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Research Application Summary

Innovation systems perspectives: Institutional change to strengthen agricultural tertiary education in sub-Saharan Africa

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Abstract

The changing face of African agriculture in the wake of myriad global, regional and local challenges requires adjustments in agricultural capacity development. Universities are better placed to spearhead this change but they too need to adjust the architecture of their programmes. This paper examines the on-going evolution of the organizational architecture of agricultural tertiary education in Africa. In line with the vision of the Regional Universities Forum for Capacity Building in Agriculture (RUFORUM), this institutional realignment will erase the long held negative image of universities as backwater populated by egotistic academicians and bureaucratic administrators. The African university is poised to be explicitly positioned in the global knowledge arena as a facilitator of agricultural innovation, technology, institutions and development. A systems perspective is used to explore these possibilities based on experiences from RUFORUM. The paper concludes that the conception of an innovative capacity building programme in Africa must go hand in hand with associated efforts to create a coordinated, multi-layered, supra-scale institutional arrangement cognizant of agricultural policy and local contexts. It is suggested that regional, national and local characteristics and differences must come to the fore in the design of demand-driven agricultural tertiary education and training programmes.

Key words: Africa, Agricultural innovation systems, agricultural tertiary education, capacity building, RUFORUM

Résumé

Le changement de visage de l'agriculture africaine dans le sillage d'une myriade de défis mondiaux, régionaux et locaux nécessite des ajustements dans le développement des capacités agricoles. Les universités sont mieux placées pour mener ce changement, mais elles aussi ont besoin d'adapter l'architecture de leurs programmes. Cet article examine l'évolution en cours de l'architecture organisationnelle de l'enseignement supérieur agricole en Afrique. En ligne avec la vision du Forum des universités régionales pour le renforcement des capacités dans

l'agriculture (RUFORUM), ce réalignement institutionnel va effacer les images négatives longtemps portées par des universités en tant bras morts, peuplées par des administrateurs et bureaucrates égoïstes. L'université africaine est prête à être explicitement placée dans l'arène mondiale de la connaissance en tant que facilitatrice de l'innovation agricole, technologique, institutionnelle et de développement. Des systèmes de perspective sont utilisés pour explorer ces possibilités basées sur des expériences de RUFORUM. Le document conclut que la conception d'innovation d'un programme de renforcement des capacités en Afrique doit aller de pair avec les efforts associés pour créer une approche coordonnée, multisectorielle, conscient supra-échelle arrangement institutionnel stratifié de la politique agricole et des contextes locaux. Il est suggéré que les caractéristiques régionales, nationales et locales, ainsi que les différences, doivent venir au premier plan dans la conception axée sur la demande d'enseignement supérieur agricole et des programmes de formation.

Mots clés: Afrique, les systèmes d'innovation agricole, l'enseignement supérieur agricole, le renforcement des capacités, RUFORUM

Background

Past and conventional approaches have concentrated on building the stock of human and scientific capital through technical training. Experience elsewhere and in the region (IAASTAD, 2008) indicate that this has perpetuated a narrow interpretation of agricultural capacity building with a focus on skills and expertise that have promoted the current development; reliant primarily on formal and inflexible public sector institutions and programs; and only weakly engaged with farmers, other economic sectors and knowledge sources (Davis *et al*, 2007). For AET to realize its largely unfulfilled role, more innovative approaches to agricultural capacity development are needed. In this regard, the Regional Universities Forum for Capacity Building in Agriculture (RUFORUM) is engaging with different actors, including the universities themselves, to unlock the potential of universities. Not only are its programmes and projects targeted at creating a new caliber of graduates able to foster innovation but it is also engaged in collaborative organizational capacity strengthening for adaptation to the demands of the "new" African agriculture. The rationale for the innovative approaches are obvious, namely: economies of scale and scope in institutional change and adaptation to new knowledge sources; demand for universities to change to be in tune with demands

