

Agricultural Education and Training in Sub-Saharan Africa: A Three-step Approach to AET Institution Building

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Abstract

Educational institution building for agricultural education and training (AET) in sub-Saharan African has struggled, leading to many false starts and only islands of success. This review examines relevant literature related to carrying out AET in developing countries, the historical successes or challenges of developing AET institutions, and the need for establishing AET institutions. Numerous factors hampering the development of AET emerged, including: shrinking national budgets, reverse return, donor congestion, fixation on a linear model of science, and political instability. Recommendations for building AET institutions in SSA are presented using Rogers' Diffusion of Innovation Theory as a framework, and include: (a) develop strategic relationships for political support of agriculture, (b) creating a more flexible framework for structuring institutions of higher learning, and (c) utilizing the SAFE model to reform curriculum to meet today's learners' needs.

Keywords: Agriculture education and training, sub-Saharan Africa, Diffusion of Innovations Theory

1. Introduction

“The thing that bothers me is that the donors have consistently tried to avoid the issue of institution-building in Africa. In South and Southeast Asia in the 1950s, the donors were building the institutional capacity it took to create the growth that began in the 1960s. In the 1970s, we didn’t do it in Africa ... I think it’s time that the donors begin to take the issue of institution-building seriously or in 2010 we are going to be having this same conversation” (Ruttan, 1991, p. 195).

The great irony of the above passage is that now, nearly a quarter century after it was written, we are still grappling with institution building for higher education and agricultural education and training (AET) in sub-Saharan Africa (SSA). While AET institution building in China, Brazil, Chile, Malaysia, and India all have “notable success stories” to share, SSA remains “riddled with false starts” (Eicher, 2007, p. 7). Aside from the sheer complexity of coordinating institution building in 52 smaller, dissimilar countries, other confounding factors — lingering effects of colonialism, shrinking budgets for agricultural education and training, donor congestion, a fixation on linear research, reverse return, outdated curricula, and political instability — have hampered the creation of a lasting system of AET in SSA (Clark 2006; Davis, Ekboir, & Spielman, 2008; Eicher, 2006; Haggblade, Djurfeldt, Holmén, Jirström, & Larsson, 2005; Kroma, 2003).

While these challenges remain unsolved, during the last decade academics have also begun to rethink the very structure of AET in SSA. Rather than transposing a Western Land Grant-style system, with its institutionalized divisions between teaching, research, and outreach — each with its own mission and metrics for success — a more integrated, less hierarchical model has been put forward in sub-Saharan Africa (Davis, Ekboir, & Spielman, 2008). The roles envisioned for this more integrated conceptualization of African AET are threefold: (a) “prepare highly trained professionals that can master complicated technologies”; (b) “provide working professionals the specialized knowledge they need to operate in an increasingly complex environment”; and (c) “grant graduates access to a vast network that shares scientific and technical information” (Davis, Ekboir, & Spielman, 2008, p. 39).

However, efforts to effect reform and build capacity for AET in SSA, have largely been “filled with disappointments and subsequently been placed on hold by many donor agencies” (Eicher, 2006, p. 9). African educators are now asking the critical question: “How, where and when will the next generation of African agricultural teachers, researchers and extension workers be trained?” (Eicher, 2006, p. 9).

This paper draws on a selection of two decades of African AET literature and utilizes Rogers’ (2003) Diffusion of Innovation theory to recommend a three-tiered set of priorities for developing a reformed system of AET in sub-Saharan Africa: (a) develop strategic relationships for political support of agriculture; (b) create a more flexible framework for structuring institutions of higher learning; and (c) reform AET curriculum in higher education to meet clientele needs.

