

# innovATE

Innovation for Agricultural Training and Education



Ethiopia Countryside. Photo Credit: Keith Pierce, Virginia Tech, OIA

## Identifying Pathways Linking Agricultural Education, Training and Extension

Jemal Yousuf Hassen, Alemu Sokora, and Mukerem Taha,  
Haramaya University

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The Innovation in Agricultural Training and Education project—InnovATE—is tasked with compiling the best ideas on how to build the capacity of Agricultural Education and Training (AET) institutions and programs and disseminating them to AET practitioners around the world. As part of this effort, InnovATE issued a Call for Concept Notes to accept applications for discussion papers that address *Contemporary Challenges in Agricultural Education and Training*. These concept papers define the state of the art in the theory and practice of AET, in selected focus domains and explore promising strategies and practices for strengthening AET systems and institutions.

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## Abstract

Despite high investment in Agricultural Education Training (AET) programs and institutions in sub-Saharan Africa since the 1950s, there is growing dissatisfaction with the contribution of graduates to the livelihoods of smallholder farmers, who still face persistent challenges of hunger and poverty. This is in contrast to the tri-mandates of AET institutions - teaching, research and extension, assumed to be complementary to one another, contributing to the skill learning of students and the extension needs of farmers. In the absence of information on pathways for agricultural education and extension, it is difficult to understand why AET programs would not have significant impact on skill learning of students as well as the extension needs of farmers. Thus, this research paper intends to assess the latest evidence on the linkage between extension and education to identify potential pathways that bond agricultural education training with extension for improved skill learning of students and extension needs of farmers. To this end the paper first highlights key challenges underlying poor or underachievement of AET in sub-Saharan Africa and attempted reforms, and then makes a detailed analysis of good practices demonstrating potential pathways to link extension with education. In the latter case the review focuses on studies that look into the link between extension and education; and measured impacts in terms of student/graduate skill learning and farmer needs. The evidence indicates potential pathways to improve the link between extension and education include: designing community-based courses within the curricula and/or linking a field/practical component to different courses that can be attached to ongoing research and extension activities undertaken by the AET organization.

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## Problem statement

In the developing world, small scale agriculture has been facing complex challenges such as poverty, food and nutrition insecurity, and climate change while sustaining the natural ecosystem (Leeuwis & van den Ban, 2004; Anandajayasekeram et al, 2008). Further, the spread of commercialization, trade liberalization, and technological advancement have created both opportunities and challenges for smallholder livelihoods (Rivera & Alex, 2008). In order to respond to these challenges and opportunities, small farmers currently need skilful and flexible agricultural extension services, which not only provide conventional technical knowledge, but also are equipped with “soft skills, such as leadership, communication, negotiation, facilitation, and organizational capabilities” to broker networks of small farmers and other value chain actors throughout the agricultural innovation system (Maguire, 2012). To do so, agricultural education and training institutions are supposed to be responsible actors producing agricultural extension professionals and administrators who would shoulder responsibilities of enhancing agricultural innovation system in a given country or region (Kroma, 2003).

In fact, it is in the first half of the 20th century that the world learned from the US and European countries that publicly funded agricultural education and extension had a dominant role for agricultural innovation (Klerkx et al, 2009). Thus, since the 1950s there have been many efforts to replicate western agricultural development model in developing world where hunger and poverty still persist. For instance, one of the largest investments was in the mid 1950s by USAID, which launched a program establishing land-grant universities in Africa, Asia and Latin America, similar to those in the United States. As a result of the program, developing nations got technical assistance in AET administrative and academic tasks; new curriculum developed; quality agricultural professionals were produced; and developing universities linked with US land-grant universities (Maguire, 2012). By and large, the impacts of USAID and other donors’ investments in AET and extension were remarkable from the 1950s to 70s.

However, after the 1970s due to changes in global development priorities, funding in agricultural sector was downsized in almost all of the developing world (World Bank, 2007). Unfortunately, due to the 1980s Africans economic crisis, almost all Sub-Saharan Africa (SSA) countries reduced investment in agriculture and hence the impacts of past investments were not sustained beyond the 1980s. Thus, long term impacts of past policy negligence and low investment in agricultural education and training (AET) and agricultural extension systems

during structural adjustment program from the 1980s to the mid 2000s, had disabled SSA countries' production of capable and client-oriented agricultural professionals, who are able to address current local and global challenges affecting small scale agriculture (Kroma, 2003; Maguire, 2012).

Fortunately, since the 2000 World Bank report calling for more investment for rural development, agricultural growth has become a top priority on the global development agenda (World Bank, 2007). Allied with that in 2002, the African governments ratified the Comprehensive Africa Agriculture Development Program (CAADP), which calls for more investment and broader reform in agricultural research, extension, and education systems to achieve agricultural innovation in Africa (World Bank, 2007). While there are many works in the literature that acknowledge the imperative of AET and extension linkages for agricultural innovation, practical examples or models demonstrating how multiple actors initiate and institutionalize that linkage leave a lot to be desired. In this respect, the innovation system approach – that places emphasis on the role of diverse actors and interactions within complex systems of innovation, and the institutional context within which these processes occur – could contribute to AET reform efforts. That is, a study aimed at AET reforms that adhere to an innovation system approach could yield a context suitable model because the innovation system approach, unlike conventional research, addresses a number of interrelated issues in the national agricultural innovation system, such as how organizational cultures change, how knowledge networks form, and how these processes combine to enable rapid organizational and technological innovation.

However, empirical evidence is yet to be developed on how an innovation systems approach can contribute to AET reform efforts in the global south, especially in sub-Saharan Africa (Spielman et al., 2008). The efforts made to reform AET institutions (for example, in SSA) have focused on structural change, investment in infrastructure, and decentralization of financial administration. System-wide reform has been overlooked. AET in SSA continues to operate in isolation from key actors in the national agricultural innovation system, posing challenges for its products (research and graduates) to be relevant in agricultural development efforts (Spielman et al., 2008; APLU, 2014; Vandenbosch, 2006; World Bank, 2007).

Some developing countries such as “India, Malaysia, Brazil, Chile, and the Philippines have achieved notable successes in establishing productive AET systems” (World Bank, 2007)

that continued funding in agriculture beyond the 1970s and have managed to train competent agricultural professionals who enabled their countries to be globally competent in agricultural innovation (Maguire, 2012). For SSA countries, which are still lagging behind in agricultural innovation, there are lessons to be learned from these countries to reform AET institutions and extension linkages and hence train competent agricultural workforces in the way it fits demands of diverse actors (small farmers, private farm firms, and youth). Some empirical studies already suggest that there should be “innovation at the policy, institutional, and program level” to enable AET to produce demanded human resources (Rivera & Alex, 2008).

The remainder of this paper, therefore, does the following: critically reviews developing nations’ experiences about attempted linkages between AET and extension systems at multiple scales and levels in different countries; examines strengths and weaknesses; and finally draws lessons for pathways toward strengthening linkages between AET institution's teaching and extension.

