating schools and departments, particularly the School of Computing and Information Technology.
   (c) College of Health Science and participating schools and departments, particularly the School of Public Health.
   (d) Institute of Biotechnology Research (IBR), which is one of the 5 centres of excellence at JKUAT
5. Representatives of the academic staff involved in each of the projects and not involved (the latter mainly through outcome harvesting)
6. Post-graduate students involved in the projects.
7. External stakeholders, such as line ministries, other donors, representatives of industry and/or CSO partners.

The evaluators assessed that **outcome harvesting** would enrich understanding and analysis related to interconnectivity of projects and the visibility of the programme for those that were not directly involved. The purpose was to get the perspective of the wider university community on the aspect of interconnectivity and to assess to what extent the interconnectivity within the IUC contributed to the emergence of an interdisciplinary research culture and the emergence of a multidisciplinary centre of excellence. Respondents were identified and invited to answer in writing (and supported by a format) the following question: ‘what changes have you observed in your department/the university that point at the emergence of an interdisciplinary research approach?’. One round of harvesting was organized between Oct 24 – Nov 6 2020, 8 of 10 respondents replied, from 8 different departments replied, all received requests for clarification (of which 4 replied). In total 23 change statements were received. These informed the field visits and the interviews (for example, additional questions were asked to PhD students) and enriched analysis.

Figure 2 below presents an overview of the outcome harvest respondents:

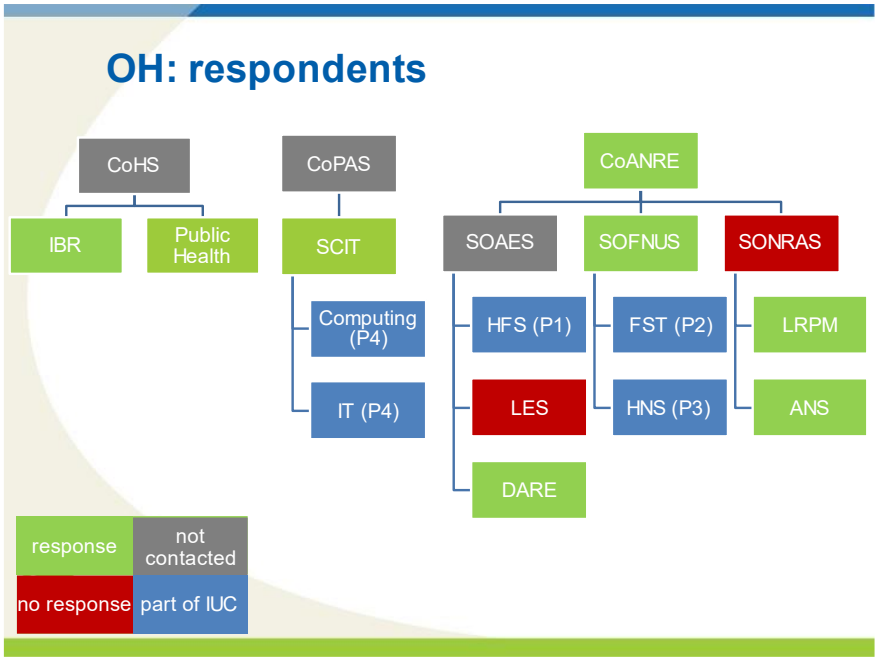


*Figure 2 – Overview of Outcome Harvesting Respondents*

A debriefing session was organised at the end of the data collection: coordinators and team leaders, together with VLIR-UOS participated in a joint discussion of findings based on written project assessments and a presentation of the overall analysis at programme level. Before the write-up of this report, comments on the project assessment were provided by the team leaders and taken into account.

**Limitations of the evaluation** – In general, the MTE was very well organised by the IUC South coordinator and the programme manager. Due to the COVID-19 pandemic, all interviews have been organised online with majority of the interviews conducted in the presence of the two evaluators between November 2nd and 16th 2021. A one day on site visit on November, 10th 2021 was organised to meet lab assistants and to see the lab infrastructure and equipment. The online meetings went very well (technically). The only limitation was the lack of interactive physical set-up of meetings that stimulate participation of all stakeholders at the same time and allow to move quicker to the main issues and to have a joint and creative reflection about conclusions and recommendations. There was no opportunity to gather information in a more informal way (by being present on the campus and experiencing the actual dynamic of relations between people).

**Quality assurance** – ACE Europe developed a COVID-19 proof approach for its evaluations and shared this with colleagues and with the IUC stakeholders. The combination of different sources (more in particular: interviews, focus group discussions, self-assessments, programme documents, and outcome harvesting) allowed for sufficient triangulation of information.

Quality was assured by the evaluation team and its careful preparation in consultation with the stakeholders at JKUAT: the feasibility of the programme for the evaluation visit was checked; the evaluators took into account constraints and adapted the programme accordingly. The question and format of the outcome harvesting were double checked with the IUC coordination. Briefing and debriefing allowed for comments and concerns to be addressed in updated versions (for example, adaptations in the inception report). The inception report was shared with the IUC stakeholders (coordinators and team leaders North

and South) prior to the field mission to allow them to assess the approach, which is thought to contribute to relevance and to buy-in of the stakeholders in the evaluation.

## 1.4. Structure of the evaluation report

The following chapter on overall evaluation findings will answer the question on interconnectivity and will present an overall assessment of the programme against the criteria of relevance, efficiency, effectiveness and sustainability. The next chapter presents the assessments for each project separately (see separate documents) followed by overall conclusions and recommendations.

# 2. Overall evaluation findings

## 2.1. Added value of the approach of interconnectivity

Assessment of interconnectivity was achieved by looking at five aspects at programme level:

i. Relevance for the legume/bean value chain can be confirmed from various perspectives.
ii. The programme management is aligned with the design of interconnectivity (efficiency – this is elaborated more on under efficiency).
iii. The interconnectivity adds value to the effectiveness and scientific/educational quality of the programme.
iv. Sustainability of the feature of interconnectivity in the development of the centre of excellence.
v. The approach of interconnectivity has the potential to contribute to impact.

The assessment of interconnectivity was very positive for all evaluation dimensions as shown in the table below. Each of these is elaborated upon in the sections that follow.

| Evaluation Question | Score |
|---|---|
| EQ 1.1. Relevance for the legume/bean value chain can be confirmed from various perspectives. | 4 |
| EQ 1.2. The programme management is aligned with the design of interconnectivity (efficiency – this is elaborated more on under efficiency). | 4 |
| EQ 1.3. The interconnectivity adds value to the effectiveness and scientific/educational quality of the programme. | 4 |
| EQ 1.4. Sustainability of the feature of interconnectivity in the development of the centre of excellence. | 3 |
| EQ 1.5. The approach of interconnectivity has the potential to contribute to impact. | 3 |

*Table 4: Overview of scores for evaluation 1 on Interconnectivity*

**Relevance for the legume/bean value chain can be confirmed from various perspectives -** Legumes are important as protein supply through animals alone is not sustainable. Legumes are the best alternative to proteins originating from plants. It is important that Africans do not loose beans (and other legumes) from their diet as has happened in the west. Due to difficulties in its storage and preparation, beans are disappearing from the plate and being replaced by grains only. Beans are rich in fibre and high in protein. Beans are also nitrogen fixating plants (take nitrogen from the air into the soil). The value-chain approach based on inter-connected projects addresses both the supply (P1) and the demand (P2/P3) for legumes.

From a national perspective, the research along the legume value-chain directly addresses the country's priorities as captured its current development plan, Vision 2030 Medium-Term Plan III (2018-2022) under the **Food and Nutrition Security flagship programme** and the **Research and Capacity Building Programme** (Economic Pillar – Agriculture and Livestock). **Food and Nutrition Security** is also one of the four pillars under the President's Big 4 Agenda (2018-2022).

The IUC is based on four interconnected projects that cover the entire legume value chain. This includes legume production practices (breeding, agronomy, and crop management) – under Project 1; post-harvest handling, processing and value addition of fresh produce – under Project 2; and legume nutrition and health as well as understanding of the factors that influence marketing and consumption of legumes – under Project 3. The team identified the whole value chain approach as the most effective way to

contribute to the increased use of legumes in eliminating protein energy malnutrition in Kenya's rural and urban areas. ICT support for legume research (over-arching) is under Project 4.

At inception, it was the intention that the interconnectivity between and multidisciplinary nature of the four projects would create high added value at the programme level, more than could be achieved by each project in isolation. The interconnectivity would foster synergy and build a strong research collaboration relationship between the departments of Horticulture, Food Science and Technology, Nutrition and Health (in the College of Agriculture and Environmental Sciences) and the School of Public Health (in the College of Health Sciences) strongly supported by the School of Computing and Information Technology. It was recognised by stakeholders at different levels within the university as providing relevance to more people and opportunities for a role out of research results and for connecting effectively with end users and beneficiaries (hence higher expectations for impact). The stakeholder workshops provided the potential to also stimulate interconnectivity between key societal actors feeding back into the programme (for example, a shift of P3 focus on diabetes purely from intake to attention on clinical outcomes). Finally, donors also started to stimulate this type of collaboration, which underlines the relevance and urgency of the choice for interconnectivity.

The JKUAT Strategic Plan 2018-2022 highlights (pp. 55) that it is the inappropriate linkages between farmers, input suppliers, processors and business development service providers that hamper the technology transfer: the IUC value chain approach clearly addresses this. The fact that all stakeholders are brought together during workshops can strengthen these linkages and thus support technology transfer.

As such, it provided a unique selling proposition for the IUC, when compared against other (IUC) programmes financed by VLIR-UOS.

**Interconnectivity adds value to the effectiveness and scientific/educational quality of the programme** - The evaluators were very positive about the level of realisation of the planned inter-connectivity of the project. The evaluators observed that the approach has succeeded in bringing together faculty and students from different departments, schools and colleges within the University, to work effectively in a multi-disciplinary environment. For example, there was evidence of P2 students having significant interactions with the statistics department on data analysis and interpretation of the lab work using SAS. Students also had interactions with the computing department and nutrition department through the students in P4 and P3, respectively. There was also strong evidence of interaction between P2 PhD students and other students in the programme, for example, with P3 masters and PhD students especially on development of nutritious noodles products. Next to being transversal, interaction with P4 PhD students and students from other projects was obvious. One particular example is to use P1 to validate the results from the tool developed in P2 to determine bean behaviour during storage (more examples can be consulted in the P4 project assessment).

Interconnectivity did come with its challenges. For example, in 2019, P2 faced a big challenge from timely availability of materials from P1. In that year, bean variety yields were low due to bad weather (low rainfall) and pest infestations. P2, however, used materials from KALRO as a mitigation measure. In addition, it was not practical for P3 to wait for final varieties from P1 and P2 to begin their work. As a result, the P3 team used bean varieties from KALRO, that have been bio-fortified through a breeding process yielding acceptable levels of zinc and iron, to develop their legume-based noodle product. Phase II work will include bean varieties from P1/P2 once they become available.

| | | Providing | | | |
|---|---|---|---|---|---|
| | | **P1** | **P2** | **P3** | **P4** |
| **Receiving** | **P1** | | Data about cooking time<br>Procedures for quick screening | Information on consumer needs (acceptance of product, colour) (is planned for) | Support in data collection in the field, installation of small weather station |
| | **P2** | Varieties of beans selected for cooking time and flatulence (through KALRO) | | Information on food product (noodles) | Support in data analysis |
| | **P3** | Varieties of beans selected for zinc and iron (is planned for) | Opportunities to define for second phase (not yet clear) | | Collaboration at the beginning:<br>advice on data collection, support in data collection with tablets (with support from P4 MSc student) |
| | **P4** | Challenges presented that provide opportunities for ICT solutions | Challenges presented that provide opportunities for ICT solutions | Challenges presented that provide opportunities for ICT solutions | |

*Table 5: Interconnectivity in practice*

The excel table 'M&E matrix of the programme' further underlines the effectiveness of the approach as it is highlighting the effect on the publications: the cumulative number of scientific papers involving the IUC team leaders between 2011-2016 was 11 and rose to 20 for the period 2015-2020.

**To conclude**: interconnectivity of the projects has given visibility to and shaped the image of the legume centre as a multidisciplinary virtual centre that can call upon researchers and labs situated in various departments. The data from the outcome harvesting and the interviews demonstrate that the programme acts as a catalyst and role model for other multidisciplinary research projects

Although the LCEFoNS was not yet specifically mentioned in the 2018-2022 strategy, it now prominently features on the JKUAT-website as one of the Vision 2030 projects of the university, which clearly positions it within the university.

The effects of the IUC-way of working on the university as a whole therefore cannot be denied. The whole set-up of the IUC is so well reflected in the strategic plan (which was drafted after the start of the IUC) that the evaluators agree with the self-assessment reports stating that the IUC influenced the strategic plan in various ways and influenced on a number of decisions, for example, the stakeholder platform concept and associated stakeholder workshops influenced the decision of the university to organise on a more regular basis seminars with industry, government agencies and development partners, for example, the fact that measuring progress on research and development is done by the indicator 'each school to undertake one research study along a supply chain per year'. Other examples are mentioned under effectiveness of the programme.

**Sustainability of the development of the (virtual) centre of excellence** based on the feature of interconnectivity- This will depend on several factors, such as:

- Ownership of the interconnectivity: there is continuous push of university leadership for multi-disciplinary research and this is supported by the current strategy.
- Clarity on the management of a 'virtual' centre of excellence: at the institutional level it is not clear how the virtual centre will be managed and how this will be different from the other centres. Typically, LCFoNS is based on a collaboration between different research teams and labs, which is slightly different from other research centres of which the management is described in the JKUAT Strategic Plan. How will new research (and even commercialisation of innovation) contribute to the centre? Further, there is not yet a policy clarifying what 'excellence' means
- Maintaining the experience with interconnectivity and value chain approach in the legume value chain: the idea was that the PhD trained would be absorbed as staff members and this is the firm objective of university leadership. Whereas some of the PhD candidates were already JKUAT staff members, many are not. Two are actually staff members at other universities and three others do not yet have a position at JKUAT, see also further under the chapter of sustainability.
- Capacity to attract additional funding and use part of the funding to strengthen the visibility of the centre and its sustainability: there is strong evidence of academic staff involved in the IUC being able to attract additional external funding under the centre of excellence, leveraging on the activities and the facilities developed under the IUC. For example, a potato research project funded by JICA and the EU Food Fortification Project. More efforts, however, need to be made to bring in more external research funding in direct support of all stages in the legume value chain as captured in the inter-connected projects.

**The approach of interconnectivity has the potential to contribute to impact** – The potential impact from building an IUC on the legumes value chain shall become evident in Phase II during valorisation. The farm-to-fork (and fork-to-farm) approach established through the interconnected projects shows strong evidence that the stated outcomes shall be realised.

For example, P2/P3 are already evaluating different bean-based food products (the 'demand'), targeting both those who may be malnourished (and thereby preventing development of disease) and those who have diabetes (and thereby helping them to manage their condition through nutrition). This has begun to show promise. A food company, Smart Logistics Ltd, has taken up their noodle product and begun to produce it commercially. In Phase II, P1 shall develop and make available a library of the "Easy-to-Cook" and "Hard-to-Cook" legume varieties (the 'supply') based on information received from P2, Kenya Agriculture and Livestock Research Organisation (KALRO) and the Pan Africa Bean Research Alliance network. In addition, they will be able to promote elite bean lines combining good agronomic traits and enhanced nutritional quality developed. Current work shows great promise that this aspiration shall be achieved.

Within the university, the approach of interconnectivity has improved the image of the SOAES by raising its visibility and ability to attract additional external funds. For academic staff, this is proof that interconnectivity along a value chain works, which is an important stimulus for them to invest in grant proposal writing. The IUC showcased and provided a big push for multidisciplinary research within the university that has become more intense and organised than before. This was recognised by the Japan

International Cooperation Agency (JICA), specifically, on the creation of groups that also include younger researchers and post-graduate students. From a development perspective, the potential impact from interconnectivity is promising but at this point too soon to fully judge (point of attention for the end evaluation). The stakeholder workshops, however, increased the visibility of the programme and JKUAT and should be instrumental in soliciting input and support. In addition, the external stakeholders are now part of a multidisciplinary approach, meet with each other, with their informed views feeding into the research.

## 2.2. Relevance

To assess relevance, the evaluators looked at three aspects across the four projects:

i. The extent to which the project objectives responded to country, university and VLIR-UOS needs.

ii. Efforts made for complementarity and synergy with other projects

iii. Coherence of the projects.

The assessment of relevance was general positive across all four projects and three dimensions as shown in the table below. Each of these is elaborated upon further in the sections that follow.

| Evaluation Questions | Project 1 | Project 2 | Project 3 | Project 4 |
|---|---|---|---|---|
| EQ 1.1. Responding to needs | 4 | 4 | 4 | 4 |
| EQ 1.2. Efforts for synergy | 3 | 4 | 3 | 3 |
| EQ 1.3. Coherence | 3 | 3 | 4 | 3 |

*Table 6: Overview of scores for evaluation on relevance*

**Responding to needs** – All projects scored high with view to their relevance. The relevance in terms of national challenges and needs was already confirmed in the point on interconnectivity (see in the above). The strong connection with national and county government development priorities is important: the current strategic plan underlines that far too often still research is too little connected.[16]

Overall, the relevance is strongly supported by interaction of the IUC stakeholders with particular (societal) stakeholders through the organisation of stakeholder meetings at the launch of the programme in 2017 and halfway in 2019.

To a certain extent this was seen to be influencing the research focus as is clearly demonstrated by P3: the focus of this project shifted from under-nutrition to non-communicable diseases (NCD), more in particular diabetes, which was influenced by the interaction of the project team leader with the National Ministry of Health and the Kenya Defeat Diabetes Association (KDDA).

It is to be noticed that the projects in the bean value chain all have privileged relations with a limited number of stakeholders. This can prepare the research teams and the university for organising and stimulating uptake of research results in society and creates opportunities for commercialisation in direct support of the goal under the Production and Technology Development in the 2018-2022 strategic plan: "developing, transferring and commercializing innovative products and technologies for enhancing economic development in collaboration with the stakeholders." The stakeholders from their side can gain as well. This is clear from the overview of main stakeholders in the table below. Interesting to note is the

16 JKUAT (2018) Strategic Plan 2018-2022, pp. 49.

case of P1 where the link between research team and stakeholder is strengthened by direct involvement in the IUC as two staff members of KALRO are connected to P1 as MSc students.

| | Stakeholder (and potential win for stakeholder) | Win for project |
|---|---|---|
| **P1** | KALRO (strengthening human capacity) | Access to bean germplasm |
| | Kenya Seed Company | Explore opportunities for commercialisation |
| | East African Grain Council (GAIN) (representing producers, traders and processors): strengthen market for beans (and their members) if the cooking time is diminishing | Understanding what can convince farmers to consider other criteria then high yields as 'easy to cook' varieties might increase demand (and price) amongst urban consumers |
| **P2** | East African Grain Council (GAIN) | Access to members of GAIN (other than Smart logistics) to work with |
| | Smart logistics (advice on their processes) | Analysing experience from practice with processing (pre-cooked dehydrated beans), looking into aspects to improve (enriching research) |
| | | Demonstrating progress on programme indicators related to policy advice |
| **P3** | KDDA (development of adapted food products such as bean-based noodles) | Developing consumer market for new products |
| | Ministry of Health (support in addressing the NCD, support in promoting healthy lifestyles | Support in mobilising health actors at county level |
| | | Demonstrating progress on programme indicators related to policy advice |
| **P4** | Several private companies and institutions involved in the network: access to experience of various stakeholders, broad network can contribute to innovation | Access to experience of various stakeholders and receiving inspiration for innovation |

*Table 7: Main stakeholders for each of the project*

Besides the relevance for the needs of the country and stakeholders in society, the projects are of high relevance to the needs of the JKUAT schools involved and the needs of the wider university, taken into account their contribution to PhD and MSc scholarship arrangements, the focus on research and the investment in equipment. When considering the hosting institutions and the human capacity currently being developed and the number of scientific publications in these institutions[17], it is correct to state that P1 and 2 are of significant relevance, P4 is also significant in terms of addressing the development of the somehow neglected expertise in software engineering. The relevance of project 4 increased with the COVID-19 pandemic and the specific need for online meetings and remote data collection: the project demonstrated readiness to address this, for example to support P3 in data collection switching from paper data collection to telephone interviews. The relevance for the hosting institution of P3 was not equally significant but also important.

The hosting institutions generally were facing decreasing government funding with higher number of students. The IUC projects enabled them to provide the necessary lab facilities to strengthen education and to increase motivation for research; although all academic staff is expected to spend 40% of their time to research, this was never enforced and given the raising number of students most of the attention went to education. The new facilities contributed significantly to the stated strategy of the university to promote the establishment of modern infrastructure and facilities within colleges/schools/departments

17 See the separate project assessments for more details.

to enhance research and innovation. The IUC projects demonstrated that it is feasible to invest in research (and proved that multidisciplinary research is effective, see further under effectiveness).

At a higher institutional level, it was already stated in the above that the IUC programme is fully in line with the strategic plan, a plan which is partly influenced by the IUC preparation and execution. The strategic plan indeed reflects attention for research, production and technology development, management of research centres, outreach and develops clear strategies with specified outcomes and indicators to be monitored and evaluated. It highlights a number of challenges related to research that are clearly addressed by this IUC, for example, the need to connect to government priorities, the need to have better inter-organisational arrangements for pursuing collaborative applied research, the need to have research along the agriculture, manufacturing and service supply chain for enhancing economic development, and the need to develop mechanisms for facilitating implementation of research results in collaboration with industry.

**Efforts for synergy** – All respondents confirm that the spirit of the programme was to look for synergies at all levels. This is already very well described in the self-assessment of the programme. Synergy was established to prepare for new research grants, to pool resources, to strengthen networking and to enhance exchange on relevant research topics. Some examples are highlighted below. The budget and time for this evaluation did not allow evaluators to look into the details of synergy between the IUC programme and the TEAM/Joint initiative programmes.

To start with, the quest for synergy is inherent to the efforts of the academic staff trying to form multidisciplinary teams with view to applying for external donor grants, not only between two different departments (as sometimes happened in the past) but **including multiple departments and schools**. All project stakeholders are investing in this. As the hosting department of P2 was most successful in securing funding for additional projects, the effectiveness of developing synergy between projects was most visible here and the IUC way of doing which was copied by the other projects and even donors (such as JICA for example,). The hosting departments of P1 and P3 are expected to follow this good example in the coming years: for example, the school of nutrition invested a lot in project proposals but needs to strengthen its volume of research data first to be more successful.

Another example of synergy is the equipment of the lab installed in an infrastructure realised by European Union funding and also receiving support from JICA and the Bill and Melinda Gates Foundation (P2). It provides a good example of how other schools can further develop their labs.

For P4, the evaluators are not aware of focused collaborative research projects/interventions yet (outside of the IUC) but the school of computing is very much involved in building and strengthening its network of stakeholders within Kenya[18] and with partners in Uganda (valorising relations developed under a previous Team project with the VUB) as such preparing the ground for more synergy in the future.

The evaluators noticed that the attention for synergy with non IUC projects was strongly present in the way PhD and MSc students were supported and coached by project team leaders in the North. There are examples of IUC students jointly developing and exchanging methods and data with students from VUB and KU Leuven (research teams in the North) that are not involved in the IUC, one of which even resulted in a joint publication (P3).

18 They were able to attract so many stakeholders that it was decided to have a separate stakeholder meeting for actors looking at big data for agriculture.