2. Literature Review

The current trajectory of agricultural education and training can largely be attributed to colonial systems, which focused heavily on formal education as a means of preparing a corps of professionals and civil servants to staff the colonial administrative ranks (Clark, 2006). Various colonial regimes left behind differing priorities in higher education. Former French colonies, with their emphasis on teaching through elite *Grandes Ecoles*, changed little after gaining their independence. Former British colonies, in contrast, did make significant changes, including a greater emphasis on research, and the linking of research with extension organizations (Spielman, Ekboir, Davis, & Ochieng, 2008). However, after gaining independence, the former colonies of both France and Britain saw AET as an expedient means of meeting the demand for cadres of professionals to managed agricultural development efforts aimed at modernizing their agricultural systems during the 1950s and 1960s (Yassin & Bruce, 1983). These nascent countries created their AET systems by transposing Western models, but “few managed to build innovative and responsive systems. By and large, many African AET systems have changed little since their establishment, and have not been able to adequately replicate the performance of similar AET systems in other countries...” (Davis, Ekboir, & Spielman, 2008, p. 2).

2.1 *Changing State of Funding*

The current state of institution building for AET in SSA is characterized by a general decline in funding for agricultural development, zero-sum competition with other government initiatives, as well as growing decentralization in funding sources (Eicher, 2006, p. 9). For example, the recent proliferation of NGOs operating in Africa, and an overall increase in donor support, have enabled a shift from merely providing emergency aid to the development of grassroots institutions. However, these NGOs have invested heavily in health, education, and community development — not in agricultural development. Though successful at local levels, projects have not been scaled up to have an impact at the national level, leading to small islands of success (Haggblade, 2005). Meanwhile, the new focus on providing rural social services has led to a decline in agricultural development: “The decline in donor support for agriculture in Africa has been matched by a lock step increase in donor support for health and education” (Eicher, 2006, p. 5). According to Kane and Eicher (2004), aid to African agricultural development declined from 29% in 1981 to 10% in 2001, while aid to the rural poor, mainly in the form of health and education, increased from 22% in 1981 to 56 % in 2001. Kane and Eicher (2004) also posit that a development program based largely on rural social services and food aid is too narrow, inefficient, and unsustainable. Instead, rural income generation and agricultural growth are essential to maintain rural social services after donor funding is terminated.

Much of this decline in funding for AET is attributed to the challenges created by changes in higher education. Donors cite two primary factors for their reduced support of higher education: (a) the rising cost of graduate education has rendered untenable AET’s reliance on overseas post-graduate training to educate staff for positions in agricultural research and extension; and, (b) SSA politicians, institutions, and donors are leery of the high number of

students who fail to return to SSA following graduation, a phenomenon called reverse return (Alex & Byerlee, 1999).

Another confounding factor for funding resulting from the proliferation of NGOs is the sheer number of donors to which AET institutions must report. During the 1960s, as India was having great success with high-yield wheat and rice, only three major donors aided its agricultural development: The Rockefeller Foundation, Ford Foundation, and USAID (Eicher, 2006). Today, dozens of major donors and many more NGOs operate in SSA, each with its own narrow focus, metrics of success, and reporting mechanisms. This has led to a condition labeled “donor congestion” (Eicher, 2006, p. 9). As a result, researchers spend only about 25% of their time on research; much of their time is spent writing what one Nigerian vice chancellor calls a “thick slug of consultancy reports” for donors (Eicher, 2006, p. 35).

Finally, a major limitation to institution building for AET is the lack of state-budgeted financial support, which offers the bulk of discretionary funding for institutions of AET. While the level of complexity and resources required for AET capacity building in sub-Saharan Africa’s 52 countries is understandably of a much greater scale than most AET success stories — such as India, Malaysia, and Chile — the resources allotted are trifling. In sub-Saharan Africa, a majority of funding for research and extension comes from national budgets, but, remarkably, SSA’s countries commit, on average, only 2.4 % of their national budgets to agricultural development — despite more than 60% of citizens being dependent upon the rural sector for jobs and income (Fan & Rao, 2003). Comparatively, India’s government spent 10% – 20% of its national budget on agriculture during its Green Revolution of the 1970s; Malaysia, similarly, dedicated an average of 20% of its budget from 1960 – 1983 (Jenkins & Lai, 1992). This phenomenon is largely attributed to a strong urban bias among lawmakers, and its effect on agricultural policy (Alam, Hoque, Khalifa, Siraj, & Ghani, 2009). Vandenbosch (2006) describes the general allotment for services to rural areas as “often either nonexistent or extremely appalling” (p. 15).