## Literature review

### Overview of persisting challenges of AET in Africa

Africa's, especially sub-Saharan Africa's, significant advance in development heavily relies on the growth of its agriculture (World Bank, 2007). The agricultural growth in Africa, in turn, faces opportunities as well as challenges in the dynamic global economy of the 21st century. The crucial role of AET in determining the success of efforts to boost agricultural productivity is widely recognized. However, AET is not realizing its potential contribution (Vandenbosch, 2006; World Bank, 2007). This literature review identifies various interlocked challenges for persistent failure or underachievement of AET institutions in the global south, especially in Africa. These include: fragmented governance structures; outdated and rigid curricula; traditional/inadequate teaching methods; declining and distorted enrolment profiles; and inadequate physical, financial and human resources both in terms of numbers and quality (APLU, 2014; Maguire, 2012; Rivera & Alex, 2008; Spielman et al, 2008; Vandenbosch, 2006; World Bank, 2007). This section discusses identified challenges and respective plausible solutions for each challenge, focusing on the most relevant ones within the scope of this paper

### Inappropriate or fragmented governance structure

Lack of strong leadership and efficient organizational structures are often cited in literature as being among key factors underlying an AET institution's relevant contribution to

the national agricultural innovation system. These challenges range from the broader system level to the individual institution, to the schools and departments within an institution. At the system level, AET in Africa suffers from highly divided and centralized governance structure. At the individual institution level, leadership has limited authority to institute significant change in their institution or to develop strategies appropriate and viable for local circumstances. This in turn limits the liberty to innovate for institutional development and problem solving faced by the institution (Spielman et al., 2008; APLU, 2014; World Bank, 2007) .

The apparent challenge of divided and highly centralized administrative structure throughout AET systems in Africa is attributed to flaws in national policy (Maguire, 2012; Spielman et al, 2008; World Bank, 2007). At the national level some AET institutions are placed under ministries of education, while the graduates are produced to serve the needs of agricultural ministries. This makes coordinated policies and funding difficult (World Bank, 2007). For example, Maguire (2012) vividly identified the following issues: “weaknesses in policies that guide AET, the [inter-ministerial] divided responsibilities for parts of the AET system, poor governance of AET institutions, continuing isolation of AET systems from key stakeholders, and serious underinvestment in AET systems.”

According to Maguire, the above challenges are external to AET and emanate from weakness of the national policy environment. That is to say, it is policy makers, who facilitate designing AET working guidelines, reinforce inter-ministerial collaboration, enact good governance structures, allocate funds, and facilitate AET linkage with other stakeholders and so on. In connection to this Eicher (2006) noted the neglect of the agricultural sector (i.e., including AET) by the political system in many African countries as indicated by insufficient funding levels.

The subsequent effects of external or broader governance challenges on AET institutions have resulted in a number of internal weaknesses at institutional and operational levels of AET. At the institutional level, the biggest problem is inappropriate governance structures that disable all levels of AET institutions from autonomously managing their financial and human resources. The bad governance often results in “over-control by central administrations, lack of freedom and incentives to innovate, isolation from national development strategies and lack of accountability” (Johanson & Shafiq, 2011). As a result of these flaws in institutional systems, empirical study shows “declining enrollments, professional



isolation, narrow and outdated curricula, inadequate staffing, and insufficient pedagogical inputs” at operation level (World Bank 2007). AET institutions are not well linked to each other (formally or informally), resulting in duplication of efforts. They are also poorly connected to international sources of knowledge (APLU, 2014; Vandenbosch, 2006; World Bank, 2007). Within the AET institution level, the structure is divided among disciplinary departments with limited cross-disciplinary interactions, limiting the shared understanding of practical application of scientific findings (Spielman et al., 2008).

Moreover, lack of management information systems (MIS) in Africa has impaired AETs to provide comprehensive, reliable and updated information on the curricula, educational planning, training areas, administrative and financial data, administrative staff records, the career of the researcher teachers, the management of the student flow, and the integration of the graduates into the labor market (NEPAD, 2014).

#### Outdated and rigid curricula

It is often cited in the literature that AET curricula in Africa are narrowly focused, outdated and rigid in responding to the emerging needs of the agricultural environment and the overall economy. The content of Africa's AET curricula are narrowly focused on production, implying the disconnect from the current reality faced by the economy (Vandenbosch, 2006; World Bank, 2007). African agriculture is going through significant change in a global economy. The spread of commercialization, trade liberalization, and technological advancement have created both opportunities and challenges for smallholder livelihoods (Rivera and Alex, 2008). In the globalized economy, food processing, storage and marketing are aspects of the production process that have become increasingly important to agricultural producers. The issue of sustainable use and conservation of natural resources has also become a priority concern (Vandenbosch, 2006).

Thus, in order to make a greater impact on increased rural productivity and growth, AET curricula should cover more than simply production technology, implying that for AET curricula to be relevant it should expand to include agri-business, entrepreneurship, rural finance, agricultural processing, food processing and marketing, post-harvest technologies, distribution of agricultural products, and the sustainable use and conservation of natural resources (Spielman et al., 2008; Vandenbosch, 2006; World Bank, 2007). For example, in order to respond to these challenges and opportunities, small farmers currently need skillful and

flexible agricultural extension agents, who not only have conventional technical knowledge, but also are equipped with “soft skills, such as leadership, communication, negotiation, facilitation, and organizational capabilities” to broker networks of small farmers and other value chain actors throughout the agricultural innovation system (Maguire, 2012).

The most frequent challenge posed concerning the relevance and quality of Africa's AET curricula is attributed to stagnant mindsets. Initially (i.e., during colonial and post-colonial independence periods), AET curricula were designed with the assumption of producing graduates for the public sector, mainly agricultural ministries. This is in contrast with the rapidly evolving trends in the labor market. The public sector used to absorb the large majority of graduates of AET in sub-Saharan Africa. This is no longer the case. Educational reform has not kept pace with new and emerging requirements of rural young people and has not been linked to overall sectoral and macro-economic agenda or with local agricultural needs. AET has not been re-oriented towards entrepreneurship and the private sector. As a result, it is increasingly difficult for many graduates to find employment (Vandenbosch, 2006).

The challenge of relevance of curricula to emerging need is not exceptional to AET institutions. It cuts across all types of higher learning institutions in Africa as clearly noted by a recent USAID-funded study:

A key challenge to African higher education relates to the relevance and quality of the curriculum. Often a carryover from colonial times or from the early years of post-independence when curriculum was first developed in many institutions, the curriculum has by and large not sufficiently evolved to prepare graduates adequately for the contemporary job market. Curriculum reform in many African countries has been a slow, burdensome process due to the problematic governance structures of higher education systems.... (APLU, 2014, p. 42)

In general, lack of relevance to local and regional development priorities and inadequate adaptation of curriculum to the national context are among the mounting criticisms of current curricula in African higher learning institutions. In this regard, African institutions are not set up to be responsive to the needs of an evolving labor market. Most institutions do not have mechanisms to incorporate private sector, government, or other external stakeholder input into curriculum development in a way that would provide the institutions with information about the knowledge and skills students will need upon graduation (APLU, 2014, p. 42).

### Traditional/inadequate teaching

Teaching and learning methods and materials in African AET institutions are very often outdated and inadequate (Vandenbosch, 2006). An empirical study by the World Bank (2007) reported that with the exception of a very few cases, most teaching in agricultural education in Africa is comprised of “chalk and talk” presentations of theory and facts. The instructors deliver knowledge and information to students as passive recipients. Students have little opportunity to develop technical competencies, problem-solving experience, or organizational skills. Adhering to the linear model of technological innovation, the graduates then go out to instruct farmers on what they should do, with the risk that the classroom instruction may not be relevant to the specific problems confronted by the farmers.

The dominance of abstract theory and neglect of practical teaching and learning components in AET implies the lack of strategic link between the three mandates of AET institutions - teaching, research and extension whereby (for example) the theoretical content can be enriched with local authentic examples from research results; and student practical learning can be attached to the AET's extension service. In connection to this Spielman et al. (2008) indicated that the AET system in Africa is tied to teaching and research approaches that are organized along a linear vision of science--a vision that subdivides faculties into strict disciplinary departments, provides minimal incentives for understanding the wider demand for scientific applications, gives the greatest importance to theoretical research, and discourages interactions with innovative actors outside academia.

