

Research Application Summary

Challenges and opportunities for regional capacity building for sustainable natural resource management and agricultural productivity under changing climate: A case of South Sudan

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Abstract

The East African region has an agricultural led economy and its population depends on natural resources for their livelihoods and development. Agricultural productivity and natural resources are however increasingly facing threats from the variable and changing climates, which is likely to negatively impact on development. In addition the countries of East African region are contending with a range of common development challenges notably natural resource degradation, decreasing agricultural productivity, rapid population growth and high poverty levels. These challenges have undermined efforts of governments to reduce poverty and improve human welfare. One of the key impediments to finding solutions to the above challenges is lack of sufficient human capacity with the right skills and mind-set to address national development challenges. Higher institutions of learning in East Africa are expected to contribute to the generation of solutions to obviate these challenges through supplying knowledgeable and multi-skilled graduates as well as providing evidence-based options to support formulation of interventions and friendly policies for accelerating national development. Most of the universities in East Africa are going through transformations geared at one major goal of responding innovatively to the national challenges and needs. Unfortunately, to be involved, the universities have to build their capacities in critical areas especially natural resource management and sustainable agriculture. In recognition of this fact, three universities in the south (University of Juba, Addis Ababa University and Makerere University) and one from the north (Norwegian University of Life Sciences) developed a project entitled “*Regional Capacity Building for Sustainable Natural Resource Management and Agricultural Productivity under Changing Climate*” (CAPSNAC). Recognising that the new state of South Sudan was in great need of capacity building as it was recovering from over two decades of conflict, and that the University of Juba had lost 50% of its staff to Sudan during the transition, the projects puts emphasis on University of Juba. This project, which is supported by NORAD, aims at taking advantage of the combined strength of the four universities to build human capacity of University of Juba in South Sudan. The goal of this regionally focused project is to increase the relevance of southern

universities in addressing national and regional development challenges in environment, natural resource management and climate change, with special attention in the project given to the University of Juba. The overall goal is to enable the partner institutions to provide innovative teaching, learning, research and outreach services that are responsive to the needs of their clientele. This paper shares the achievements, challenges and opportunities of implementing a collaborative regional capacity building program in natural resource management and agricultural productivity. It also compares the CAPSNAC model with other models in the region used in regional capacity building programs and proposes “dos and don’ts” in regional capacity building programs.

Key words: Climate change, human capital development, natural resource management, South Sudan, University of Juba

Résumé

L’Afrique orientale a une économie essentiellement agricole et la subsistance et le développement de sa population dépend des ressources naturelles. La productivité agricole et les ressources naturelles sont cependant en train de faire face aux menaces des changements climatiques, qui va probablement avoir un impact négatif sur le développement. En outre, les pays de la région de l’Afrique de l’Est sont en train de lutter contre les défis communs de développement notamment, la dégradation des ressources naturelles, la baisse de la productivité agricole, explosion démographique et de taux élevés de pauvreté. Ces défis ont affaibli les efforts des gouvernements à réduire la pauvreté et améliorer le bien-être humain. L’un des obstacles clés qui entravent la lutte contre les défis suscités, est l’insuffisance en ressources humaines avec les compétences requises et une mentalité à résoudre les défis de développement. Les institutions supérieures d’apprentissage en Afrique de l’Est sont attendues à contribuer à l’engendrement de solutions pour prévenir ces défis en livrant sur le marché des diplômés bien formés et compétents ainsi que de fournir des options pratiques pour appuyer la formulation d’interventions et de politiques adaptées pour l’accélération du développement national. La majorité des universités d’Afrique de l’Est sont en train de connaître de transformations vers un principal but qui est de répondre aux défis et besoins nationaux de façon innovante. Malheureusement, pour être impliquées, les universités doivent renforcer leurs capacités dans les domaines critiques notamment, la gestion des ressources naturelles et l’agriculture durable. Prenant conscience de ce fait, trois universités du Sud (Université de Juba, Université d’Addis Ababa et l’université de Makerere) et une du Nord (L’université norvégienne des sciences de la vie) ont développé un projet intitulé “Renforcement régional des capacités pour une gestion durable des ressources naturelles et de la productivité agricole sous les changements climatiques” (CAPSNAC). Reconnaissant que le tout jeune Etat du Sud Soudan était en grand besoins de renforcement de capacité puis qu’il se rétablissait du long conflit de deux décennies, et que l’Université de Juba avait perdu 50% de son personnel durant la transition, une attention particulière a été accordée à l’université de Juba dans le projet. Ce projet supporté par NORAD, vise à profiter de la force combinée de quatre universités pour renforcer la capacité en ressources humaines de l’université de Juba au Sud Soudan. Le but de ce projet à vision régionale, est de d’accroître importance des universités du Sud à faire face aux défis de