for new technologies, products and processes, and new organizational cultures and behaviors; advantages associated with networking approach to resource mobilization and sharing for training and research; need to understand the dynamic demands of the many actors in the agriculture and rural sectors; building on the comparative advantages of different universities to mount world-class training and research programmes for reduced transaction costs, synergies in innovation and associated complementarities.This paper examines an innovation systems perspective for emerging approaches to regional capacity building for agriculture in sub-Saharan Africa. The paper uses experiences from RUFORUM initiatives to lay the conceptual framework for innovative role of higher AET in agricultural development. The institutional change and architectural design issues for universities are examined to layout the prospects for an innovation systems application in AET for sustainable agricultural and rural sector prosperity. The paper is summarized from nascent literature and project documentation in RUFORUM, its member universities and network partners and also draws from the rich emerging literature on agricultural innovation systems in Africa.

Literature Summary

Innovation is about doing something "new" by using existing or novel information in new ways (Davis *et al.*, 2007). With innovation, higher agricultural education and training (AET) in Sub-Saharan Africa is poised to immensely contribute to agriculture and rural development through innovative programmes that foster innovation. The capacity of universities to realign themselves to the regional development needs hinges on institutional change to better be socially or economically relevant to smallholder farmers, policy processes and other actors and platforms in agriculture and rural sectors. There is no doubt that AET is significant to development in Sub-Saharan Africa (Spielman *et al.*, 2009; Klerkx *et al.*, 2010). New or different approaches for universities to provide the much needed technologies and expertise for this process will be paramount. With this "innovation" AET system in sub-Saharan Africa will obviously make quantum leaps in strengthening its contribution to development. Davis *at al.* (2007) argue that the potential and real demand for AET professionals and graduates in the region goes hand in hand with an innovation systems perspective enabling an AET system to develop individuals and organizations with the innovative capabilities needed to stimulate the growth of a more dynamic agricultural sector. The systems itself reflects a network of actors and their lower level networks (Fig. 1).

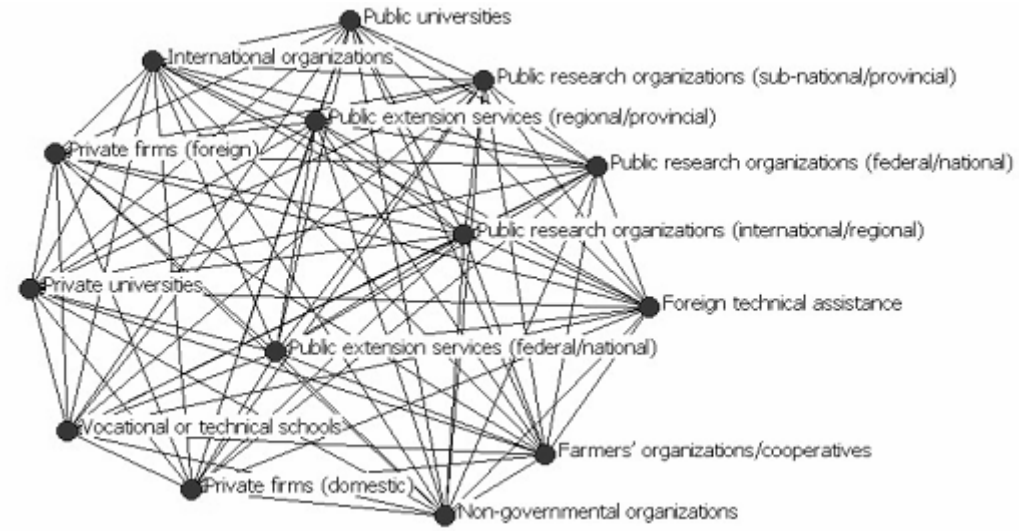

Figure 1. Structure of innovations networks in an AET system (Davies *et al.*, 2007).

The application of innovation systems perspective in AET programmes has clear objectives, strategy and instruments as indicated in Table 1 that also compares it with the more linear conventional science perspectives to capacity development.