In general, with the exception of a few emerging good practices, the prevailing situation of teaching and learning in Africa's AET system is in sharp contrast with the emerging and needful paradigm of teaching and learning. Linking classroom learning to the root context of the working environment has become the defining feature of the emerging paradigm of quality teaching in the twenty-first century. Graduates are expected to operate in complex, interdisciplinary, dynamic, and uncertain working environments. The mode of learning at university will need to equip students with appropriate skills, knowledge, values, and attributes that will enable them to succeed in such challenging working environments. To this end, there is a strong drive to build and create knowledge together with an understanding of working life and to reformulate the concept of knowledge in learning situations. Tighter connections with

working life through different academic projects provide authentic opportunities to learn both generic and professional competencies (OECD, 2012).

#### Crisis in staffing and lack of facilities

Academic staffing is among the serious challenges faced by African higher education institutions (HEIs) in general and agricultural faculties in particular. Currently the African HEIs, especially the agricultural faculties are grappling with limited staff for teaching and research, both in terms of quantity and quality. Senior qualifying faculty are leaving for more rewarding jobs and have been replaced by junior lecturers. Poor incentives in terms of salaries, benefits, and research support services are among factors contributing to the eroding of academic staff numbers and quality (Spielman et al., 2008; APLU, 2014; World Bank, 2007). The condition in the future is expected to worsen given the projected large number of senior staff nearing retirement (APLU, 2014).

The lack of modern facilities for teaching and learning such as laboratory, classrooms, computer and internet connectivity (such as for an e-learning facility) is often indicated as a problem for most AET institutions across Africa. In addition, limited finance to invest in modern facilities and staff skill development (example, in using modern technologies such as an e-learning system) remains to be a challenge (Spielman et al., 2008; APLU, 2014).

#### Attempted reforms and outcomes

Pertaining to the above challenges, in general, the literature shows that there are signs for growing interest and some degree of AET system reform in sub-Saharan Africa. For example, the 2003 Jinja Consensus (as indicative of magnificent vision of reform) aimed at establishing a new African University to produce entrepreneurs and the establishment of an African center of excellence are often mentioned in the literature (Spielman et al., 2008; Vandenbosch, 2006). However, the majority of reforms are structural in nature, giving primary attention to infrastructure, administration and financing. But, there is limited empirical evidence to suggest that such reforms have been successfully adapted to the specific context of sub-Saharan Africa, implemented in ways that produce long-lasting organizational change, or generated positive impacts on agricultural development, poverty reduction, and economic growth. These reforms have also contributed little to creating innovative AET systems responsive to emerging challenges as well as opportunities (Spielman et al., 2008 p 3).

In only a few cases has priority been given to the creation of more dynamic, responsive and competitive AET systems by introducing new and different educational approaches and learning philosophies, by supporting new organizational cultures and practices, or by building networks that link a wider range of stakeholders in the agricultural innovation system. Added to that, few reforms are sufficiently geared to complement parallel reforms occurring in sub-Saharan Africa's research and extension systems; few AET reforms are being conducted through consultative processes that result in some degree of coordination and creative engagement with actors in agricultural research organizations, extension service, and the private sector. Thus, it remains unclear whether these initiatives are the beginning of a substantial transformation of AET systems, or are just isolated experiments (Spielman et al., 2008, p. 6). The recent study by the Association of Public Land-Grant Universities (APLU) (2014) reported that the AET or institutions of higher learning in Africa remain to be under the influence of centralized administrative control, isolated from new knowledge sources, and tied to traditional teaching and research, confirming that key underlying challenges remain unresolved, at least for the majority of AET.

In general, it is widely agreed that reforming AET in Africa calls for both addressing structural and other challenges underpinning their poor performance or underachievement in the national agricultural innovation system. To this end, alternatives have been suggested based on successful experiences from developing countries such as India, Brazil, Philippines and Malaysia showing that productive AET systems are possible. Their success has been attributed to: (i) political support and commitment to investing in agriculture and accomplishment of necessary reforms; (ii) increased and sustained public investments; (iii) integration of different ministries and agricultural learning institutions under the umbrella of a national innovation system (linking education-research-extension as a single entity) to reduce transaction costs, balance investment in education-research-extension and increase efficiency; (iv) sustained reforms in AET for many decades in order to achieve intended returns; (v) aggressive investment in human resource development; and (vi) autonomy/no political interference.

Internally, a capacity to respond to changes in the economy and hence demand is more likely to be achieved where the AET institutions have a large degree of operational, financial and governance freedom (Ashworth, 2005). APLU (2014) also recommended the need for flexible financial management. Thus, at institutional and operational arenas, to tackle broken linkages

between AET institutions and extension service providers, Rivera and Alex (2008) have recommended public-private partnerships. They suggested that an initiative for collaboration with AET may come from private and/or public sector based on comparative advantages of extension functions. For instance, a public sector ministry of agriculture might contract with a university for an in-service training course for extension agents or might enroll them in a higher education distance learning program. This, in turn, may depend on the advantage that the two enrollment options (in-service training or distance learning) may provide to the extension agents with respect to the extension service the sector intends to provide to its clients. Similarly, if a private seed supplier needs in-service training on seed quality for its staff, it should collaborate with relevant AET institutions (for example, entering into contracts). Furthermore, AET institutions, either public or private, should design course curricula beyond agricultural production such as “agricultural business, farm management, entrepreneurship, marketing, organizational skills and knowledge, management, and program development” (Rivera & Alex, 2008). In addition, as experiences from successful countries like India indicate AET institutions should forge a diverse set of program delivery mechanisms (e.g., continuing education, modular courses, and distance learning, non-formal adult education techniques, etc.) to meet learner and employer demands (Rivera & Alex, 2008; World Bank, 2007).

Vandenbosch (2006) also recommended diversifying funding sources, providing support to educators, changing demands in the region’s labor markets (e.g., combining school-based learning with apprenticeship training), and the need for closer school-community linkages (e.g., transforming educational institutions into multifunctional community learning centers).

Spielman et al. (2008) recommended application of the innovation system perspective to reform AET in SSA, not as substitute but to complement ongoing structural reforms, although empirical studies to guide application of this perspective in the context of SSA AET is still lacking. That is, AET reform in the region needs to: more closely examine key challenges underlying innovative capabilities among both individuals and organizations; create organizational cultures in AET that are sufficiently open and dynamic to facilitate change; and build innovation networks, partnerships, and linkages to foster greater adaptation, imitation, and use of available information and knowledge. The detailed recommendations, which could not be presented here, covers key challenges of AET. For example, among innovation networks indicated by the authors were included programs that link farmers with students and educators,

allowing for synergistic interactions that promote multidirectional flows of knowledge, both modern and traditional. This includes fostering stronger linkages between formal AET organizations and national extension systems (in all their plurality—public, private, and NGO) to bring students and educators into closer contact with farmers.

In general, it is widely agreed in literature that interventions designed to strengthen AET systems are long-term undertakings (Eicher, 2006; Maguire, 2012; Spielman et al., 2008; World Bank, 2007). For example, Spielman et al (2008, p. 8) indicated it is “only through a long-term outlook on change can AET systems contribute to the development of more dynamic and competitive agricultural economies that engage farmers, entrepreneurs, extension agents, researchers, and many other actors in a wider system of innovation.” Relevant to the themes of this research is that all authors recommended the need for linking education and extension.

#### [Attempted good practices demonstrating potential pathways to improve the link between extension and education](#)

From the argument in preceding section, linking extension and education in AET is imperative to address the key challenges faced by AET in making concrete contributions to the agricultural innovation system; that is: linking extension and education enables AET institutions to strategically position their role in agricultural innovation systems (AIS) in terms of generating problem solving research that meets priority stakeholder needs, and producing graduates with the skills to make concrete contributions in a work environment. The good practices linking extension and education found in this review include: establishing university processes for linking extension and education from the outset; designing tailor-made programs; improving curricula and delivery of existing programs; and reforming system level constraints on linking extension and education for agricultural universities.