**Coherence** – As they are part of a value chain, supported by a transversal project, the coherence between the projects is strong. This was already underlined in the part on interconnectivity. P4 aims to strengthen capacity in applying existing data-centric tools in all projects and as such is part and parcel of the value chain. Moreover, the PhD student of P4 identified his topic for study based on the interaction with the other projects in the IUC to ensure relevance of the research results. From the interaction it was noticed that a lot of data collection by researchers still happens on paper. The goal is now to automate data collection, a modest start is already made and the PhD study will be immediately of use. The focus on intermittent data collection using the concept of extensibility and offline accessibility and how to ensure efficient and correct merger of data is in particular interesting when working in remote locations, which was already the case for some sites under P3.

One point of attention related to coherence in the evaluation framework is the choice of indicators. Cleary, it is not easy to formulate relevant indicators for a long-term programme. Particularly at the level of the specific objectives, it is not always clear what exactly is measured and how. The indicators are not chosen in such a way as to instigate reflection and discussion about strategies and progress and do not differ a lot from what is measured under the intermediate results.

## 2.3. Efficiency

This criterion focusses on the overall management of the IUC programme, the role of the steering committees (joint and local) and their interaction with the JKUAT top management to ensure efficient and effective implementation of the projects. Assessment was achieved by looking at three aspects at programme level:

i. Management of the execution of the IUC is done in an efficient way.
ii. Role division is clear
iii. Transparent financial management and support to execution of procurement

This section combines the assessment of efficiency at programme and project level as they are very much interconnected. At project level the evaluation dimensions are:

i. Delivery of (planned) intermediate results
ii. Support provided to ensure the quality of research
iii. Relationship between means and results
iv. Conducive project management

The assessment of efficiency was overall very positive for all three evaluation dimensions at programme level as shown in the table below. At the level of the projects, efficiency is also assessed to be strong with some minor points of attention that will be elaborated further. Each of the evaluation dimensions is elaborated upon in the sections that follow.

| Evaluation Questions | Score at programme level |
|---|---|
| EQ 2.1. Management of the execution of the IUC is done in an efficient way. | 4 |
| EQ 2.2. Role division is clear | 4 |
| EQ 2.3. Transparent financial management and support to execution of procurement | 4 |

| | Project 1 | Project 2 | Project 3 | Project 4 |
|---|---|---|---|---|
| EQ 3.1. Intermediate results have been delivered | 3 | 4 | 4 | 3 |
| EQ 3.2. Support to the quality of research | 4 | 4 | 4 | 4 |
| EQ 3.3. Relationship between means and results | 3 | 4 | 3 | 4 |
| EQ 3.4. Conducive project management | 4 | 4 | 4 | 4 |

*Table 8: Overview of scores for evaluation question 2 on efficiency at programme and project level*

**Realisation of intermediate results** – Planning is done very carefully and at an early stage in the year and overall, majority of the activities planned have been executed as planned. The programme is considered by respondents from North and South as the best performing IUC they know of and best performing externally funded programme within JKUAT.

The realisation of intermediate results is at various stages of realisation. Strengthening and developing human capacity is generally well on track with a delay of graduation (and in research results) for some PhD and MSc students, dominantly due to COVID (with some having an expected date of graduation only in 2022 so beyond the closing date of phase I of the IUC). The table below provides an overview of the investment of the programme in human capacity. P1 is moving a bit slower in realising publications because it needs at least 3 seasons of data for analysis. The total number of publications as specified in the logical framework indicators (or two peer reviewed articles/student which is the the minimum required in Kenya for graduation) might be obtained by the beginning of Phase II. Lab equipment that was planned to be installed, has been installed and is functioning (which was confirmed by the field visit). The lab equipment installed under P2 allows the school to be internationally competitive as very few researchers in Africa are able to apply the FT-NIR technique (finger pressing and Fourier Transfer Near Infrared technique that is being used to classify the beans into easy and hard to cook which is helping P1 in designing its breeding experiments). P4 will finalise a database and interface for an online portal absorbing all research findings and making them available for other researchers in the field.

| | No. PhD Students | Year of graduation (Expected) | Number publications[19] | No. MSc Students | Year of graduation (Expected) |
|---|---|---|---|---|---|
| P1 | 3[20] (1F) | One in 2021, one in 2022, 3rd in 2022 | 3 (1 published 2018, 2 drafts) | 3 (1F) | One graduating in 2021, and the rest in 2022 |
| P2 | 2 (2F) | One in 2021, one in 2022 | 3 (2 published, 1 draft) | 5 (4F) | 2 expect to graduate respectively in 2021 and 2022<br>1 graduated in 2018 got a PhD scholarship from JICA<br>1 cancelled and replaced by short term training travels |
| P3 | 2 (1F) | Both graduating in 2022 | 4 (1 published, 3 conference proceedings) | 5 (4F) | Two graduating in 2021, the rest in 2022 |
| P4 | 1 | 2021 | 2 (published) | 3 (of which 2 are international) | 2019, 2020 |
| total | 8 (4F) | | | 16 (9 F) | |

*Table 9: Contribution to human capacity: overview of investment in post-graduate students*

[19] The programme monitoring matrix of Year 3 highlighted that it is planned that all publications will appear in internationally reviewed journals, in Year 3, 2 publications (P2, P3).

[20] One PhD financed on a budget of the National Committee of Science and Technology (NACOSTI, Kenya)

It should be noted that all project stakeholders are sensitive to gender (in terms of equal access to opportunities) and have ensured a gender balance in identification of scholarships. This is evidenced in the balance of male and female post-graduates (Masters and PhD) supported by the IUC (see in the above).

The transversal project, P4, provided the (multi-day) tutorials and trainings that were planned for academic staff and post-graduate students of the IUC teams and within JKUAT University, overview is provided in the table below. From this table appears that participation is higher than anticipated (total of 63 participants planned for) and appeal from outside of the IUC is growing.

| Date | Topic | No. Participants | No. outside of IUC teams |
|---|---|---|---|
| July 2017 | Mobile applications | 30 | 7 |
| Sep 2017 | Resource mobilisation | 28 | 5 |
| Jan 2019 | Statistics | 35 | 23 |
| June 2019 | Data science | 50 | 21 |

*Table 10: Overview of tutorials and workshops organised by P4*

**The programme will be able to realise almost all planned intermediate results during Phase I**. The 2020 planning document for activities to be executed in 2021 demonstrates attention for any delays and addresses these to ensure that most intermediate results will be obtained by the end of Phase I of the IUC. The planning demonstrates that the management of the programme (see further below) is really a very important factor in ensuring the efficiency of the projects. Besides the delays in realising the graduation of some students and the scientific publications as highlighted in the above, a **minority of planned intermediate results** proves **more difficult to realise**:

- P1: realisation of new genotype of beans combining agronomic traits and nutritional quality (to support further development of appropriate products in P3);
- P4: realisation of the repository of tools on data analysis, assisting researchers to identify the most appropriate tool for their analysis needs;
- For P1-P3: for all projects, the development of guidelines and strategies for non-academic actors (for example, on beans processing, new dietary behaviour strategies) will not be realised under Phase I as planned. The stakeholders argue that these are seen as part of the consolidation strategy which is planned for under Phase II.

The programme and projects faced a number of **challenges in execution** that were all-in-all well managed (see also further below under programme management). The challenges were the following:

- 2019 bad yield for P1 (related to lack of rain and breakdown of irrigation structure)
- Procurement: this was increasingly managed by anticipating in an earlier stage the needs (see further below under programme management). For P1 this was in particular embarrassing as it was not possible to have easy access to spare parts to fix the irrigation structure)
- Weak capacity of an external lab to ensure trustworthy blood sample analysis (KEMRI): analysis is now outsourced to a German lab and KEMRI will deliver in the coming future by outsourcing some analysis to a private lab.

- The COVID-19 pandemic has influenced a lot on access to labs, the research of the PhD (more in particular for P1 and P2 where students could not go to Belgium and have rescheduled parts of their research to 2021), access to support from P4 (where the PhD student did not return to Kenya as planned), delay in organizing regional conference in Uganda with Makerere University on ICT in agriculture (P4) and for P3 it was impossible to carry on with the work in the schools as they were closed in March 2020 under COVID-19 prevention measures that also restricted operations with human beings. It was therefore also not possible to work in hospitals. P3, therefore, were forced to change methodology to use online and mobile phone interviews.

One particular challenge, the identification of suitable MSc candidates and their timely graduation is not yet fully addressed: it was difficult for the programme to attract good local MSc students (those studying at JKUAT). This is because the IUC does not offer stipends to them. The effect has been that the local Masters students are taking longer than the stipulated time to complete their programmes. This is because many of them have to work outside college to raise living expenses. Although the VLIR regulations state that it is possible to provide stipends for MSc students in Kenya, the expenditure must come from the local IUC administrative budget. The evaluators found that this budget is already fully committed as used to cover PhD students when in Kenya (stipends) and also pays for the local support staff. From discussions with University leadership, is revealed that where possible, some leadership (but not all) feel that stipends should be factored into budgets in programmes that support MSc students.

One **area of concern** identified by the evaluators was the apparent narrowing of the programme scope from investing legumes to primarily focussing on beans as case-study for Phase I. Discussions with the IUC team revealed that that was the intention developed in the inception phase of the programme and thus this was not clearly spelt out in the programme document. The reasoning provided is that the common bean has more impact due to wider availability and consumption in comparison with the other two legumes, cowpea and green gram. The team therefore opted to go in depth with the bean varieties during Phase I. As the legume families are quite similar (and research results on beans are useful for the other legumes), investigations involving cowpea and green gram shall be part of the valorisation in Phase II as well as external funding from other sources. The evaluators accepted this reasoning as an appropriate path to follow.

**Support to the quality of research** – The organisation of providing support to research and students was excellent. Examples mentioned are: easy access to labs and high-end equipment (and support of lab assistants on how to use equipment), availability of consumables and facilities, support for organising field work. Of 23 outcome stories collected in departments that are not hosting the IUC-projects but have been interacting with the programme, 8 point at changes related to research facilities.

**The transversal project has played its role in supporting the quality of research**: P4 has been very supportive in strengthening capacity for data collection and analysis and making staff and students aware of what is possible in terms of software programmes. And P4 was ready to support (more in particular P4) in dealing with the negative impact of Covid19 on data collection in the field. All of this, respondents stated, significantly contributed to the good progress they were able to achieve and the further development of the research.

**Supporting post-graduate students was well organised**. The students across all projects described their interaction with their promoters as an “open-door policy” where they have been able to get all the assistance and guidance they need, when needed.

PhD students who were staff members at JKUAT (and also two other universities) were afforded adequate time to focus on their studies and research work by freeing them from (most of) their teaching duties. When needed, PhD students could sign up for additional trainings (for example, in P1 additional training course was possible in Kenya and in Belgium). Further, the PhD students expressed their appreciation for having received strong 'mentoring' support, from various professors covering different aspects of their research. Various inputs were not too difficult to take in, thanks to alignment between professors (and the respect for each other's work).

**A particular feature of the IUC is the connection between PhD research topics and MSc students**. This connection is not typical across JKUAT University. As such PhD students were there to assist MSc students in developing clear research topics thereby addressing a common difficulty of MSc students to conceptualise their research question and generating research ideas. This connects MSc to the research which is also a stated goal in the current JKUAT Strategic Plan.

Finally, students expressed the view that most challenges they experienced through the programme were overcome and addressed through monthly meetings with their professors. The recurrent meetings for managing the IUC programme are helpful to keep everybody on track, they create a stimulating environment for exchange on different research topics and create 'demand' for further research topics to be explored (scientific day during the meetings).

Already now, the programme stakeholders are **thinking about how to organise in Phase II the support in such a way as to contribute to the further development of a research culture in the departments concerned**: the plans are to have a research budget to support graduated PhD students in the next phase to continue research to ensure a transition from study to (research) work. The initiative is inspired by bad experiences from the past where PhD students came back with energy and ideas to their previous department and did not find opportunity to do their research and lost their research networks. The initiative is most commendable from the perspective of effectiveness and sustainability of results.

MSc Students from P4 would warn future students to inform themselves better about the requirements for an MSc abroad. Future students going to VUB from JKUAT should be better equipped on the expectations or they may find programmes are harder than expected. There is also a misconception on the workload, punctuality and the many deadlines.

**Relationship between means and results** – Investments, more in particular lab equipment has increased capacity for research in a significant way. Overall, all projects have realised great value for money, in some cases, for example, P4 as a transversal aspect benefitting the whole university: the lab is of good quality and accessible not only for the P4-team, the equipment and software appears to be usable beyond the project, the server proved to be very useful in Covid19 period (supporting online work), the trainings were highly valued and reached a public beyond the IUC team members and from other faculties as such increasing the visibility of the school of computing and, finally, the trainings were organised in an efficient way. For the organisation of the trainings, the project worked with the resources that were available in the North (network of the VUB, and professor from Hasselt involved in a Teams project) and in the South (Makerere university).

Cases of underspending are mainly situated in P1 and P3. Especially for P3, it proved difficult to identify suitable candidates for PhD which had a hand in the delay and consequently budget (which was, before Covid19, allocated on an annual basis) could not be spend. In P1, one of the PhD students did more work than planned in Kenya rather which lowered the costs. In general, what was not spend on (PhD) scholarship was shifted to investment. The attempt is always to shift unspent budget as professionally

as possible and first choice is always investments. Yet, the example of the limited equipment purchased for P3 illustrates carefulness of analysis of costs: it was decided not to set up an analytical lab for blood samples for several reasons:

- An analytical lab would require specific infrastructure funding, which would be difficult to argue within the budget rules of VLIR-UOS.
- The running cost (staff, equipment) of an analytical lab is too high to be run by solely one department. The amount of research money that can be secured is volatile and depends on many factors, therefore research money was not seen to be the right source to set up and run an analytical lab in a cost-efficient way.

There is one point of attention/consideration: in relation to the comment made in the above concerning the lack of stipends for MSc students, the evaluators noticed that JKUAT made the decision to hire additional staff on the PSU rather than to use part of the administrative budget to pay for stipends for Master students. Although, the university provided in-kind support to the students to execute their research, there was no financial support to cover living costs. This choice has negatively affected the results related to MSc students' progress. The question is raised whether JKUAT could not make other choices. This question did not receive a reply during the execution of the evaluation.

**Conducive programme and project management** – There was strong evidence that IUC was efficiently and transparently managed at programme and at project level, demonstrated flexibility and addressed challenges adequately.

This is first of all a result of strong ownership and participation of all concerned, for example, in joint steering committee (JSC) meetings held at the beginning of each year in January. These 3-4 day meetings would include project level meetings, a science day where the scientific progress of the programme was discussed, a joint steering committee meeting on planning as well as a PSU meeting. JSC meetings were also held in September each year to review current progress and plan for the next year. The evaluators found that these series of meetings ensured that all team members were abreast of the programme progress as well as issues that arose, enabling a joint approach to seeking a solution. This was even more important given the inter-connectivity of the projects.

At JKUAT, the local steering committee, held bi-monthly, enabled the regular review and planning of activities. These management activities were supported by the development and use of a detailed project management manual and a share point drive storing all relevant documents for all projects (including information about budget). A key contributor to the efficiency in the project is the personality of the people managing the programme. The evaluators found them all to be very enthusiastic and excited about the work they were doing in the programme. They had also developed a good working relationship and report between them, thanks to a long history of collaboration.

The regular JSC and LSC-meetings also provided a frequent platform for discussions on the aspects related to the interconnectivity of the projects thus providing the **mechanisms to make the interconnectivity work**. For example, flexibility in operations allowed projects to discuss and agree on which aspects of the individual projects can be done in parallel and which ones remained connected and therefore sequential. Meetings and continuous and frequent email communication also facilitated discussions and agreeing on solutions when challenges/delays arose in one project receiving material from another. For example, in 2019 when due to bad weather and pest infestations P1 was not able to provide the volumes of materials required, a joint decision was made to source materials from KALRO as a stop-gap measure.

Next to the management meetings, the **clear separation of roles and responsibilities was helpful.** This was starting from leadership at project level (with a north and south leader), establishment and actualisation of both local and joint steering committees as well as the programme support unit, ensured a clear division of roles. The evaluators found that these were well captured in the programme management manual developed by the IUC. It was also evident that the **University leadership played their role** and gave strong support to the IUC programme directly, but also took on board the suggestions for institutional changes that have resulted in some of the intended institutional impact. For example, the establishment of the Research Grants Office to provide a one-stop-shop to support faculty with pre- and post-award grant support services and training and the establishment of the research desk in the procurement office to speed up the procurement process (see also under assessment of effectiveness).

The IUC-management team implemented an **open approach to financial management** whereby activities and attendant budgets were discussed twice a year at the joint steering committee meetings, with all management and planning documents, including budgets, made available on a commonly accessible platform, Sharepoint (installed by the programme coordinators as advised by the coordinator from the North). PhD students were also incorporated into the budgeting process, drawing up budgets for their planned activities in the coming year and going through the internal process of getting those budgets scrutinised, vetted and approved, which strengthened their competences for managing future research projects. Being connected to the programme management has contributed to the learning process of a PhD on how to manage research in a cost-efficient way.

The COVID-19 pandemic presented significant challenges both in Kenya and Belgium. Closure of Universities at the beginning of the pandemic in March 2020, travel restrictions both local and international, as well as the need to comply with a host of new guidelines and regulations both in Kenya and Belgium forced the IUC-management to quickly re-think and re-plan the activities for 2020-2021. These included the inability of students to travel to or back from Belgium, restrictions on how data could be collected in the field (especially for P3), and initial limited access to the laboratories at JKUAT. The evaluators were able to establish that the JSC and LSC, working with the various students in the programmes and the University management, were able to re-organise the programme activities to the extent that the negative impact of the pandemic on the progress within each of the projects was minimised. A key part of this was P4 stepping up and providing ICT tools that enabled physical meetings to be shifted virtually and data collection to resume without the need for physical contact (restricted under the COVID-19 guidelines).

**Procurement continued to present a challenge but was increasingly managed at programme level**, and as a result of the IUC example this drove efficiency changes at the institutional level. For example, at programme level procurement requests, where possible, were made much earlier than needed to factor in the potential delay in the process. Of course, due to spending limits at different phases of the project this was not always possible. For Phase II it is already decided that there will be a small budget managed by the PSU at JKUAT for emergency provision where not everything has to go through procurement (for example, for P1 when the fields are invaded by pests, the procurement process takes too long as the pests wreak havoc).

In addition, at institutional level, a research desk was established in the procurement office to work towards fast tracking the approval and procurement process for research items. It also enabled the persons manning the desk to have a better understanding of the peculiarities related to research procurement.

## 2.4. Effectiveness

To assess effectiveness, the evaluators looked at the realisation of the specific objectives of the project related to research on the one hand and uptake on the other hand. In the self-assessments, effectiveness receives a high score and this is largely confirmed by the evaluation. As this is a mid-term evaluation, the question is whether the projects and the programme are moving towards the realisation of the specific objectives. The evaluators have taken a look at the indicators defined by the programme but also at non-planned results. Effectiveness of the approach was already highlighted under the question of interconnectivity (see in the above).

| Evaluation Questions | Project 1 | Project 2 | Project 3 | Project 4 |
|---|---|---|---|---|
| EQ 2.1..Realization of objective related to research | 4 | 4 | 4 | 4 |
| EQ 2.2..Realization of objective related to uptake | 4 | 4 | 3 | 4 |

*Table 11: scores related to effectiveness*

**Realisation of specific objective related to research** – When looking at the indicators to monitor and assess research culture and performance, the evaluators find that the programme has made progress in:

- **Increased use of lab facilities**: this was already highlighted under efficiency and is supported by high end equipment and accessibility. The technicians in each of the laboratories were trained on the equipment use, enabling them to train JKUAT faculty and staff. As a result, the use of equipment has extended beyond the core participants in the projects and is used by other faculty and students.
- Efforts of research teams to write grant proposals for external research funding: this is evident with most success for P2 (more than the one which was planned for in the programme document). In total, the teams secured 1 big project for 4 MEUR and three smaller projects for a total of 340.000 EUR) and new
- Development of research teams that connect academic teams are being formed and JKUAT staff is preparing students for their integration in multi-disciplinary research teams. For example, as a result of the support they received and the example of what mentoring looks like and their first experiences with MSc students, PhD respondents expressed a **clear readiness to support MSc students and other young researchers**.
- Writing scientific papers (progressing with some delay due to Covid);
- Regional and international connections and networks are being developed and strengthened (P2 and P4 in particular).

Respondents expect a shift in regional and international university rankings is possible but acknowledge at the same time that it might be difficult to establish a causal link with the programme for now.

As already stated in the above, the interconnectivity approach contributed a lot to this effectiveness. Changes have not gone unnoticed in the university and in departments that were not directly involved in the IUC. A lot of enthusiasm is noticed amongst the respondents (outside of the IUC teams) about the intermediate research results and the new research proposals and secured funding (more in particular by P2 JKUAT staff). The evaluators have received information about a number of observed changes through outcome harvesting and were able to confirm them by triangulation: the three main results highlighted and appreciated are the following:

- the presence of research facilities (boardroom, labs, computing,…), which contributed to more and new research output, training, university reputation. These facilities are seen to be shared without excessive protocol or mistrust which is highly appreciated by respondents;
- Increased knowledge and skills development of individuals (addressing the human capacity issue in the university);
- Changes in research attitude and the emergence of a multidisciplinary approach in various departments (including departments that were not part of the IUC programme); evidenced by increasing number of multidisciplinary research proposals being developed.

Respondents from the outcome harvesting explain these changes mostly by (in this order): the financial support of the programme (for scholarships and lab equipments), the excellent coordination & communication, openness, synergy, team spirit and the IUC tutorials offered.

Other **factors that contributed** according to the evaluators are:

- The way of supporting the post graduate students;
- The strong and good connections between leadership, university structures and the South coordinator.
- The very ambitious university leadership (of which many are also JICA-'alumni');
- The dynamic in different schools (investing in PhDs and in publications: data provided show that all hosting departments have various PhD and publications ongoing over the last years);
- The establishment in 2014 of the Pan African University, which attracted interest of old and new donors;
- The fact that research output and outreach are acknowledged to be important criteria in staff performance appraisals;

The evaluators find it important to highlight a **number of unplanned results** which strengthen the capacity of the university as a whole. The effects are remarkable for a programme that is only halfway. The effects are the following:

- The establishment of the Grants Management Directorate in 2018: this initiative was clearly inspired by the IUC (and supported by benchmarking study by the IUC South coordinator). The IUC programme management ensured access to meeting facilities from the programme and gave input on the set-up and operationalisation of the directorate (which is chaired by the South coordinator of the IUC). Initial training in resource mobilisation (2017) was quickly picked up by JKUAT. The directorate has built upon a first tutorial on grant writing and is now offering training (4 trainings have been organised jointly with P4 so far, which constitutes a new offer provided by the university to its staff members), providing support in writing proposals and planning for new trainings (however depending on future funding to organise these). The directorate has a stimulating function as it urges applicants to look at the whole value chain to consider the set-up of teams for research projects (and as such contributes to sustainability). Already more research proposals are going out (however also a side effect of COVID as teaching stopped and more time was liberated for this kind of work) and already 4/5 applications for external funding are rewarded with the school of agriculture leading.

- The programme experience has supported the university in managing the COVID pandemic. The server, alternative approaches for data collection and knowledge of most appropriate hardware for organising online distance meetings was provided by P4.