Calls for sustainable reforms in AET in Africa have been many but responses have been limited for many reasons. It is now more relevant given the myriad of sociopolitical, economic, and ecological changes witnessed in Africa and beyond. Many current reform agenda revolve around university visions and mandates, relevance to national development priorities, changes in curricula, improvements in incentive systems for researchers, alternative financing strategies and organizational structures, and realization of new opportunities in science and technology (African Union, 2007). The 2003 Jinja Consensus, for example, called for the creation of a new African agricultural university to build a new cadre of agricultural graduates who will go on to become entrepreneurs and wealth creators rather than cogs in the wheels of existing agricultural education, research, and extension organizations. The International Assessment of Agricultural Science and Technology for Development (IAASTD) Africa report (IAASTD, 2008) called for carefully thought-out regional postgraduate training programmes, a direction RUFORUM had already taken before the report. Holistic transformation also demands reliance on student-centered learning styles with university environment merely facilitating the development of graduates as innovation system thinkers and facilitators.

Table 1. Innovation as a linear versus complex process: A comparison of key elements for AET.

	Linear science perspectives	*Innovation system perspectives*
Objective	Emphasis on - advanced technology and radical innovations - technological "shocks" that change production modalities	Emphasis on - learning within universities and networks to innovate - strengthening individual and collective capabilities to innovate - long-term efforts to build holistic innovation systems
Strategy	- Supply-driven science and technology - Hierarchical knowledge dissemination: from education to research to extension to user - Typically embedded knowledge dissemination: in capital goods, production inputs, and technology packages - R&D undertaken by large firms (in industrialized countries) and public institutes (in developing countries) - Typically centralized management of innovation processes	- Demand- and supply-driven science and technology economy - Focus on complex and dynamic interactions among innovative agents - Network-based knowledge dissemination - Both embedded and disembedded knowledge dissemination: in both tacit and codified forms - Typically decentralized management of innovation processes
Instruments	- Direct public financing - Indirect public financing: subsidy programs, incentive schemes - Private investment	- Scientific exchanges - Advisory and consultancy services - Stakeholder forums - Participatory research projects - Public–private–civil society partnerships - Competitive grant programs - Advanced market commitments Changes to individual and organizational practices, behaviors, and cultures to - promote labor mobility of educators, researchers, and technicians; and - integrate educators, researchers, and technicians into networks with other innovation agents

Source: Adapted from Spielman *et al.* (2008).

All-in-all, such transformations must see changes in the cultures of AET organizations – primarily universities, and enhanced innovative capabilities among lecturers, students, researchers and practitioners. A more relevant and effective AET model must respond to changing demands in African agricultural labour landscape (including diversification AET schemes, integration of apprenticeship in training and closer university-society linkages, effective AET monitoring systems (Ochieng', 2007). Rivera (2006) provides a comparison of these reforms with practice in other parts of the world and further recommends emphasis on incentive systems for human capital development and intensifying partnerships. Similar syntheses are provided by InterAcademy Council (2004) and Oniang'o and Eicher (1998). The establishment of a high-quality Ph.D. program in plant breeding at Makerere University and at the University of KwaZulu-Natal; the Africa Union's US$3 billion support for African institutes of science and technology (African Union, 2007) are some recent responses.

Study Description

An examination of the discourse of integration of innovation systems perspectives into capacity building programmes at RUFORUM, within the network of universities and individual agricultural tertiary education systems has been performed. The assessment considered individual, institutional and organizational context of capacity building for agriculture. A review of agricultural education and training systems in sub-Saharan Africa, innovation systems perspectives and the application as well as experiences from on-going capacity development efforts have been reviewed. The lessons from RUFORUM capacity development initiatives have been compiled to gain a systems-based understanding of the processes, outcomes and interactions between actors in AET systems. The article is based on preliminary findings from RUFORUM capacity building Monitoring and Evaluation system.