2.2 Institutional Reform and a Changing, Complex Environment

Numerous calls for reform in Africa’s system of AET — most relating to an inability to address the complex problems faced by farmers — have been identified repeatedly in the literature. Examples include: (a) the strict adherence to a Western, linear view of science (Clark, 2006; Spielman et al., 2008); (b) a narrow focus on expert knowledge (Eicher, 2006); (c) a majority of curricula designed for farmers focus overwhelmingly on acquiring scientific principles and concepts of agriculture, rather than problem-solving and application (Kroma, 2003); and, (d) the ongoing problem of reverse return (Alex & Byerlee, 1999).

2.2.1 Linear Model of Scientific Research

The linear model of scientific research refers to the progression from basic research to real-world application of research findings, which is the norm in Western contexts. However, in SSA, many believe the linear model to be detrimental to AET’s mission. Spielman and colleagues (2008) contend that the linear model subdivides faculties into departments organized along strict disciplinary lines, which “provides minimal incentives for

understanding the wider demands of scientific applications, gives the greatest importance to theoretical research, and discourages interactions with innovative actors outside of academia” (p. 3). Still, SSA policymakers adhere to the linear model “even after years of failure in situations in which it does not apply” (Kidane & Worth, 2012, p. 2743).

2.2.2 Personnel Unable to Address Complex Problems

Criticism of the Extension component of AET focuses on both training for personnel and curricula. Compton (1989) argues that higher education has failed to train Extension personnel to address the complexities of SSA’s AET challenges in a holistic fashion. Even current training practices are predicated on relevant subject-matter knowledge residing in the heads of Extension agents, which is then disseminated to a rural farming population. This “narrow emphasis on expert knowledge has not prepared professionals to deal with ... the diverse and complex rural ecologies where conventional agronomic knowledge and technology offer inadequate responses to the challenges farmers face” (Kroma, 2003, p. 358). Similarly, AET’s approach to curricula design has been characterized by a preoccupation with scholarly rigor that results in siloed disciplinary areas (e.g. economics, etymology, crop science, etc.), rather than focusing on the complex interconnections and overlaps. This reductionist approach to addressing complex problems tends to deny the interdependence of agricultural production systems. This method also privileges extension courses featuring didactic, top-down styles, based largely on lecture. It leaves little room for social learning, problem-solving, or experiential education (Davis, 2008).

2.2.3 Reverse Return

Reverse return refers to both: (a) the tendency of African post-graduates who are sent to overseas institutions to complete graduate training failing to return to Africa upon completion of their degrees (Alex & Byerlee, 1999); and, (b) the tendency for those who do return home to work for only 10 – 15 years before emigrating (Tettey & Puplampu, 2006). The phenomenon of reverse return is highly detrimental to African AET, as considerable financial investment is lost when this “brain drain” occurs (Eicher, 2006). Such is the problem that the World Bank declared AET’s reliance on overseas training of post-graduates to be “no longer feasible,” and calls for African institutions of higher learning to be responsible for the training of their own post-graduates (Alex & Byerlee, 1999, p. 5).

3. Theoretical Framework

This literature review was largely informed by Rogers’ (2003) Diffusion of Innovation theory, which offers a useful explanation of how agricultural education and training practices are spread and adopted. Diffusion of Innovation theory seeks to explain how, why, and at what rate ideas and new technology spread, as well as the process by which they are adopted or gain acceptance in a given society or culture (Surry & Farquhar, 1997). “Diffusion is the process by which an innovation is communicated through certain channels over time among the members of a social system,” (Rogers, 2003, p. 5). This process is influenced by four major factors: (a) the innovation itself; (b) communication channels used; (c) time; and, (d)

the nature of the social system (Rogers, 2003). These factors, as well as their interaction effects, help or hinder the adoption of a practice. Several factors determine the success of an innovation in a given culture or society. These factors are, perhaps, the most important factors to consider when reorganizing African AET for success in the 21st century. Rogers' (2003) five factors of innovation adoption are: (a) relative advantage, or how improved an idea, practice, or device is when compared to the status quo; (b) compatibility, or how easily does the innovation integrate with the individual's current practices or worldview; (c) complexity-simplicity, or how easy or difficult is the innovation to use; (d) trialability, or how easily can an individual test the innovation before committing; and (e) observability, or how visible are the benefits (Rogers, 2003). These factors should be kept at the forefront when planning AET reform efforts if innovations are to be adopted.