- Effect on teaching: although this IUC did not have ambitions to influence the educational programmes, the school of computing is foreseeing that the **curriculum** (for undergraduate programmes) will be revised – inspired by P4 and the curriculum at the VUB (and an audit that VUB executed to assess and benchmark its own programmes). P2 research results are providing input for the establishment of a mirror programme on food technology (with the mother programme, IUPFOOD created at the KU Leuven) in collaboration with the universities of Makerere (Uganda) and Nelson Mandala Institute of Science and Technology (in Tanzania). The specialisation that will be offered at JKUAT on fruit and vegetable technology links to the research thematic and human and infrastructural capacity developed by the IUC.

- Although not specified as a planned result, P4 also had a strong effect on the hosting department and school of computing: the school of computing has clearly opened up and is reaching out to other schools at JKUAT and beyond. As such, the dept and school of computing (its area of research and its leadership) gained a lot of **visibility** within the university. This is supported by various examples provided by the respondents: there is more attention to the aspect of data science at the level of the current PhD students (confirmed during the evaluation by participants in training), the diversity in participants in trainings has created perspectives on new types of synergies within JKUAT (for example, with the dept of architecture, machine engineering, to be exploited in the future).

- Interviews revealed that participants of trainings and workshops expanded their **individual networks** with JKUAT stakeholders but also stakeholders outside of the university.

The IUC has contributed to the overall image of JKUAT in Kenya as was already described in the self-assessment. Given the various examples that were shared, the evaluators have no doubt that this is the case. The self-assessment highlights the representation of the university in Kenya newspapers and the recognition of LCFoNS in May 2019 by the President of Kenya as one of the projects that is likely to contribute significantly to Food and Nutrition Security in Kenya.

**Realisation of the specific objective related to uptake** – To measure uptake, the projects identified indicators such as: interaction with stakeholders, number of requests for policy advices, guidelines developed, policy documents prepared, … The mid-term evaluation confirms that uptake is prepared from the beginning by engaging with stakeholders. Halfway the programme, advice based on research results and experience of staff is already provided to various types of stakeholders through bilateral interactions (see also the table highlighted under the section of ‘relevance’). There is no doubt that this will lead in the second phase to translation of research results in useful and usable formats for societal stakeholders. It may well be that these take different forms: collaboration in spin offs, policy advice, exchange and networking. This close collaboration is in line with and supportive of the goal statements in the 2018-2022 Strategic Plan (under the research and development section and the production and technology development section).

A particular feature of the programme is the ambition to develop the interaction with stakeholders through platforms. As yet, the concept of ‘platform’ does not refer to any kind of physical entities, but to

the willingness to regularly bring together stakeholders around the same topic through workshops (organised by P4). This is developing the ground for increased networking on legumes/ICT in the agricultural sector in the country and in the region (amongst academics and societal actors). Within P4 and on ICT, already stronger south-south connections are emerging with Makerere University in Uganda based on existing links (of the VUB): for example, exchange on a soil monitoring device for one of the MSc students at JKUAT, exchange with the PhD student at JKUAT, providing feedback and jointly preparing for presentation on the Pan African Conference on software engineering – in 2020 which was virtually hosted by JKUAT). The idea, more in particular for P4 is to evolve to a community of practice on ICT in agriculture with a larger dynamic of working together and developing joint research proposals. This has been hampered so far by the COVID Pandemic.

For P1-3, interaction with other stakeholders (non-university stakeholders) is organised collectively (by P4) and is at the level of getting to know each other: presenting of and exchanging on various researches from within JKUAT and other universities.

## 2.5. Sustainability

To further assess sustainability, in addition to its review under interconnectivity, the evaluators looked at two aspects of sustainability at project level:

xii. Level of academic and institutional sustainability, and
xiii. Level of financial sustainability.

Overall, the assessment of sustainability was rather positive for both dimensions as summarised in the table below. Some points of attention were identified as well and are elaborated upon in the following sections.

| Evaluation Questions | Project 1 | Project 2 | Project 3 | Project 4 |
|---|---|---|---|---|
| 4.1. Level of academic and institutional sustainability | 3 | 4 | 3 | 4 |
| 4.2. Level of financial sustainability | 3 | 4 | 3 | 3 |

*Table 12: scores related to sustainability*

**Academic and institutional sustainability** – Sustainability at this level was assessed as strong, because of findings related to the university leadership and strategic plan and policies, the practices of lab maintenance, the stimulating role of the Grants Management Directorate and the integration of research results in education. One point of attention is related to retainment of PhD students. These findings will be elaborated in the following.

The Strategic Plan of JKUAT refers to the management of research centres and the ambitions related to that. Currently there are 6 centres of excellence, with the 6$^{th}$ being LCEFoNS which is the single virtual centre. Although specific elements connected to being a 'virtual' centre are not touched upon, the strategic plan convinces in terms of its commitment to ensure effectiveness and sustainability of its centres. The current policy is that that centres receive funding from the University Research Fund and have to reserve 10% of their income to ensure maintenance of infrastructure and labs. The ambition is

to ensure financially sustainable centres that are well managed, all centres need to establish firm linkages with industry and need to have a unit that is operated as a business cost centre to ensure their own revenue streams and they are co-responsible for ensure that innovations get IP rights

One of the key challenges with establishing new laboratories at JKUAT in the past has been the poor maintenance of purchased equipment past the grant period. Maintenance of the equipment shall now be assured through a new equipment maintenance unit established in 2018, primarily driven by the new facilities developed under the IUC. The unit is able to carry out basic repairs and maintenance. Further, the equipments were all absorbed by their hosting departments enabling some departmental resources (as requested each year from the University) to be committed to their maintenance. Across all four projects, the programme made a conscience choice to source all equipment through local vendors. This has ensured the availability of trained personnel for equipment maintenance and repair.

The various trainings offered by Project 4 that were in general well received are planned for the future. Grant proposal writing, for example, has been taken up by the Directorate of Grants Management who will offer it on a regular basis (if there is funding). Others such as statistics and data analysis have been well appreciated but are not yet anchored within the appropriate unit in the University.

The University has also continued to invest in supplementary ICT infrastructure to further support the use of ICT and broad online work, especially in the context of the COVID-19 pandemic.

The evaluators found evidence of aspects and examples from the projects gradually becoming part of post-graduate courses and training. A stronger research-based approach to education stimulates the call for more research and as such supports sustainability of the IUC results. For example, Project 1 team leader has drawn on research examples courses breeding and genetics. Project 2, and using the IUC programme as a foundation, developed a dual degree programme between JKUAT and KU Leuven, that has been approved by the Senate. Once signed by the two universities, both universities shall be recognised in future degrees. Further, under Project 2 the research methodologies from KU Leuven have been domesticated at JKUAT using the state-of-the-art equipment now available in the laboratory. Finally, the Department of Human Nutrition Sciences was created on the strength of the work under Project 3 and the expected research output in this emerging area. The new lab created under the IUC was instrumental in the accreditation of the Department by the Kenya Nutritionists and Dieticians Institute (KNDI).

The evaluators found that the IUC management team are currently drawing up plans to have a research budget in the next phase that would support post-doctoral researchers, enabling the current PhD students to continue their research work thus ensuring a smooth transition from their study phase to work. The need for the post-doc positions stems from previous bad experiences where PhD students return from completion of their studies with energy and ideas but could not find opportunities to carry on their research and also lost their research networks.

The retainment of PhD students is an issue, despite the strong commitment of JKUAT leadership: at institutional level, absorption of 5/7 PhD students graduating from the IUC programme as staff members remains a challenge primarily due to the on-going hiring freeze across public universities in Kenya (except for replacement of staff who leave employment). Three PhD students are not yet staff members of JKUAT, 2 other PhD students are coming from another university. Strong commitments are, however, being made by university leadership to retain them. One possible avenue, more in particular for the three PhD that are not yet a staff member, is to offer them post-docs positions funded through the IUC in Phase II and from other external grants. Although the University has an approved policy on post docs, they still must be funded from external sources. The two other students might be connected in another

way to the research: as LCEFoNS is a virtual centre, academic staff from other universities could be connected.

**Financial sustainability** – Financial sustainability remains the biggest challenge, especially as industry in Kenya is still not yet in a position to co-finance research. Avenues towards financial sustainability of the programme have been pursued mainly on two fronts: ensure a continuous stream of additional external funding from development partners and other funding agencies, and commercialisation of the products currently under development in LCEFoNS.

On additional complimentary funding, Project 2 has secured complementary funding from JICA for a potato project and from the European Union on a project on food fortification. There is evidence of Project 1 and Project 3 from submitted proposals to external agencies. These may bear fruit in Phase II. Project 4 has not engaged in seeking new complimentary funding during this Phase but could do so in Phase II. The platform of stakeholders P4 is developing, however, is aiming at creating a community of practice that would jointly develop proposals (in collaboration with industry) which seems to be a promising path and is fully in line with the stated goals in JKUATs' strategic plan.

To further support financial sustainability of the laboratories, the Department of Food Science and Technology lab is currently undergoing an accreditation process to enable it to process samples for other institutions for a fee. Accreditation in Kenya is under the mandate of Kenya Accreditation Service (KENAS). The funds generated would support repair and provide for the purchase of consumables.

On commercialisation, Project 1 has begun internal discussions on possible avenues for limited commercialisation of the developed legume varieties, including possible registration as a seed company. Project 2 is exploring supplementary funding through the commercial analysis of samples from entities outside the university when the equipment is not in use for teaching or learning.

Commercialisation is a key cornerstone of sustainability. JKUAT does have experience on successful commercialisation of research output, through their banana tissue culture programme. Running for several years now, it continues to produce high-yielding, pest-resistant banana varieties that are doing very well in the market and come at a low price (being affordable). Proceeds from the programme have ensured the sustainability of the Institute for Biotechnology Research's (IBR) programmes.

# 3. Project assessments

The assessment of the project contains the following topics: succinct description of the project, and assessment according to the evaluation questions as specified in the evaluation framework.

## 3.1. Project 1 - Legume breeding for improved quality

### 3.1.1. Introduction

Project 1, *Legume Breeding for Improved Quality*, is hosted by the Department of Horticulture and Food Security in the School of Agriculture and Environmental Sciences (SoAES) and implemented in collaboration with the Institute of Biotechnology Research (IBR).

**Objectives:** The project sought to develop improved bean varieties that are easy to cook. This is to be achieved with the support of post-graduate students (Masters and PhD) and improvements in the laboratory and other supporting infrastructure. The specific objectives were (i) to develop bean varieties with improved cooking and nutritional quality and (ii) to improve research practice at the Department of Horticulture and Food Security (DHFS) and IBR.

**How to realise the objectives?** To support the first specific objective, the project sought to assemble legume (bean, cowpea and green gram) germplasm from several sources including the Kenya Agricultural and Livestock Research Organisation (KALRO), the World Vegetable Centre (Arusha) and JKUAT. The germplasm will be grown in JKUAT fields over several seasons to enable their characterisation. and association mapping. Seed bulking shall follow for legume genotypes found to have farmer and consumer-preferred traits and good cooking and nutritional qualities. In addition, the project shall build human capacity in breeding and biotechnology by training two PhD and four Masters students.

The second specific objective shall be supported through the upgrade of selected equipment in laboratories and greenhouse of DHFS and IBR. This will include the purchase of small equipment as well.

**Execution So far.** On the whole, the project was executed as originally planned with some minor changes, especially in 2020 due to the COVID-19 Pandemic. These changes included small redistributions of budgets to account for slightly higher requirements for equipment purchase occasioned by settling on the exact equipment to buy during execution of the project; revised mobility of PhD students due to COVID-19 related travel restrictions; and implementation delays of some activities (for example molecular characterization of germplasm and publications) due to procurement delays.

This assessment of P1 is based on desk review of project and programme documents, interviews and a site visit. Overview of the documents consulted and people interviewed is attached in the annex of the overall report.

**Factual data -** The following data on the current status was provided by the hosting department. Figures since the start of the IUC programme.

| **Hosting Department Project 1** | **Department of Horticulture and Food Security in the School of Agriculture and Environmental Sciences.** |
|---|---|
| Number of research staff | • There are 22 academic staff involved in teaching with 4 having a background of plant breeding (which is the topic of project 1)<br>• All involved in one or more on-going or in a recently concluded research project.<br>• Each project employs research staff on a temporary basis and casual labourers for manual work.<br>• Most of the technical work is done by postgraduate students attached to projects |
| Status of academic staff (how many in fixed position, service contract, others) | All academic staff are on permanent terms of service |
| Number of PhD finished/ongoing (with IUC funding) | 3 PhD ongoing (last one joined in 2019) |
| Number of PhD finished/ongoing outside IUC funding | 5 Phd of which 2 ongoing |
| Number of MSc with IUC funding | 3 |
| Number of MSc outside IUC funding | 6 (of which 4 ongoing) |
| Number of publications in peer reviewed journals or conference proceedings within the IUC programme | 1 published 2018<br>2 draft manuscripts being reviewed. |
| Number of publication in peer reviewed journals)/conference proceedings (outside of IUC programme) | 18 papers (2017-2020) |

## 3.1.2. Evaluation findings

| **Relevance** | |
|---|---|
| 1.1 The objectives of the project are consistent with country/local needs, the needs of the university, the VLIR-UOS strategy and donor's policies<br><br>Score: 4 | Country Needs<br>• The project directly addresses the Country's national priorities as captured its current development plan, Vision 2030 Medium-Term Plan III (2018-2022) under the Food and Nutrition Security flagship programme and the Research and Capacity Building Programme (Economic Pillar – Agriculture and Livestock). Food and Nutrition Security is also one of the four pillars under the President's Big 4 Agenda (2018-2022)<br><br>University Needs<br>• Well aligned to the University objective to play a more effective role in the development of agriculture and technology. |

| | |
|---|---|
| | School/Department Needs<br>• A screenhouse was constructed with funding from the project enabling the planting of crops off-season, also using protocols and tools developed by P2 and their labs.<br>• Bio-technology done inside the IBR labs (DNA screening, etc) using the new equipment from the project. The equipment is also used by other members of staff in other departments and not necessarily in breeding.<br>• Local students able to carry out lab work that was not possible prior to the acquisition of new equipment<br><br>Stakeholder Needs<br>• KALRO is one of the key stakeholders for the project. This link is strengthened by the engagement of two of KALRO's staff members as a master students in the project.<br>• KALRO was engaged from the start of the project, and a large proportion of the initial bean germ plasm was obtained from them. One of the students also has a supervisor from KALRO and is thus able to evaluate and compare varieties from both institutions.<br>• Held a stakeholder workshop in January 2017. Although the stakeholders did not shape the initial project plan, they have provided valuable input to it. These included scientists from other universities (Nairobi and Egerton).<br>• Brought in farmers representatives (mainly women as culturally they are the ones who grow bean, men grow maize) who gave their input. Primary focus for the farmer is high yield, then other qualities such as easy to cook. P1 therefore used the workshop to get buy in from the farmers and to get other inputs, for example, on seed colour. Different colours may have lower acceptance (most accepted is red, or red with white speckles) even if they have better qualities.<br>• Kenya seed company also participated and is the type of company that could play a very important role during commercialisation<br>• In addition, the 2017 workshop was attended by both faculty and students in the project as well as additional faculty in the departments but not directly involved in the project.<br>• Future engagements in Phase II, once products are ready, will be at Agricultural Society of Kenya Shows, Annual JKUAT Exhibitions and set up of a demonstration plot in one or two counties. |
| 1.2 There have been efforts made to ensure complementarity and synergy with other projects/other (Belgian) actors<br><br>Score: 3 | • A PhD student at VUB, not part of IUC is working on gene-editing in legumes in close collaboration with IUC PhDs who are working with same technology but on other traits: both directions are useful, they are using the same methods, share data on expression analysis. Provides great opportunities to learn from each other.<br>• Complimentary multi-disciplinary project funded by the International Atomic Energy Agency on pest resistance in cowpea through mutation breeding (2019-2024) |
| 1.3 The project is coherent<br><br>Score: 3 | • The project is at the base of the legume value chain and its results feed into P2 and P3. During this Phase this interconnectivity was difficult as not practical for P2 and P3 to wait for results from P1. P1-P3 work were therefore carried out in parallel with key inputs provided where possible. For example, P1 bulked and provided bean accessions obtained from KALRO for use by P2.<br>• New varieties developed by P1 will only become available in phase II.<br>• The logic within the project itself was coherent.<br>• It appears work on greengram and cowpea has not proceeded at the rate of work on beans. According to the Project Leaders, common bean in Kenya is grown on an area 4x that allocated to cowpea and green gram. At the inception of the project, therefore, the team agreed to perfect the |

| | |
|---|---|
| | methodology using common bean and later apply it in cowpea and green gram |
| **Final judgement/comments** | |
| P1 has shown strong relevance to country, stakeholder and institutional needs with engagement of KALRO, farmer representatives (East African Grain Council) and Kenya Seed Company. For the farmers this is especially important; yield is typically their most important consideration before other characteristics (easy-to-cook, nutrition content, etc.). Although the project started out to work on greengram, cowpea and beans it appears work under the IUC is only continuing on the beans. This was a deliberate reduction on scope due to the larger area under beans (4x) than under cowpea and greengram. | |
| **Effectiveness** | |
| 2.1 Extent to which the specific objectives of the project with regards to research and support to research have been realised<br><br>Score: 4 | Two specific objectives were presented<br>• The first objective sought to develop bean varieties with improved cooking and nutritional quality. In meeting this objective, P1 has assembled bean germplasm from several sources as planned and they are being grown in JKUAT fields and in the screenhouse constructed through the project. Work is on-going on characterisation and association mapping. Bean seed samples have been provided to Project 2. Unrealised, thus far is seed bulking as it awaits characterisation work to be completed.<br>• The second objective aimed at improving the research practice in the DHFS and IBR through upgrade of laboratories and equipment. Main equipment bought was the germplasm freezer in the preparation room of the lab and the greenhouse which allows for control of moisture. The IBR also received equipment (PCR, qPCR, nanodrop) giving it enhanced capabilities that enables the extraction of RNA and then quantifying gene expressions for the different bean varieties, a central part of P1.<br>• The facilities are also being used by faculty and students who are not directly associated with the project.<br>• The project has also been able to bring on board 2 PhD (3rd about to be enrolled) and 3 Masters students with supervision from JKUAT faculty (2 work for KALRO, 1 masters student's trip to Belgium was put on hold due to COVID travel restrictions.)<br>• Evidence of strong interaction between PhD students in P1 with P2 (P1 has grown the varieties that P2 uses for lab analysis and cooking experiments and also assisted in those experiments) and with P4 (developing a labelling footprint for the food culture products that are produced and in data collection; get weather information analysis from sensors developed in P4 correlating rainfall and temperature to times to mature, etc) illustrating the project inter-connectivity. |
| 2.2 Extent to which the specific objectives of the project with regards to uptake have been realised<br><br>Score: 4 | • It is too early in the project for the evaluation of the extent of uptake as the development of the different varieties is still a work in progress. However, P1 has continued to engage stakeholders (KALRO and CIAT) in anticipation of eventual uptake.<br>• Despite the challenges P1 has been able to provide P2 with candidate bean varieties as they move towards easy to cook varieties.<br>• There has been uptake in the use of the equipment purchased both by faculty and students directly and not directly involved in the project. |
| **Final judgement/comments** | |
| P1 has demonstrated excellent performance in enhancing the breeding capabilities of the DHFS (improved storage capability for germplasm and a new greenhouse) as well as the analysis capabilities of the Biotechnology lab in IBR. These facilities are also used by other students and faculty not directly related to the project. Students in P1 have also progressed well with strong support from their promoters. | |
| **Efficiency** | |

| | |
|---|---|
| JC. 3.1 Intermediate results have been delivered<br><br>Score: 3 | Intermediate Results (IR) delivered<br><br>• The following research oriented IRs are at various stages of delivery; IR1: A working collection of bean, cowpea and green gram germplasm assembled and characterized – although it appears that all energies are focussed solely on beans as part of IUC. A recently recruited PhD student is about to start work on cowpeas; IR2: candidate genes controlling cooking and nutritional quality identified<br>• Publication outputs will take a little longer as in breeding need at least 3 seasons of data.<br>• The following capacity IR is being delivered; IR4: Training and research capacity of students and staff enhanced in the area of breeding and biotechnology – 3 PhD students on board (#1-Sandwhich PhD programme at VUB expected to graduate in 2021, #2 PhD student at JKUAT expected to graduate in 2022 and #3 on about to start) and 3 Masters students.<br>• IR5: Awareness of products and product development enhanced among stakeholders was achieved through a stakeholder workshops in 2019 and continued engagement with KALRO.<br><br>Intermediate results not yet delivered<br><br>• IR3: Elite bean lines combining good agronomic traits and enhanced nutritional quality developed – outgrowth of IR2. IR3, therefore, can only be delivered after the work on IR2 is complete (not clear whether this can be achieved before Phase II..<br><br>Challenges that have impacted the timely delivery of intermediate results:<br><br>• Recruiting Masters students to the project as the IUC does not offer stipends. Students tend to pick projects that offer stipends. If stipends were offered P1 may have been able to take more students on board.<br>• Increase time of Masters completion from students working to raise living expenses<br>• At JKUAT evidence of delays in procurement, for example reagents, hindering faster progress of the research work.<br>• COVID-19 Pandemic resulted in PhD student who was supposed to be in Belgium could not travel and the work on knock out experiments (which can only be done in Belgium) has been pushed to 2021 delaying her work.<br>• Sandwich programme presents difficulties when you have experiments that have been initiated by the student in Belgium which require more than 6 months suggesting an imbalance between time allocated abroad and time required to carry out the work (realising that the latter may be hard to predict in advance).<br>• 2019 saw major challenges in the production of bean varieties. There was little rainfall in the country, not enough to produce the desired yields. In addition, irrigation system broke down. This has now been rectified and the pumps fixed – the main issue was that the project did not have a budget for emergency repairs of university systems when they break down. |
| JC. 3.2 Support was provided to ensure the quality of the research and educational processes | • Project supervision was available (described as open door policy) when needed enabling students to make good progress<br>• Evidence of both PhD students providing support to Masters students in the project through assistance in problem formulation and supervision of their ongoing work.<br>• Additional training opportunities were provided to students, for example a workshop on geno-typing data analysis carried out at the International Livestock Research Institute (ILRI) in Kenya.<br>• The PhD and MSc students who conducted part of their research in |

| | |
|---|---|
| Score: 4 | Belgium were provided with Training in Biosafety Regulations at VUB. |
| JC. 3.3 Relationship between means and results achieved and objectives (qualitative assessment)<br><br>Score: 3 | • The project team agreed to begin work with the common bean to perfect the methodology using the common bean before moving ttto green gram and cowpea.<br>• The judicial expenditures have enabled significant increase in research capabilities both in the areas of breeding (preparation and storage facilities for the germplasm and greenhouse) and for biotechnology analysis in the IBR lab<br>• Despite the challenges of weather and pests in 2019 and COVID-19 pandemic in 2020 the team have been able to realise significant results towards meeting the stated objectives as presented earlier. |
| JC 3.4. Project management is conducive for efficient and effective project implementation<br><br>Score: 4 | • There is support of the view that the project has been run in an open and clear manner enabling it to move forward.<br>• As with other projects under this IUC, the development and use of a detailed project management manual and good working relationship with the programme support unit as well as holding regular local and joint steering committee meetings ensured smooth operations within P1.<br><br>Challenges experienced and suggestions from respondents<br>• When dealing with work in the field there should be an emergency provision where not everything has to go through procurement, for example when the fields are invaded by pests, the procurement process takes too long as the pests wreak havoc. The project team has agreed to set aside a small sum to manage this within the project. |
| **Final judgement/comments** | |
| P1 has shown strong performance in the delivery of intermediate results. This is despite major challenges from the weather (lack of rainfall and a failed irrigation system), pests and the restrictions and guidelines as a result of the COVID-19 pandemic. To all intermediate results were delivered to varying degrees except for IR3: Elite bean lines combining good agronomic traits and enhanced nutritional quality developed that depends on the conclusion of IR2. Procurement remains a challenge that needs to be addressed at the institutional level. | |

| **Sustainability** | |
|---|---|
| 4.1 Level of academic and institutional sustainability<br><br>Score: 3 | • Aspects and examples from the projects are slowly being incorporated into post-graduate courses specifically courses on breeding and genetics, for example by the project team leader.<br>• Equipment (though imported) is sourced through local suppliers to ensure pathway to service and spare parts. The university has accepted responsibility for the maintenance costs of the equipment after the project ends.<br>• Technician on site are fully conversant with use of all equipment and provide training to students/faculty who need to learn for a project or research work.<br>• Absorption of PhD remains a challenge at JKUAT and at all Kenyan public universities due to an on-going hiring freeze mandate by government (except to replace) and financial constraints faced by the institutions. Graduating PhDs from the programme (the developed talent) are likely to be hired elsewhere – likely an institution that shall not have the infrastructural research capacity now established at JKUAT forcing the PhDs to spend most of their time teaching and not in research.<br>• The project team shall seek to engage PhD graduates as post docs in Phase II, and work with the graduates to respond to calls seeking post- |

| | |
|---|---|
| | docs in their area of expertise. |
| 4.2 Level of financial sustainability<br><br>Score: 3 | • Internal discussions have begun on areas of sustainability with a long-term view and weighing various options. For example:<br>(a) the University could link up with a private seed company to multiply and sell the developed varieties to the farmers,<br>(b) JKUAT, through JKUATES could multiply seeds of the improved varieties and sell them directly to farmers,<br>as is done with the Tissue Culture banana or with open pollinated crops at the KALRO Seed Unit or<br>(d) JKUAT could link up with farmer groups/cooperatives to produce the seed directly for sale/distribution to their members. This approach is difficult to manage with view to maintaining the quality of the seeds.<br>• These commercialization options should provide some royalties to the university.<br>• In addition, Project 1 team will continue responding to various Calls for Proposals in a bid to get additional funds from other donors |
| **Final judgement/comments** | |
| The P1 team shown strong performance in terms of institutional sustainability ensuring the developed facilities are being used by students and staff not directly tied to the project. More effort should be made to attract additional funding leveraging on the developed facilities to ensure the growth of the research output, the use of the facilities and the financial sustainability of the research group. | |

## 3.2. Project 2 - Storage and processing of legumes for convenient products of high nutritional value

### 3.2.1. Introduction

Project 2, *Storage and Processing of Legumes for Convenient Products of High Nutritional Value*, is hosted by the Department of Food Science and Technology (DFST) in the School of Food and Nutrition Sciences (SoFNS).