For mapping the dynamics and a structured analysis of innovation system interaction at the different levels, the innovation history analysis method (Spielman *et al*., 2009) was applied. The method is useful in mainstreaming innovation systems analysis as an innovation "journey analysis" framework. A review of RUFORUM capacity development programmes and project documents to gather information on perspectives of both innovation network and institutional environment actors was also done. The multi-stranded approach adopted permitted triangulation of data sources for validity and reliability. Treating

RUFORUM as a case analysis, transcription, content analysis and collation of emerging innovations systems application to capacity building was done. The review covered an assessment of the programme design processes, implementation and institutional lessons and feedback from actors in capacity development. Reports from studies on capacity building demand analysis, M&E baseline study were also consulted.

Research Application

RUFORUM recognises that a more nuanced understanding is needed of AET's role in promoting innovation, development, and growth in agriculture especially how alternative strategies and selective approaches might shift AET into closer, more productive relationships with other actors in the agricultural sector and wider economy. This would build on the comparative advantages of different actors and institutions to reduce transaction costs, achieve economies of scale and scope, exploit complementarities, and realize synergies in innovation (Davis *et al.,* 2007; Spielman *et al.,* 2009; Klerkx, 2010).

RUFORUM is applying a conceptual framework for its capacity development initiatives as innovation processes, specifically with respect to African agriculture. The actions and interactions of the actors in such innovation systems are governed by formal and informal rules that regulate their practices and behaviours. Figure 2 illustrates the model of an innovation system embedding technological change within a larger, more complex system of actions and interactions among diverse actors, social and economic institutions, and organizational cultures and practices. This has to taken into account in a capacity building framework to inform innovative development.

In RUFORUM's capacity development programmes, concerted efforts are made to ensure the innovation systems offer:

- Innovations through new training models of new inputs or technologies in agriculture;
- Ability of actors (universities, students, farmers, governments, private sector, etc) to learn and adjust;
- Ability of actors to interact and exchange information and knowledge that promotes innovative capacity building;
- Reduction of complexity that often constraints innovations;
- Balance between existing capacity development models with new ones
- Participation of many actors with mutual responsibility;

