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## The Contributions of Human Capacity Development to Improve University Relevance: the iAGRI Model

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### ABSTRACT

Human capacity development (HCD), through long-term degree and short-term training, is critical to improving the performance and relevance of agricultural higher education institutions (AHEI) and their contributions to agricultural development in sub-Saharan Africa. The Innovative Agricultural Research Initiative (iAGRI) was an investment in agricultural higher education and research capacity building in Tanzania funded by the U.S. Agency for International Development (USAID) and led by The Ohio State University (OSU), five other U.S. land grant universities and the Regional Universities Forum for Capacity Building in Agriculture (RUFORUM). Its main goal was to improve food security and agricultural productivity in Tanzania by strengthening the training and collaborative research capacities of Sokoine University of Agriculture (SUA) and the Ministry of Agriculture, Livestock and Fisheries (MALF). The project focused on multiple dimensions of capacity building including human resource development through degree and short-term training. Over the course of the project, 115 MSc and 20 PhD students completed their post-graduate studies at universities in the U.S., Africa and India. Half the graduates were female and all students returned to Tanzania. The project also sponsored 25 short-term training workshops and 73 seminars at SUA for students and staff. The paper summarizes important contributions the degree training programme made to institutional strengthening and agricultural development in Tanzania, and degree training “best practices”. It ends by recommending the need to continue with degree training to keep the human resource pipeline filled; continuing with short-term training to incentivize and invigorate staff; and supporting training at diverse institutions.

### RÉSUMÉ

Le développement des capacités humaines (HCD), à travers une formation à long terme et à une formation à court terme, est essentiel pour améliorer la performance et la pertinence des établissements d'enseignement supérieur agricole et leur contribution au développement agricole en Afrique subsaharienne. L'initiative de recherche agricole innovante (iAGRI) était un investissement dans l'enseignement supérieur agricole et le renforcement des capacités de recherche en Tanzanie financé par l'Agence américaine pour le développement

The contributions of human capacity development to improve University relevance

international (USAID) et dirigé par l'Ohio State University (OSU), Le Forum régional des universités pour le renforcement des capacités en agriculture (RUFORUM). Son objectif principal était d'améliorer la sécurité alimentaire et la productivité agricole en Tanzanie en renforçant les capacités de formation et de recherche collaborative de l'Université d'Agriculture de Sokoine (SUA) et du Ministère de l'Agriculture, de l'Elevage et de la Pêche (MALF). Le projet s'est concentré sur de multiples dimensions du renforcement des capacités, y compris le développement des ressources humaines à travers une formation diplômée et une formation à court terme. Au cours du projet, 115 étudiants de niveau maîtrise et 20 doctorants ont complété leurs études de troisième cycle dans des universités des États-Unis, d'Afrique, et d'Inde. La moitié des diplômés étaient des femmes et tous les étudiants sont retournés en Tanzanie. Le projet a également parrainé 25 ateliers de formation à court terme et 73 séminaires à SUA pour les étudiants et le personnel. Cet article résume les contributions importantes du programme de formation diplômante au renforcement institutionnel et au développement agricole en Tanzanie, ainsi que les «meilleures pratiques» de formation diplômante. Il termine en recommandant la nécessité de poursuivre les études afin de maintenir le réservoir de ressources humaines, poursuivre la formation à court terme pour inciter et dynamiser le personnel; et soutenir la formation dans diverses institutions.

## INTRODUCTION

Past contributions by universities to sustainable agricultural development in sub-Saharan Africa have been well documented (Eicher, 2004; Bloom, 2005; World Bank, 2007; Montenegro and Patrinos, 2013). Yet, population increases coupled with low agricultural productivity and low incomes contribute to persistent malnutrition and food insecurity on the continent. Surmounting these challenges will require an agricultural transformation that shifts smallholder farmers from semi-subsistence, low-input and low-productivity farming to a knowledge-based, more commercial agriculture that uses improved technologies to increase productivity for markets and improved livelihoods. To increase their contribution and relevance to African agriculture development, agricultural higher education institutions (AHEI) will need to transform their teaching, research and outreach programming.