#### [EARTH University, Costa Rica: A new kind of agricultural university](#)

EARTH University is an example of an institution that was newly developed to address the need to educate and train young people to deal with the region’s (the humid tropics) numerous agricultural, social, and political problems in rural areas. Its model blends academic work with practical experience and collaboration in agrarian communities and agribusiness. It is a private, non-profit, international university and was established in 1990 with the support of the Costa Rican Government, U.S. Agency for International Development (USAID) and the W.K. Kellogg Foundation (<https://www.earth.ac.cr>). It has an international faculty, a student body originating from 25 Latin American and Caribbean countries and a small number of

students from Africa. It is small with 400 students and 40 faculty members. The university's 3,300-hectare farm is used for training as well as commercial, income-generating crop production (Maguire, 2012).

#### *Theory of EARTH University*

The mission of EARTH University is to create the type of leader capable of responding to the social and environmental problems facing rural communities of the humid tropics. For this purpose, EARTH developed a unique educational model based on four pillars: technical and scientific knowledge; development of social and environmental awareness and commitment; personal development (attitudes and values); and entrepreneurship. The other unique components of EARTH's education model are: curriculum structured with balanced theory and practice; and a dynamic, participatory, student-centered, experiential learning based teaching and learning process (<https://www.earth.ac.cr>).

#### *Responsive curriculum and experiential based learning*

EARTH University was established in response to urgent problems in Central and South America, including rural poverty, high population growth, low productivity, migration to cities, destruction of fragile ecosystems, and political instability and war throughout the region. In addition, the establishment of EARTH University coincided with the 1980s structural adjustment programs and other changes that had largely eliminated the possibilities of graduates' (in agronomy and other fields) employment in the public sector. To this end, providing graduates with entrepreneurial skills and abilities became fundamental to EARTH's program (Maguire, 2012).

The five keystone programs (Maguire, 2012) within EARTH's curriculum are based on experiential learning and bring students and educators into closer contact with agricultural communities (farmers, agribusiness and NGOs). The programs provide the students opportunities to develop planning and leadership skills, foster responsibility, encourage them to become decision makers and critical and creative thinkers, improve their ability for analysis, synthesis, and evaluation, and apply technical and scientific knowledge in real situations. The agricultural communities benefit from the interaction.

#### *Impact of EARTH program*

In 2012, alumni survey results reported that the graduates are having: (1) social impact through job creation, workplace improvements, volunteerism (active volunteers in their



community), and improvement of living standards through farmer training; and (2) environmental impact through waste management, organic farming, and biodiversity conservation (EARTH University website: <https://www.earth.ac.cr/en/alumni/impacto-de-graduados/study-results/>). Another recent study by EARTH University (2014a November) that sought to measure the impact of graduates through personal interviews with alumni, their families, co-workers and employers reported overwhelming positive results confirming that “the University’s focus on innovative, experiential education and emphasis on values are essential to creating ethical leaders for a better tomorrow” (p.2). According to this study, one of the most important findings is that 97% of the graduates have returned to their countries of origin, fulfilling their promises to “go back and give back.” The study also reported, “85% of graduates are fulfilling EARTH’s mission by promoting both cultural diversity and social equality in their companies, while 74% of alumni are positively impacting biodiversity conservation” (EARTH University, 2014a November, p.2). One alumnus, Edilberto “Eddie” Romero, expressed the quality of training and how that changed his life:

I remember the quality of the professors and the classes that they gave us, the practice in the field and above all, being able to learn from my teachers as well as my classmates....EARTH opened up a path for us where we learned theory in addition to practical skills. I learned to value the knowledge of the communities, and I can say that working in the community opens up your heart and helps you to see life differently. Also, the classes that were focused on protecting the environment showed me another aspect of agriculture, which led me to complete a master’s degree in Natural Resources Economy. Today, my job is centered on production, conservation and sustainable development—and it all started at EARTH. (EARTH University, 2014b, p. 4)

In general the success of EARTH is attributed to the above mentioned innovative educational model as well as other factors which include: staff incentives to apply participatory teaching, engagement in research and extension, a favorable student/staff ratio allowing high interaction, and investment in infrastructure (Maguire, 2012).

#### Chiang Mai University, Thailand

Initiated by a single department using locally available resources, University of Chiang Mai developed a highly influential learning and research model, the Community-Based Research (CBR) program, that integrated faculty, students, and rural communities (Maguire, 2012).

Maguire (2012) reported that the CBR benefits all stakeholders. Feedback from the community experience continues to influence the university's research focus, its curriculum, its role in the AIS, and its international standing. The process involved for the achievements is described below.

The CBR program was initiated through the Department of Agricultural Extension in the faculty of agriculture. In 1990s, this department realized the isolation of students and faculty from rural living conditions, technical agricultural challenges, and social problems. The university had little contact with communities, and had placed heavy emphasis on classroom learning, literature reviews, and laboratory experimentation. As a result, many undergraduates had little capacity to analyze and synthesize information on social situations or conduct community-based research, and their facilitation, communication, and writing skills were poor.

In 1996, the Thailand Research Fund (TRF) had resources to support a Community-Based Research (CBR) program to answer the question: "How can research findings be used by local people - the users of research results?" By 1998, the Agricultural Extension Department realized that the CBR projects could provide an opportunity for students' practical learning experience. To this end, the department integrated student learning with CBR through a number of initiatives. Students enrolled in Extension Communications, visited active CBR projects, and as an exercise were asked to write an article on their observations and village issues, produce a script to be broadcast over community radio, or submit an article for community newspapers. Students specializing in Media Production for Extension visited CBR projects and developed media products that reflected the needs of community researchers, such as posters, newsletters, photographs, DVDs, and radio programs. Graduate students enrolled in Agricultural Communities Studies did the following: undertook study visits to CBR communities; participated in discussion and dialogue; listened carefully when interacting with CBR researchers, counselors, and staff; took detailed notes; and produced a review of their visits. The materials produced, together with their experiences in the communities, formed the basis of their theses topics.

In cognizance of the potential of the imitative, further efforts were made to expand the experience to other programs in the faculty of agriculture. This required overcoming challenges of financial support and collaboration from organizations inside the university (university's Student Affairs Unit and Practical Training Unit), with the communities, and the support of the

research funding agency. To this end, a program specific to the university—the Research Management Fund—was established in 2002 with support from TRF to foster wider collaboration among the faculty of agriculture, TRF, and CBR communities for integrating teaching/learning, research, and community service. The ultimate objective was to create a learning community of undergraduate students based on CBR projects. To reach this objective, a Center for Community-Based Research was established in the Faculty of Agriculture to develop CBR projects as a means of empowering community researchers. In 2003, 11 CBR projects were developed.

The involvement, right from the start, of the university’s Student Affairs Unit and the Practical Training Unit in launching student practical training ensured the required support from these units. The involvement of staff from the Practical Training Unit provided the chance to learn, for the first time, how to organize such training in rural communities and how to communicate with community members and undergraduate students. A practical training manual was prepared for the program. As a result, the Faculty of Agriculture has allotted an annual budget for this training activity. It was also the first time that communities had hosted 30 university students for a five-day visit, helped organize the practical training program, and interacted closely with such a group of visitors. For the students, the visit was a true learning experience. For the first time, students lived with rural families, communicated, understood the realities of rural life, and appreciated the value of local wisdom in dealing with livelihood issues.

