

Research Application Summary

Increasing scientific research capacity in Africa through a Proven Model

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Abstract

The study focuses on an international model that is designed to strengthen scientific research in higher education. Research skills are taught in various universities and some are acquired through experience and interaction with researchers. The need for research is unquestionable and the desire for it to be integrated into formal education is greatly accepted. However, there is no standard, uniform model for integrating research into education programmes. This case study will focus on CRDF Global's model that integrates agricultural research into existing university programmes. CRDF Global is a non-profit organisation, non-governmental organisation that has worked for more than a decade to build sustainable institutional capacity for research and higher education.

Key words: Capacity building, integrating research with education, scientific research capacity, training

Résumé

L'étude se concentre sur un modèle international qui vise à renforcer la recherche scientifique dans l'enseignement supérieur. Les compétences en recherche sont enseignées dans les différentes universités et certaines sont acquises par l'expérience et l'interaction avec les chercheurs. La nécessité de la recherche est incontestable et le désir pour qu'elle puisse être intégrée dans l'éducation formelle est grandement accepté. Cependant, il n'existe aucune norme, ni de modèle uniforme pour intégrer la recherche dans les programmes éducatifs. Cette étude de cas portera sur le modèle CRDF Global qui intègre la recherche agronomique dans les programmes universitaires existants. CRDF Global est une organisation sans but lucratif, une organisation non gouvernementale qui a travaillé pendant plus d'une décennie pour construire une capacité institutionnelle durable pour la recherche et l'enseignement supérieur.

Mots clés: Renforcement des capacités, intégration de la recherche à l'éducation, capacité de recherche scientifique, formation

Background

In the 21st century, the importance of scientific research for economic development is indisputable. Most developing countries are struggling to improve their economy as they are trapped in agrarian or extractive economies and have a low level of science and technology advancement and utilisation. Current world trends indicate that integrating research with teaching leads both to better research and to better teaching. CRDF Global's higher education model advances science and technology capabilities to address local and regional challenges. The programme provides resources to young scholars enabling them to create new knowledge and promote innovative activities within improved institutions, which can further be incorporated into the marketplace. The programme model allows students to become more efficient, knowledgeable, innovative and outstanding performers at an earlier stage in their academic career. The CRDF Global higher education programme model argues that adopting this experience will benefit African agricultural researchers, and contribute to internal capacity development.

Under CRDF Global's higher education model, 30 research and education centres have been established in six countries. Each is a 'centre of excellence' in a multidisciplinary field of natural science. The centres were designed and established to train a new generation of scientists and scholars to take their place in science and innovation, provide up-to-date equipment for research and education, stimulate innovation, integrate research and research-oriented education, and serve as a model to promote the development of a new type of a research university. To implement this programme, CRDF Global partners work with local government agencies to strengthen existing scientific institutions and improve the distribution of resources for science. CRDF Global has worked on science and technology capacity building programmes in more than 30 countries and over 100 individual universities and institutions, and has established more than 50 international centres of excellence including the 30 research and education centres. The oldest and largest of these programmes, the Basic Research and Higher Education programme in Russia, was started nearly 14 years ago and now consist of 20 centres. In programme design and implementation, CRDF Global has taken a consistent and highly successful approach that combines international best practices with country-specific needs. CRDF Global has reached over 13,000 scientists, primarily in underserved or emerging scientific communities. Funding for CRDF Global's programmes includes both direct

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governmental sources, funding from privately endowed foundations, and innovative public-private partnerships that build sustainable solutions.

Development experts and international donors have focused on primary and secondary education for decades, but more recently higher education and research has been identified as a critical component of development (Bloom *et al.*, 2005). There is also an increasing understanding that scientists and engineers in low-income countries are in the best position to understand and address their local and regional challenges, but only if they can strengthen their indigenous problem-solving and technology-generating capacity. As the world continues to increase food production while depleting existing resources, the need for agricultural innovation to improve production is paramount. Combating this challenge requires well-trained African scientists, researchers and institutions (Tuttle *et al.*, 2011). There is no easy or inexpensive way to improve science and technology education on a large scale, but using models that have been proven successful would be a good starting point.

Strengthening the capacity of agricultural scientific research in universities will help countries tap into the resources of the global research and education community to solve immediate development problems and accelerate economic development in Africa. It will also prepare the human capital that is a prerequisite for attracting international investment. The 2012 African Economic Outlook supports this argument by stating that one of the challenges of African countries' is related to skills mismatch which is contributing to the unemployment of graduates (African Economic Outlook, 2012).

Indigenous scientific capacity in developing countries has improved with the wealth of scientific and technological advancement. However, the challenge is to adapt the existing knowledge to local needs. Recent developed and emerging economies like Japan, South Korea, Singapore, Ireland, Brazil, China, India, Malaysia and Thailand followed this approach. Their success was highly dependent on building basic infrastructure and investing in higher education in addition to private enterprise (Juma, 2008).

Case Study: CRDF Global's Higher Education Model. As the Russian economy has gained strength, CRDF Global's higher education programme has now clearly been adopted and

replicated on a larger scale by the Russian Ministry of Education and Science, which is an encouraging sign that the programme is self-sustaining. In the world's largest country and one of the world's largest economies, it is difficult to assess the macroeconomic effect of a relatively small higher education programme. However, some anecdotal evidence may serve to indicate that this programme is a success both as a model for educational development and as a stimulus to innovation and entrepreneurship (Idenburget *al.*, 2007). The first evidence is the replication of this model in five additional Eurasian countries. Second, Technology Transfer Offices (TTOs) in eight of the participating universities created under the programme have greatly improved the innovation culture in their host universities. Together, the TTOs have held over 50 training sessions instructing over 5000 scientists about intellectual property protection and licensing. The TTOs have together filed nearly 1,200 patent applications, and attracted over \$2 million (RUR 60 million) in funding. Impressively, in less than six years, the TTOs have assisted scientists to form 130 spinoff companies based on inventions stemming from their research, creating over 350 new jobs.

The additional ten centres in five other Eurasian countries have been, like the Russian centres, competitively selected and organised around a specific research topic, making each centre a regional centre of excellence in that area. Industry, government, and other research institutions look to these centres for expertise, collaborative possibilities, and skilled personnel because of the multidisciplinary approach and high quality of training and research output. Each of the programmes has the benefit of strong host country support, and each grant is cost shared with the host government. Each centre of excellence has strong national and international research collaborations that help tie the work of the centre to world science. Communication among the centres facilitates the sharing of best practices and transfer of skills in research management and technology commercialisation.

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This case study introduces a proven, flexible model that integrates education, research, and innovation through a sustainable programme that is scalable and adaptable to the needs of countries of varying sizes, income levels, and stages of development. The programme results in opportunities for the next generation to contribute to economic development through careers in science and technology. In Africa, providing a

pathway for youth to contribute to their country's agricultural development is critical. The proposed model is unique in its commitment to ensuring the long-term sustainability of each programme. It is designed to encourage and support international engagement through collaborations with international agricultural researchers, while retaining primary focus in local institution or university. As technological advancement and institutional framework must be central in the development policies of African countries, this model would highly complement current efforts in the continent.

Specifically, the study provides recommendations on how to replicate CRDF Global's higher education model with an emphasis on agricultural research needed in developing countries, tailoring the programme to each country's particular situation and initial condition. For adopting countries, the key to economic development is to focus on agricultural research based science and technology education that addresses local and regional development challenges.

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