Also important is that not all individuals in a given community will adopt innovations at the same rate. Rogers (2003) has identified five categories of individuals involved in the adoption of an innovation. These five groups represent the whole of a social system, and are organized along a normal curve: innovators, early adopters, early majority, late majority, and laggards (Rogers, 2003). Innovators are individuals close to scientific or other technological sources who are first to adopt a new innovation; they have a high risk tolerance, usually as a result of greater financial or social capital. Innovators constitute 2.5% of the population (Rogers, 2003). Early adopters are also characterized by a willingness to accept the risk of adopting an innovation, but because they are more discerning than innovators they play a key role in opinion leadership. Early adopters constitute 13.5% of the population (2003). Early majority members represent a critical mass, or tipping point, for the adoption of an innovation; at 34% of the population, these individuals take longer to adopt an innovation and are generally not considered leaders (2003). The late majority and laggards constitute a combined 50% of the population, but are characterized by a general skepticism of the innovation, lack of social status, lack financial resources, and aversion to change (Rogers, 2003).

4. Methods

In an effort to synthesize current knowledge surrounding African agricultural education and training, inform future research and practice, and offer recommendations for reform of the African AET system, a systematic, three-stage process adapted from Creswell's (2009) criteria for scholarly reviews was employed. To be considered for inclusion in the review, publications had to either: (a) explicitly address AET in developing countries, (b) describe historical successes or challenges of AET in developed countries, or (c) discuss the need for establishing AET in developing countries. In the first step of the review process, the following keywords were identified: *Africa* and *agriculture* and *education* and *training*. These terms were used to search Google Scholar™, as it allows access to both published, peer-reviewed journal articles, and numerous government agency reports. In the second step of the review process, selected articles were examined in depth to ensure the inclusion criteria described above were met. In the third step of the review process, remaining articles were reviewed and categorized according to identified themes: (a) historical and current state of

higher education in Africa; (b) historical and current state of AET in Africa; (c) challenges associated with AET; (d) changing need for AET; (e) political and budgetary factors affecting AET; and (e) AET curriculum and pedagogy. Articles and reports were reviewed until data became repetitive, indicating a saturation point had been reached (Creswell, 2009).

5. Discussion

Governments in SSA generally continue to view institutions of higher education in the same manner as in the 1950s and 1960s: a means to generate the cadres of professionals necessary to modernize agricultural systems (Yassin & Bruce, 1983). This model needs to be reconsidered for a 21st century AET system. Yet, even as Kane and Eicher (2004) report long term declines in government funding for agricultural development, there are still many reasons to invest in institutions of higher education.

5.1 Institutions of Higher Education are AET's Largest Existing Resource

Higher education is of strategic importance to Africa's system of AET. With more than 1,600 existing universities conducting agricultural education or research in some capacity (including veterinary medicine and forestry) in sub-Saharan Africa, the continent-wide higher education system is the foundation of African AET (Alex & Byerlee, 1999). These universities represent an immense existing resource for AET to capitalize upon. Universities have the capability of supporting agricultural research with little additional cost by using existing faculty and staff, as well as other resources, such as libraries and laboratories (Eicher, 2006). Additionally, existing universities are uniquely positioned to access global research, and attract researchers and instructors for Extension programs (Eicher, 2006).

5.2 Development of More Than Human Capital

The conventional understanding is that "universities are the principal means for replenishing the stock of human capital in research, extension and agribusiness organizations in Africa" (Eicher, 2006, p. 3). However, these same institutions also have a vital role in building capacity in new *organizations* to "transmit and adapt information, products and processes, and new organizational cultures and behaviors" (Davis et al., 2008, p.1). Similarly, institutions not only play a role in the development of human capital, they also play a key role in the creation and dissemination of new agricultural technologies. Röling (1999) reminds us that, while the "technological treadmill" might have run its course in industrialized societies, technology still has the ability to drastically impact productivity in developing countries where 80% of the population is still engaged in primary production (Eicher, 2006). This is perhaps the most straightforward example of the use of Rogers' (2003) Diffusion of Innovations theory: As developers and purveyors of new technologies, AET institutions maintain close working relationships with innovators and early adopters in an attempt to package and promote technological innovations in a manner that maximizes the chances of adoption (i.e. trialability, visibility, compatibility, etc.)