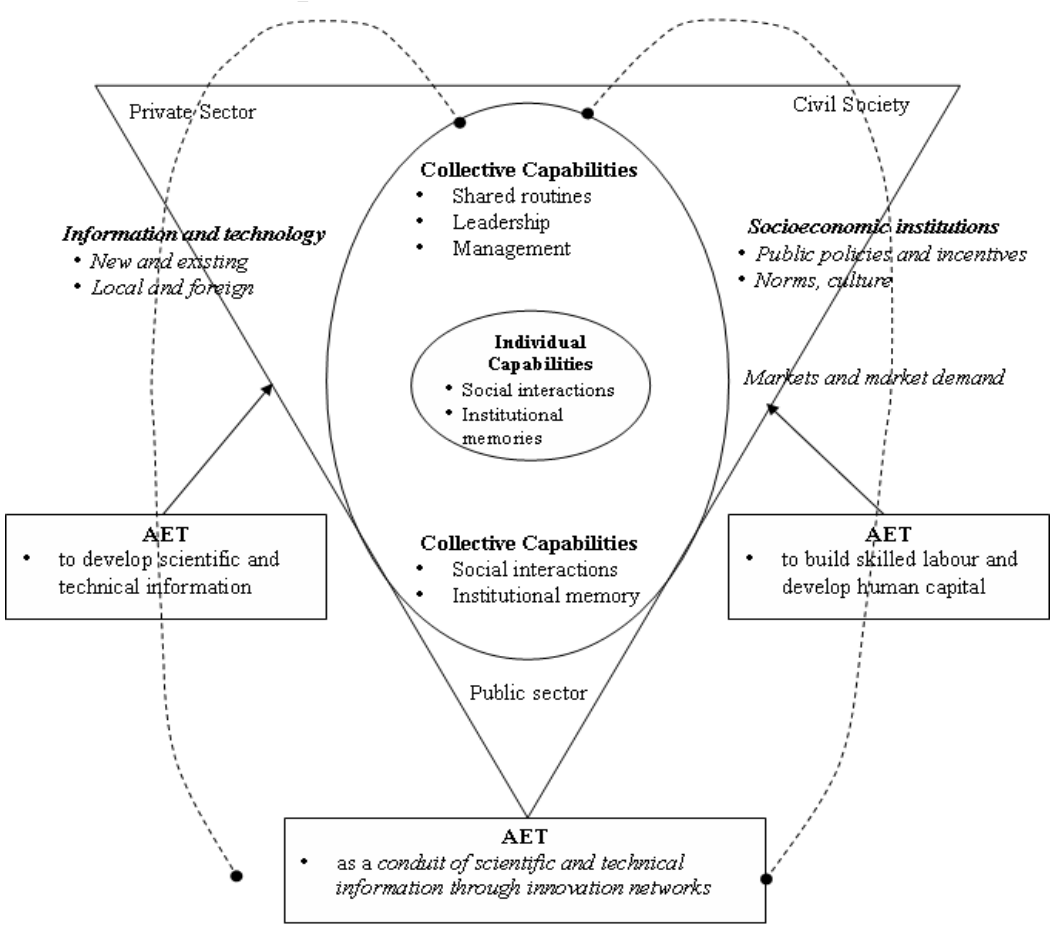

Figure 2. AET in an innovation system (Davies *et al.*, 2007).

- Ensuring and advocating for enabling conditions such as leadership support, infrastructure including ICT, policy, IPR and others; and
- Comprehensive capacity development involving three elements: individual and collective innovative capabilities, organizational culture and behaviour, and networks and linkages among innovation systems actors. Each programme covers three dimensions of capacity development (technical, soft skills and managerial competencies).

The principles outlined by Davis *et al.* (2007) are applied to the design and improvement of regional postgraduate programmes and other university capacity enhancing initiatives. Chief among them is the fact that innovation goes beyond scientific research and the dissemination of new technologies; the actions and interactions of diverse agents, and the social and economic institutions that condition their practices and behaviour, are of

equal importance to understanding the innovation process (Spielman *et al.*, 2009). Innovation for an AET system depends on:

- Development of individual capabilities
- Development of organizational capabilities in AET systems with sufficient reference to other innovation system actors
- Development of organizational culture and behaviour that transform AET systems into conduits for transmitting new applications
- Active participation of AET professionals in networks, partnerships, and other interactions

The outcome of these process has seen the introduction of the following initiatives at RUFORUM:

- Regional MSc and PhD programmes
- Skill enhancing and competency improvement programmes for students, lecturers and researchers involving training in:
- Proposal writing and scientific communication
- ICT literacy and use in research, course development and delivery as well as in university management
- Scientific data management
- Strategic policy support through gender mainstreaming policy framework
- Institutional change management through leadership and management training support
- Staff and student exchange programmes
- Collaborative research projects
- Specialized networking and network support
- Policy engagement and advocacy

Recommendation

From this article, it is clear that conception of an innovative capacity development system for agriculture in Africa must go hand in hand with the many associated efforts to create a coordinated, multi-layered, supra-scale institutional arrangement cognizant of agricultural policy and local contexts. This heavily borrows from agricultural innovation systems perspectives. It is recommended that regional, national and local characteristics and differences must come to the fore in the design of demand-driven agricultural tertiary education and training programmes. For the consideration of policy makers and capacity development organizations, the paper recommends continued realignment of capacity building programmes to institutional, national and continental visions and mandates. This involves, among others:

- Designing capacity development interventions that develop the human capital base by enhancing innovative capabilities of individuals and organizations (universities)
- Facilitation of the flow of information and technology among agricultural innovation systems actors
- Support for capacity building by inducing change in organizational cultures, behaviors, and practices through stronger leadership and management and capacity for managing change
- Creating an appropriate policy environment for long-term transformation of AET in sub-Saharan Africa
- Identifying, nurturing and retaining high-quality human capital including instructors, researchers, and research teams

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