The need for African AHEIs to be more relevant to agricultural development on the continent was recognized by the 45 deans and faculty

representatives who attended the “Workshop on Capacity Building for Scientific Relevance in African Agricultural Universities”, held at Sokoine University of Agriculture (SUA) in Morogoro, Tanzania from 14-16 September 2017 (SUA, 2017). Representatives attending the biannual meeting of The Regional Universities Forum for Capacity Building in Agriculture (RUFORUM) held in Cape Town, South Africa in October 2016, a consortium of 85 of the continent's agricultural and allied science universities, also called for enhanced university relevance by urging its member institutions to be more engaged in the development process (RUFORUM, 2017). African AHEIs are relevant to the extent that they respond to the changing needs of society and economy and contribute to finding solutions to local, national, and regional food and agriculture development challenges and constraints. They can improve their relevance by providing strong teaching, research and outreach programmes that address development constraints through new technology generation and innovation and training the next generation of scientists, educators and leaders. All three

programmatic areas are the responsibility of an AHEI and its academic staff. For AHEIs to attain and sustain relevance, developing and maintaining quality human resources through human capacity development (HCD) is essential (AGRA, 2016).

### **Human Capacity at AHEIs**

In the last decade, national governments and donors came to recognize that AHEIs required support to replenish dwindling human resources if they were to contribute to agricultural development and transformation on the continent (World Bank, 2007). Prior years of neglect by donors and national governments had left AHEIs with overcrowded and deteriorating facilities, depleted faculty numbers, and diminished instructional and research capabilities. Staffing at AHEIs had been eroded by high rates of attrition, aging of senior staff, long-term civil service recruitment freezes and poor remuneration packages. Staffing gaps were commonly filled by recruiting junior staff members who lacked training and experience, a situation that was often exacerbated by a lack of postgraduate training opportunities for these staff members (Lynam *et al.*, 2016).

Strengthening institutional performance and relevance requires strong human resources making HCD a critical component of strategic plans to improve institutional capacity and quality. AHEIs can invest in HCD through longer-term degree training programs and shorter-term faculty development activities. Post-graduate degree training can improve the scientific and research capacity and instructional quality of AHEIs by filling critical gaps with high quality, motivated individuals. Short-term training can improve teaching and research skills, provide leadership training, and assist in curriculum development and proposal preparation. The criteria for assessing the relevance of an HCD programme are that they

produce skill sets in demand from the agriculture sector; produce high performing graduates and high quality research responsive to the needs of farmers and agribusiness; and result in outputs that achieve development results.

### **Human Capacity Development under iAGRI**

Given the expanding population of Tanzania and the major demographic shifts it was experiencing, the Government of Tanzania and USAID recognized that the agricultural training, research and outreach capacities of the major agricultural support institutions were deficient and unable to contribute to transforming the agricultural sector, improving agricultural productivity, boosting food production and reducing food insecurity.

The Innovative Agricultural Research Initiative (iAGRI) was conceived by USAID and the Government of Tanzania as a long-term investment in agricultural higher education and research capacity building. The iAGRI was funded by USAID under its Feed the Future initiative. The Ohio State University led it, in conjunction with five other U.S. land grant universities (Michigan State, Florida, Iowa State, Tuskegee and Virginia Tech) and RUFORUM. The main goal of the iAGRI project was to improve food security and agricultural productivity in Tanzania by strengthening the training and collaborative research capacities of Sokoine University of Agriculture (SUA) and the Ministry of Agriculture, Livestock and Fisheries (MALF). The project's four major objectives were: 1) implementing a programme of collaborative agriculture research with SUA and MALF; 2) providing advanced degree training programmes in agriculture for 135 Tanzanian graduate students; 3) strengthening the capacity of SUA to develop and implement instructional, research and outreach programmes in agriculture; and 4) promoting cooperation between SUA, U.S. universities, and global

The contributions of human capacity development to improve University relevance

south universities.

In terms of training, iAGRI undertook two types of training: long-term degree training and short-term training. Both addressed skill and knowledge gaps that had been identified early in the project through assessments of SUA, MALF and the Tanzanian food system.