Finally, on a continent as large and geographically diverse as Africa, knowledge of

agriculture is also highly location specific. Hence, developing and delivering appropriate educational opportunities for farmers requires a “detailed and intimate knowledge of local farming systems” (Eicher, 2006, p. 3). This is also consistent with the requisite conditions for innovations — whether technological, behavioral, or cultural — to diffuse throughout a society (Rogers, 2003). Local opinion leaders play a key role in the adoption of new farming practices and technologies. By having a local presence, AET institutions are more likely to successfully spur the adoption of beneficial innovation.

5.3 Rethinking the Current Model of AET

The criticisms of the current model of AET involve both the rigidity of organizational structure and the inflexibility of its accompanying pedagogy. Also, the “at a distance” model of educating graduate students has proven detrimental because of seemingly intractable issues like reverse return. This has prompted the reconsideration of the efficacy of Africa’s predominant model of AET and the exploration of alternative structures and practices.

5.3.1 Rigidity of Higher Education Institutions

Most sub-Saharan African systems of AET are characterized by an organizational structure privileging a linear vision of science. Consequently, teaching and research, as well as extension, tend to be separated. So, too, are faculties, which are typically divided into disciplinary departments (Spielman, Ekboir, Davis, & Ochieng, 2008). This structure disincentivizes understanding the wider, practical application of agricultural science, places a primary focus on theoretical research, and discourages collaboration with actors outside of academia (Spielman et al., 2008). Eicher (2006) also cautions against the “futility of promoting one model of agricultural higher education such as the Land Grant model or one model of extension, such as the Farmer Field School model” (p. 31). Eicher (2006) concluded that, though the Western Land Grant model had some success in India, Morocco, and the Philippines, it remains a uniquely American institutional model that has been “impossible to replicate ... because of path dependence, and entrenched research and extension departments” (p. 31).

5.3.2 Curricula and Pedagogy

Agricultural education and training in sub-Saharan African is “slow to adapt to new patterns of demand” and “lacks proper mechanisms for identifying emerging needs as well as for reforming curricula” to meet current demands (Kidane & Worth, 2012, p. 2743). Wallace (1997) also argues that teaching methods and curricula must be kept relevant, and should be need based and market oriented to achieve success. This burden of achieving sustainable success with relevant curricula is placed squarely on higher education with its mission of developing the human capital needed to address emerging issues. Kroma (2003) contends that adaptation to these changing needs must become strategic, rather than reactive, and challenges educators on the continent to:

- 1) thoughtfully examine and critically reflect on core underlying values and academic curricula (philosophies, epistemologies, subject matter content, and pedagogical practices) that have traditionally shaped agricultural and extension education in the

context of their continuing relevance to the needs of the 21st century development in sub-Saharan Africa, and 2) construct alternative frameworks for curricula revitalization that facilitate extension training relevant to the sustainability challenges and interests of rural producers, communities and households in the region. (p. 355)

To accomplish these twin goals, Kroma (2003) suggests employing the Sasakawa Africa Fund for Extension Education's (SAFE) method of revitalizing curriculum and pedagogy. Created in 1986, SAFE was the first systematic method devised to address the "increasingly evident ineffectiveness of traditional [AET] programs in Africa" (Kroma, 2003, p. 362). The SAFE methodology is conceptually framed around six factors: (a) scoping and situation analysis, (b) examining philosophies and visions behind practices, (c) thematic subject matter content, (d) experiential/active learning, (e) enabling environment, and (f) institutional networking (Kroma, 2003, p. 362).