développement nationaux et régionaux en environnement gestion des ressources naturelles et changements climatiques avec une attention particulière accordée à l'université de Juba. L'objectif général est d'amener les institutions partenaires à mettre à fournir un enseignement, un apprentissage, une recherche et une vulgarisation innovantes qui répondent aux besoins de leur clientèle. Cet article vient pour disséminer les résultats, difficultés et opportunités de la mise en œuvre d'un projet régional de renforcement de capacités en gestion des ressources naturelles et la productivité agricole. Il compare aussi le model CAPSNAC à d'autres dans la région utilisés pour des programmes régionaux le renforcement des capacités et propose des préceptes dans les programmes régionaux de renforcement de capacité.

Mots clés: Changement climatique, développement de capital humain, gestion des ressources, Soudan du Sud, Université de Juba

Background

The East African region has an agricultural led economy and its population depends on natural resources for livelihoods and development (Tuttle *et al.*, 2011). Agricultural productivity and natural resources are however increasingly facing threats of the variable and changing climate, which is negatively impacting on development. In addition the countries in the East African region are contending with a range of common development challenges notably natural resource degradation, decreasing agricultural productivity, changing and variable climates, rapid population growth and high poverty levels. These challenges have undermined efforts of governments to reduce poverty and improve human welfare.

The higher institutions of learning in East Africa are expected to contribute to the generation of solutions to alleviate these challenges through supplying knowledgeable and multi-skilled graduates as well as providing evidence-based options to support formulation of interventions and friendly policies for accelerating national development. Unfortunately, as observed by Botman (2010) African Universities faces major human capacity development challenges; their capacities need to be built in environmental management, climate change and agricultural productivity to enable them contribute effectively to solving development challenges in their countries. For example, the University of Juba in South Sudan is going through a recovery and transformative phase having lost 50% of its staff to Sudan, while Makerere University is repositioning itself as a research-led University and has transformed into a Collegiate University since 2011. To address this challenge, three universities in East Africa (University of Juba, Addis Ababa University and Makerere University) and one from the north (Norwegian University of Life Sciences) developed a project entitled "*Regional Capacity Building for Sustainable Natural Resource Management and Agricultural Productivity under Changing Climate*" (CAPSNAC). This project aims at taking advantage of the combined strength of the three universities to build human capacity of University of Juba in South Sudan.

This project aims at increasing the relevance of southern universities in addressing national and regional development challenges in environment, natural resource management and climate change. The objectives of the project are to; (i) review and strengthen academic

programmes in respect to climate change and natural resource management in the three partner institutions in the south; (ii) strengthen research capacities in climate change and natural resource management to generate knowledge and technologies for development and policy formulation; (iii) build staff capacities through PhD, postdoctoral training for the three southern institutions and master level training specifically for the University of Juba; (iv) strengthen research and teaching infrastructure in order to produce better and responsive graduates; and (v) strengthen north-south, and south-south linkages through staff exchange, joint collaborative research and outreach activities