#### *Impact of CBR program*

The program has had the following impacts:

- Improved awareness among students and faculty on how isolated the university had been from life in rural communities.
- Research has become more focused, and the curriculum reflects the knowledge and skills needed by graduates who will meet technical and social needs in rural areas.
- The university, through its faculty and students, has gained visibility and stature among its stakeholders and has become an active AIS actor. By 2007, 650 CBR projects had been funded with grants from TRF, and 264 had been implemented, facilitated by the core research team that runs the Center for Community-Based Research.
- Collaboration between the center and the Practical Training Unit in the faculty enabled students to undertake “practical training” in communities.

- Collaborative interaction among students, the Faculty of Agriculture, the Center for Community-Based Research, the TRF, and local communities, benefited all. For example, research problems identified by community members have increased the effectiveness of the students' clubs. Local communities have increased their ability to manage "student practices" as a vehicle for identifying community problems, to analyze causes of problems, and to develop solutions through a participatory research process in which students and faculty become their co-researchers.

#### India's state agricultural universities (SAUs)

India's state agricultural universities (SAUs) are an example of system-wide change to improve the AET role in AIS. India's first state agricultural university (SAU) was established in 1960 at Pantnagar in Uttar Pradesh. Currently, all states have at least one SAU, with state-wide responsibility for agricultural research, education and training or extension education. They receive funding support from regional and national levels, and also from other organizations. At the national level, the agricultural university system is coordinated by the Indian Council of Agricultural Research (ICAR), which is also a source of research funding for the universities. The SAUs have significantly contributed to Indian agricultural development. The green revolution, with its impressive social and economic impact, witnessed significant contributions from the SAUs, both in terms of a trained, scientific work force and the generation of new technologies (Tamboli & Nene, 2013). In the 1990s, ICAR realized the decline in the SAU system. As a result, ICAR approached the World Bank to reestablish SAUs as a center of high quality agricultural education. To this end a six-year project (1995–2001), supported by the World Bank and the Indian government was initiated and implemented (Maguire, 2012).

The SAUs envisaged system-wide reform seeking improvement at policy, institution, and program levels. For that purpose, the project intervention considered reform through its four major components: (1) university programs; (2) strengthening ICAR; (3) in-service human resource development and human resource management; and (4) manpower needs assessment. Through these components, the project intervention aimed to modernize administration and management, update curricula and pedagogical approaches, upgrade teaching materials and laboratories, set new norms and standards for higher agricultural education, and improve human resource management in state line departments working closely with the agricultural universities (Maguire, 2012). Maguire (2012) indicated that the aims of the project and delivered activities are innovative. Rivera and Alex (2008) indicated that reform at policy,

institutional, and program levels are the requisite innovative action to enable AET to respond to the challenges of the 21st century.

The ICAR and state level human resource management components directly dealt with some aspects of policy level reforms. Within the ICAR capability strengthening component, the project aimed to establish norms and standards in agricultural education and monitor compliance with these standards. To this end, the Agricultural Education Council was established, ICAR's Education Division was strengthened, and the Norms and Accreditation Committee was restructured. The other two components focused on upgrading human resource management at the state level, which included: (i) In-service Human Resource Development and Human Resource Management programs in 14 line departments that worked closely with SAUs; and (ii) a manpower needs assessment, involving the establishment of broad-based Manpower Advisory Councils to sponsor rigorous studies of labor-market requirements and trends (that is, to begin developing labor-market intelligence) within each state. This support involved training focused on job-oriented needs; systematic training needs assessments; training of trainers; evaluation of training effectiveness; better instructional facilities; and improved management of state agricultural employees. Data from the studies were expected to provide state authorities and university officials with technically sound information for crafting public policy, academic programs, budgets, and adjustments to university intake numbers (Maguire, 2012).

The above indicated components are also among specific policy level innovative actions indicated by Rivera and Alex (2008). Forging public-private cooperation and designing a system to diagnose and communicate agricultural human resource needs to AET institutions and policy makers are indicated as the required innovative action at policy level. For example, for diagnosis of human resources there is a need for improving managerial and technical capacity to ensure quality in the system among other requirements. Spielman et al. (2008) also indicated the importance of reform aimed at improving individual as well as organizational innovative capacity.

For the university program, the reform process was initiated with four universities (one each from Haryana and Andhra Pradesh and two from Tamil Nadu) to demonstrate the effect of reform in other universities across India. The project intervention with these universities sought to improve curricula and syllabi, improve faculty quality, revitalize teaching methods,

organize faculty exchanges within India and with foreign universities, modernize university administration and management systems, upgrade infrastructure (teaching laboratory equipment, computer systems, communications, farms, libraries, and hostels), and establish placement centers and programs for student attachments to agro industries. The project also promoted initiatives to involve university clientele more in university management and programs and improve education-related financial management (Maguire, 2012). In this regard the key elements as requisite for institutional and program level reform indicated by Rivera and Alex (2008) were addressed. These authors noted that at the institutional level reform generally should include investment to improve infrastructure and client orientation - focusing agricultural educational institutions on client interests and needs. According to these authors, client orientation requires a shift from the top-down decisions on educational content and delivery methods to a more responsive and flexible institutional culture of serving the client. Client orientation also requires forging multiple institutional linkages. If done effectively, multiple institutional linkages enhance the relevance of the AET institution, builds political support, expands influence and reach, and provides opportunities for cost recovery and income. At the program level, the needed reform direction includes designing a system that allows participatory, problem-solving and location-specific education services (Rivera & Alex, 2008).

#### *Impact of India's SAUs*

The quality and relevance of higher agricultural education was improved by establishing an Accreditation Board, demand-oriented curriculum reforms, and complementary investments in staff training and educational infrastructure.

- A participatory system of institutional accreditation was developed, and ICAR was implementing it throughout the SAU system.
- Academic norms for all undergraduate and postgraduate programs were revised and implemented.
- Education programs were more relevant: curricula were updated; new courses were introduced; and, coursework was broadened to include skills-oriented, hands-on training programs developed through wide consultation with stakeholders. These changes were reported being reflected in new and improved teaching materials (laboratory manuals, course modules, textbooks, and so forth) and methods, along with substantial

investments to train research and teaching faculty and upgrade classrooms, laboratories, libraries, and IT facilities.

- In-service training improved in quality and relevance through the establishment of needs-based training programs, greater client involvement (farmers, agro industry, input suppliers, and others), modernized training facilities, and investments in staff training. Improved training programs and the adoption of more effective practices to disseminate agricultural technology appear to have improved extension performance.
- The capacity of participating states to develop and manage agricultural human resources was enhanced by the creation of skills, institutional capacity, and infrastructure. These new resources enabled line departments to assess their human resource development needs, formulate and implement human resource management plans, provide in-service training, and liaise with other relevant institutions.

#### *Weaknesses*

In general, the study reported the project achieved its development objectives. Yet the outcomes of the project were reported being less-than-satisfactory outcomes due to project design flaws. In this regard, the evidence from the study implies that the impact of the project is inconclusive in the absence of substantial data establishing project achievement in institutionalizing and sustaining the reform. When the project ended, changes in institutions and procedures, including managerial and administrative changes, were partly internalized, and the relevant stakeholders favored continuing the reform program (for example, by addressing governance reform and individual performance incentives). Staff from SAUs and line departments reported a greater sense of achievement and job satisfaction. Overall, the sustainability of the project was rated as “likely.” The likelihood of a follow-up project provided incentives to continue project activities. However, these expectations were not fulfilled. A second phase of the project, which would have institutionalized the reforms, was never funded.

The other reported weaknesses of the project intervention are: (i) the manpower needs assessment was not satisfactory; data were delivered late and were not used; (ii) the content and style of teaching did not change in any substantial way, even though trainers were using more instructional aids; and (iii) human resource management - intended to make training more meaningful in the state line departments that worked closely with the SAUs - proved more difficult to manage than expected, because the universities and line departments were administratively separate.