1. The degree training activities of iAGRI were intended to increase the number of agricultural and nutrition scientists, teachers, managers, and entrepreneurs in Tanzania. The iAGRI degree training program involved conduct of training needs assessment, student recruitment, application and placements at universities, pre-departure orientation, classroom studies, research proposal writing, field research, data analysis, thesis/dissertation preparation, final examination, and graduation. Training applicants were recruited from SUA, MALF, local governments, government institutes, NGOs, and companies. The selected trainees pursued Masters and PhD degrees in 12 subject matter areas related to agriculture and nutrition.

2. Short-term training activities sponsored by iAGRI targeted specific knowledge and skill gaps in agriculture and nutrition. Relevant topics were identified through needs assessment surveys. Subject matter specialists from the U.S., Tanzania, RUFORUM and other African countries taught the training courses. Some courses targeted academic staff members and graduate students at SUA while others targeted farmers and agribusinesses.

### **Outputs of iAGRI HCD**

**Degree Training:** Over the course of the project, 115 MSc and 20 Ph.D. students completed their post-graduate studies under iAGRI, meeting the target of 135 degree completions set by USAID (iAGRI, 2017). Based on guidance from USAID Tanzania, iAGRI placed half

(51%) of the students in U.S. universities and the other half (49%) at universities in Africa and India. Fifty-five Masters students and fourteen Ph.D. students studied at Ohio State University Consortium (OSUC) member universities in the U.S.; thirty students studied at SUA, including five Ph.D. students; 30 at nine RUFORUM affiliated universities in Africa; and six students at Punjab Agricultural University in India (see Figure 1). More than half (52%) of the trainees were women. iAGRI was able to achieve this gender-based target despite the fact that the pool of applicants for trainee slots consisted of 70% males and 30% females. All trainees returned to Tanzania.

A training needs assessment of the Tanzanian agricultural and food system, conducted early in the project, identified priority topics for student research and projected subject matter staffing shortages. Eight research themes were identified that included Crop improvement, Value chain management, Gender and agricultural productivity, Climate change, Nutrition, Water resource management, Agricultural policy, and Agricultural extension. Each student was provided funding for field research - \$5000 for Masters students and \$15,000 for PhD students – to conduct their research in Tanzania. Those enrolled in U.S. or other African universities were assigned a local advisor to supplement the guidance provided by the advisor at the university where they were enrolled, and to aid in tailoring the research to Tanzanian conditions. Visits by advisors allowed them to observe and assist in the students' data collection and analysis in Tanzania.

**Short-term training:** Over the life of the project, iAGRI sponsored 25 short-term training workshops to enable students, professors, government officials, and the private sector to better understand and manage food security in Tanzania. The workshops addressed important