**Objectives:** The aim of the project is to increase the diversity of legume-based value added products with high consumer acceptability. The overall goal captures the inter-connectivity of the programme in that it takes into account the bean varieties offered by P1 and uses the nutritional data obtained from P4. The specific objectives were to (i) improve the research and dissemination practices in legume processing in DFST and (ii) generate knowledge and guidelines on legumes processing that would be made available for uptake by stakeholders.

**How to realise the objectives?** To support the first specific objective, the project sought to acquire research infrastructure in the form of equipment including Near Infra-Red (NIR), water baths, colorimeter, centrifuge and a light microscope. In addition, the first objective was supported by building human capacity through two PhD students (who are staff of DFST) and five Masters students, and the generation of a library of “Easy-to-Cook” and “Hard-to-Cook” legume varieties from P1 and from the Kenya Agriculture and Livestock Research Organisation (KALRO) and the Pan Africa Bean Research Alliance network. Development of the Library will also leverage on the Andean Diversity Panel lines.

The second objective shall be supported by the formation of an active stakeholder platform for Kenya and beyond that shall facilitate technology transfer and adoption. The platform shall also provide a forum for stakeholder consultation in carrying out the project and during the development of the guidelines.

**Execution so far**: no significant changes were made to the project plan during implementation. There were however minor changes in budget distribution among different categories, mainly in increased equipment budget. There was also revisions in travel occasioned by the COVID-19 pandemic with the one PhD student (Elizabeth Wafula) not being able to travel to Belgium and the other's stay extended to a full year. Elizabeth was still able to carry out a large part of her PhD while at JKUAT thanks to previous investments in FT-NIR equipment.

This assessment of P2 is based on desk review of project and programme documents, interviews and a site visit. Overview of the documents consulted and people interviewed is attached in the annex of the overall report.

**Factual data -** The following data on the current status was provided by the hosting department. From these data, it appears that most research activity is with the IUC or other projects run by the project team leader and IUC coordinator.

| **Hosting department project 2** | **Department of Food Science and Technology** |
|---|---|
| Number of research staff | 16 |
| Status of staff (how many in fixed position, service contract, others) | Professors = 3,<br>Associate Profs = 3,<br>Senior Lecturers = 2,<br>Lecturers = 6,<br>Tutorial Fellows = 1,<br>Teaching Assistant = 1,<br>(not including: Technicians = 8, Workshop attendants = 5, Secretary = 1, Cleaner/Messengers = 2) |
| Number of PhD finished/ongoing (with VLIR funding) | 2 PhD |
| Number of MSc in VLIR-UOS | 5 |
| Number of PhD finished/ongoing outside VLIR funding (2017 -2020) | 8 |
| | |
| Number of publications in peer reviewed journals IUC programme | 2 published, 1 draft |
| Number of publications in peer reviewed journals (outside of IUC programme), from 2017-2020 | 48 |

## 3.2.2. Evaluation findings

| **Relevance** | |
|---|---|
| 1.1 The objectives of the project are consistent with country/local needs, the | Country Needs<br>• The project directly addresses the Country's national priorities as captured in its current development plan, Vision 2030 Medium-Term Plan III (2018-2022) under the Food and Nutrition Security flagship programme and the Research and Capacity Building Programme (Economic Pillar – |

| | |
|---|---|
| needs of the university, the VLIR-UOS strategy and donor's policies<br><br>Score: 4 | Agriculture and Livestock). Food and Nutrition Security is also one of the four pillars under the President's Big 4 Agenda (2018-2022).<br>• Legumes are important as protein supply through animals alone is not sustainable. A plant solution is needed. Legumes are the best alternative to proteins originating from plants, especially the combination of cereals (e.g. maize) and beans. It is important that Africans do not loose beans from their diet as has happened in the west. Due to its difficulties, beans are disappearing from the plate and being replaced by grains only. Beans are rich in fibre and high in protein. Beans are also nitrogen fixating plants (take nitrogen from the air into the soil).<br>• (from the application 2016): despite the large potential of legumes to be part of a sustainable long-term solution to resolve problems of food insecurity, their intrinsic properties (HTC, cooking time, anti-nutrients, and flatulence) limit consumer acceptability of legume-based food products. Surprisingly, little in depth mechanistic insight is available on how not only the choice of varieties but also storage and (pre)-processing can solve these problems.<br><br>University Needs<br>• Well aligned to the University objective to play a more effective role in the development of agriculture and technology.<br><br>School/Department Needs<br>• The DFST laboratory's capabilities were significantly enhanced by the purchase of new high-end equipment enabling work that would have required students and faculty to travel abroad to be done at JKUAT.<br>• This project is supporting the development of a research culture and is an ally to the academic staff that is motivated to invest more in research. From the application file (2016): the human capacity for teaching, research and extension is under pressure because of to the increasing student numbers that are not matched by growth in infrastructure for research and teaching (473 students against 16PhD holders, 3 of whom are not active). Over the past 5 years, government funding has declined reducing the department budget of about US$ 50,000/year. With limited income generation avenues, most of the funds are used for teaching at the expense of research and extension. Funding from external sources was limited despite the effort from some staff members. In parallel, motivation to do research was low. The policy that each staff member should spend 60% of his/her time teaching and 40% in research and extension was rarely enforced.<br><br>Stakeholder Needs<br>• P2 focusses on post-harvest handling and value addition and have deliberately worked with small (Smart Logistics) and large industries (for example, East African Grain Council, Njoro Canners)<br>• Smart Logistics is a key stakeholder connected to JKUAT through the Global Alliance for Improved Nutrition (GAIN) Market Place. P1/P2 are trying to bring convenient bean access to the market where a big deterrent has been the long cooking time and need to soak. So mainly used in rural areas and not urban. Their factory pre-cooks and dehydrates the beans to a shelf stable level to give them a long shelf life. The consumer simply has to rehydrate and heat the beans and they are ready to eat. Their process keeps the bean's nutrition. P2 thus exploring both avenues to provide the consumer with beans that take a short-time to prepare. First, and the planned focus of P2, is to develop bean varieties that are easy-to-cook. Second, working with Smart Logistics, is on pre-cooked de-hydrated bean products by |

| | |
|---|---|
| | helping Smart Logistics to improve their processes and aspects of food safety. |
| 1.2 There have been efforts made to ensure complementarity and synergy with other projects/other (Belgian) actors<br><br>Score: 4 | • The project results can feed in to a future international Masters' programme. The IUPFOOD Programme with Vietnam built with VLIR-UOS funding started together with an IUC programme of VLIR. Together with four universities, have a common first year with different specialisations in second year. Looking at creating a mirror programme in Africa: Looking at Nelson Mandela, JKUAT and Makerere University in Uganda. Programme set-up is being developed (for all three partners building on past IUPFOOD alumni). The first year will be at JKUAT and then the second year will be linked to the research capabilities/capacities of the various universities. Specialisation will be in fruits, vegetables, legumes at JKUAT and will build on the current IUC alumni.<br>• There is synergy between IUC and EU Food fortification programme. It is expected that the academic staff trained in IUC will become the trainers in the EU Food fortification programme.<br>• JICA participated in the stakeholder meeting and agreed to strengthen other departments. They have been able to complement the work of the IUC by providing support. In fact, they duplicated the IUC model and have been carrying out calls every year within the University. The JICA project in the DFST focuses on potato breeding, post-harvest handling, storage and value-addition.<br>• P1/P2 also analysing bean varieties from Sudan and Congo that have come about as a result of collaborations with the Pan African University. The Institute for Basic Sciences, technology and Innovation of the Pan African (PAUSTI) is hosted at JKUAT. It focusses on Mathematics, Molecular Biology and Biotechnology; Civil Engineering; Mechanical Engineering; Mechatronic Engineering and Electrical Engineering. |
| 1.3 The project is coherent<br><br>Score: 3 | • P2 takes in varieties from P1 and from KALRO to establish desired characteristics and shall also feed into the work by P3<br>• Project logics coherent with appropriate mitigation measures applied when yields from P1 insufficient to meet its needs thus ensuring work does not delay.<br>• Activities well-structured to be able to deliver project objectives. |
| **Final judgement/comments** | |
| P2 has demonstrated excellent relevance to the country, stakeholder and institutional needs. There is strong evidence of stakeholder engagement (especially with KALRO and Smart Logistic) providing a strong likelihood for uptake of research results by food processors. P2 has developed strong complementariness with existing projects and with newly developed funded projects. The latter ensures that the developed facilities are fully utilised and form the basis to grow the research programme, a key expressed need of the university. | |
| **Effectiveness** | |
| 2.1 Extent to which the specific objectives of the project with regards to research and support to research have been realised<br><br>Score: 4 | Two specific objectives were presented<br>• The first sought to improve the research and dissemination practices in legume processing in DFST. In meeting this objective P2 has acquired significant research infrastructure that is part of a well-equipped modern laboratory set in building built with funds from the European Union – A reference food fortification lab.<br>◦ DFST has successful grown the capability of the facility through incremental equipment acquisition from the European Union, RUFORUM and VLIR-UOS. For example, the Fourier Transform Near Infra-Red Spectrophotometer (FT-NIR) that can carry out the FT-NIR– tests that would previously take a long time by conventional means (in a wet lab) to be done quickly using this technique, light microscope, high speed centrifuge, colorimeter and others. The lab has great capabilities that previously the students and staff would only find in Belgium (or elsewhere). The equipment has enabled the continued building of local expertise. |

| | |
|---|---|
| | ◦ Other DFST staff members not directly involved in the project have benefited immensely from the use of the lab for their research and that of their students. This was determined through the interviews with faculty involved and not involved in the project.<br>◦ Broad use of the equipment is because the DFST technicians are fully trained on the use of the equipment and were thus able to train and provide support to faculty and students.<br>◦ Multi-disciplinarity and work across departments was evidenced by P2 students having significant interactions with the statistics department on data analysis and interpretation of the lab work using SAS. Students also had interactions with the computing department and nutrition department through the students in P4 and P3, respectively. There is also strong interaction between P2 PhD students and other students in the programme. For example, one of the PhD students has developed a tool that will determine how a bean will behave in storage depending on the variety and duration of storage that serves as guide for P1 students. There is also interaction with P3 masters and PhD students especially on development of nutritious noodle based products. Finally, there is interaction with P4 PhD student to use AI to validate the results from the tool developed in P2 to determine bean behaviour during storage.<br>• The library of the "Easy-to-Cook" and "Hard-to-Cook" legume varieties from P1, Kenya Agriculture and Livestock Research Organisation (KALRO) and the Pan Africa Bean Research Alliance network is yet to be completed. This is in progress in collaboration with P1 where approximately 300 bean lines are being grown and tested for cooking quality.<br>• The second objective aimed to generate knowledge and guidelines on legumes processing that would be made available for uptake by stakeholders. This objective has not yet been achieved. A User Guideline will be developed by consolidating the results of the PhD and MSc students. This will be available at the end of Phase I and will further be strengthened during Phase II. |
| 2.2 Extent to which the specific objectives of the project with regards to uptake have been realised<br><br>Score: 4 | • There is wide use of the equipment in the laboratory by faculty and students by those directly involved and not involved in the project.<br>• Significant assistance provided to Smart Logistics in their processes to improve on quality and food safety for pre-cooked bean products.<br>• Signs for uptake of bean-based noodle product even as goes through final refinement both by P3 (will be using them with their diabetes patients' participants) and Smart Logistics (already taken this up and produce commercially). |
| **Final judgement/comments** | |
| P2 team have shown excellent performance by significantly increasing the capabilities of the Food Fortification lab in DFST allowing most of the necessary analysis to be done at JKUAT. The P2 team has also ensured that the technicians are fully trained and able to train students and faculty on the use of the equipment. This has ensured broad use of the equipment. The students in the programme have also progressed very well evidenced by the emergence of published research output. | |
| **Efficiency** | |
| JC. 3.1 Intermediate results have been delivered<br><br>Score: 4 | Intermediate Results Delivered<br>• The following IR are at various stages of delivery.<br>◦ IR 1: DFST human and infrastructural capacity for research on legume processing strengthened – the project has 2 PhD students (#1 is a JKUAT employee on a JKUAT and KU Leuven sandwich programme and expected to graduate in 2021; #2 is at KU Leuven and expected to graduate in 2022 and hopes to be absorbed at |

| | |
|---|---|
| | JKUAT) and 5 Masters students (#1 graduated and now a PhD student at JKUAT on a JICA funded project, and #2 graduated and working in Vietnam, #3 expected to graduate in 2021 and #4 in 2022. #3 and #4 interested in continuing into PhD programme if opportunity is available). There was an expressed view that the project has facilitated equipment and facilities in DFST that has instilled confidence that they are able to compete internationally with locally produced and analysed data and also having one of the few experts in FT-NIR in Africa.<br>◦ IR 2: Screening tools for identifying sensitivity of legumes for hard to cook available and applied to characterise different raw materials;<br>◦ IR 3: Role of variety and seed substructure in hard to cook behaviour identified;<br>◦ and IR 4: Impact of raw materials, storage and processing on nutrients and digestion (in vitro level) of legumes evaluated. IR2-IR4 are at various stages based on the work done by the Masters and PhD students in the project.<br><br>Intermediate results not yet delivered<br>• IR5: Guidelines on legume storage and processing available to stakeholders – These are to be based on the work on-going as part of the delivery of IR2-3.<br><br>Challenges experienced that have impacted the timely delivery of intermediate results.<br>• Biggest challenge faced by P2 was the timely availability of materials from P1 (that faced yield challenges, especially in 2019 when the yields were low due to weather and pest infestations). P2, therefore, used materials from KALRO as a mitigation measure.<br>• COVID-19 pandemic travel restrictions prevented one of the PhD students travel to Belgium. That aspect of work and travel had to be pushed to 2021.<br>• Procurement delays: P2 took mitigation measures by changing their mode of operation and procuring items much earlier than needed thus building in a lead time to account for potential procurement delays ensuring items are delivered “on time”, which seems to be a good practice that is most often not applied in academic environments |
| JC. 3.2 Support was provided to ensure the quality of the research and educational processes<br><br>Score: 4 | • Students expressed:<br>◦ An appreciation for the ready availability of the consumables and facilities that are/were needed for their work. Unlike other master students, they felt privileged as they were able, as soon as coursework was done to go directly to the lab to get preliminary studies including assistance from the lab support and then able to jump right into their work<br>• The view that most challenges experienced through the programme were able to be overcome and addressed through monthly meetings and meetings with professors.<br>• Although the PhD students had 3 promoters each (2 JKUAT and 1 KU Leuven) coupled with 2 additional evaluators, the mutual respect between the faculty of each other’s scientific input made it an enriching experience. |
| JC. 3.3 Relationship between means and results achieved and objectives | • The leveraging of funds from this project with others have created a world-class laboratory with capabilities similar to what students who travel to Belgium are able to achieve. This has enabled P2 to work towards achieving their stated objectives.<br>• Despite travel restrictions from COVID-19 pandemic, PhD student still able to continue analysis using equipment in the laboratory at JKUAT. |

| | |
|---|---|
| (qualitative assessment)<br><br>Score: 4 | |
| JC 3.4. Project management is conducive for efficient and effective project implementation<br><br>Score: 4 | • There is support of the view that P2 is being run in an open and clear manner.<br>• As with other projects under this IUC, the development and use of a detailed project management manual and good working relationship with the programme support unit as well as holding regular local and joint steering committee meetings ensured smooth operations within P2. |
| **Final judgement/comments** | |
| Despite the challenges faced (including COVID-19 pandemic restrictions, yield challenges from P1), P2 exhibited excellent performance and, to a large extent, was able to deliver on the stated intermediate results, with the exception of IR5, Guidelines on legume storage and processing available to stakeholders. This shall be based on the on-going and not completed work to be delivered by IR2-IR3. Procurement still remains a challenge (and the same may apply across all projects) and is an issue that needs to be addressed as the IUC moves into Phase II. The establishment of a dedicated Research Desk in the Procurement Department is a step in the right direction. The officers manning the desk will continue to develop a better understanding of the needs of researchers and, with fewer procurements to perform, be able to provide faster turnaround time. | |
| **Sustainability** | |
| 4.1 Level of academic and institutional sustainability<br><br>Score: 4 | • Have developed a joint PhD for Project 2 that has been approved by Senate (note that this is different from a Dual Degree). It is awaiting signature from the two universities to be effected and would enable both universities to be recognised in the degree in the future.<br>• Maintenance of the laboratory equipment is primarily done by two technicians who are paid by the university. The new equipment also has service contracts for the vendor to come and carry out repairs as needed that are not possible to be done internally.<br>• Domestication of knowledge and methodologies from KU Leuven to JKUAT by the PhD students leveraging on the equipment now available in the laboratory.<br>• Scheduling of the laboratory and training on use of the equipment is done by the technicians who are very knowledgeable on the use of the equipment. Equipment is available for use by faculty and students not directly associated with P2. Priority for use of the equipment, however, is given for project students (for the duration of this programme). |
| 4.2 Level of financial sustainability<br><br>Score: 4 | • JKUAT currently provides support for maintenance of the equipment. P2 is exploring revenue generation from analysing outside samples. The lab is currently going through the process of accreditation to enable it to do so. Accreditation in Kenya is under the mandate of Kenya Accreditation Service (KENAS). This is a body established with the objective to provide Government, Industry and Private Laboratories in general with a scheme for third-party assessment of the quality and technical competence of testing and calibration laboratories to carry out specific testing, measurements and calibrations. The funds generated would support repair and provide for the purchase of consumables.<br>• P2 has fed into other complimentary funded projects including potato project funded by JICA and the EU Food fortification project. These were funded after the start of the IUC illustrating a culture of fund-raising for research taking root with the CoANRE. |
| **Final judgement/comments** | |
| The P2 team have done an excellent job in working towards ensuring institutional and financial sustainability. Sourcing funding through multiple sources both for equipping the lab and for carry | |

out research leveraging on the capabilities of the lab shall ensure its sustainability. Providing access to and training on the equipment in the laboratory to other students and faculty not directly related to the project ensures institutionalisation of the research capability and strengthens the research culture.

## 3.3. Project 3 - Legumes in nutrition and health

### 3.3.1. Introduction

Project 3, *Legumes in Nutrition and Health,* is hosted by the Department of Human Nutrition Sciences (DHNS) in the School of Food and Nutrition Sciences.

**Objectives:** The main objective of the project is to improve the zinc status of children and diabetic patients in line with the Scaling-Up-Nutrition movement in Kenya. The specific objectives are to (i) improve the research practices in the field of human nutrition at JKUAT, and (ii) create conditions for uptake by communities and the government of the newly created knowledge.

**How to realise the objectives?** To support the first specific objective, the project seeks to set up infrastructural investments through setting up a nutrition research laboratory (clean and wet benches, basic counselling furniture) and the purchase of equipment including a deep freezer, centrifuge and gas cookers. In addition, there shall be capacity-building through bringing on board two PhD and five Masters students.
The second research objective shall be supported by the establishing a baseline for legume consumption patterns and related determinants among school children and diabetics. The data will be gathered through a survey using digital technologies developed by P4. In addition, nutrition studies will be carried out on legume varieties from P1 and legume-based products from P2, a demonstration of the interconnectivity within the programme.

**Executions so far**: no significant changes were made to the project plan during implementation. Due to the COVIID-19 pandemic, changes were made to project activities that had required face-to-face interaction with participants. Plans to conduct focus group discussions were not possible. With the support of P4, however, research protocols were changed to leverage on ICT tools for data collection and to conduct discussions via telephone. COVID-19 pandemic guidelines have also resulted in delays in the progress of both PhD students.

This assessment of P3 is based on desk review of project and programme documents, interviews and a site visit. Overview of the documents consulted and people interviewed is attached in the annex of the overall report.