A study conducted after a decade from the time period of the project intervention (albeit no specific reference is made to the project intervention) implies that the project's innovative actions have not been sustained and/or expanded to the SUA system (as intended by the project). This study acknowledged that "[in] the first green revolution, SAUs played a key role in generating technology and taking it to end users through effective integration of education, research, and extension. During the past 2-3 decades, the journey of higher agricultural education (HAE) got interrupted and SAUs are on fast track of deterioration" (Tamboli & Nene, 2013, p. 251). Among the specific challenges faced by SUA reported by the study include: difficulty in attracting first class students; funding problems; lack of autonomy of the Vice-chancellors (i.e., the Vice-chancellors are not consulted in budget allocation by the state, high state political interference, no autonomy to appoint and promote faculty); lack of networking and public-private partnerships, poor state-center and state-SAUs relationships; traditional teaching methods; curricula not responsive to the needs of the private sector, etc. (Tamboli & Nene, 2013). Another study also shows a disappointment with the past 50 years' success indicating a variable track record of the 42 SAUs in terms of quality and the ability to mobilize financial support, and that many of the SAUs are in need of reform (Eicher, 2006).

#### [Intervention in Agricultural Universities in Egypt](#)

The intervention in the Agricultural University of Egypt is an example of curriculum level change to strengthen the link of universities to the innovation system. This intervention, curriculum change, was initiated following the falling enrollments and mismatch between graduates' skills and labor-market requirements. This was implemented in five agricultural universities in Egypt by the Institutional Linkage Project, a component of the USAID-funded Agricultural Exports and Rural Income (AERI) project. The project's strategy was to strengthen connections between important institutions in the innovation system (universities, private firms, and commercial farms) while transforming academic programs. Innovative elements in the design and implementation of the project include: leaders from the academy and the private sector participated in a Steering Committee that guided the project's implementation; a skill gap analysis identified knowledge and skill deficits in graduates; academic staff participated in redesigning and improving courses and learning materials; university deans and private sector leaders gained firsthand views of overseas university systems; external Advisory Committees were created and provided feedback on sector development and labor-market needs to



university management; and student internship programs were developed. The contribution of these elements in achieving project strategy is listed below.

- A Steering Committee of Egyptian academic and private sector leaders guided planning and implementation of the project's capacity-building component, bridging the gap in understanding and cooperation between the private sector and the participating institutions.
- Based on a skill gap analysis that revealed the human resource needs of private employers and the corresponding weaknesses in academic programs, faculty updated core courses and made them more consistent in content as well as in academic standards.
- The project also trained faculty, instituted active learning and recognition of good teaching, and improved the use of teaching aids. In this regard, the intermediate project evaluation reported that the vast majority of training participants (93 percent) intended to modify their teaching methods in various ways, by promoting greater student teacher interaction, encouraging more use of the Internet, making courses more market driven, bringing in more guest lecturers, stressing practical applications, increasing field visits, and promoting more team-based learning.
- An overseas study tour formed the basis for significant institutional changes in the participating universities (for example, the universities organized external advisory committees to provide feedback on sector development and labor-market needs to university management).
- The universities also established internship programs and career resource centers. Additional links were forged between the university and others in the AIS through the establishment of extension-outreach centers, which enabled universities to provide direct assistance to communities and, in turn, learn about real community needs.

The main lesson from the design and implementation of this project is that curriculum reform is complex (see also the box below), involving many aspects of the academic program, the university administration, and stakeholders. For example, a revised or updated curriculum without improved teaching materials and appropriate pedagogical skills is unlikely to have much impact. The benefits of a revised curriculum will not be sustained unless the curriculum keeps pace with stakeholders' evolving needs. Key stakeholders inside and outside the university must

contribute their perspectives on the knowledge and skills needed in a developing agricultural sector. To ensure support for curriculum change, teaching staff, administrators, and stakeholders must be consulted and engaged as partners in making the desired changes. The other important lesson that can be learned from this experience is that project interventions need to be flexible in achieving the intended goals. For example, in this case, the skill gap analysis demonstrated the need for the universities to change their curricula, but that was found to be difficult in view of the time and effort needed for the Supreme Council for Higher Education to approve the modifications. As an alternative strategy, the basic structure of the curriculum was retained and individual courses were modified to reflect the current knowledge base in each field of study. The focus shifted to updating basic course content and teaching methods and developing common academic standards across all five universities, especially for the common core courses.

Overall, the intervention achieved impressive reforms in improving the contents of the curriculum, capacity building for academic staff, and improved links to agribusiness. However, the question of whether these five universities can sustain their efforts appears unanswered. One approach to ensure institutionalization of the reforms would be for the project to include a mechanism for continuing high-level dialogue with stakeholders.

#### The Innovative Mid-Career BSc Agricultural Extension: Sasakawa Africa Fund for Extension Education (SAFE) Program

The Mid-Career BSc Program in Agricultural Extension is an example of program level initiatives. With support of the Sasakawa Africa Fund for Extension Education (SAFE), an innovative Mid-Career Agricultural Extension BSc Program launched first in Ghana in 1993 currently (by the time of this review) expanded to 9 African countries in 20 universities and colleges, including Jigjiga University of Ethiopia that launched the program in November 2015. The program was initiated to fill the gap in skilled manpower for the extension systems of targeted African countries. With over two decades of experience, the program has been addressing the challenges which higher learning institutions often fail to address. In this regard, the SAFE program is known for its dynamic and innovative approach in revitalization of the relevance of curricula to emerging needs; innovative delivery that provides program graduates to obtain skills that enable them to make concrete contributions in practical life; forging strong partnerships between universities, employers, and the agricultural industry (Mutimba, Knipscheer, & Naibakelao, 2010).

The evidence reviewed and elaborated here shows the potential of the program in addressing the challenges indicated in the preceding sections. Unlike the other good practices reviewed above, the reviewed studies on the SAFE program were comprehensive in including key stakeholders of the program: graduates of the program working in government (such as Ministry of Agriculture) and non-government; employers; and farmers. To this end we found it is worthwhile to first indicate the overarching theory of the program, followed by empirical evidence on program impact, and finally, potential challenges to sustaining program quality.

#### *Theory of SAFE program*

The main aim of the SAFE program is to produce graduates with the requisite human relations, methodological and technical skills that can assist farmers. The pillars of the SAFE initiative are the principles of lifelong learning, demand-driven curricula, student-centered experiential learning, and rural leadership development (<http://www.safe-africa.org>). In order to ensure that in the delivery of the program (teaching and learning process), emphasis is given to experiential learning, i.e., the combination of theory, experience, critical reflection and practice.

For this purpose, one of the innovative aspects of the program is a component in which students plan and execute independent field-based projects called the Supervised Enterprise Project (SEP). SEP is built on the philosophy of experiential learning, narrowing the gap between theory and practice. The SEP is, thus, designed to immerse students in valuable farmer-focused, experience-based learning activities, reduce the discrepancy between training and the tasks the extension staff perform in their real work environment, and avoid the traditional tendency of making the training too theoretical. The essence of SEP is to develop the students' ability to identify problems and explore practical ways to correct them. SEP is organized in two phases. During the first phase, which takes place at the end of the first of academic year of coursework on-campus, students go back to their work areas to conduct an assessment of farmers' extension needs from which each student develops an extension project proposal to address those needs. This is performed with the assistance of farmers, employers and lecturers (supervisors). Each project includes an extension research component (Akeredolu, n.d.; Kassa, Karippai, & Eshetu, 2010). As discussed below, SEP has been very much commended by the graduates, instructors and employers, and has greatly enhanced the performance, confidence and professionalism of the graduates. It has also addressed the priority need of farmers.

