

SOUTH-NORTH CO-OPERATION ON RESEARCH AND CAPACITY BUILDING AT AFRICAN UNIVERSITIES.

EXPERIENCES FROM A COOPERATION
PROJECT AT MAKERERE UNIVERSITY,
KAMPALA, UGANDA.

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ABSTRACT

- The South –North co-operation on research and capacity building at African Universities is usually achieved through collaboration in education, research, and competence building between two or more Universities in the North and in the South. Such a University – University collaboration linkage is typified by the University of Bergen and Makerere University collaboration that started way back in 1991 when NUFU approved funding for research in Basic Sciences for the first time..
- During the life span of the project, there were improvements of infrastructure in the participating departments of Chemistry, Science and Technical Education, Mathematics and Physics. Technical staff training through workshops and attendance of specialized courses was carried out. Forty MSc's and 26PhD's were trained at Makerere University, about 30% of whom were females. Through this training both capacity and competence building were achieved. It is significant that six MSc and two PhD students from the University of Bergen have written theses based on data collected from Uganda.
- Apart from postgraduate training the project increased the research output in basic sciences as evidenced by the increase in the number of publications in refereed journals. The project formed a springboard for the Frame Agreement between Makerere University and the University of Bergen. This led to collaboration in Library, Human Resource , and Financial Information systems, and in ICT support for Makerere University.

1. INTRODUCTION

- Research cooperation between Universities in the South and those North is often initiated through individual efforts. In the case of Makerere University and the University of Bergen(UiB) the collaboration in research in the Basic Sciences was initiated through Professor Emeritus Endre Lillethun of UiB. It took him three years to achieve this. Planning for collaboration is usually made difficult by the fact that there are very few researchers from the North who show willingness to participate owing to the differences in priorities of researchers in the North and of those in the South. This was evident in planning for phase I of the Basic Sciences project at Makerere University.

2.OBJECTIVES OF THE BASIC SCIENCES PROJECT.

Research in basic sciences was supported by NUFU for fifteen years in three phases of five years each. The following were objectives of each of the phases .

- **2.1 Objectives of Phase I(1991-1995)**
- The broad objective of this phase was to facilitate technological development in Uganda through education and research in the natural sciences.
- The specific objectives were
- To rehabilitate and modernise teaching laboratories. at Makerere.
- To develop capacity of academic and technical staff at Makerere.
- To develop research groups.
- To develop capacity and competence in research, especially experimental research in the natural sciences.

2.OBJECTIVES OF THE BASIC SCIENCES PROJECT(Cont'd).

The following strategies were undertaken to achieve the set objectives.

- Visits by academic staff from Makerere to laboratories in Norway.
- Identification of priority research topics and scientists at Makerere and of interested counterpart researchers in Norway. *This was crucial to successful collaboration.*
- Planning for capacity building.
- Equipping research laboratories at Makerere.
- Holding of annual coordinators' workshops to discuss performance and budgets to ensure efficient use of funds.

2.2 Objectives of Phase II(1996-2000).

In addition to the objectives of phase I , the following were added:

- Capacity building through training of academic staff of Makerere University to PhD.
- Collaborative research between staff at Makerere University and at UiB.
- Co-supervision of PhD students.
- Exchange of postgraduate students between UiB and Makerere University.

2.3 Objectives of Phase III(2002-2006).

The following fundamental values were to be upheld:

- Academic freedom in the Ugandan context.
- The virtue of the scientific method.
- Cooperation between researchers and between institutions.
- Social responsibility.

The basic principles which guided the operations of this phase are:

- To recognize the social relevance of the basic sciences.
- To recognise the human factor as the corner stone of developing science.
- To recognise the necessity of promoting recruitment of qualified staff and of encouraging women in science.
- To uphold good institutional administration and transparent management of funds.
- To share attained competence with industry and society.

Objectives of Phase III(2002-2006)(Cont'd)

- The specific objectives were:
- To build competence and capacity through research relevant to local needs and through group work and experiments.
- To develop sandwich programmes in education.
- To promote national, regional and international collaboration.
- To promote inter-disciplinary research.

3.SUBPROJECTS

The subprojects of the Basic Science project were:

- Pigments from flowers, fruits and vegetables.
- Fish Oils.
- Environmental Chemistry.
- Enhancement and sustaining pedagogical quality in science and mathematics Teacher education at Makerere University.
- Capacity building and joint research in Industrial and Financial Mathematics.
- Joint research in Statistics, mathematical modelling in Epidemiology and Numerical Analysis.
- Materials Science (Clays of Uganda, up to first year of phase III).
- Environmental Physics: Light and Life in African environments.
- Solar radiation.
- Electronics and instrumentation (up to phase II).
- Radiation physics (up to phase II).