**Factual data -** The following data on the current status was provided by the hosting department.

| **Hosting department P3** | **Department of Human Nutrition Sciences (School of Food and Nutrition Sciences) - (created in 2018)** |
|---|---|
| Number of research staff | 10 academic staff involved in teaching and in research + 4 non – academic staff members |
| Status of staff (how many in fixed position, service contract, others) | All of the above are permanent staff<br>Part time/contract lecturers are hired when needed (per year about 10-15 teaching different units) |
| Number of PhD finished/ongoing (with VLIR funding) | 2 PhD (+ 1 planned for phase 2) |
| Number of PhD finished/ongoing outside VLIR funding since 2018 | 4 graduated and 27 ongoing. Note that these students were and/or are being supervised by our staff (together with others from other departments/universities) and were registered for our PhD programme before 2018. |

| | |
|---|---|
| Number of MsC with VLIR-UOS support | 5 + 1 MSc in BE (KU Leuven) |
| Number of publications in peer reviewed journals or conference proceedings within IUC programme | 1 +<br>Abstracts for 3 scientific conferences |
| Number of publications in peer reviewed journals)/conference proceedings (outside of IUC programme 2018-2020 | 85 |

### 3.3.2. Evaluation findings

| **Relevance** | |
|---|---|
| 1.1 The objectives of the project are consistent with country/local needs, the needs of the university, the VLIR-UOS strategy and donor's policies<br><br>Score: 4 | Country Needs<br>• The project directly addresses the Country's national priorities as captured in its current development plan, Vision 2030 Medium-Term Plan III (2018-2022) under the Food and Nutrition Security flagship programme and the Research and Capacity Building Programme (Economic Pillar – Agriculture and Livestock). Food and Nutrition Security is also one of the four pillars under the President's Big 4 Agenda (2018-2022).<br>• P3 also directly addresses the key result areas in the Kenya National Nutrition Action Plan (2018-2022) and all County Nutrition Action Plans that aim to scale up prevention, control and management of diet related non-communicable diseases.<br><br>University Needs<br>• Well aligned to the University objective to play a more effective role in the development of agriculture and technology and to strengthen multi-disciplinarity in research. There is co-supervision of master's students by faculty in DHNS and the School of Public Health (SOPH).<br>• Addressed one of the main challenges faced by the University, that is team formation across different departments, schools and colleges. Tendency has been for individuals to work in silos. The project has started to break down the silos and have teams working together and ready to respond to calls as multidisciplinary teams. The SOPH had worked with the College of Agriculture and Natural Resources (COANRE) before. Practice of working together is not new. But in the last three years has been able to bring more disciplines together.<br><br>School/Department Needs<br>• Have been able to establish an equipped laboratory meeting the needs of the project and the broader needs of DHNS.<br>• The procured equipment has enabled the faculty in the department to add practical demonstrations in their teaching using the facilities in the lab<br>• Post-graduate students are using the equipment of the laboratory to do their research.<br>• The lab was instrumental in their accreditation by Kenya Nutritionists and Dieticians Institute (KNDI).<br><br>Stakeholder Needs<br>• The main stakeholder has been the Kenya Defeat Diabetes Association |

| | |
|---|---|
| | (KDDA) that also serves as a potential avenue to market the bean-based noodle for selling to members and also get others to buy for patients – which may be an alternative income generating method for KDDA's 60,000+ members.<br>• Through the stakeholder platform P3 was able to engage with diabetes patients, the Ministry of Health, and officials of Makueni county to obtain their feedback on their needs, county reports, facilitate research, etc.<br>• Also through the stakeholder platform P3 able to work with community mobilisers for field research.<br>• P3 engaged the County of Nakuru Department of Health to gain access through the hospital leads to the hospitals who linked the P3 team to the patients in the hospitals through telephone and to different diabetes support groups via the KDDA. Nakuru County was selected as it has the 3rd highest diabetes outpatients who visit the care clinics. Nairobi and Kiambu, number 1 and 2, respectively, have done had a lot of studies done already.<br>• The Department of NCDs, Diabetes Control Programme in the Ministry of Health is part of the stakeholder platform. Participated in the 2019 Stakeholder workshop and continues to engage with P3. Specifically, for the prevention of diabetes, the Ministry suggested that P3 may better inform the support groups on the purpose of the project and also have sessions about diet. P3 may also want to consider:<br>o Involving people from the Ministry of Health once in a while during their fieldwork, for example, to see where the legumes under P1 are being grown and to get a better understanding of the project<br>o Having cooking demonstrations within the members of the KDDA to show that the new varieties of legumes cook faster.<br>o Revisiting the improvement of health live-styles of school-age children that was dropped from the project. The evaluators discussion with stakeholders suggest that this is important and should continue and may also incorporate kitchen gardens. |
| 1.2 There have been efforts made to ensure complementarity and synergy with other projects/other (Belgian) actors<br><br>Score: 3 | • There is evidence of synergies with other projects, especially at methodological level. For example, one of the PhD students in the programme has collaborated with PhD students at KU Leuven not in the programme has resulted in one joint journal publication so far.<br>• Another PhD student is collaborating with another PhD student in Uganda who is under the VLIR-UOS Global Minds PhD programme.<br>• Collaborations are also evident between the Masters students in the programme and PhD students not in the programme. These collaborations have provided important information and experience exchange.<br>• There is some complimentary with a non-IUC master's student at KU Leuven using baseline children's data collected by P3 PhD student in her Master's thesis. |
| 1.3 The project is coherent<br><br>Score: 4 | • When IUC was conceived P3 did not start out as looking at NCDs. Initially was only going to look at under-nutrition, but based on the health benefits of beans (high protein combined with high levels of micronutrients such as iron and zinc), it was decided to look at under-nutrition, obesity and NCDs, specifically diabetes.<br>• P3 has therefore evolved into the refocus driven by discussions with KUL and the Ministry of Health at the initial design meetings. The move to nutrition on chronic NCDs is considered a "new" research area. Initial match-making did not focus on this.<br>• Provides JKUAT a unique selling point from research point of view as not a lot of research work has been done in this regard in Africa and it is an area that would provide better opportunities for publication in high-impact journals. |
| **Final judgement/comments** | |
| P3 has demonstrated a strong relevance at country, stakeholder and institutional levels. The re-design of the project based on further discussions between the partner institutions (JKUAT and | |

| | |
|---|---|
| KU Leuven) as well as input from the Ministry of Health have significantly simultaneous strengthened the national relevance and the academic rigour propelling JKUAT into a new emerging research area. The active involvement of stakeholders as part of the research process (KDDA, MOH, County Departments of Health) will contribute to the ease of uptake of the generated results.<br><br>The evaluators found the P3 had made efforts to seek additional external funding through submission of grant proposals for example to Nestle Health Foundation, UK Medical Research Council and JICA. Though not successful, the main feedback from them to provide preliminary data (currently being developed) should result in better success in future efforts. | |
| **Effectiveness** | |
| 2.1 Extent to which the specific objectives of the project with regards to research and support to research have been realised<br><br>Score: 4 | Two specific objectives were presented:<br>• The first sought to improve the research practices in the field of human nutrition at JKUAT. Towards achievement of this objective,<br>o the DHNS has set up an entirely new small nutrition laboratory where all the equipment within was purchased from the project. A key part of the project is to be able to determine the percentage of zinc and iron in the blood. There was therefore a need to check for this through blood samples for iron and zinc deficiencies. The aim is to increase the zinc content without increasing carbohydrate content for diabetes patients. If zinc is deficient, inflammation rates are high. If zinc deficiency, patients have a high difficult in controlling their sugar. There is however, limited data available on micronutrients (for example iron and zinc) in order to advice diabetics about their diet. Iron deficiencies has been shown to be high in the general population but similar comprehensive studies in diabetes patients have not been done.<br>o All equipment in the lab is mainly for the collection and storage of blood samples, including low temperature freezer, mobile freezers, bioimpedance analysis machines, anthropometric machines, glucometers, etc.. The actual blood testing had to be outsourced (currently to the Kenya Medical Research Institute (KEMRI)) as purchase of the necessary equipment was not part of P3 project budget.<br>o There were good reasons to work with KEMRI: setting up an analytical lab requires a lot of resources that may not be used all the time if there is not a lot of other research on-going. DHNS has mainly been more of a teaching and then a research unit. This is slowly changing with the department starting to build a research tradition.<br>o Other faculty in the DHNS and the SoPH are involved in the supervision of the PhD and Masters students.<br>o 2 PhD (Both #1 and #2 JKUAT PhDs as part of sandwich programme expected graduation 2021, both have positions at other universities though interested in post-doc or position at JKUAT on graduating. The University has, however, strongly committed to find a way to bring them on board) and 5 Masters students (Sample: #1 JKUAT student started in project 2018 with expected graduation in 2021, would like to pursue PhD at JKUAT or abroad where the opportunity arises; #2 JKUAT student started project in 2019, expecting to graduate in 2021, is a graduate assistant at a local private university and would want to continue on with PhD at JKUAT if presented with opportunity).<br>• The second objective aimed at creating conditions for uptake by communities and the government of the newly created knowledge. Towards achievement of this objective the P3 team have sent and received food frequency and food records questionnaires from Type II diabetes patients. The data analysis is on-going.<br><br>Challenges experienced in realising the specific objectives |

| | |
|---|---|
| | • As a result of COVID-19 pandemic and resulting restrictions<br>◦ One Masters students planned travel to Belgium was pushed to 2021 (if at all). One PhD travel back to Belgium has been delayed since return in December 2019 could not return in May 2020.<br>◦ P3 was targeting school-going children in addition to diabetes patients, but had to drop this group as schools were closed.<br>◦ Have slowed the processes working with the students as was not possible for local supervisors to meet with the students for a while as there were initial challenges with online activities<br>◦ Data collection during this period has been a challenge for P3 as students could not physically meet respondents (they did not want to get in contact with each other for fear of contracting the corona virus). When questionnaires were sent, response rate was however low. P3 was able to adapt well. For example, for the PhD student, data collection was changed to online which proceeded well. The new methodologies were approved by the relevant ethical and research committees. Data collection from school children, one of the study populations, was not possible to do online as schools were closed in March 2020.<br>• Developing baseline for legume consumption patterns P3 faced the challenge of literacy among the respondents (Type II diabetes patients, age group between 45-60). They sought assistance from nephews and nieces to assist. (use of proxies is a standard procedure when the respondents are children or older people). |
| 2.2 Extent to which the specific objectives of the project with regards to uptake have been realised<br><br>Score: 3 | • With the limited resources, DHNS was able to set up a new laboratory providing capability that they did not have before.<br>• Despite not being able to analyse blood samples (outsourced) P3 has developed capability to collect and store samples prior to analyses.<br>• Students have been able to effectively use the developed facilities in the realisation of P3's objectives and intermediate results.<br>• It is too early in the project for uptake of the results by the targeted beneficiaries (diabetes patients). Tests on the bean-based noodle product is on-going with P3 team expecting to begin trials with beneficiaries in 2021. |
| **Final judgement/comments** | |
| During this period P3 was able to establish and put into use a new nutrition laboratory while developing a research programme around a new area (diabetes). Despite the challenges from COVID-19, P3 with the help of P4 were able to adapt their data collection methods to ensure continued progress towards achieving stated objectives leading to an excellent performance. Further, the P3 team should consider securing more research funding to be able to develop DHNS' analytical lab capabilities. Finally, and with strong support from the IUC, the newly formed DHNS was able to get accreditation from the KNDI for its lab. The new laboratory enables the teaching of undergraduate and post-graduate courses to include more practicals. | |
| **Efficiency** | |
| JC. 3.1 Intermediate results have been delivered<br><br>Score: 4 | Intermediate Results Delivered<br>• The following IRs have been achieved to varies degrees<br>○ IR1 (capacity building): Human and infrastructure research capacity within human nutrition at JKUAT strengthened - A nutrition lab has been set up and equipped. The PhD students, however, are not employees, and would leave just when they are able to accelerate their research output if not absorbed by JKUAT. External candidates were recruited into the programme as JKUAT did not have right people on staff. If the both PhD students return to their Universities that have limited research capacities, they will be unable to build up their research potential. The university management has, however, strongly committed to employing the students on graduation. |

| | |
|---|---|
| | ○ IR2 (research): Legume consumption patterns and determinants established - currently blood samples have served a baseline study demonstrating that malnutrition levels among men in particular are quite high. In addition, the team has collected consumption and preference data, awaiting publication. Though initially the project targeted school children and those living with diabetes, work with school kids dropped due to the schools' closure as a result of the COVID-19 pandemic;<br>○ IR3 (research): Evaluation of newly developed legume-based food product – P3 team happy with level of zinc and iron in bean varieties that have been bio-fortified through a breeding process (beans from KALRO). Thy have used these to develop high zinc and iron nutritious products. The PhD student is currently working on bean-based noodle product. Work will also include bean varieties from P1/P2 once they become available. Are able to carry out sensory evaluation (colour, taste, texture and other ratings) within the developed facility and equipment acquired via the project.<br><br>Intermediate results not yet delivered<br>• IR4 (research): New dietary behaviour strategies developed & evaluated and IR5 (outreach/extension): Guidelines on strategies to improve dietary intake. This would be undertaken once IR2 and IR3 are completed.<br><br>Challenges experienced that have impacted the timely delivery of intermediate results.<br>• Priority was given to setting up lab facilities where there was no capacity within the network of the school. KEMRI was in the network and had the capacity to carry out the blood analysis.<br>• This arrangement did not work as well, but that only came about in 3rd year of the project and this was too late to set up a new lab. Results presented were not reliable, resulting in having to send the samples to Germany for analysis. KEMRI will still meet their contractual agreement by getting another lab to carry out the work that they were not able to do. This was re-negotiated by the PL North and South. It is them who identified the weakness in the KEMRI work.<br>• The inter-activity and connectivity between P3 and P1 have their limitations at this stage in the programme as the P1 has not completed development of the final pool of bean varieties. Inter-activity and connectivity proceeding well with with P2 (for the cooking time, etc) based on varieties from KALRO that has worked well for the project. Collaboration has been ongoing with P4, for example, on the creation of a digital tool to collate baseline survey information, and to develop a calculation tool to calculate the specific nutrient intake. |
| JC. 3.2 Support was provided to ensure the quality of the research and educational processes<br><br>Score: 4 | • There has been a close collaboration between PhD and Masters Students in P3, which is not typical across the University. This has been made possible thanks to the project design where it is possible for the masters' students' work to fit into the PhD students work (typically most masters students develop their own projects and are thus not closely linked to others).<br>• P3 illustrates benefits to have faculty members develop programmes or areas of research so that they can guide their students (Masters and PhD) to pick aspects within their programme. This ensures that the work done by students in their programme are able to be linked enabling PhD and Masters students to interact and for the programme to have a more impactful output than smaller disconnected projects.<br>• PhD students able to meet regularly with promoters who are very |

| | |
|---|---|
| | accessible. Having 3 and 4 promoters split between Kenya and Belgium has enabled the students to collectively building specific skills and receive strong support for their work.<br>• Caution should be given, according to respondents, to overly optimistic planning by the students with overly optimistic timelines as in reality they find that work takes longer or a bit harder than plan.<br>• Close collaboration with P4 who provided assistance to carry out paperless data collection using a software tool and tablets.<br>◦ During COVID period as activities could not take place were able to change mode of data collection from physical to telephone; assisting in interventions for m-Health mobile technology. For example, one of the PhD students is working on an intervention using telephone and not smartphone app as the work during the baseline survey showed low use of smart phones.<br>• Collaboration with P2 who helped in developing a bean-based product, a noodle, that is being used to test its effects on managing sugar levels. |
| JC. 3.3 Relationship between means and results achieved and objectives (qualitative assessment)<br><br>Score: 3 | • P3, with its limited resources was able to establish a new laboratory for the DHNS that has been essential in achieving the stated objectives.<br>• Blood analysis, a key component of P3, cannot be done at JKUAT and had to be outsourced. This caused a lot of problems for meeting stated objectives. Given its central role in the project and the potential of use of the equipment by the College of Health Sciences, the additional external funding to possibly purchase the necessary equipment during Phase II should be ensure but: both the team and the university (as part of a university driven strategy) could play their role. The P3 team expects the university to seek the support of different colleges and research departments for the acquisition and installation of basic analytical equipment that could function as a research core facility focussing on laboratory analyses for the entire university<br>• Having blood analysis equipment would provide potential for revenue generation (sustainability) through contracted analysis. |
| JC 3.4. Project management is conducive for efficient and effective project implementation<br><br>Score: 4 | • There is support of the view that P3 is being run in an open and clear manner.<br>• As with other projects under this IUC, the development and use of a detailed project management manual and good working relationship with the programme support unit as well as holding regular local and joint steering committee meetings ensured smooth operations within P3.<br>• P3 PhD students are expected to prepare a budget for their activities for that particular year and are therefore the main project managers for the work that they are doing, as well as account for funds when dispensed. This approach begins to prepare them for research management.<br>• PhD students experienced great support, especially when travelling that was described as smooth and trouble free.<br><br>Challenges experienced<br>• Having to spend money within the year budgeted for should include some flexibility. For example, one of the PhD student's request for ethical approval got a negative response from the research committee (had questions) despite an approval from the ethical committee. This presented P3 with the challenge of spending the funds as with the delay, cannot spend the funds in time. |
| **Final judgement/comments** | |
| With a relatively small budget P3 during the period to a large extent met its stated intermediate results demonstrating very good performance. As a result of the project re-design, blood sample analysis became a central part of P3. JKUAT currently does not have the capabilities to carry out this work and this had to be outsourced (not an ideal situation as was illustrated with KEMRI). A | |

| | |
|---|---|
| central part of the IUC is developing capabilities and capacities to carry out high-quality research work in the agreed upon areas. For JKUAT to be a leader in the "new" area of nutrition on chronic NCDs, it probably is essential, from the point of view of the evaluators, for the University to develop its own analysis capabilities. This facility can be used by the College of Health Sciences as well. The evaluators recognise that this cannot be done within the context of P3 Phase II budget. The P3 team could leverage their current activities to seek additional external funding to create these facilities but the main role is for the University to should seek the support of different colleges and research departments for the acquisition and installation of basic analytical equipment that could function as a research core facility focussing on laboratory analyses for the entire university. | |
| **Sustainability** | |
| 4.1 Level of academic and institutional sustainability<br><br>Score: 3 | • The fact that a fully-fledged department of Human Nutrition Sciences is created (August 2018) demonstrates ownership by the university.<br>• The initial P3 design was on legume consumption focusing on under nutrition which is not a clinical outcome. Increasing consumption of legumes can serve as a clinical marker and not clinical outcome. For P3 to be sustainable, it was decided to also focus on the clinical outcome which comes after legume intake (typically where a lot of nutritional research work ends). By going to the extent of the clinical outcomes e.g. anaemia, P3 shall be able to get higher impact research and publish in high impact journals.<br>• P3 leverages on the University internal structures for equipment repair and maintenance. In July of each year, departments forward information to the University for all equipment that need repair. The equipments are locally sourced and therefore are able to locally source service and maintenance expertise.<br>• P3 PhD students are not JKUAT employees and their expertise may not impact the research capacity and output at JKUAT if they are not absorbed after graduation (but could still be useful through inter-university collaborations for the centre of excellence). The University, however, has made a strong commitment to hire them, even if on a part-time basis to start. |
| 4.2 Level of financial sustainability<br><br>Score: 3 | • The main support for the laboratory outside the IUC is the University itself.<br>• The team is not yet very clear on the avenue of potential revenue generation. The idea of having a nutrition counselling centre might be one avenue. Another could be the bean-based noodle product under development. |
| **Final judgement/comments** | |
| P3 team should put effort into seeking additional grant funds leveraging on the new facilities and the on-going work and output from the IUC to grow the research programme and thus ensure its sustainability (both institutional and financial). | |

## 3.4. Project 4 - ICT support for legume research

### 3.4.1. Introduction

The School of Computing and Information Technology (SCIT) sits under the College of Pure and Applied Sciences in JKUAT. The project is hosted by the department of computing in the SCIT. The IUC programme application (2016) found the role of ICT as a service to legume/agriculture research largely unexploited so far, including the use of mobile platforms for data gathering, data analytics and dissemination.

**Objectives** - The general objective of P4 is to have JKUAT's data science research performance recognised internationally. The specific objectives are to improve: (i) JKUAT's research performance in software technologies for data gathering and data analytics and (ii) JKUAT's research in the area of food and nutrition through the application of software technologies for data science in research. The second objective underlines the **transversal character** of P4 in the IUC, strengthening capacity for the whole university and supporting execution and effectiveness of the other 3 projects in the IUC.

**How to realise the objectives?** - To support the first specific objective the project aims to **build human capacity** in the form of 1 PhD and 3 Masters in the domains of software tools for (big) data science (focusing on computer science as a research field rather than as a supporting suite of technologies (aka "ICT"). And to have some **infrastructural investments** to bring the research-oriented computing facilities (both hardware and software) in (big) data processing tools to a level that is on par with international standards.

To support the second specific objective the aim is to **centralise expertise about existing off-the-shelf tools** for data gathering and statistical data processing with a focus on supporting research in agricultural domains as an ICT service on a **public portal**. The portal will present a list of existing data gathering tools and data processing packages and will evaluate every such tool against a number of properties that describe its complexity, its generality (e.g. does the user need programming skills to deploy it or not?), its availability (e.g. is it open source or does it require a licence) and its power (e.g. does it support particular statistical tests?). Apart from this information that will allow a researcher in agriculture to "navigate" to the right tool for his/her job, as many manuals and documentation guides of the tools as possible will be gathered and made available to the researchers of the other 3 projects and to other researchers of JKUAT. The portal will also act as a data management server that will allow researchers to share and exchange data across various projects.

Secondly, in relation to supporting the realisation of the second specific objective, the project will improve the **staff's (of JKUAT) abilities to disseminate research at higher ranked venues** (e.g. by improving academic writing skills) and to be more successful in **fundraising and launching future research** initiatives (e.g. by improving proposal writing skills).

This will enable the school of computing to position itself as a relevant internal JKUAT research partner that possesses useful supportive skills and up-to-date scientific knowledge especially when it comes to technologies and methods in the field of the gathering, processing and disseminating and visualising (big) data coming from agricultural research experiments.

**Execution so far** - No major changes in design and/or execution of the project were noted, except the change in position of the team leader from Director of SCIT (School of Computing and IT) to ICT Director for JKUAT (Feb 2020), while remaining an academic member of staff in the Department of Computing. As such, the change in position does not affect the management of the project. The budget of the project is 50.000 euro/year (on 5 years) or 14% of the overall budget yearly and for the 5 years (1.750.000 euro, 350.000 euro/year).

This assessment of P4 is based on interviews, desk study and a site visit. Overview of documents consulted and people interviewed is attached in annex of the overall report.