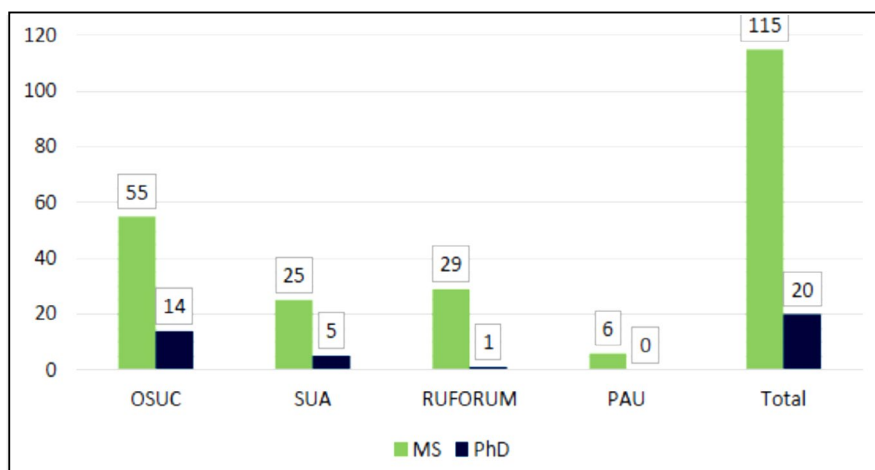


Figure 1. iAGRI Student Placements in Post-Graduate Degree Programs

skill and knowledge gaps among iAGRI's key stakeholders and reached 915 participants. A Short-Term Training Committee, consisting of persons from SUA and iAGRI, identified the topics. Topics included plant disease diagnostics, social science research methods, introduction to evaluation research, randomized controlled trials, scientific data management, social network analysis, participatory research methods, gender and agriculture, writing of agricultural policy briefs, qualitative research methods in agricultural extension education, weather data management, research and project proposal writing, conducting technology field tests, business plan development, broiler production, introduction to the Statistical Package for Social Sciences (SPSS) software, and introduction to the R statistical software. Further iAGRI sponsored an additional 73 seminars provided by visiting advisors of iAGRI students that were closely aligned with the research of the student. These seminars were attended by over 1,118 faculty and graduate students, and helped restore the practice of collegial sharing of research in seminars, an important element of academic culture.

#### **iAGRI HCD contributions to impact and**

**relevance.** Evidence that the iAGRI HCD activities made relevant contributions to institutional performance and agricultural development in Tanzania are based largely on short-term results. Generally, longer-term impacts from HCD degree training do not appear for several years following the degree recipient's return and integration into the home system.

**1. Addressed important development challenges:** The training needs assessment of the Tanzanian agricultural and food system ensured that student-based research addressed priority agricultural development challenges. The largest topical area of placement was Economics/Agribusiness (34) due to the relative shortage of Tanzanian personnel in value chain analysis, marketing, farm management, and agribusiness development. Food Science and Nutrition was the second-highest area of concentration of degree studies (33). Nutrition was prioritized based on current country needs and USAID programming directions. The third highest ranked area of study was Horticulture and Crop Production (28), consistent with the focus of USAID Tanzania on horticultural crops, maize, and rice. The fourth highest area

The contributions of human capacity development to improve University relevance

was Agricultural Extension/Education (19), the fifth highest was Agricultural Engineering (8), and the sixth highest was Natural Resource Management (8). A handful of students (5) undertook studies in other areas of agriculture consistent with the findings of the needs assessment.

**2. Student research output:** Publication of research results is an important measure of research productivity. Table 1 below indicates that at least 95 articles based on student research were published in scientific journals and that at least 143 presentations, based on this research, were made at conferences.

**3. Employment:** Most of the returning graduates were employed at their home institutions where they are filling research and teaching gaps, and training the next generation of scientists and researchers. Nearly 65% of the trainees reported having received a promotion upon degree completion and 17 % had been newly hired or changed employers (indicating that the degree had improved their job mobility).

**4. Impact of degree training on future earnings:** In the iAGRI Final Report (2017), Kraybill estimated the net benefits in future earnings of the trainees as an approximation of the impact of the training on the economy. For Masters graduates, the estimated net lifetime benefit was \$287,294. Summed across all 115 Master trainees, the aggregate net earnings gain is \$33,038,810. The estimated net lifetime

benefit for PhD graduates, after subtracting costs, was \$208,486. The discounted increase in lifetime earnings is \$259,783 and the net lifetime benefit is \$84,269. Summed across all 20 PhD trainees, the aggregate net earnings gain is \$4,378,203.

**5. Sustainability:** The impacts from degree training implemented by iAGRI will continue for many years into the future because it was, in essence, a “training of trainers” (TOT). Many of the programme graduates are now teachers at SUA, other Tanzanian universities, and the MATIs where they are using the improved teaching practices and methods that they acquired through this USAID investment in human capital.

#### Degree training best practices

**1. Training needs assessment:** Conducting a training needs assessment in the first year of the project provided vital information that helped the iAGRI staff prioritize subject-matter areas for recruitment of degree training candidates. The needs assessment also helped the iAGRI staff identify food-security knowledge gaps that could be addressed through problem-focused thesis and dissertation research and led to the commissioning of eight papers detailing potential research topics for student research as well as collaborative research. The background papers provided useful guidance to the students and their advisors as they narrowed down the topic of the students’ research.