In addition to providing a conceptual framework for rethinking AET, the SAFE method — despite originating in 1986 — still advocates relatively novel and much-needed changes to the stagnant educational system: systemic and holistic learning; critical thinking; subject-matter areas that overlap to form interdisciplinary and practical knowledge; and participatory and experience-based learning (Duo & Bruening, 2007). Early assessments of the SAFE method show promise. An external evaluation of the University of Cape Coast, which utilized the SAFE method, found its revised curriculum reveals an undergraduate program for agricultural extension with purposefully selected course content, pedagogy, and philosophy that are in line with the discourse surrounding sustainably revitalized curriculum (Muchena, Vodouhe, & Atengem, 1999). And a more recent assessment of revitalized extension degree curriculum that resulted from the SAFE method found that "extension staff increased their level of confidence and understanding of various job requirements as a result of participating in the SAFE BS extension degree program" (Duo & Breuning, 2007, p. 11)

As lawmakers, civil servants, academicians, and donors begin to rethink the current model of AET, they must remember Rogers (2003) five attributes that impact the likelihood of adoption of any innovation in the model of AET: (a) relative advantage, (b) compatibility, (c) complexity, (d) trialability, and (e) observability. These factors are critical when creating a strategic plan for AET. Moreover, there exist success stories on which to model any innovation, such as: using monetary incentives to maximize relative advantage of a new crop; mobilizing existing social structures to ease compatibility and reduce complexity; and creating smaller, experimental institutions as a form of trialability.

5.4 Need for Sustained Political Action

The fundamental, but typically overlooked, aspect of institution building for AET is the amassing of long term political support needed to structure a high-functioning, adaptive *system* of higher education. Federal support for agriculture in African countries is negligible, as urban bias among lawmakers results in unfavorable, incomplete, and often conflictual government policies and budgets for agriculture (Vandenbosch, 2006). Furthermore, those budgetary and policy initiatives undertaken for agriculture are made with little input from farmers and farmer associations; the end-user is not setting research priorities or assessing the

efficacy of government programs (Eicher, 2006). Additionally, Eicher (2006) found that “building an interactive system of three core institutions — research, education and extension — has been, and will remain, a multi-generational challenge” (Eicher, 2006, p. *i*). When examining successful models of three-part institutions — such as in the U.S., Japan, Brazil, and India — the average time span necessary for developing a “productive and financially sustainable system” was between 40 and 60 years (Eicher, 2006, p. *i*).

Those countries with the most sustainable and successful institutions carrying out AET programs, such as the U.S. and Japan, were able to mobilize political support for their cause. Country studies by Eicher (2006) found that “many different ways can be used to mobilize political support for AET, and different ideologies and development pathways can be followed,” such as, in 1884, the National Agricultural Association of Japan was established to exercise political influence on behalf of farmers (Eicher, 2006).

6. Recommendations/Conclusions

Based on this review of literature, and using Rogers’ (2003) Diffusion of Innovation theory as a theoretical framework, the researchers recommend a long-term, systemic approach to implementing reform in Africa’s agricultural education and training institutions. The following major steps are outlined in order of priority: (a) develop strategic relationships for political support of agriculture; (b) create a more flexible framework for structuring institutions of higher learning; and (c) utilize SAFE model to reform curriculum to meet learners’ needs.

6.1 Political Support

Rogers (2003) asserts that in order for the diffusion of an innovation to occur in a population: (a) it must first reach a critical mass, and (b) its diffusion is reliant on human capital, opinion leaders, and channels of communication. Addressing these points means engaging an element often neglected when developing strategic plans for AET in SSA — politics. Garnering political support is key for the multi-generational endeavor of developing a system of higher education to support AET in SSA. Sustained effort over time is needed to reach a critical mass, or tipping point, necessary for the diffusion of innovation (Rogers, 2003). Engaging human capital and channels of communication includes identifying sympathetic lawmakers, key opinion leaders, and technical experts in the field of AET to: (a) advocate for the adoption of a coherent, comprehensive national agricultural policy; (b) advocate for a significant increase in state funding for the development of the agricultural sector; and (c) work to associate and educate local farmers so that they might become involved in the political process. It is unrealistic for any country in which a majority of the population is engaged in the primary production of agriculture, and in which a plurality of the national gross domestic product is derived from agriculture, to expect to develop as a self-sustaining nation without a clear, comprehensive plan for agricultural development and a commensurate financial investment. “High-level political commitment” is required for creating the favorable policy and budgetary environments necessary to support AET and sustain agricultural growth

(Hagglblade, Djurfeldt, Holmén, Jirström, & Larsson, 2005, p. 154).