Electronics and Instrumentation, and later Materials science were phased out owing to lack of counterpart researchers at the UiB.

4. ADMINISTRATION

The project was managed by two management committees, one at Makerere and one at UiB. Each committee consisted of:

- Main Coordinator.
- Four coordinators (one for each discipline).
- One administrator/Accountant .

:Management committee met monthly.

:The two committee's held joint annual workshops.

Institutional ownership assured through

- Departmental NUFU committee.
- University's Finance Department(financial transactions channelled through the department).
- Dean of Faculty of Science (who endorsed annual reports)
- Vice Chancellor.

5.RESULTS

5.1: Phase I.

- The following were the major achievements of phase I of the project.
- Provision of teaching and learning materials.
- Rehabilitation of the laboratories.
- Rejuvenation of research in the departments. Research fields appropriate to the needs of Uganda were identified.
- Interaction of researchers at Makerere with the outside world through increased attendance of workshops and conferences.
- Commencement of training at both MSc and PhD levels.

RESULTS (Cont'd)

The following were achieved during phase II

- Purchase of research equipment. This resulted into increased research activities. In 1998, the first researchers' workshop funded by the project was held at Makerere. At this workshop research results obtained since the commencement of the project were presented.
- Increased personal contacts between scientists at Makerere and at UiB.
- Purchase of books for postgraduate and research work, in a range of fields.
- Purchase of computers for research and internet connectivity.
- Training of technical staff through workshops and attendance of specialized courses. Technical staff from UiB facilitated these workshops.
- Training of 34 MSc's since phase I and of 10 PhD's during this phase.

RESULTS (Cont'd)

Mode of PhD training:

- Joint supervision by academic staff at Makerere and UiB.
- Sandwich model (two to three months at Universities in Norway); no significant interruption of teaching, and students' social and family obligations.

RESULTS(Cont'd)

5.3 Phase III

5.3.1 Educational achievements.

- Training of 12 MSc's and 16 PhD's who included those that had not completed by the end of phase II. Of the PhD candidates two still have to submit their theses.
- Four vocational training courses were developed and conducted by the Department of Science and Technical education (DOSATE). These represent a modest attempt by the project to reach out to the community. The trainees were young school dropouts. All 35 attendees of the vocational courses are gainfully employed.
- Development of new programmes. The Mathematics Department at Makerere University in collaboration with the Mathematics Department at UiB started MSc and PhD programmes in Insurance/Financial Mathematics. (Production of needed manpower and improvement of financial base of the department)

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- Development of new programmes. The Mathematics Department at Makerere University in collaboration with the Mathematics Department at UiB started MSc and PhD programmes in Insurance/Financial Mathematics. Besides producing the much needed manpower, the programme is expected to improve the financial base of the Mathematics Department at Makerere University.

RESULTS (Cont'd)

5.3.2 Scientific achievements.

The improvements in infrastructure and the acquisition of research equipment enabled the project to improve capacity and competence in research.

- Nearly fifty papers were published in refereed journals while over one hundred papers were presented at conferences and workshops.
- The first International Biomathematics conference to be held in Africa ran from 8th -12th December 2003. The African Biomathematics Society (ASB) was formed at this conference. Professor Livingstone Luboobi, the sitting Vice Chancellor of Makerere University, was elected the first president of ASB.

The proceedings of the conference have been published by Makerere University Press [ISBN 9970 418 14 3] under the title “The importance of Mathematical Modelling of Biological and Biomedical Processes”.

RESULTS (Cont'd)

Scientific achievements (continued)

- A workshop to commemorate fifteen years of NUFU funded research in Basic Science at Makerere University was held February 2007.
- Two researchers' workshops were held at Makerere University in August 2005 and August 2006, and one at UiB in April 2005. The workshops held at Makerere served to train the budding researchers in writing research papers and in dissemination of research findings.
- Following increased research output by academic staff at Makerere University, the staff have risen through the ranks.
- The project coordinators have documented their experiences during the life of the NUFU project in a monograph which they hope will be published in the near future, if funds can be secured to do this.