Table 1. Summary of Scientific Outputs by iAGRI-Supported Students

Degree Received	Publications		Conference presentations		Total	
	Number	Percent	Number	Percent	Number	Percent
M.S.	41	43	102	71	143	60
PhD	54	57	41	29	95	40
Total	95	100	143	100	238	100

**2. Selection of students who have a high probability of success:** Several steps were used to select students. First, iAGRI developed a broad candidate pool by using multiple media sources to advertise and recruit potential trainees including announcements in websites, newspapers, and email. Distributing flyers featuring a call for applications at the SUA booth at the Nane Nane Agricultural Fair proved to be particularly effective and resulted in attracting a large number of female applicants. Second, iAGRI developed a merit-based trainee selection process that began by selecting applicants' on the basis of their previous cumulative Grade Point Average, having them complete an application with statement of interest, a personal interview with the Training Committee and finally, if selected, to take the Graduate Record Exam (GRE) and an English as a Second Language exam, which are required for admission at most U.S. universities. Given the high ultimate graduation rate of the trainees, it can be concluded that the selection process worked well.

**3. Selection of Advisors:** Selecting an advisor who has a strong interest in seeing that the student succeeds and is interested in the student's area of research requires a campus contact person who knows faculty interests at the host university and who will invest the time required to contact and select motivated advisors. Advisor selection was carried out by the iAGRI training team, which included local staff in the PMU (Programme Management Unit) at SUA and the Training Coordination team in the Management Entity at OSU.

**4. Dual advisor model:** Assigning graduate students an advisor at their host university as well as one in Tanzania from SUA or MALF, proved to be beneficial by providing a practical platform for Tanzania and host-country advisors

to collaborate and to ensure that the students' research addressed priority agricultural and nutrition challenges in Tanzania.

**5. Importance of Information Technology:** Early in the project, iAGRI developed enhanced IT capacity at the PMU headquarters on the SUA campus. This allowed iAGRI students to use videoconferencing for "virtual advising" with their U.S. advisors after they returned to Tanzania to conduct their field research. It also allowed returned students to take their final oral examination (thesis or dissertation defense) in Tanzania by videoconferencing. This avoided the cost of a return trip to the U.S. merely for the examination. The use of IT also made it possible to offer leadership webinars to the students while they were studying at their host universities in the U.S., Africa, and India or while they were conducting their field research in Tanzania.

**6. Leadership training for graduates:** Two leadership webinars based on well-known leadership books developed trainees' personal and professional leadership skills through instructional webinars with Ohio State faculty and the staff of the PMU. This programme complemented the technical training they received through their degree programme and strengthened leadership and communication skills necessary for assuming a leadership role in the graduates' home institutions.

**7. Gender:** iAGRI designed its training programme so that at least 50% of the selected trainees were female. Providing training options at SUA, in the East Africa region and in the US allowed women to make choices that best suited their own personal circumstances. This resulted in the training of approximately 71 women who will contribute significantly to improving Tanzania's food and agricultural systems at SUA, MALF, and in the private sector, as well as facilitating the acceptance of women in

The contributions of human capacity development to improve University relevance

positions of leadership in agriculture-related institutions in Tanzania.

the Tanzanian food system, emergent research themes and labor force needs.

**8. Working with a consortium of U.S. universities and RUFORUM:** Graduate degree training at RUFORUM member institutions, the Punjab Agricultural University, and in the USA at OSU consortium partner institutions, provided diverse degree training placement opportunities, allowed access to a wide array of resources and brought together Tanzanian scientists with international scientists to share knowledge and solve problems through thesis and dissertation research. While in Tanzania, many of the international student advisors shared cutting-edge knowledge and practices with researchers and academics at SUA through seminars with staff and students.

RUFORUM played an essential role in the placement and monitoring of students at nine of its affiliated institutions in Malawi, Kenya, South Africa, Uganda and Zambia. RUFORUM staff also provided important staff-development training activities at SUA and took the lead in supporting trainee participation at its international conferences and in attachments with the private sector.

## **Human Capacity Development**

### **Recommendations**

**1. Continue to build human capacity through degree training:** A major contribution of iAGRI was the training of the next generation of leadership for the Tanzanian agricultural sector. Degree training will need to be continued for both SUA and MALF due to retirements and the need for replacements so that the human resource pipeline remains filled. Human Capacity Development needs to be a continuous sustained process to maintain a balance among new, mid-career and experienced staff. Thus, SUA and MALF should develop and continuously update staff training plans based on assessments of

**2. Continue to build human capacity through short-term training:** Continued attention will need to be given to human capacity development through staff development activities including sabbatical leaves, short-term professional training, participation in professional meetings and leadership training. These types of opportunities are essential for incentivizing and invigorating staff and building research networking.