### *Curricula responsive to emerging needs*

The curriculum of the program has been responsive to changing national priorities in the countries where the program is being implemented. For example, in the initial inception of the program, the curriculum mainly focused on production (animal and crop production and management), natural resource management, and soft skills (communication) among others. Recently, the curriculum of the program has been oriented towards agricultural value chains. This was in cognizance of the lack of knowledge and skill on the agricultural value chain and its importance in transforming smallholder agriculture through commercialization, which is among the priority policy foci of national states and the African Union to transform smallholder agriculture (NEPAD & CAADP, 2013, p. 28). In addition, it is interesting to note that in November 2015 the SAFE program was launched in Jigjiga University (Ethiopia), with curriculum oriented toward the needs of pastoral and agro-pastoral communities in the country.

### *Community-based learning, benefiting students' skill learning and farmers' extension need*

Studies conducted on the impact of SEPs reported that student-implemented SEPs improved farmers' livelihoods as well as skill learning of students. In Ethiopia, a study reported students worked on a wide range of projects thereby broadening opportunities for farmers; several SEPs had direct benefits for women farmers through improved income and labor saving technologies; many SEPs improved utilization of farm produce; and most of the projects are believed to have led to wide adoption among the farming community. Some of the technologies have been sustained more than ten years after their introduction (e.g., maize storage cribs; Kassa et al., 2010).

In Mali, student-implemented SEPs focused on various agricultural, socioeconomic as well as cultural practices at the village and community levels. This had largely helped students' understanding of the farmers and their practices. The students had guided, collaborative and very reflective projects in farmers' fields, which improved their skills in the application of improved technologies and helped to bridge the gap between theory and actual experiences in the field. With regard to benefits to the farmers, students organized farmer groups that enabled them to access services (for example, a women's group received a grant to buy some shea butter processing equipment); farmers acquired technical and managerial skills as a result of training offered by the students; for the first time farmers were involved in project conceptualization, planning and implementation which made them feel needed and active, as a partner for development intervention in their community (Akeredolu, n.d.).

A study in Ethiopia (Kassa et al., 2010) noted graduates reporting that SEP provided opportunities for learning different skills. Students had used participatory needs assessment techniques and prioritization before designing and implementing projects. Close supervision and follow up were consistently used in the course of implementing SEPs. Another commonly seen feature was skill based training of contact farmers in the initial stage and a field day at the end of the SEP for dissemination of the results at community level. Encouraging farmer-to-farmer knowledge-sharing was also a commonly used strategy, in sharp contrast with the conventional extension methods (individual, group extension methods whereby development agents provide extension services through face-to-face contact) prevailing in the country. The use of mass media, preparation of learning materials, and the ability to convince farmers to embrace a system of record keeping were other significant positive achievements associated with the SEPs.

The students learned how to bring changes in knowledge, attitudes and skills among farmers on different agricultural practices. In this regard, their SEP reports included empirical evidence for these changes as captured through a 'before and after' analytical method. They also learned how to create a sense of ownership of the intervention idea. Organizing farmers in groups and establishing structural and functional linkages with other stakeholders and farmers' groups were among strategies used by the students to institute sustainability.

#### *Lifelong impact on the graduates' performance*

A study in Mali reported the program improved graduate skill learning and empowerment of rural farmers. That is, the curriculum and delivery improved graduates' professional competence and performances, leading to better service delivery to their clients and thus adoption of technologies by rural clients. After completing their professional development program, the SAFE graduates expressed high self-efficacy in using participative approaches in their work with clients. This study provided a concrete example of self-efficacy theory in a real-life context, i.e., SAFE graduates' perceptions of their ability to serve clients that they associated with the training, as well as the "resiliency" they expressed when overcoming constraints to reach their goals (Kante, 2010). Similarly, a study in Ghana reported the graduates of the program increased their levels of confidence and understanding in applying various job requirements (Duo & Thomas, 2007). In the case of Ethiopia, although quite a few respondents, mainly male, reported that they assumed managerial responsibilities before they joined the program, the managerial responsibilities they assumed after graduating from the program measured by the number of subordinate staff under them and the amount of financial

resources (budget) that they had to manage - have shown a marked improvement. Added to that, some of them hold challenging and demanding key managerial/political positions of high status and with considerable decision making power (Kassa & Azerefegne, 2008).

The study by Kassa et al. (2010) in Ethiopia reported that great numbers of graduates were assigned to senior positions after graduation. This study also sought graduate-initiated development projects and programs. That is, whether the graduates were involved in or initiated new or similar projects or programs based on the experience gained from SEPs. The study reported that 35 of the 78 respondents (44.9%) indicated that they had initiated or were involved in similar projects or programs after graduation which include: cereals, fruits and vegetables development; livestock and forage improvement; agro-forestry, natural resource management; soil and water conservation; irrigation and drinking water facilitation; post-harvest technologies; and integrated community development and income generation. The study further revealed that the majority of the newly initiated projects/programs were perceived to be beneficial to the farming community in different ways. Survey responses indicate that the projects were: increasing household income (100.0%); helping in the adoption of improved technologies (96.3%); increasing yield (93.0%); improving livelihoods (93.0%); and improving food availability (88.9%). All the employers contacted for the purpose of this study agreed that mid-career graduates were highly qualified and competent with better professional knowledge and skills. They further noted that the graduates were able to translate development messages to the field through SEPs. The SEPs served as model approaches for other professionals in designing and implementing development projects.

#### *Impact on instructional design*

Different studies indicate that the implementation of SEPs has influenced the delivery of the curriculum towards a more practical and student-centered approach. This experience has also influenced delivery of other programs in the hosting institute or department, albeit the performance of these programs is unclear in the absence of documented evidence such as on students' skill learning and how that impacted in their real life context and also benefited farmers (example, where students conducted their projects).

In Haramaya University, the SAFE program is hosted by the Department of Rural Development and Agricultural Extension (RDAE) in the College of Agriculture and Environmental Sciences. Besides the mid-career program, this department offers undergraduate

BSc degree in RDAE and postgraduate MSc and PhD programs. The mid-career program's success, mainly the lesson learned in the course of implementation of SEP, has led to overhauling of the regular undergraduate bachelor of science degree curriculum, which now has more practical orientation and field based experiential learning. In this curriculum, community-based courses involving community field work and village stay camps were introduced. In 2004 the department realized the potential to improve skill learning in the regular bachelor of science curriculum in Rural Development and Agricultural Extension. For this purpose the Department secured a competitive grant from the World Bank, Development Innovation Fund (DIF) and implemented a project "Enhancing Experiential Learning and Self Confidence among Undergraduate Students" for a period of three years (2005-2008). The major objectives of this project included: creation of favorable conditions for undergraduate students to acquaint themselves with rural life situations and gain practical knowledge and skills to work with farmers, by frequent contacts with the communities and learning from them.

Implementation of the project started with a briefing workshop on project objectives to staff members in the department. A field practical guide was developed. Students were trained and organized into small groups working in selected villages near the university campus. In the first semester of the second year of study they identified development related problems in a participatory manner and designed project interventions to improve household livelihoods. In the second semester, they implemented the intervention projects with the support of the university, NGOs and other stakeholders. In the first semester of the third year, they evaluated the projects in terms of attaining the stipulated objectives. All these activities were carried out under the close supervision of instructors from the Department of Rural Development and Agricultural Extension. In the same year, before the final semester, the students were taken to remote villages far from the university campus where rigors of rural life could be experienced, and made to stay and work with farm families. This 'village stay' for two weeks provided the students with opportunities to understand rural life and appreciate the realities on the ground. It also gave them skills to work with rural communities and helped them build self-confidence for field based extension work. Moreover, the village stay was a good learning experience for undergraduate students in terms of indigenous wisdom and practical situations, which they never gained during campus-based learning. This was affirmed by the feedback gathered from the first cohort of students which was also shared with department heads in the College in a half day experience sharing workshop.