6.2 Flexible Framework for Higher Education

Institutionalized divisions between research, teaching, and extension obstruct the continued adaptation and success of AET in Africa. For AET and higher education to be able to respond to the complex, interdisciplinary needs of African farmers, these institutions must be restructured to achieve the more collective goals of preparing professionals to operate in complex environments, offering access to a network of scientific and technical information, and disseminating new technological advances (Davis, Ekboir, & Spielman, 2008). This means creating a system of higher education designed to meet African needs, rather than continuing to transpose a Western Land Grant-style institution that has largely failed to achieve success. Several Regional Centers of Excellence (RCE), which operate more like integrated polytechnics, have achieved notable success. By studying the success of these homegrown institutions, the researchers believe a series of best practices could be established for replicating and adapting this model across the continent. This belief is based on Rogers' (2003) five factors of innovation adoption, RCEs must: (a) demonstrate a relative advantage to existing institutions for AET; (b) be designed to be compatible with existing AET institutions; (c) be easy to access; (d) have opportunities for nations to try at a low level of investment, and then scale up as commitment increases; and (e) the benefits must be visible within the region. Additionally, incentives for faculty, staff, departments, and institutions must first be redesigned to match the outcomes desired. Success should not be measured in degrees awarded or articles published, but rather in positive impact on the complex, interconnected environments in which farmers operate.

6.3 Curriculum Reform

Of course, achieving the abovementioned goals are only antecedent conditions for the ability to offer beneficial, impactful education and training to farmers. This requires a curriculum that prepares farmers for the complex, interdisciplinary challenges they face. Educators must abandon curricula that focus primarily on scientific principles, subject-matter knowledge, and a linear model of research, as these prepare farmers to be experts in an environment that needs generalists. Instead, curriculum designers should draw upon African successes in curricula that feature: competency-based programs; shorter, more focused courses; project-, problem-, or theme-based learning; and social learning (Kroma, 2003). Curricula should also prepare farmers for ancillary functions by offering non-science courses, such as business management or marketing.

Such a process of adopting new curriculum in change-averse sub-Saharan Africa's AET system must be predicated on what Rogers (2003) calls collective innovation-decision, in which the decision to adopt an innovation is made collectively by a group or community. The researchers suggest employing the Sasakawa Africa Fund for Extension Education's (SAFE) model of curricula revitalization, which simultaneously offers an organized structure for discussing and debating the goals of AET, and leads participants to adopt curricula more suited for Africa's farmers; curricula that feature systemic and holistic learning, critical thinking, and subject-matter areas that overlap (Kroma, 2003). Launched in 1986, SAFE was

the first systematic method devised to address the “increasingly evident ineffectiveness of traditional [AET] programs in Africa” (Kroma, 2003, p. 362). The SAFE methodology in conceptually framed by six steps: “(a) a scoping and situation analysis involving stakeholders, (b) underlying philosophy, visioning, and learning theories linked to pragmatic contexts of practice, (c) thematic subject matter content, (d) experiential/active learning experience based on Kolb’s experiential learning model, (e) enabling environment, and (f) institutional networking” (Kroma, 2003, p. 362). The program has had success in Ghana. However, based on experience in employing the model, one lesson Muchena, Vodouhe, and Atengdem (1999) recommend is that, when implementing the SAFE program, particular care should be taken to ensure that teachers’ socialization as didactic instructors not unduly influence the process and bias results from the beginning.

Institution building for agricultural education and training (AET) in sub-Saharan African has struggled, leading to many false starts and only islands of success. This review has examined relevant literature related to carrying out AET in developing countries, the historical successes or challenges of developing AET institutions, and the need for establishing AET institutions. Numerous factors hampering the development of AET emerged, including: shrinking national budgets, reverse return, donor congestion, fixation on a linear model of science, and political instability. The researchers recommend utilizing Rogers’ Diffusion of Innovation Theory when devising revitalizing AET reform, and include the following priorities: (a) develop strategic relationships for political support of agriculture, (b) creating a more flexible framework for structuring institutions of higher learning, and (c) utilizing the SAFE model to reform curriculum to meet learners’ needs.

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