**Factual data -** The following data about the current situation were provided by the hosting department. The 2016 application only provides information in relation to the whole school. As such it is not possible to compare the situation in the dept in 2016 with today. From the data provided, it appears that the dept uses additional sources to invest in PhD scholars (besides the IUC funding) and in realising publication/contributions to conference proceedings. However, from the interviews, the evaluators understand that P4 is quite specific in its research focus on software engineering.

| **Hosting department project 4** | **Department of computing (school of computing and information technology)** |
|---|---|
| Number of research staff | 30 |
| Status of academic staff (how many in fixed position, service contract, others) | 24 with Fixed positions, 6 on Contract (as Tutorial Fellows & Teaching Assistants) |
| Number of PhD finished/ongoing (with IUC funding) | 1 PhD (ongoing at VUB) |
| Number of PhD finished/ongoing outside IUC funding | 2 PhD (finished i.e. graduates), 5 PhD (ongoing i.e. students), PhD graduates/students who are staff members in the Department of Computing. |
| Number of MSc with IUC funding | 2 (finished at VUB) |
| Number of publications in peer reviewed journals or conference proceedings within the IUC programme | 2 |
| Number of publication in peer reviewed journals)/conference proceedings (outside of IUC programme) | 42 (cumulative from when the IUC programme started) |

## 3.4.2. Evaluation findings

| **Relevance** | |
|---|---|
| 1.1 The objectives of the project are consistent with country/local needs, the needs of the university, the VLIR-UOS strategy and donor's policies<br><br>Score: 4 | Needs of the country<br>• Leveraging Information and Communication Technology (ICT) for increased national competitiveness is expressed in the Country's development plan, Vision 2030, Medium Term Plan III (2018-2023). The Government expects the sector to play a big role under the Big 4 Agenda priorities, one of which is Food and Nutrition Security<br>• Kenya agriculture sector: P4 recognizes growing need to exploit ICT solutions and innovations for the researcher in the sector (and for the farmers) From the application, the evaluators retain that current low levels of capacity in applying existing data-centric tools in agriculture form a major developmental challenge for the South: both the modern agriculture value chain and agricultural research chain contain many aspects of data gathering, data storage, data analysis and data dissemination. The growing importance and wide scale application of data-centric methods give rise to novel domains such as agro-informatics and precision farming.<br><br>Needs of the university<br>• It should be noted that the PHD student identified its topic for study based on his interaction with the other projects in the IUC. From here it was noticed that a lot of data collection by researchers still happens on paper. The goal is now to automate data collection, a modest start is already made and the PhD study will be immediately of use. The focus on intermittent data collection using the concept of extensibility and offline accessibility and how to ensure efficient and correct merger of data is in particular interesting when working in remote locations.<br><br>Needs of the school<br>• The project responds to the analysis of the School that ICT can play a bigger role to boost research, that computer science research (software engineering) was not strongly developed and that researchers had challenges in data analysis. As such the project supports the quest started by the Director of the school advocating for more attention since 2011 (after having positive learning experience in Australia).<br>• This is currently the only project in the dept/school focusing on software engineering and programming, a research topic that is often ignored or underdeveloped.<br>• Assessment of existing equipment or the current research vision/agenda in the school/dept was not executed prior to the definition and start of the project. The evaluation did not reveal that this negatively affected the project or its relevance.<br><br>Needs of stakeholders |

| | |
|---|---|
| | • Engagement with stakeholders started with meetings and presentations at the start (programme formulation) and the launch of the programme. Further to specific initiatives (see below) there is informal exchange and continuous relation building with individual stakeholders.<br>• A list of 20 key stakeholders is established which combines donors, other universities and private companies (start-up IT companies) and institutions.<br>• Engagement with stakeholders was intensified through a workshop in Jan 2019: 12 organizations (besides VUB and JKUAT) were present of which majority are already involved in projects of the School of Computing.<br>• A regional workshop (of several days) was organized in Sep 2019 with 26 participants of which 5 organizations external to JKUAT and VUB. Various partners, such as Makerere university (Uganda, also partner of the VUB, input on big data management) and the USIU (United States International University) were ensuring input in the workshops.<br>• Researchers from JKUAT appreciate interaction with stakeholders as it helps to understand the landscape and to integrate them when formulating a research agenda, for e.g. one of the researchers has been interacting with one of the stakeholders (Centre for Agriculture and Biosciences International) in the process of her PhD studies.<br>• Through the Kenya Agricultural and Livestock Research organization (KALRO) and the Centre for Agriculture and Biosciences International (CABI) there is a (indirect) connection with the farmers (for e.g. CABI provide information on information dissemination to farmers) |
| 1.2 There have been efforts made to ensure complementarity and synergy with other projects/other (Belgian) actors<br><br>Score: 3 | • Seeking interaction with 'close the gap', e.g. identify affordable equipment<br>• The stakeholder workshop of Jan 2019 brought together various project partners of the school of computing and also involved researchers from other VLIR-UOS funded Team projects which can develop the ground to enable synergy in the future.<br>• Individual researchers are involved in other donor funded programmes. The evaluators are not aware of focused collaborative research projects/interventions yet (outside of the IUC). |
| 1.3 The project is coherent<br><br>Score: 3 | • The project was designed to support other projects in the IUC, this will be further highlighted under effectiveness and efficiency<br>• The intervention logic is coherent<br>• Relevance of project increased with COVID-pandemic and specific need for remote data collection: the project demonstrated readiness to support P3 in data collection switching to telephone interviews. |
| **Final judgement/comments** | |
| The relevance of the project is high.<br><br>The programme application (2016) highlights 3 challenges for academic excellence in technologies and methods for data science and for harnessing this excellence for supporting agriculture-related research and activities: (i) Low infrastructural and human capacity in the general academic computer science domains related to (big) data science, (ii) Limited infrastructural and human capacity for the domain-specific application of such expertise in supporting agriculture/legume- | |

related research, (iii) Low human resource levels regarding necessary skills to support future research activities: proposal writing, scientific communication and data analysis using statistical tools. Al of these challenges are addressed through the project.

The project is contributing to developing the ground for networking on legumes/ICT in the agricultural sector in the country and in the region. Already stronger south-south connections are emerging with Makerere University in Uganda based on existing links. For example, exchange on a soil monitoring device for one of the MSc students at JKUAT, exchange with the PhD student at JKUAT, providing feedback and jointly preparing for presentation on the Pan African Conference on software engineering – in 2020 which was virtually hosted by JKUAT).

Interaction with other stakeholders (non-university stakeholders) is happening. The interaction is currently at the level of getting to know each other: presenting of and exchanging on various researches from within JKUAT and other universities. The idea is to make the stakeholder platform evolve to a community of practice with a larger dynamic of working together and developing joint research proposals. This has been hampered so far by the COVID Pandemic. The school has built its visibility and image which is a strong factor in further developing the interaction.

It should be noted that the transversal components of the project are not part of the core competences of the hosting department. The investment of the team to realise the transversal aspects is therefore to be very much appreciated.

Although there is attention for linking up with other projects in the university (through individual researchers), the evaluators have not seen evidence of focused collaboration with research projects outside of the IUC, even though this was planned. It is possible that the interconnectivity and transversal character of P4 serving other projects does not leave space for developing more focused synergetic research interventions.

**Effectiveness**

| | |
|---|---|
| 2.1 Extent to which the specific objectives of the project with regards to research and support to research have been realised<br><br>Score: 4 | Comments on the indicators:<br>As the project is half-way, it should not be expected that both specific objectives are fully realised. When taking the indicators as a lead, it can be stated that there are indications of:<br>• Active participation in international scientific venue: for e.g. emerging collaboration with Makerere University, hosting a regional seminar<br>• A research group on tools for data analytics and data gathering being established in JKUAT: this is currently a small team of 1 PhD (Joined in 2017 and expected to graduate in 2021, is a staff member at JKUAT on leave of absence) and 2 MSc (Both at VUB, #1 in 2017 and #2 in 2018), a 2nd PhD student will be added in the next phase. There is evidence given by respondents that the PhD student is working with some MSc and bachelor students (outside of P4) to formulate research topics and to support short projects of MSc students. The labs are effectively used (also by other projects of the IUC and staff members not involved in the IUC), but the evaluators understand that the research group is currently confined to the P4 team mainly.<br>• involvement in another department of JKUAT (non-VLIR-UOS supported project) in data analytics and/or data gathering: this involvement can be qualified as exchange of experiences between researchers (rather than actual joint research activities), which was realized through the trainings and the workshop.<br>• using scientific deliverable (technical solution) in the research activities of another - VLIR-UOS supported – project: this was understood as support for projects within the IUC: concrete examples are project 1 |

| | |
|---|---|
| | (weather and environmental data system and QR code application for automated labelling of plants) and project 3 (mobile data collection application advice on telephone interviews).<br><br>There are some changes that were not planned in the project proposal and merit to be described further below:<br><br>Initial training in resource mobilisation (2017) was quickly picked up by JKUAT. As a result of P4 and the combined efforts and management at programme level, JKUAT leadership decided to establish a grants management office which is now ensuring trainings in proposal writing with specific focus on multi-disciplinary research proposals (4 trainings organised jointly with P4 so far which constitutes a new offer provided by the university to its staff members.). This greatly strengthens the capacity of researchers to write grant proposals, and this is visible in JKUAT (teams are formed during training, increase in proposals going out was witnessed by the grants management office – effect on proposals being funded not yet evaluated.)<br><br>Although this IUC did not have ambitions to influence the educational programmes, the school is foreseeing that curriculum (for undergraduate programmes) will be revised – inspired by the curriculum at the VUB (and an audit that VUB executed to assess and benchmark its own programmes).<br><br>Although not specified as a planned result, P4 also had a strong effect on the dept and school of computing: the school of computing has clearly opened up and is reaching out to other schools at JKUAT and beyond. As such, the dept and school of computing (its area of research and its leadership) gained a lot of visibility within the university. This is supported by various examples provided by the respondents:<br><br>• More attention to the aspect of data science at the level of the current PhD students for various schools (confirmed by participants in training)<br>• Diverse participation in trainings has created perspectives on new types of synergies within JKUAT, with the dept of architecture, machine engineering (to be exploited in the future)<br>• Witnessing more students (from other faculties) and other faculties expressing their interest in data science: compared to 2015 more people are associating their field of interest with data science, which was demonstrated by their participation in the courses and workshops (this is not yet impacting on student enrolment in regular courses).<br>• Former dean and team leader of P4 became head of the university ICT dept and was invited a reviewer of grants by KENET and member of the management board of KENET (both since 2019). He is also involved in the main taskforce of a programme funded by JICA<br><br>These results can be explained by the following factors:<br><br>• The school was stimulated to open up for trainings, launching open calls for participation;<br>• Support from university management in organising the trainings;<br>• External stakeholders showing up for stakeholder meetings, showing their interest in the work of the school of computing;<br>• Gaining additional experience as team leader with management of projects and budgets (supported by donors). |

| | |
|---|---|
| | Another unplanned result is the good understanding of the type of ICT equipment that can benefit JKUAT: this assisted a lot in the purchase of equipment by the ICT department in the course of 2020 to allow online meetings for university management (forced by the Covid pandemic)<br><br>Finally, participants of trainings and workshops expanded their individual networks with JKUAT stakeholders but also stakeholders outside of the university. |
| 2.2 Extent to which the specific objectives of the project with regards to uptake have been realised<br><br>Score: 4 | It would be too early to assess the further uptake of the project outputs by specific groups of users. However, when taking the indicators as a lead, it can be stated that there are indications of the P4 team demonstrating:<br>• involvement in another department of JKUAT (non-VLIR-UOS supported project) in data analytics and/or data gathering: this involvement can be qualified as exchange of experiences between researchers (rather than actual joint research activities), which was realized through the trainings and the workshop.<br>• using scientific deliverable (technical solution) in the research activities of another - VLIR-UOS supported – project: see in the above. |
| **Final judgement/comments** | |
| The effectiveness of the project is considered to be excellent (taking into account the fact that the execution is half-way. The non-planned effects on the school of computing need to be underlined. The focus on transversal issues in P4 have paid for the school, in terms of visibility and developing a reputation of a credible and necessary partner in research.<br><br>It is hard to assess the direct effects of training. During the project, formal evaluations to assess if and how knowledge is enrooting were not taking place (only the 2017 trainings seem to have been evaluated right after the training). From the respondents, the evaluators understand that training on statistics was much appreciated but at the same time, working on R was too far fledged for most respondents. Of 23 outcome stories collected in departments that are not hosting the IUC projects but have been interacting with the programme, 4 point at changes that were directly related to training. The outcome harvesting relates the trainings to changes in knowledge at individual level mainly, which seems logic; it is difficult to expect organisational effects from on/off trainings. It is said by various respondents that are part of the IUC teams that the training has been essential for students and staff involved in the projects.<br><br>The training on proposal writing seems to be most important: the evaluators underline that this training has been repeated over the years by the Grants management office (already 3 trainings were provided), which explains its effect in having more proposals written and submitted (though not necessarily successful). Some respondents pointed at the lack of support in the process of proposal writing (intervision and feedback might be better organised).<br><br>The details under 2.1. about the visibility of the school of computing and the investment in stakeholder identification, relation building and exchange through workshops (under evaluation question 1) convince the evaluators that the project is developing the necessary pre-condition for ensuring uptake of research results (as soon as they are ready). It is only when more people gain more understanding in data and computing science that they will be more articulate about their needs thus orienting the research towards relevant topics. This process takes time. | |
| **Efficiency** | |
| JC. 3.1 Intermediate results | 2/2 MSc planned graduated in 2019; one of them has joined the IT industry in Brussels; the current PhD (VUB degree, sandwich PhD) will finalise end 2021. One MSC topic (on distributive mobile applications) was directly relevant for |

| | |
|---|---|
| have been delivered<br><br>Score: 3 | the PhD topic. The post graduate students are male. The PhD wrote 1 conference proceeding. The second PhD position is considered for phase II<br><br>All planned tutorials/workshops on tools for data science were provided to local researchers (see further below). New tutorials are planned for local students in 2020, to be provided by the PhD (tutorials on data processing tools and data gathering technologies to local students).<br><br>What is not yet realised are the databases and the platforms mentioned under the indicators (platform and portals for researchers and farmers, a repository of knowledge on tools for data science is available and accessible for JKUAT staff and students) (IR2.1, IR 3, IR 5). When asked for, most respondents referred to the idea of an online portal for researchers in food and nutrition functioning being prepared and the user requirements study is already executed with web development expected to be ready by the end of 2020. 2021 will be used to address emerging issues with the functioning of the online portal. Respondents underline the uniqueness of the content that will be provided: various existing platforms only focus on farmers but not on the other actors and elements of the food system value chain.<br><br>The repository on tools for data-science remains very relevant and the demand amongst academic staff is there.<br><br>The project learned (see also self-assessment) that the preparation of these platforms ideally should start from the start of the programme including more attention for user involvement (who needs what kind of information, to do what, when, …). All of these issues are clearly addressed in the 2020 planning for the following year and will help in strengthening their effectiveness.<br><br>Respondents that received training in 2019 were very appreciative of the relevance and quality of the training. The training on statistical programme R was quite advanced and most respondents state they are not using the programme but appreciated the introduction in different statistical methods and are aware of what R has to offer (more in particular for advanced data analysis).<br><br>Various respondents confirm that lab access is possible and that there is sharing of new equipment throughout the dept/school for research staff and post-graduate students. There is also appreciation for the lab: high end equipment is installed. Of 23 outcome stories collected in departments that are not hosting the IUC projects but have been interacting with the programme, 8 point at changes related to research facilities, 3 of which directly mention computing facilities.<br><br>Some researchers' underline that they might need stronger computing power for their analysis (for e.g. research that is involving image processing). This will also be addressed in 2020 (see the new planning).<br><br>As a transversal project, the evaluators would like to highlight the interconnectivity of P4 with the other projects. Specifically, P4 received input from the other projects and provided input to them: |

| | |
|---|---|
| | 1) **Receives**:<br><br>(a) Agriculture, food and nutrition data from the other projects. The data assists Project 4 in its research (such as from Project 1 to woe worked on by the PhD student in his PhD research) and identification of support activities (such as Project 1 and Project 3).<br><br>(b) Domain-related expertise (agriculture, food and nutrition) from the other projects (such as Project 1 and Project 3). This assists Project 4 in its research and system/application development.<br><br>(c) Workshop participants from all the 3 projects, among other participant/stakeholder allowing to have an interdisciplinary class room.<br><br>In brief, Project 4 receives program statements, problem context, research data and participants from the other projects.<br><br>2) **Provides**<br><br>ICT-related support to the other projects in their specific areas of need (such as application development for Project 1 and Project 3, data analysis for all the 3 projects, workshop training for all the 3 projects, etc). |
| JC. 3.2 Support was provided to ensure the quality of the research and educational processes<br><br>Score: 4 | A distinction is made between the transversal activities (highlighted in the above) and the support to the students. In this section, the evaluators focus on the second issue.<br><br>With regards to the support of the students, the following can be highlighted:<br><br>• Because software engineering is not yet strongly developed in the school and the training at bachelor level is still very theoretical, the MSc and PhD students were not fully ready for the academic rigour at the VUB. This required additional support from the VUB (also in financial terms to make up for some of the months lost). Students would warn future students to inform themselves better about the requirements for MSc abroad. Future students going to VUB from JKUAT should be better equipped on the expectations or they may find programmes are harder than expected. There is also a misconception on the workload, punctuality and the many deadlines.<br>• The first workshops organised in 2017 were very instrumental in supporting the formulation of the research questions for the PhD and MSc students and to make the PhD student understand he was expected to serve research in the domain of agriculture<br>• The PhD has two promotors (North and South) and can consult three additional professors. When working at the VUB, he enjoys a stimulating environment in a lab with many other post-docs and PhD students<br>• The involvement of the PhD in the organisation of the regional workshop, contributed to other than scientific competences at his level.<br>• The PhD has been very supportive of the MSc students<br><br>In general, there is a culture of openness within the IUC programme, which is confirmed by the majority of respondents. The recurrent meetings for managing the IUC project are helpful to keep everybody on track, they create a stimulating environment for exchange on different research topics and create 'demand' for further research topics to be explored (scientific day during the meetings). |

<table>
<tr>
<td>JC. 3.3 Relationship between means and results achieved and objectives (qualitative assessment)<br><br>Score: 4</td>
<td>
The project has to some extent been affected by the COVID Pandemic, for e.g. it was not possible to organise the second regional conference on ICT (planned to be organised in Makerere). Because of COVID, it was decided to keep the PhD student in Belgium, as such his availability for other projects (notably P3) is affected.<br><br>
Challenge to work with a small budget, as transversal project there is quite some focus on transversal ICT support, whereas ICT support is something different than developing academic research in computer science. But MSc have been realised and PhD is progressing well. There were some issues in delays for procurement caused by the rules to which the university of JKUAT (as all universities in Kenya) has to operate.<br><br>
Overall, the project has realised great value for money, more in particular in looking at the transversal aspects: the lab is of good quality and accessible not only for the P4-team, the equipment and software appears to be usable beyond the project, the server proved to be very useful in Covid period, the trainings were highly valued and reached a public beyond the IUC team members, and they were organised in an efficient way as is elaborated below.<br><br>
Organisation of the trainings:<br>
• Open calls in the university were organised for participation in the tutorials and workshops (that lasted for several days and were provided by colleagues from the VUB and the University of Hasselt)<br>
• Post graduate students and university staff (sometimes with participants from outside the university) sat together in the same training<br>
• As such the public reached was diverse which contributed to having a multi-disciplinary class where one could learn from experiences in other research fields. The figures received related participation, did not specify the number of students that participated, but feedback from respondents confirms that various PhD students had the opportunity to participate.<br>
• For the organisation of the trainings, the project worked with the resources that were available in the North (network of the VUB, and professor from Hasselt involved in a Teams project) and in the South (Makerere university).<br><br>
Overview of trainings provided (source: P4)
<table>
<tr><th>date</th><th>topic</th><th>#participants</th><th>Of which outside of IUC teams</th></tr>
<tr><td>July 2017</td><td>Mobile applications</td><td>30</td><td>7</td></tr>
<tr><td>Sep 2017</td><td>Resource mobilisation</td><td>28</td><td>5</td></tr>
<tr><td>Jan 2019</td><td>statistics</td><td>35</td><td>23</td></tr>
<tr><td>June 2019</td><td>Data science</td><td>50</td><td>21</td></tr>
</table>
</td>
</tr>
<tr>
<td>JC 3.4. Project management is conducive for ef-</td>
<td>The team and the project is rather small and thus not difficult to manage. No particular issues were shared with the evaluators on project management.</td>
</tr>
</table>

| | |
|---|---|
| ficient and effective project implementation<br><br>Score: 4 | Respondents from P4 confirm that PSU (support in North and South) has been most efficient and responsive; quality of communication was excellent. This was confirmed by respondents at different levels (both students and staff) |

**Final judgement/comments**

The efficiency of the project is strong. There are two points of attention:

1. the realisation of the intermediate results related to the realisation of the databases and repositories: the responsibility lies with P4, but the evaluators believe that strong involvement from the other projects will be required to ensure their effective realisation. This issue of involvement does not yet appear clearly from the 2020 planning.

2. investing in MSc students: one student did not return to Kenya of JKUAT (as there were no particular prospects offered by JKUAT or foreseen in the design of the IUC). The question is to what extent this investment can contribute to the institution? Although JKUAT is committed to recruiting young brilliant graduates for part-time teaching and attachment to research, the means and rules for hiring academic staff are often a stumble block to ensure this.

The evaluators have noticed a strong focus on ensuring the involvement and well-being of students involved and supporting and guiding them in their research. There is a clear plan on how to build further on their knowledge to benefit other students and the school (which contributes to sustainability – see further).

Efficiency of the provision of trainings could be even stronger if trainings, more in particular related to mobile data collection, statistics, … would be organised on a more recurrent basis by staff of the School of Computing (supported where necessary by colleagues from other universities) and open for all JKUAT staff. This could be done as a service to pay for. The participation from participants from various disciplines should be maintained as it is appreciated by participants as a strong feature.

The general management of the project and commitment of team leaders involved has contributed strongly to the efficiency of the project.

**Sustainability**

| | |
|---|---|
| 4.1 Level of academic and institutional sustainability<br><br>Score: 4 | ICT component and support<br>• part of the training is already absorbed by the Grants management office (grant proposal writing), yet still on the budget of the IUC<br>• JKUAT already is investing in supplementary ICT infrastructure to support the adoption of ICT and online work due to Covid, this will continue in the future<br>• It is understood that training in phase 2 and stakeholder workshop might be online to a certain extent. The demand for training is there amongst academic staff<br><br>Software engineering<br>• There is strong commitment from academics involved at VUB professor to ensure that PhD students receive all the support necessary and to ensure their continuation in research (for e.g. effort to connect former PhD student of Makerere to the P4)<br>• There is a clear plan on how to build further on the knowledge of PHD and MSc students to benefit other students and the school<br>• the PhD can be promoted upon graduation (see also self-assessment). The future position is probably that of a lecturer. This might be a risk for |

| | |
|---|---|
| | future investment in research (for e.g. when lecturing takes too much time). It is not yet clear how research could be combined with a position of lecturer. Currently, there is a policy to support Post-Docs but the University cannot not fund them. A project with funding is able to engage a post doc.<br>• The IUC intends to provide a research budget in the next phase for this project to continue research. This is to ensure a transition from study to (research) work and is based on previous bad experiences where phd students came back with energy and ideas and did not find opportunity to do their research and lost their research networks. |
| 4.2 Level of financial sustainability<br><br>Score: 3 | • Within the university, there is attention for commercialisation of innovations/tools, but there are not yet clear strategies and it is too early for this project to see what comes out and can be commercialised.<br>• Stakeholders at JKUAT are aware that updating of registered software needs to be carefully planned in the budgets.<br>• There is no evidence of P4 team seeking or bringing in new funded projects that would contribute to financial sustainability but the idea is to use the platform of stakeholders to develop as a community of practice that jointly develops research proposals. |
| **Final judgement/comments** | |
| The institutional sustainability of the results obtained is supported by the commitment of the partners and the willingness of leadership to absorb some of the activities and to support the adoption of ICT (accelerated under the influence of Covid. It is important to maintain the difference between ICT support and software engineering. The project has a clear view on how to build further on the knowledge but the reality (freeze in hiring new staff and financial issues) might make it difficult to further strengthen the knowledge on software engineering within the School. | |

# 4. Conclusions and recommendations

## 4.1. Lessons learnt from the approach of interconnectivity along the value chain

Despite the challenges, interconnectivity has brought a vibrancy among the participating departments and post graduate students, and developed a better understanding of each other's interests, needs, and capabilities. These are key to be able to develop future multi-disciplinary research proposals, building on the on-going work of the IUC. To the evaluators, it was apparent that JKUAT is well on its way to becoming a regional academic leader in legume research from breeding to processing, to food products, and clinical and nutritional outcomes. Success will, however, largely depend on the team carrying on with the current momentum into Phase II of the IUC and:

- The continued drive by the schools to seek additional complementary external research funds, and
- Maintaining the strong leadership (university and programme level) and programme management practices currently in place through the programme support unit, team leaders and programme coordinators.