Literature summary

The World Bank report (2008) identifies education as one of the most valuable asset for rural people to pursue opportunities in agriculture, obtain skilled jobs, and start businesses in the rural nonfarm economy. While the same report strongly argues for educating of the rural population it is silent on higher education, yet as noted by Bloom *et al.* (2005), lack of serious investment by African Governments and the Donor Community into higher education, in particular for producing high quality scientifically- and technically-oriented graduates is one of the major reasons for the failure of the African continent to steer out of poverty and reach economic prosperity. As a result, the number of indigenous high-qualified scientists is low. Yet addressing the challenges limiting agricultural productivity in Africa requires a great deal of ingenuity and capacity of the scientific community to develop new and appropriate technologies (Tuttle *et al.*, 2011). The urgency to develop capacity has been echoed by many scientist and organisation (Babu *et al.*, 2011). Consequently there have been a number of programs established to address the issue of capacity building in agriculture. For example, building scientific capacity has been an important and productive aspect of United States engagement in Africa. USAID has supported significant number of East African scientists for long-term postgraduate training in the USA (Tuttle *et al.*, 2011). The scientists who have returned home have played and continue playing a significant role in improving agricultural productivity and environmental protection. Although this mode of training has been successful it has been criticised for being expensive, the African scientists conducting research in areas which are more relevant to USA and not their home countries (Tuttle *et al.*, 2011). Consequently new models of training have are being implimented to address the gap.

There are new capacity building models that have been designed taken advantage of the scattered capacity in African Universities to conduct collaborative capacity building in specific fields of studies. Example of such programs include the African Regional Postgraduate Program in Insect Science (ARPPIS) which was established by the International Centre of Insect Physiology and Ecology in 1983 to build capacity in insect science on the continent. This program by 2011 had provided training to a total of 600 scholars (out of which 250 PhD) from 32 African countries, narrowing the huge capacity gap in entomologist for national and regional research institutions in Africa (Margiotta, 2011). The other example is The Regional Universities Forum for Capacity Building in Agriculture (RUFORUM), established in 2004, with is a consortium of 65 universities in 25 African countries. As of 2016, RUFORUM has trained close 2000 M.Sc and PhD graduates. The two programs above, have relied on the few qualified human capacities in different institutions to conduct human capacity building

in Africa. Another model that has evolved overtime is the sandwich degree model in which the training is both in the African institution and in developed countries and there is joint supervision. This model as observed by Tuttle *et al.* (2011) results in research procedures which are applicable to home countries, a deeper impact on institutional and individual capacities, lower cost and important learning experience for the developed country scientists and the African researcher. This model is currently being implemented by some of USAID training supported program. Similarly sandwich model was used with slight modification under the “East African Regional Programme and Research Network for Biotechnology, Bio-safety and Biotechnology Policy Development (Bio-EARN)” a Sweden funded program (Niels and Louwaars, 2004). In this program the students from East African countries studied in Sweden, but conducted research on problems in their home countries and were jointly supervised by professor from the South and Sweden. This program helped establish biotechnology programs in the East African countries in a fairly short time.

It is therefore appropriate to generalize that sandwich collaborative capacity building programs are more efficient and acceptable to the African setting as they promote complementarities between North-South institutions through joint supervision, student taking advantage of the advanced laboratories to conduct research and sharing experience. It is against this background that the sandwich model was adopted for our capacity building project. The project is building capacity in natural resource management and climate change.

Project description

The project is being implemented under five Work Packages (WP) which include:

WP1: PhD and master level training. The project is committed to deliver 10 PhD’s (five for University of Juba, three for Makerere University and two for Addis Ababa University) in five years, thematically focusing on natural resource management, agriculture, food productivity and climate change. The project is also training 12 staff members from University of Juba at MSc level at Makerere University. Scientists from the four participating universities are jointly supervising the PhD and MSc students. This capacity development has formed a strong foundation for the consortium, which will lead to continuity in addressing climate change and natural resource management in the region.

WP2: Joint Regional Research and Outreach. Joint research is being conducted by senior scientists, PhD, post-doctoral and masters students from the participating universities. Our research platform has three themes, i.e., (a) climate change, adaptation and mitigation, (b) sustainable environmental resource use and management, and (c) agricultural productivity and food security. The climate change adaptation and mitigation theme is seeking to ascertain a suite of socially acceptable and ecologically suitable agro-technologies under climate change and variability conditions. The components of this theme are:- (i) Downscaling and modelling to refine and improve the spatial resolution of climate change models to enable site-specific agricultural recommendations for cropping systems, forestry and rangelands, (ii) determining emission pathways and fluxes under different land uses in the region, and (iii) understanding the gendered indigenous knowledge systems for climate change adaptation and livelihoods.