RESULTS (Cont'd)

5.3.3 International collaboration.

Research collaboration, in physics, with scientists from Tanzania, Gambia, University of Oslo, NIVA, and Steven's Institute of Technology in USA was initiated and is on -going.

RESULTS (Cont'd)

5.4 Impact on development

- Research on clays has established the effects of porosity and microstructure on the mechanical strength, electrical and thermal conductivities. Transformation of the results into consumable goods has been hampered by lack of entrepreneurship. The current Vice Chancellor of Makerere University has taken initiative to link the university with the private sector and positive results are expected.
- The research on plant pigments has led to the isolation of a number anthocyanins. Anthocyanins exhibit antioxidant activity which is deemed to be chemoprotective. They have other health benefits such as treatment of various blood circulation disorders. They also have potential applications as colorants in foods and beverages in the budding food industry in Uganda. It is expected that jobs will be created through cultivation of good plant sources of anthocyanins

RESULTS (Cont'd)

- The research in Fish Oils has resulted in the extraction of omega3 and omega 6 fatty acids. These have potential pharmaceutical applications.
- Biomathematical models on malaria and HIV(aids) transmission have been developed. Their implications still need to be assessed.
- Research on photosynthetically active(PAR) and ultraviolet(UV) radiation levels in Lake Victoria has accumulated data on which to base future studies that will facilitate protection against cataracts.

RESULTS (Cont'd)

- The solar radiation collected so far has been used to validate models for prediction of solar radiation from meteorological data. Approximate solar radiation distribution maps for Uganda have been drawn. These will be useful in onsite installations of solar energy devices in different parts of the country.
- Through attending international conferences, researchers at Makerere have been able to interact with researchers from other parts of the world. The interaction has been beneficial to their research and indirectly to institutional development.

RESULTS (Cont'd)

5.5 Challenges:

Several challenges were encountered during the execution of the project.

- It has been taking unnecessarily long for students to register into the PhD programme. This has led to some of the candidates failing to meet deadlines for completion of their research. Potential paying graduate students tend to shy away from the programme because of current delays. The project has been constantly in dialogue with Faculty of Science administration and the Academic Registrar's department about the issue of delays. There are indications that the situation will improve in the near future.
- Lack of adequate government support for postgraduate training has made it difficult to recruit M.Sc. candidates into the programme because they had to pay tuition fees. This will ultimately stifle institutional capacity building. The few that entered the programme did so as Research Assistants who then used their earnings to pay tuition.

RESULTS (Cont'd)

Challenges:

- The percentage of females admitted to postgraduate studies in Science is still low, currently standing at about 30%.
- PhD candidates were jointly supervised by academic staff at the University of Bergen and at Makerere. The project recognized this as healthy. Occasionally though, difficulties arose from insufficient dialogue between supervisors, with regard to how much work to expect from the candidates.
- The number of postgraduate students from UiB carrying out research in the research fields at Makerere is low.

RESULTS (Cont'd)

Challenges:

- Lack of sufficient mechanisms for sustainability. The financial base of Makerere University has not improved substantially for the university to be able to commit reasonable funds to research. Direct government funding for research is minimal. The project was unable to create linkages with industry. Creation of such linkages remains Makerere University's challenge. Industry as the ultimate consumer of products of research needs to participate in:
 - Supporting research by provision of research grants.
 - Awarding researchers who come up with technology innovations.
 - Popularization of science and technology.

7.CONCLUSION.

The project offered the Faculty of Science, Makerere University, unique opportunities for:

- improvement of infrastructure.
- capacity building through postgraduate training of academic staff.
- competence building in research .
- collaboration between Makerere University and universities and research institutes in Norway.

Appendix: Outputs of NUFU Basic Sciences Project.

Department(UiB)	MSc (Female)	MSc(Male)	PhD (Female)	PhD (Male)
Chemistry	5	-	-	2
DOSATE	-	-	-	-
Mathematics	-	-	-	-
Physics	1	-	-	-
Total	6	0	0	2

Appendix: Output of NUFU Basic Sciences Project

Department (Makerere)	MSc(Female)	MSc(Male)	PhD(Female)	PhD(Male)
Chemistry	7	13	-	5
DOSATE	-	-	2	1
Mathematics	2	5	1	7
Physics	1	12	-	10
Total	10	30	3	23

PUBLICATIONS

Department	In refereed journals	Presented at workshops
Chemistry	5	26
DOSATE	1	11
Mathematics	22	27
Physics	24	42
Total	52	106