The evaluation confirms the relevance of the value chain approach which is fully in line with and supportive of the JKUAT 2018-2022 strategic plan and the choice to focus on beans as a case study for looking into the possibility for legumes.

Strong evidence was provided to sustain the appreciation of high efficiency and effectiveness of the approach as seen in the self-evaluations. Only halfway its programme execution, this IUC and the specific approach has further developed the LCEFoNS from its nucleus (a TEAM project with a small research team in one school) towards a virtual centre of excellence that connects various schools and equipped labs to the research objectives along the value chain aimed at developing new technologies to strengthen local industry and improve situation of nutrition amongst children and diabetic patients.

This legume research centre, the research teams and their (varying) performance in terms of acquisition of grants and research results has been noticed throughout the university and beyond (at the level of industry, and amongst other societal actors and government actors). Data-collection during the evaluation presents a convincing portrait of a group of people that know what they are doing and where they are heading. The idea developed by the programme coordinators for Phase II to support the newly founded or strengthened research teams connected to the centre with seed money for the graduated students to build further on their research is very positive and strengthen sustainability of the centre and the current research results.

The sustainability of the approach is strongly supported by the ownership at the level of the schools involved and by the university leadership. The JKUAT 2018-2022 Strategic Plan also strongly urges academic staff to work along a value chain and to seek for multi-disciplinary partnerships within the university. The good performance of the programme is convincing a critical mass of academic staff and post graduate students of the effectiveness of the value chain approach and interconnectivity and this strengthens the sustainability of it. The evaluators are not yet fully convinced by the sustainability of the

structure of a virtual centre of excellence; the proof of this will have to be delivered in Phase II and supported by some clarification of how the university intends to manage and position this kind of structure within the university.

This evaluation was requested to identify some **lessons learned** from the interconnectivity based on a value chain approach. The following lessons are useful for other inter-university collaboration programmes (to be considered when developing and executing their programme):

- Organising interconnectivity and multidisciplinary research within an IUC is easier when it is combined with a clearly defined value chain approach from 'fork to mouth' (or from source to user), which by design forces/invites/stimulates academic staff and students from various departments to interact more intensively and systematically with each other.
- The value chain approach focusing on legumes supported greatly reaching out to external stakeholders. The fact that they are gathered together in stakeholder meetings is creating conditions for necessary interlinkages between actors outside of the university that (the interlinkages) are essential for effective uptake. The programme is creating a space where actors that do not usually mingle can meet. In this respect, this approach offers more chances for impact and uptake
- Organising the stakeholder platforms for the whole programme really helped the separate projects to start thinking about and working on 'uptake' from the beginning with success; realising the same dynamic would be far more difficult to achieve if organised by each project separately.
- The effectiveness of the multidisciplinary value chain approach in terms of attracting attention and funds from external donors provides a strong incentive for other academic staff to invest more in multidisciplinary research.
- Key competences and conditions that need to be put in place (or need to receive attention when not yet strongly developed by other IUC programmes) are the following:
  - Strong **leadership** at programme level that is always connecting the projects to the overall objectives of the programme ensuring convergence of efforts;
  - Strong **communication** skills and monitoring the execution of planning to ensure continuous contact in-between joint meetings;
  - Pro-activeness, not waiting for things to happen, is essential when trying to stimulate interconnectivity, this quality was demonstrated, for example, by the simple fact that the preparation for the second phase did not wait for this evaluation to happen;
  - Sufficient **flexibility** in organising the programme is key for interconnectivity to work: for example, it was clear when and where joint collaboration and sequencing between projects and their outputs was possible and where not and the programme acted accordingly, see capacity to manage the impacts from the COVID-19 pandemic and adapt planning and discussions to find a way forward.
  - **Transparent** management of programme (for example, involving students in meetings and discussions in joint meetings) also using share point and of budget so that budget absorption can be monitored by all involved and early action can be taken when necessary.
  - **Development of a good working team** across projects and disciplines.

**Recommendation 1 – VLIR-UOS when having a dialogue with universities developing an IUC could use the lessons learned with regards to developing stronger interconnectivity of projects in assessing programme proposals and providing guidance to applicants. Rather than focusing on a single value chain, the evaluators estimate that** a *systems approach should be used by future*

*applicants when applying* as not all research areas necessary fall along a value-chain which is product oriented. It is therefore worth considering having projects in other UC programmes following a multi-disciplinary systems approach that seeks as much as possible to connect different thematic domains. The key competences and conditions there are described in the conclusions above are valid for multi-disciplinary approaches

**Recommendation 2** – This recommendation is addressing the programme stakeholders and more in particular P1-2. It is about ensuring a more systematic and explicit gender sensitive analysis of the value chain to assess, anticipate and take into account the possible different effects of research results and outputs and new technologies on the lives of the men and the women that are working in or concerned by the legume value chain. P3 stakeholders are, by the nature of their work more used to consider differences between men and women; this sensitivity could also find its way in other research domains. Stakeholders agreed that this is a point of attention for the second phase in order to ensure uptake and impact when consolidating research results and when exploring other legumes (other than beans).

**Recommendation 3** – This recommendation is addressing the university leadership. During phase II it will be important to work on the operationalisation of the concept of being a virtual centre and being a centre of excellence (either physical or virtual). The evaluators are assured that sufficient expertise and insight can be mobilised within the network of the IUC stakeholders. The evaluators are not suggesting that a policy should be drafted, rather that an in-depth discussion is to be organised amongst the IUC stakeholders and at the level of JKUAT leadership.

## 4.2. Assessment of the evaluation criteria

**Relevance** – The programme and the projects are highly relevant for the society, the schools involved and the university as a whole. The programme responds to national challenges in the field of food security, nutrition and health and is designed in such a way to allow input from societal stakeholders in responding to research focus and results. This creates a win-win situation for all and offers good prospects for uptake. The programme responds to a context in which schools at JKUAT have seen a rise in students, putting pressure on time to be allocated to research in combination with poorly equipped labs. More in particular for the schools involved in P1 and P2, the programme has significantly boosted the lab facilities; overall, focus on research has been strengthened. The programme and the JKUAT strategy are strongly connected: the preparation of the IUC has, next to other influences, inspired the formulation of goals in the strategy and is now developing alongside supporting the execution of the strategy.

All research teams involved in the IUC are pursuing synergy within JKUAT and are taking this to the next level: it is no longer about collaboration between 2 schools; the ambition is to connect multiple schools and labs. So far, particularly the research team of P2 was seen to be most effective and successful in terms of attracting additional research funds.

The evaluators underline that P4 was more than a transversal project, as it was seen to be fully part and parcel of the value chain. Coherence and synergy were further strengthened by the practice to connect the IUC post graduate students to each other's' research topics, engaging in exchange during scientific days and joint meetings and connecting them to research teams outside of the IUC programme (when in the North and stimulated by the team leaders in the North.

The choice of indicators to measure progress at the level of the specific objectives calls for particular attention: it is not always clear what exactly is measured and how and it is not fully clear to what extent

the follow-up of indicators instigates reflection and discussion about strategies to be strengthened or adapted within the IUC.

**Recommendation 4** – This recommendation is aimed at the main IUC programme stakeholders. All stakeholders in the meantime have gained an even better understanding of what is possible within this programme, which might help in fine tuning the intervention logic and identifying appropriate indicators for Phase II to ensure monitoring, more in particular at the level of the specific objectives. The evaluators suggest that the teams would be inspired by some of the indicators identified in the JKUAT strategic plan: as such data collection will be also useful to monitor the progress in realising JKUATs strategic objectives and the IUC programme could clearly demonstrate where the IUC will boost capacity of JKUAT. To give some examples, the evaluators refer to the indicators related to technology development (for example, measuring the number of innovative products at the end of a programme, number of products that acquire IP rights), technology transfer and uptake (number and type of activities, such as trainings with specific business clusters), the management of research centres (evidence of revised policies with resource mobilisation strategies,  per cent of income reserved for improvement and maintenance of infrastructure, joint use of labs with industry players and number of research activities developed with industry players and collaboration with the Industrial Park (established in 2013 to facilitate transformation of innovation and research into sustainable enterprises through business incubations).

**Efficiency** - This programme was executed in a most efficient way and the intermediate results are of good quality. The lab infrastructure, especially within P2 ensures international competitiveness. In general, the programme is well on track. COVID-19, although well handled (with the support of P4) will cause some delays in the graduation of some students and the publication of scientific papers. Some additional intermediate results will probably also need some extension into Phase II to be realised, for example, realisation of database with tools (P4), development of some genotype of beans combining agricultural traits and nutritional quality, the development of guidelines for stakeholders.

The support to the quality of research and the post-graduate students have been excellent: promotors show-cased what ‘mentoring’ should look like, they applied an open-door policy, involved the students in the programme at different levels and ensured that they were really part of the IUC research teams. The evaluation strongly supports the idea of the project coordinators to provide the graduated PhD students with seed money for their research. It will support the further development of research teams and will consolidate research that was started in phase I.

The overall programme management is characterised by high efficiency with a clear consideration of costs, transparent communication, effective joint planning, clear separation of roles and tasks using the IUC structures and manual in an efficient way, acting pro-actively and ensuring that the interconnectivity approach can work. Procurement challenges were increasingly managed, for example, by the creation of a research desk in the procurement department, partly inspired by the IUC programme.

A point of attention is related to the recruitment of suitable Masters students and the lack of stipends making it difficult to ensure recruitment of the best students and ensuring their timely graduation.

**Recommendation 5** – This recommendation is aimed at the IUC programme stakeholders. The evaluators urge the stakeholders to fully use phase II to invest in, what the evaluators would call ‘outscaling’ and pursue the original intention to develop and strengthen the research in other legumes based on the results of the beans case study. The 2021 IUC planning mentions attention for cowpeas already which is a first step in the direction of outscaling.

**Recommendation 6** - This recommendation is aimed at the IUC programme stakeholders: to have a discussion on why and how to use the administrative budget for stipends for MSc students. The National Research Fund used to cover stipends for students but this was recently stopped and only funding for research is now covered. The evaluators invite both North and South team leaders and coordinators to discuss the importance of MSc for the general objectives of the IUC programme and the contribution to the realisation of the JKUAT strategic objective to connect MSc (and education) better to the research teams and topics.

**Effectiveness** – The IUC is already having a strong effect on the schools involved and beyond. The effect on the whole university was firmly confirmed by the outcome harvesting data provided by eight JKUAT departments that are not directly involved in the programme. Their answers underline the visibility of the programme but also the access for others to use some of the planned results, such as the labs. Thanks to the training of lab technicians and the open access to labs, labs are increasingly used which is supporting the emergence of a research culture. Explanatory factors for the effectiveness lie in the financial support of VLIR-UOS and the way this was managed, next to connection with and engagement with JKUAT leadership. The PhD students having experienced the mentoring and support to the quality of their research have declared to be ready to offer the same mentoring to young researchers in the future which raises high hopes for the strengthening of the research culture at JKUAT.

The evaluators underlined the emergence of unplanned results, such as the creation of the Grants Management Directorate in 2018 which is now home to the grant writing workshops and one of the stimuli for developing multi-disciplinary teams. Other unplanned results is the input of the research results and lab facilities in the development of a food technology mirror programme, the strengthening of the networks of individual researchers and the increased visibility of the school of computing (and attention for the importance of reliable data analysis). As such the overall image of JKUAT in Kenya received a strong boost.

The mid-term evaluation confirms that uptake is prepared from the beginning by engaging with stakeholders. Halfway the programme, advice based on research results and experience of staff is already provided to various types of stakeholders through bilateral interactions. There is no doubt that this will lead in the second phase to translation of research results in useful and usable formats for societal stakeholders.

A particular feature of the programme is the ambition to develop the interaction with stakeholders through platforms. To date, it is not yet clear to what extent these platforms are more than another name for workshops where stakeholders can get to know each other. The idea, more in particular for P4 is to make the stakeholder platform evolve to a community of practice with a larger dynamic of working together and developing joint research proposals. This has been hampered so far by the COVID Pandemic.

Some points of attention in ensuring effectiveness are related to the continuous offer of training on data collection, management and statistics and underlying techniques of the new equipment and the access of P3 to capacity for blood analysis.

In order to strengthen effectiveness in the next phase and opportunities for impact and uptake, the evaluators have formulated following recommendations.

**Recommendation 7** - This recommendation is aimed at the IUC programme stakeholders. To strengthen effectiveness and impact related to uptake by societal actors and government actors, the

programme stakeholders should be clearer about how they see the stakeholder platforms evolving beyond events such as stakeholders meetings and workshop to inform them about the project and ask for their feedback. The JKUAT Strategy 2018-2022 does not provide inspiration as this is mainly focusing on relations with 'industry' but not about platforms and the functions they could fulfil. The evaluators are assured that sufficient expertise and insight can be mobilised within the network of the IUC stakeholders to address the issue. Already, P4 has a specific view on how to further develop, their insights could be used to build on further. A lot of literature related to the management of multi-stakeholder partnerships (from the perspective of societal actors) is also readily available.

**Recommendation 8** - This recommendation is aimed at the IUC programme stakeholders and University leadership. To support research and based on the enthusiasm of respondents, the evaluators would recommend to continue to offer courses on data analysis and statistics. The courses that were developed and offered could find a home, just as the courses on proposal grant writing have found a home in the Directorate of Grants Management, for example, in the Mathematics department. This offer should be continued to be funded by the programme in Phase II (but with an exit strategy by the end of the programme) and should be connected to the portal on data analysis tools that is being developed.

**Recommendation 9** - This recommendation is aimed at the school management. The evaluators recommend that Phase II should move beyond ensuring good access to labs: respondents have highlighted their need to be further trained on the underlying techniques rather than only understanding how the equipment works.

**Recommendation 10** - This recommendation is aimed at the IUC programme stakeholders, and more in particular P3 in conjunction with the management of relevant schools and colleges. If the IUC is further looking into the nutrient quality of intake and its effect on people, the stakeholders should discuss the conditions for purchasing equipment for blood sample analysis. Reflection upon the conditions need to lead to decisions upon the hosting lab, the joint management by the school of public health and school of medicine, the access for other schools to the lab, the business model. Some respondents warned us that to run an analytical lab in a cost-efficient way, a constant flow of blood samples is needed. Such a lab cannot be run by only one department and the funding in Phase II is too restricted to install and run a fully equipped analytical lab. So this calls for a university-wide strategy, which includes collaboration with many other departments and school, as well sourcing of funds specifically for setting up a lab. The establishment of the lab in P2 and its current accreditation process (to be able to process samples from other organisations) can be leading. Having blood analysis equipment would provide potential for revenue generation (sustainability) through contracted analysis.

**Sustainability** – The programme and project leadership and staff working with the university leadership initiated strategies that will ensure the sustainability of the centre of excellence beyond the life of the IUC programme. This includes working towards institutionalisation of key IUC activities (for example, the grant proposal training programme taken up by the Directorate of Grants Management); putting in place strategies to ensure the equipment in the new facilities are maintained and repaired as needed (for example, incorporating the installed equipment into relevant departments thus accessing maintenance funds and moving towards accreditation of the labs to enable processing at a fee of outside samples); and creating new units within the university that have responded to the needs of the IUC and the university at large (for example, creation of the Directorate of Grants Management and the equipment maintenance unit).

The teams have also been actively engaged in seeking additional sources of external funding. This is essential as sustainability of centres of excellence is primarily based on the ability to continually attract external funding in support of the centre's research. Obtained external funds (1 bi project for 4 MEUR and three smaller projects for a total of 340.000 EUR) and new proposals will build on the results that continue to be generated by the current activities and leverage on the human capacity being developed as part of the programme.

A third avenue for sustainability is tied to uptake of the research-based products and IP. Discussions are underway across all projects on which outputs can (and should be) commercialised either directly (for example, establishing JKUAT as a seed company) or indirectly through licensing (the products and processes developed in support of developed legume-based food products). These deliberations are being informed by among others, the expectations of various funders who support the research, the JKUAT strategy for 2018-2022 (explicitly talks about the need to commercialise research-derived products) and the university's experience with successfully commercialising banana tissue cultures.

**Recommendation 11** - This recommendation is aimed at programme stakeholders and VLIR-UOS. The programme needs to focus more on how to commercialise, this might require an open dialogue with the VLIR-UOS on the conditions under which commercialisation of innovations coming forth from funded programmes (aiming at development) is allowed. The banana tissue culture case could provide some insight: commercialisation supports the sustainability of the lab, the varieties are not for free but come at a very low price allowing to continue the research work in the lab and continuously upgrading the samples and the types.

| **Summary of recommendations in relation to** | |
|---|---|
| Interconnectivity and value chain approach | 1. VLIR-UOS when having a dialogue with universities developing an IUC could use the lessons learned with regards to developing stronger interconnectivity of projects in assessing pro-gramme proposals and providing guidance to applicants. |
| | 2. Ensure a **gender sensitive analysis** of the legumes value chains in order to take into account the possible different effects of research results and outputs + new technologies on the lives of the men and the women that are working in or concerned |
| | 3. Clarify **what is behind the concepts of a *virtual* centre of *excellence*** and operationalise |
| Relevance | 4. **Redefine the indicators** at the **level of the specific objectives** and align them with indicators the JKUAT strategic plan where possible |
| Efficiency | 5. **Ensure outscaling** to cover additional legume value chains<br>6. Have a **discussion over why and how to use the administrative budget for stipends** for MSc students |
| Effectiveness | 7. Clarify the **functions and management of a 'stakeholder' platform**<br>8. Continue to offer **courses on data analysis and statistics** (ensure institutionalisation through hosting and connection to P4 database on data collection and analysis tools)<br>9. Ensure **further training on underlying (new) techniques** made possible by up end lab equipment<br>10. Discuss **conditions for purchasing equipment for blood sample analysis** |
| Sustainability | 11. Focus more on how to **commercialise in order to strengthen sustainability** |

*Table 13: summary of the IUC mid-term evaluation recommendations*

# 5. Annexes

## 5.1. Annex 1: Terms of Reference – available at request at VLIR-UOS

## 5.2. Annex 2: Evaluation framework

(From the inception note) The evaluators have formulated two questions, one question on interconnectivity and one question on efficiency at programme level.

**Programme level**

| **EQ 1 – How is the interconnectivity between the 4 projects constructed and executed and what are the first effects?** | |
|---|---|
| Rationale<br><br>As required by the ToR, the evaluators will assess the added value of implementing an IUC programme that focusses on a single product value chain with four tightly interconnected projects that span 2/3 schools of the College of Agriculture and Natural Resources (CoANRE) and more in particular 4/7 departments of this college, 2 departments in the School of Computing and Information Technology in the College of Pure and Applied Sciences and two other institutions, the Institute of Bio-technology Research (IBR) and the School of Public health within the College of Health Sciences. The ambition of the IUC programme is to develop and consolidate a centre of excellence that will have interdisciplinary research at the heart of its operations.<br><br>The evaluators want to understand and assess interconnectivity as the key feature of the IUC. There are claims (for e.g. in the self-evaluations) with regards to the contribution of this interconnectivity to effectiveness and impact. It is important to look at this and obtain some substantiation. The conditions and factors that allow for or are contributing to this interconnectivity merit to be mapped. Also, the extent to which the transversal project on ICT has been supportive to projects related to agriculture, processing of food and health needs to be highlighted. This will allow the evaluators to draw lessons from this interesting experience that could also benefit other IUC programmes.<br><br>The judgement criteria, used to answer this question follow the OECD criteria. A specific data collection technique by the name of outcome harvesting will be used to answer some of the points under efficiency and effectiveness – the design of the outcome harvesting is explained in the inception report Power Point Presentation. | |
| **Judgment criteria** | **Guiding questions/indicators** |
| **1.1. The relevance for the legume/bean value chain can be confirmed from various perspectives** | – University leadership, CoANRE leadership and leadership of other institutes involved confirm relevance of the thematic focus<br>– The choice for the value bean chain is relevant from the point of view of food security policies in Kenya<br>– Gender related aspects of the bean value chain are taken into account/specified<br>– The value chain approach provides an opportunity for synergy with interventions of other development and academic actors (with specific attention for Belgian actors and other VLIR-UOS projects)<br>– There is an added value of the IUC programme (in terms of budget, approach) compared to other interventions at JKUAT. |
| **1.2. The programme** | – The specific approach is recognised by all stakeholders in North and |

| | |
|---|---|
| **management is aligned with the design of interconnectivity (efficiency)** | South (including post-graduate students), they can identify advantages (and possible disadvantages)<br>– Mechanisms to ensure interconnectivity (for e.g. to ensure complementarity, constantly feeding research data and results back and forth, to connect P4 to the other three projects, communication on research and data sharing, …) are installed<br>– Execution is flexible and takes into account possible risks for interconnectivity (for e.g. one project not delivering upon products needed by another project, especially important for P1 and P2, for e.g. effects of COVID)<br>– IUC consultation and decision-making structures are supportive to interconnectivity<br>– Outreach, for e.g. stakeholder platform (for outreach) is jointly managed |
| **1.3. The interconnectivity adds value to the effectiveness and scientific/educational quality of the programme** | – the virtual 'infrastructure' of the centre of excellence for legumes is emerging (ideas for joint research agenda are developing, protocols for collaboration amongst researchers and joint use of labs are in place or being developed) and this can be confirmed by more distant resource persons in the colleges and institutes that are not directly involved in project activities (see outcome harvesting method)<br>– Tools and capacity for data gathering, storage and analysis of scientific data is accessible for all team members<br>– (more) data are available for improvement of educational programmes (for ex. the IPC programme on Food Technology)<br>– Evidence of efforts to produce articles and products that combine authors/data from the various projects<br>– Development of a policy for uptake and technology transfer (pathways to transfer) is jointly managed |
| **1.4. Sustainability of the feature of interconnectivity in the development of the centre of excellence** | Institutional<br>– academic research staff and students recognise the added value of the approach of working together (for their own work/career)<br>– university policies are in place or being developed to ensure the consolidation of the centre of excellence.<br>– Efforts to enrol newly trained MSc into JKUAT PhD programmes for continuity of the specific approach (with view to the centre of excellence)<br>– Efforts to ensure integration of new students in the philosophy of interconnectivity<br>– Consolidation of tools developed by P4 to benefit other users within the university<br><br>Financial<br>– Evidence of a plan to address and enhance financial sustainability of the research in bean value chains/legumes/centre of excellence.<br>– Capacity and efforts to secure complementary external grants in support of the same type of interdisciplinary research connected to the legume chain/the centre of excellence (skills of staff, task division for resource mobilisation, development of networks, …) |
| **1.5. The approach of interconnectivity has the potential to contribute to impact** | Academic and institutional impact:<br>– Mechanisms for programme influence on university policies and practices (with regards to develop or promote a similar way of working) have been identified/defined<br>– Emerging effect of interconnectivity on the dynamic of researchers in the schools involved (development of new joint research proposals developed along a value chain, attraction of new funds, interest of other universities) |

| | |
|---|---|
| | – Emerging effect (of the volume of new post graduates, research facilities and infrastructure) on the college of agriculture and its leading role in research in the country and at regional level on the legume value chain<br>– increased visibility and interest from other schools/departments to be involved or work in a similar way<br>– the extent to which the programme has functioned as a leverage to attract other donors and funds<br><br>Development impact:<br>– external stakeholders (and beneficiaries, such as farmers, processors, community organisations related to health) acknowledge the potential of the centre of excellence<br>– quality and frequency of interaction with important development actors at programme/school/JKUAT level<br>– #requests for policy advice<br>– development of mechanisms (if needed at university level) to ensure upscaling of research outputs by industry (in line with university guidelines on working with industry, incubation, …) |