The Sustainable environmental resources use and management theme is taking an ecosystem-based approach to address a range of issues including:- (i) Water management, crop water use efficiency, water harvesting and water quality issues from point and non point sources of pollution. (ii) The role of wetlands in maintaining water quality and improving people's livelihoods under the changing climate; (iii) Soil degradation under diverse gendered management practices and systems including mapping hotspots for runoff, soil loss nutrient exports; (iv) Land use and land cover change and carbon sequestration in agricultural, forestry and rangeland ecosystems. The theme on strengthening agricultural productivity and food security is testing and refining technologies to enhance adaptation to climate change and variability. These include: developing crop varieties and soil-water and crop management technologies adaptable to climate change and variability stressors

WP3: Infrastructure development. This work package is addressing infrastructural needs in order to smoothly implement the project and improve research and teaching capacity.

WP4: Competence building. This work package is covering (i) Strengthening newly initiated academic programmes and staff competency targeting Makerere University and Addis Ababa University; (ii) mainstreaming climate change and gender issues in natural resource management, environment and agriculture programme; (iii) Small competitive research grants targeting strengthening research capacities of young scientists in the three universities in the south; (iv) Short courses development and implementation; (v) Short term staff exchange: Regional short term staff exchanges are being undertaken among the three southern partners with the aim of co-learning from each other to enhance scholarly practices and efficiency.

WP5: Project implementation and management. This work package focuses on the coordination and administration of the project It covers collection of reports and deliverables, communication with end users and facilitation of scientific dissemination.

Research application

Over the period we have observed CAPSNAC partnership growing strong since the initiation of the project. Makerere University as the grant recipient, has lead the implementation of the project, (ii) Makerere University has completed registering the targeted number of students on the project, from University of Juba, for MSc. training in natural resource management and agricultural related disciplines , (ii) Makerere University is providing joint supervision to PhD students registered at Makerere University and Norwegian University of Life Sciences as well as coordinating joint research. Similarly University of Juba has identified their institutional staff training needs and selected students for M.Sc and Ph.D students are now pursuing their studies at Makerere University and Norwegian University of Life Sciences. Figure 1 gives the number and distribution of students by country on the project. The degree programs being pursued by the student on the program are given in Table, 1 and indicate that not all the students are registered for environmental and agricultural course. The project is supporting curriculum review in the three universities in the south. The programs which have been revised are listed in Table 2. In the nutshell this project is demonstrating that

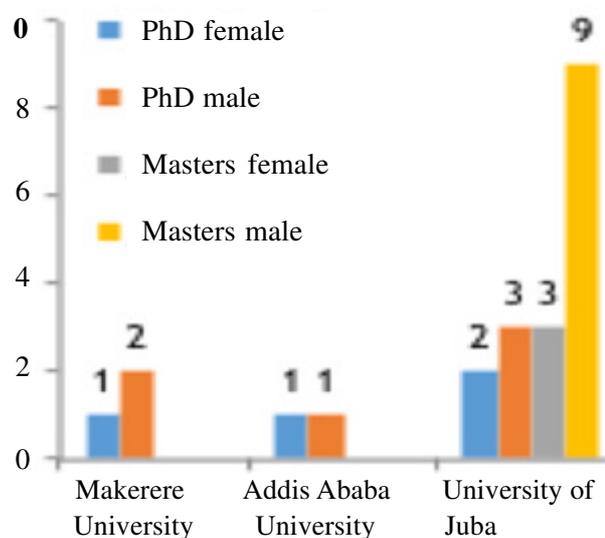


Figure 1. Number of students from the participating institution

Table 1. The degree programs the students are undertaking under the CAPSNAC project

Degree Program	Students country of origin		
	South Sudan	Uganda	Ethiopia
MSc. Applied Human Nutrition	1		
MSc. Agricultural Engineering	3		
MSc. Animal Science	1		
MSc Agricultural Extension/Education	1		
MSc. Zoology	1		
MSc. Environmental & Natural resources	5		
PhD Environmental Sciences	1	2	2
PhD Food Science	1	-	
PhD Forestry	1		
PhD Crop Science	1		
PhD Soil Science	1		
PhD Agricultural and Rural Innovation		1	

institutions in the South can provide leadership in south – North collaborative training programs.