**3. Support training at diverse institutions:** Degree training needs to be supported at diverse institutions in Sub-Saharan Africa as well as at U.S. land grant universities (LGU) and other similar institutions on other continents. Because of the diversity of host universities, it was possible to match student interest with advisor interest and to make a wide range of research and teaching foci available to students. Training at diverse universities also helps prevent institutional in-breeding by exposing students and faculty to a wide variety academic, research and outreach systems and experiences.

## **Institutional Capacity Building Recommendations**

**1. Retain focus on comprehensive Institutional Capacity Development (ICD):** Comprehensive ICD implies the integration of training, research and outreach activities with a focus on promoting institutional change and development. Improvements in the structure and performance of agricultural higher education institutions are required for them to harness the creative, professional/scientific talents and energies of their well-trained staff. Strengthened institutional capacity raises the return on investments made in HCD and greatly expands the effectiveness of HCD to improve food security. Clearly, HCD will have its greatest

The contributions of human capacity development to improve University relevance

impact when it is part of a comprehensive programme targeting ICD as the main goal.

## **2. Importance of partnerships in ICD:**

Agricultural higher education partnerships need to be long term because it takes time to build capacity and commitment on the part of all partners. Indeed ICD is a long-term process and partnerships take time to evolve because they are fundamentally based on trust, which itself takes time to develop. Five mechanisms contributed to building trust under iAGRI: 1) Prior experience of OSU working in Tanzania and with SUA; 2) OSU having its own faculty on the ground in the host country on a resident basis; 3) having SUA staff embedded in the iAGRI team; 4) having a local regional network organisation (RUFORUM) with knowledge about the higher education and agricultural sectors in Africa, and 5) the prime contractor (OSU) was a university and handled both the academic and management aspects of the project. This parallelism in the university-to-university relationship facilitated building trust, which is created through shared values and experiences.

## **Future Challenges:**

Strengthened institutional capacity through HCD will assist SUA to address the following future challenges:

**1. Provide quality programming:** In response to increased demand for higher education in Tanzania and the region, the number of public and private higher education institutions has increased, as have enrollments. For SUA to excel in this increasingly competitive higher education environment, it will need to emphasize and incentivize the provision of quality training, research and outreach programmes. As such, HCD programmes that create a well-trained faculty are critical to providing quality programming.

**2. Strengthen research capacity:** Continuous assessments of farmer and other client needs should be undertaken to identify and prioritize an applied problem-solving research agenda. Identified research themes can best be addressed using trans-disciplinary teams of scientists that include graduate students to foster human capacity development. Simultaneously, SUA will need to continue strengthening its capacity to conduct basic science research so that students are exposed to advanced, cutting-edge research techniques and methodologies. Again, this requires a well-trained and motivated faculty.

**3. Strengthen programmatic linkages with the private sector:** SUA will need to continue to strengthen its linkages with the private sector. As Tanzania has liberalized its economy, private sector agribusinesses have become major contributors to agricultural growth and important employers of agricultural graduates. Market forces are driving the transition to more commercial and productive agriculture. For SUA to contribute to this important transformation of Tanzania's agricultural and food systems, the University must reorient curriculum, research and outreach programmes, and build its institutional capacity to provide training and technologies in demand by agricultural businesses.

**4. Improve University outreach programming:** SUA will need to continue to develop and strengthen its outreach programming to support the emerging agriculture sector transition in the country. To do so, it will need to develop appropriate incentives and enabling organizational structures. A vibrant outreach strategy will make SUA relevant and responsive to changing needs and interests and stakeholders will come to value the university as a key resource. Clearly, SUA cannot achieve this alone but needs collaborations with and support from governmental, non-governmental, donor,

and private-sector organizations.

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## STATEMENT OF NO-CONFLICT OF INTEREST

The authors declare that there is no conflict of interest in this paper.

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