*Sources of verification*:

- Strategy and policy documents of JKUAT and VLIR-UOS
- Kenya Development road map, Vision 2030, and Vision 2030 Medium-Term Plan 3
- Monitoring data: at programme level related to the centre of excellence + overview on indicators related to outreach
- Self-assessment reports
- Annual progress reports 2017-2018-2019
- Programme and project documents, design and annual plans
- Interviews with programme managers, project leaders and students
- Interviews with researchers and leadership of schools/institutes (involved in execution of activities)
- Interviews with university management
- Interviews with external stakeholders (amongst which members of the stakeholder platforms)
- Outcome harvesting

| EQ 2. What is the level of efficiency at the programme level? | |
|---|---|
| Rationale<br><br>This evaluation questions focusses on how the overall programme was managed with a key emphasis on the steering committees (joint and local) and their interaction with the JKUAT top management to ensure efficient and effective implementation of the projects. This also includes attention for the extent the programme management was able to leverage on additional resources to meet identified gaps or expanded roles within the IUC. | |
| Judgment criteria | Guiding questions/indicators |
| 2.1. Management of the execution of the IUC is done in an efficient way | – Appropriateness of result-based planning, execution (management of timelines) and monitoring in place<br>– Factors hampering efficient management have been identified timely and managed well<br>– Quality of communication within the partnership |
| 2.2. Role division is clear | – The extent to which programme management has shown leadership in managing the programme (clear agenda, uptake of decisions, support to project leaders and interaction with university leadership)<br>– The extent to which different stakeholders involved in management |

| | |
|---|---|
| | have taken up their respective roles and mandates were clear and respected (steering committee members, PSU, project leaders, etc).<br>– Quality of working relation with the programme support unit with regards to the projects (clear guidelines, transparency, timeliness, etc.) |
| 2.3. Transparent financial management and support to execution of procurement | – Financial management system used to enable adequate and transparent financial management<br>– Management of changes in the budget/over- and underspending<br>– PSUs ability to offer support in managing procurement |
| Sources of verification:<br>- Self-assessment reports<br>- Interviews with Steering committee members, PSU, programme managers, project leaders in North and South<br>- Interviews project teams<br>- Interviews with university top management<br>- Annual financial plans and reports<br>- Annual narrative plans and reports<br>- Management manual<br>- Sample of reports: quarterly reports, mission reports, minutes of the steering committee meetings, | |

**Project level**

As this IUC programme is very much integrated, there might be some overlap between evaluation questions and judgement criteria at project and at programme level. The question on impact is integrated in the question on interconnectivity at programme level and will not be treated at the project level. The question on scientific quality is integrated under efficiency as it correlates with the indicators specified at the level of intermediate results in the results frameworks of the projects.

| **EQ 1 – To what extent is the project relevant?** |
|---|
| Rationale<br><br>The ToR defines relevance as '*the extent to which the objectives of a project are consistent with beneficiaries' requirements, country needs, global priorities and partners' and donors' policies*.<br><br>This IUC aims to contribute to national development goals by reducing food and nutrition insecurity. At the level of the university, the programme aims to increase visibility and contribute to the university vision 'to be a centre of excellence in training, research, and innovation'.<br><br>From the project documents and the self-evaluation, the evaluators understand that the relevance at different levels is quite strong. The evaluators will pay particular attention to the link with the university strategy and current dynamics (including the management of COVID, using all ICT support possible), the position of the project in the respective departments and schools and the link with final beneficiaries (how have their needs been identified, how are they taken into account, how is change in the needs monitored). We understand that the stakeholder platform is one mechanism to ensure relevance (and impact), but we would like to understand if and how extra mechanisms/relations exist at project level; the effects of this interaction will be looked at under effectiveness.<br><br>The positioning in the respective departments will require sufficient understanding of how these dept have been operating so far, what have been the dynamics and how is the particular project important to the department (next to its contribution to the centre of excellence). |

The evaluators will look at the design of each project and the coherence between activities, outputs (or intermediate results), results at the level of specific objectives and the link with the overall objective for each project. This is important to assess to what extent the logical frameworks are supporting monitoring and learning about progress. Two strands appear clearly from each project: (i) attention for research (and support to increased research culture and performance, through equipment (each project) and technical data collection solutions (through project 4)) and (ii) attention for uptake through guidelines and interaction with stakeholders. The latter are situated more explicitly at the level of the specific objectives. The evaluators will take into account the question in the self-evaluations related to 'What would the stakeholders do different if they had the chance to redesign the project?'

| **Judgment criteria** | **Guiding questions/indicators** |
|---|---|
| **1.1. The objectives of the project are consistent with country/local needs, the needs of the university, the VLIR-UOS strategy and donor's policies** | – The mechanisms of interaction with beneficiaries of the project (of different type: government actors, institutions, private sector, communities)<br>– The positioning of the project within the respective department and the school, what are the needs at this level and how are these answered? What have been the dynamics in the departments so far? This particularly interesting for P4, where the school of computing and information technology is providing services to other schools.<br>– The link of the project with the transversal themes of Belgian development cooperation (gender, environment and D4D, digitalisation for development) |
| **1.2. There have been efforts made to ensure complementarity and synergy with other projects/other (Belgian) actors** | – The extent to which the project is looking for synergy with other VLIR-UOS interventions in the country or at regional level<br>– The extent to which the project is looking for synergy with projects supported by other donors, more in particular Belgian development actors |
| **1.3. The project is coherent** | – There is coherence between expected results, specific objectives and the overall objective<br>– The choice of activities is relevant to obtain results and objectives<br>– The formulation of the project entails attention for interconnectivity<br>– The indicators are well chosen to monitor progress and to support learning.<br>– Is the formulation of the project still relevant, taking into account changes in context (such as COVID but also changes in the departments, new dynamics?) |

*Sources of verification*:

- Self-assessment reports
- Annual progress reports 2017-2018-2019
- Programme and project documents, design and annual plans
- Interviews with programme managers, project leaders and students
- Interviews with university management
- Interviews with external stakeholders

**EQ 2 – To what extent have the project's specific objectives been achieved (effectiveness)?**

Rationale

The ToR defines effectiveness as '*the extent to which the programme' s objectives are expected to be achieved, taking into account their relative importance'*.

Each project has two specific objectives and one general objective. As a transversal project, P4 is generally supporting research with infrastructure & human capacity development, aimed at P 1-3 but also beyond.

Since this is a mid-term evaluation, the evaluators will look at the extent to which the specific objectives have been realized so far, as well the expectations for the remaining two years. The self-evaluations part on 'the way forward' will be looked at in detail to assess the chances of realising the specific objectives. As part of this question, the evaluators will judge to what extent projects are ready for Phase II (consolidation & valorisation) and which evidence shows this.

We will look at factors explaining delays (e.g. travel restrictions due to Covid), and how the projects plan to mitigate this in the future.

One objective is related to **uptake** outside the university (for P1-3) and inside the university (for P4): The ToR for this evaluation assignment ask to pay specific attention to use of outputs and uptake of results, and as a consequence, changes in behaviour of direct beneficiaries. These results will mostly require more time to become visible. There is some overlap here with the question at programme level related to interconnectivity (1.5 on development impact): the evaluators understand that indicators on the number of (non-academic) extension/outreach activities realised and number of persons reached through these activities are partly shared by project and programme level. The evaluators will try to distinguish.

Another objective is related to improvement of **research culture and performance**. Key indicators here are related to the increase of external research funding, increased used of research infrastructure and academic staff participating in national and international conferences/meetings.

| Judgment criteria | Guiding questions/indicators |
|---|---|
| **2.1. Extent to which the specific objectives of the project with regards to research and support to research have been realised** | – Progress in indicators developed for the specific objective at project level related at research (such as the number of publications in (inter)national refereed journals or the number of external funding projects attracted (jointly prepared with other departments and other)<br>– Non-expected effects that have emerged (not specified by indicators)<br>– Factors contributing to the level of achievements (both positive and negative), e.g. the influence of Covid<br>– Appreciation of progress by respondents involved<br>– The extent to which the way forward (as specified in self-assessments) is sufficiently geared towards the realisation of the specific objective and the overall objective<br>– Level of reflection with regards to the availability of qualified staff (maybe new expertise is needed for e.g. from engineering department, …?) |
| **2.2. Extent to which the specific objectives of the project with regards to** | – Progress in indicators developed for the specific objective at project level related to uptake, for e.g. the number of project specific outreach activities and people reached: specific guidelines and protocols developed. |

| | |
|---|---|
| **uptake have been realised** | – Non-expected effects that have emerged (not specified by indicators)<br>– Factors contributing to the level of achievements (both positive and negative), e.g. the influence of Covid<br>– Appreciation of external stakeholders<br>– The extent to which the way forward (as specified in self-assessments) is sufficiently geared towards the realisation of the specific objective and the overall objective<br>– Level of reflection with regards to existing relations and networks (maybe the 2nd phase requires new expertise or networks?) |

*Sources of verification*:

- Self-assessment reports
- Annual progress reports 2017-2018-2019
- Programme and project documents, design and annual plans
- Interviews with programme managers, project leaders and students
- Interviews with university management
- Interviews with external stakeholders

**EQ 3 – What is the level of efficiency in the project?**

Rationale

Efficiency looks at (i) the manner in which inputs are processed for the delivery of the expected outputs in a timely and cost-efficient manner and (ii) the realisation of the intermediate results.

In relation to the first point, the ToR do not request a quantifiable cost-effectiveness assessment but rather a qualitative appreciation of the relation between inputs and outputs. This also includes an analysis of the factors that have strengthened or hampered efficient project implementation. At project level, the evaluators will primarily look at the management of the project. The self-assessments all attribute the highest score to efficiency ('very good performance') with a score for good performance under P1 (for the criterion of 'active involvement of all team members in the planning based on a shared vision') and for P3 (on the same issue). Inception interviews provided the evaluators with several examples of organisation of communication (through research days, a share point, …). The desk-study by the evaluators confirms the higher level of efficiency in the project, this will further be verified through interviews. The evaluators also would like to assess to what extent realisations from P4 have contributed to the management of the COVID-pandemic challenges by the schools involved and the university. The evaluators will also take into account the quality of communication in the projects (this is part of the question on sustainability in the self-evaluations). The self-evaluations attribute the highest scores to this.

In relation to the second point, the intermediate results are related to: number of peer reviewed articles and the number of PhD and MSc students and key steps in the research. As this is a mid-term-evaluation, it will be checked whether the project is on track in realising the intermediate results and how activities planned for the final two years will support this. Since this is a mid-term evaluation, many projects have not yet reached the final stages of publication. Therefore, evaluators will also look at the progress that and the quality of the research *processes* under the question of efficiency. The evaluators would like to better understand the pace of the research and the number of publications (it seems to be the minimum required according to the guidelines for PhDs in Kenya, which is 2 peer reviewed articles/student)? What is being produced besides this as a team or by separate team members and what can be shown as progress related to realising a stronger research culture?

This second point is partly related to the ToR question on 'scientific quality': this refers to the quality of research and education within the project. Quality of research can be judged from the publication records (for the sake of the ICT project, conference proceedings will also be taken into account). But also from other elements (see under intermediate results). According to the ToR, specific attention should be paid

to ‘cutting edge’ research. The documents nor the self-evaluations refer to the concept of cutting-edge research. In any case, the evaluators will not assess themselves the quality of the research. The evaluators will use the monitoring table that is used at programme level (see question on interconnectivity at programme level) which is amongst others related to ranking of the university.

Quality of education refers to future job prospects for alumni and fellowships or grants received from foundations or other external sources. This can be discussed with PhD and MSc students. However, we need to take into account that this programme is not an educational programme. There is a link with an international Masters programme on Food Technology: the interaction between the IUC and this programme will be looked at.

The evaluators will take into account the delays caused by the COVID-19 pandemic. Effects have been noticed in P 3 as the team members should be able to move around amongst communities and in schools and hospitals (project recognised for the human interaction/intervention studies). Impact was also noticed on the organisation and the mobility of PhD studies).

| Judgment criteria | Guiding questions/indicators |
|---|---|
| **3.1. Intermediate results have been delivered** | – Level of realisation of intermediate results according to indicators formulated in the logical framework<br>– Evidence of other elements that point at scientific quality, such as implementation of research protocols developed, ability of PhD students to formulate research questions, spin-off master theses, …<br>– Factors contributing to the level of achievements (both positive and negative), for e.g. how realistic were the planned results given the resources and time available in the framework of the project?<br>– Outlook towards full achievement of IR in remaining two years<br>– # of trainees reached by P4 in the other projects<br>– Specific for P4: added value of the products realised for the management of the COVID-pandemic (if any, because not anticipated by the project design). |
| **3.2. Support was provided to ensure the quality of the research and educational processes** | – The project provides adequate training, support, mentoring and follow-up for students (PhD and MSc, including support in managing effects of COVID-19 on their research)<br>– The project provides adequate training and support for students in terms of grant writing and job searches<br>– Project alumni have good job prospects.<br>– There is a clear link and interaction with IPC programme to feed research results into education<br>– lab facilities (and other infrastructure) can be used by researchers and for education<br>– Appreciation of project alumni of this point 3.2. |
| **3.3. Relationship between means and results achieved and objectives (qualitative assessment)** | – Share of missions from the partner in the North, PHD’s, trainings, investment costs and operational costs is reasonable in relation to the realisation of the intermediate results<br>– Relevance of the expertise that was mobilised from Flemish universities and other partners (e.g. JICA)<br>– Management of spending and rate of over- and/or underspending (and explanatory factors)<br>– Choice of activities: cost-effectiveness is being pursued in programme design and management |
| **3.4. Project management is conducive for efficient and effective project implementation** | – Good working relation within the project team (clear guidelines, transparency, communication flows, timeliness of planning, etc.)<br>– The extent to which the project teams can be flexible in project execution (taking into account emerging needs, challenges from the context, amongst which COVID 19) |

| | |
|---|---|
| | – Factors hampering efficient management have been identified timely and managed well<br>– Bureaucracy related to procurement (equipment purchases, travel approval…) has been managed well by the project team |
| *Sources of verification*:<br>- Self-assessment reports<br>- Annual progress reports 2017-2018-2019<br>- Programme and project documents, design and annual plans<br>- Interviews with programme managers, project leaders and students<br>- Interviews with university management<br>- Interviews with external stakeholders | |

| **EQ 4 – To what extent will the project results continue after the IUC programme is completed (sustainability)?** | |
|---|---|
| Rationale<br>The ToR defines sustainability as '*the continuation of benefits after the project has been completed'*.<br><br>As this is a mid-term evaluation, the evaluators will take into account that a lot of results and approaches need to be consolidated first.<br><br>A distinction is made between institutional and financial sustainability. Focus here is at sustainability at project level. Evidently factors facilitating or hampering sustainability at programme level will have an influence on the sustainability at project level.<br><br>When looking at the self-evaluations, the scores related to sustainability are a mix between very good performance and good performance. For all projects, the criterion on ownership by JKUAT receives the highest score. For the continuation of the project results and effects, P2 and 3 are very confident that the effects will continue (score very good performance). Financial sustainability receives a score of good performance, except for project 2 (very good performance). | |
| **Judgment criteria** | **Guiding questions/indicators** |
| **4.1. Level of academic and institutional sustainability** | – Level of (personal) commitment of stakeholders within the department/school concerned<br>– Measures taken for retention of PhDs and trained staff<br>– joint research interests for both the Northern and Southern academics involved, are identified and pursued<br>– Evolution in networking with other national universities |
| **4.2. Level of financial sustainability** | – Allocation of funds by Flemish universities (e.g. giving fellowships or by allowing academics to go to the field, matching funds)<br>– Availability of funds for operations and maintenance of physical infrastructure at university/college level<br>– Availability of proper funds (at university or college level) to continue all or a number of activities that are important/relevant<br>– Capacity for resource mobilisation to build on the achievements (Strategy and initiatives to attract external funding (from other donors, government, private sector, …), skills of staff, task division for resource mobilisation, networks, …) |

| | |
|---|---|
| | – Development of business approaches towards financing |
| *Sources of verification*:<br>- Self-assessment reports<br>- Annual progress reports 2017-2018-2019<br>- Programme and project documents, design and annual plans<br>- Interviews with programme managers, project leaders and students<br>- Interviews with university management<br>- Interviews with external stakeholders | |

## 5.3. Annex 3: Mission programme and list of persons interviewed

All meetings and interviews were conducted online, except for the interaction with lab technicians. A briefing meeting with VLIR-UOS took place on September 17th 2020. The evaluation team was presented to the IUC coordinators on September, 24th 2020. Presentation of the inception report to full team (coordinators, programme managers and project leaders North and South) was organised October 21st.

| Name and function | Project | Date |
|---|---|---|
| Peter De Lannoy, head of programmes | VLIR-UOS | September, 17th 2020 |
| Michaëla Stubbers, Process Analyst | VLIR-UOS | September, 17th 2020 |
| Professor Daniel Sila, IUC programme coordinator | IUC programme | October 1st 2020 |
| Dr. Kahenya, programme manager | IUC programme | October , 1st 2020 |
| Professor Marc Hendrickx, IUC programme coordinator | IUC programme | October 2nd 2020 |

Actual data collection took place from November 2nd to 16th 2021. With a debriefing organized with the full team (coordinators, programme managers and project leaders North and South, P4 Team leader North excused) on November 26th.

| Dates Sep-November 2020 | Mission programme: interviews and site visit |
|---|---|
| November 2nd | 1. Indepth interview with professor Daniel Sila, IUC coordinator en P2 Team leader South |
| | 2. Indepth interview with professor Henrickx, P2 team leader North and IUC coordinator |
| November 3rd | 3. Indepth interview with Prof. Wolfgang De Meuter, P4 Team leader North |
| | 4. Indepth interview with Prof. Kimani, P4 Team leader South |
| | 5. Indepth interview with Brian Muriithi (ICT user from the university) |
| | 6. Indepth interview with Linet Mutwiri, PHD P3 |
| | 7. Indepth interview with Dianah Mulwa and Eunice Gathoni, Master students P3 |
| November 4th | 8. Indepth Interview with Rose Mutuku from Smart Logistics (stakeholder) |
| | 9. Indepth Interview with Dr. Leah Mutanu (beneficiary of P4) |

| | |
|---|---|
| | 10. Indepth Interview with Elizabeth Wafula, PhD student P2 and Irene Wainaina, PhD student P2 |
| | 11. Group interview with Ariel Buzera, Vivian Kiptum, Alice Ritho and Nancy Samoey, all Master student P2 |
| | 12. Indepth Interview with Caleb Toroitich (beneficiary P4 training) |
| November 5th | 13. Indepth interview with Prof. Christophe Matthys, P3 Team Leader North |
| | 14. Indepth interview with Prof. Angenon P1 Team leader North |
| | 15. Indepth Interview with prof. Githiri, P1 Team leader South |
| | 16. Indepth Interview with Esther Toili and Samuel Wahome, both PhD students P1 |
| | 17. Indepth Interview with Prof. Nyende from IBR |
| | 18. Indepth Interview with Nelso Maitima, Master student P1 |
| | 19. Indepth Interview with Dr. karanja from KALRO (stakeholder and beneficiary P1) |
| | 20. Indepth interview with Prof. Naomy Maina, grants manager |
| November 6th | 21. Indepth Interview with Mercy Lungaho, CIAT (stakeholder) |
| | 22. Indepth Interview with Prof. Kikuvi, dean of school of public health at JKUAT |
| | 23. Indepth Interview with Mr. Magoko from KDDA (stakeholder P3) |
| | 24. Indepth Interview with Karanja, School of Public Health JKUAT |
| | 25. Group interview with Isaac Oteyo, graduated PHD, Patrick Gakuo, graduated MSc and Samuel Ngugi, graduated MCs, all P4 |
| November 9th | 26. Indepth Interview with Dr. Florence Kyallo, P3 team leader South |
| | 27. Indepth Interview with Dr. Lawrence Nderu (users of ICT P4) |
| | 28. Indepth Interview with Prof. Hiroshi Koaze, Chief Advisor of JICA (funder) |
| | 29. Indepth Interview with Prof. Mary Abukutsa (Deputy Vice Chancellor -RPE) |
| | 30. Indepth Interview with Joan Njeri (beneficiary of P4 training) |
| | 31. Indepth Interview with Mr. Ndegwa, Ministry of Health |
| November 10th | 32. Visit to food and nutrition lab P2: interaction with lab technicians |
| | 33. Visit to P1 lab: interaction with technicians |
| | 34. Visit to P 3 nutrition lab: interaction with technicians |
| | 35. Visit to P4 lab: interaction with technicians |
| November 11th | 36. Indepth Interview with prof. Engineer Bainomugisha (stakeholder P4) |
| | 37. Indepth Interview with Dr. Muriithi (beneficiary P4) |
| | 38. Indepth Interview with Jonathan Mwai (beneficiary user of ICT, P4) |
| | 39. Indepth Interview with Prof. Kinyua (DVC-AA) |

| | |
|---|---|
| November 12th | 40. Indepth interview with Tupac Calfat and Ann Haesendonckx from ICOS, KULeuven, dealing with finance |
| November 13th | 41. Follow-up interview with Dr. Kahenya, IUC programme manager |
| November 16th | 42. Indepth Interview with prof. Onyango (team member P2) |
| | 43. Indepth Interview with Dr. Beatrice Kiage (team member P3) |

## 5.4. Annex 4: List of programme documents consulted

- All self-assessments at programme and project level (received September 2020)
- PP: Partner Programme Phase I (IUC_LCEFoNS Partner Programme 2017_revised)
- AP2019: Annual Progress Report 2019 (APR_KE2017IUC037A101_Y3_final)
- AP2021: annual plan
- PMM2019: Programme Monitoring Matrix 2019 (Annex 1 PROG Monitoring Matrix-2019) and monitoring matrix per project
- SI2019: standard indicators (APR_KE2017IUC037A101_Y3_annex2_standard indicator monitoring)
- for each project: LFM_Px_2019: Logical Framework Matrix, Operational plan, Risk Management (Annex 1 PROJ x_LFM_OP_RM_2019)
- AFR_AP2019: Financial report 2019 (AFR_KE2017IUC037A101_Y3_final)
- AFR_AP2018: Financial report 2018 (AFR AP2018)
- AFR_AP2017: Financial report 2017 (KE2017IUC037A101 AFR AP2017_FINAL)
- IUC Management Structure and Manual. Revised version February 2018
- Standard indicator monitoring sheet Y3
- VLIR-UOS Institutional fact sheet.related to Jomo Kenyatta University of Agriculture and Technology
- JKUAT organigram
- JKUAT Strategic Plan 2018-2022
- Website of JKUAT university: https://www.jkuat.ac.ke (consulted several times during inception phase and during the field mission)

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/2021/10.960/1

**www.vliruos.be**



THE BELGIAN DEVELOPMENT COOPERATION .be