There are over twenty-two research projects being undertaken by the PhD, MSc students and Postdoctoral research fellows with the aim of generating results that may contribute to the management of environment degradation and agricultural productivity under changing climate.

Table 2. Degree programs which have been reviewed with support from CAPSNAC

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Name of university hosting the programme/module	Degree type and name of programme	New or Revised
Makerere University: Department of Geography, Geo-informatics and Climate sciences	MA Geography	Revised
Makerere University: Department of Geography, Geo-informatics and Climate sciences	Master of Land Use and Regional Development	Revised
Makerere University: Department of Geography, Geoi-nformatics and Climate sciences	B.Sc. Earth and Geographical Sciences	Proposed (new)
Makerere University: Department of Extension and Innovation Studies	Master of Sciences in Agricultural Extension and Innovation Studies	Proposed (New)
Addis Ababa University Department of Plant Biology and Biodiversity Management	Master of Science in Plant Biology and Biodiversity Management	Revised
Addis Ababa University Department of Plant Biology and Biodiversity Management	PhD in Plant Biology and Biodiversity Management	Revised
University of Juba : Department of Agricultural Sciences	MSc. In: (Agric Economics), (Horticulture), (Plant Protection)	Revised
University of Juba - Department of Animal Production	MSc in: Animal Production MSc. in Animal Production & Technology	Revised New
University of Juba -Department of Environmental Studies	MSc in: (Environmental Studies) MSc. Conservation Biology	New Revised
University of Juba -Department of Fisheries	MSc (Aquaculture)	Revised
University of Juba Department of Forestry	MSc in: (Agroforestry); (Forest Economics) (Forest Biology); (Forest Engineering) (Wood Utilization & Technology) and (Forest Management)	New “ “ “
University of Juba Department of Wildlife	MSc in Wildlife Management	New

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Lessons learnt

There are a number of lessons we are learning as we implement this project and they include:-

In implementing collaborative capacity building programs in politically volatile region, it is important to plan for political turmoil and ensure there is an alternative plan. The political turmoil in South Sudan has affected implementation of some project activities in UJ. It is however not affecting the capacity building program as all the students from South Sudan are either registered in Makerere University or NMBU. Nevertheless it has affect our sandwich training model as research activities meant to be carried out in south Sudan have been shifted to Uganda or Norway. Furthermore, it is creating stress among the students from south Sudan who are worried about their future after the training program. It is therefore important to fact in how students would be facilitated after completing their studies and cant go back home.

Recognising the variations in academic standards of the collaborating institutions.

The performance of most of the M.Sc. CAPSNAC students from UJ has not been good, consequently some of them have retaken the courses. There two possible source of this problem; the first one being variation in academic standards of the participating universities in which case remedial course would have to be given. The other source could be that some of the students selected to benefit from the project were weak academically. To avoid this pitfall, the selection process must be strict; and perhaps all the partners in the collaborative program should be involved in the vetting process.

Appreciating the gender imbalance that exists with in the different institutions.

At the inception of the project it was expected that there would be numbers of men and women trained by this project. Unfortunate there has been serious lack of gender balance in the members of Staff identified by UJ for postgraduate training. UJ currently lacks a pool of female staff to select from for further training. Therefore more emphasis should be put in educating girl child at all levels of education. And there is need for flexibility in order to support females undertaking postgraduate studies. In this project we have had to cater for special needs of student who were admitted to the university with young children.

Being specific in terms of defining the area in which to develop the capacity.

The original objective of the project was to develop capacity in biological natural resource management, sustainable agriculture and climate change. However as indicated in table 1 some of the student are in physical natural resource management. We adopted a general capacity building model, which may not be able produce, the type of products we had anticipated.

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