Realizing the benefits of the field based experiential learning and encouraged by the positive feedback from students, the Department decided to continue the project activities even after the completion of the DIF project, with the support and encouragement of university management. Currently, it is one of the prestigious practical learning components of the Bachelor's degree program in the Department of Rural Development and Agricultural Extension. The same model has been tried by other universities in Ethiopia offering the same curriculum. In general, similar to the mid-career program, the regular program's field-based experiential learning is believed to impact on students' skill learning and provided learning opportunities for faculty through their engagement with students in the field. Since the students' projects are based on participatory needs assessment and prioritization, they are believed to have some impact in those villages as feedback and evidence indicate from students' reports (Kassa et al., 2010). This impact and impact of the program on graduates need to be supported by a scientific study which has not yet been conducted.

At the Rural Polytechnic Institute for Training and Applied Research (IPR/IFRA) in Mali, both lecturer supervisors of SEP projects and other lecturers of the institute claimed that the SEPs helped to introduce new courses, modify the content of courses and change the volume of other courses. The lecturer supervisors claimed that the SEPs brought about changes in their teaching method since they had to adopt group-work and field visits as an essential part of their method of teaching students. The students had guided learning-by-doing in the farmers' fields through collaboration with their supervisors, technical service unit, farmers, researchers etc. In the final analysis this helped the students to gain a mastery of curricular knowledge and skills (Akeredolu, n.d.).

The other important impact of the program is the idea of the Technology Village that is emerging in the SAFE program hosting universities such as Haramaya, Hawassa and University of Cape Coast which is also attributed to impact of the SEP component. In Hawassa University, the second university in Ethiopia after Haramaya to launch the SAFE program in 2006 has been reported to have embraced the concept of the Technology Village in its fullest sense, where the university has adopted entire villages where the different departments, from agriculture to health and education, go and identify needs and find solutions, which they apply in the villages (Kassa et al., 2010). However, how this impacted teaching and learning has not been reported. In Ghana, University of Cape Coast has a Technology Village on campus, observed as being



functional, albeit at small scale. The idea of the Technology Village is elaborated below in Haramaya's plan for implementation.

Haramaya University has embarked on the establishment and development of Technology Villages to achieve its academic and development objectives. The villages will be hubs for supplying information on improved agricultural technologies, techniques, knowledge and materials to farmers and other interest groups. In addition, they will be used to expose students to real-life situations of the farmers and develop their social and communication skills as well as self-confidence in dealing with farmers. The Technology Villages will help to create strong linkages between the university and farmers. The intention was to have two types of Technology Villages -- a Technology Village on the university campus and Technology Villages outside the University. The university Technology Village is a basic and simple building complex and area of land dedicated for practical training and demonstration purposes. The major functional components include basic infrastructures, appropriate technology inputs, services, information, and mobile exhibition van. This has been established with university-committed funding support and small top-up from SAFE (Kassa & Azerefegne, 2008). At its current stage, the infrastructure is limited to shades and display areas. Technologies which are already available in the university and those that can be acquired easily have been used. In general, it has yet to become fully functional and it is better described as a work in slow progress.

The envisaged Technology Villages outside the university will be used as “field laboratories” for overall development of the villages by transferring integrated technologies. Eight villages in the vicinity of Haramaya Research Station representing the highland, and seven villages near Babile Research Station covering the lowland will be established. This has not materialized to date. In general, taking this idea further to establish full-fledged technology village and sustaining it depends on the full collaboration, enthusiasm and contribution of faculty members of the college of agriculture and interested others. The challenge is expected to remain until faculties realize the importance of the village and its contribution toward achieving the academic and development objectives of the university. On the other hand, taking on board governmental and non-governmental stakeholders, especially in establishing off campus Technology Villages, will also be a difficult challenge. The university is expected to engage the stakeholders in a series of discussions, workshops, etc to create awareness(Kassa & Azerefegne, 2008)

*Bridging the weak link between university's tri-mandates*

It is well known that AET institutions of higher education are established with tri-mandates -- teaching, research and extension/community engagement. Lack of a strong strategic link among these mandates has been among the glaring factors underlying the growing desertification in Sub-Saharan Africa. The SAFE program has demonstrated the potential option to strengthen the strategic link among tri-mandates to achieve the global south's AET institutional contribution to national AISs. In this regard, Maguire (2012) in reference to Ghana (University of Cape Coast) noted that the SEP is central to the success of the program in bridging the gap between tri-mandates of the university because it fostered the alliances that spread the benefits to all participants. Communities gained from the external contacts. Ministries of agriculture gained better-trained staff with more field experience, which made their contribution to sector development more effective. Universities gained greater community visibility and access to real rural training settings and challenges, and university research programs and curricula were enriched to reflect changes in agriculture on the ground. Another study in Ghana also affirmed that the SAFE program strengthened the department's outreach initiative, adaptation of research, and teaching methods which resulted in a more diverse curriculum delivery mode (Duo & Thomas, 2007). Similar findings were reported from Mali's (IPR/IFRA) program "the SEPs component of the training program impacted significantly in the area of teaching and learning especially in centering the curriculum on authentic problems faced by producers along the whole agriculture value chain, invariably boosting the professional development of the students" (Akeredolu, n.d.).

In the case of Haramaya University, the multidisciplinary and interdisciplinary nature of the mid-career program enabled the staff members to understand and appreciate the importance of different subject areas in working with rural communities in an integrated manner. The University has also benefited in terms of improving its working relationships with villages and several development actors through the SEPs. The annual mid-career workshops are the occasions where multi-disciplinary scientific staffs are engaged in scrutiny and approval of the new SEPs, evaluation of the concluded SEPs as well as networking and interaction with other stakeholders. The field supervision of the SEPs provides the academic staff with opportunities to learn from real rural life, and strengthen linkages with other actors in the sector (Kassa et al., 2010).

### *Organizational innovations*

The study in Ethiopia (Kassa et al., 2010) reported that organizational innovation brought about by the SEPs in different parts of the country included: motivating farmers to get organized into cooperatives; establishing farmers' linkages with Regional Offices for market coordination and facilitation; organizing small scale agri-based enterprise unions; organizing women for effective utilization of micro-finance and women's empowerment; and strengthening of farmers research groups (FRGs) for demand driven research and extension. Similar findings are reported in Mali that as a result of the SEPs farmers, including women farmers, were organized, trained and acquired skills (technical, communication and managerial skills). These new skills acquired had made it possible for them to negotiate better with donors and other development partners.

### *Challenges to institute the SAFE program*

In the beginning the program faced resistance due to fear of compromising academic standards. This is because the university system is used to the conventional BSc program offered for three to four years. The SAFE program with a two and half year BSc degree was unusual. As a result, it faced resistance from academic staff and university higher officials. After long negotiation the program was launched with doubt. Once the program started the performance of students and the SEP results removed all doubt from those who resisted the program. They rather became champions of the program. In the process of implementing the program limited staff skills in adult teaching were a challenge, especially for the courses offered by staff outside the hosting department. This has been tackled through training with support of SAFE and frequent dialogue with faculties (Maguire, 2012; Mwangi, Chibwana, & Azerefege, 2005).

Financing is still a crucial challenge. As already indicated the off-campus SEP is the distinctive feature of the program. Although the return on investment is high, it is expensive to run. Looking for an exit strategy for SAFE is vital to enable the university to opt for its own means of continuing the program (Maguire, 2012; Mwangi, Chibwana, & Azerefege, 2005). In Ghana, MOFA is considering including the SAFE program in its budget. Incentives also help universities adopt the program. At UCC, for example, a multipurpose building (the Sasakawa Center) was completed and is used to generate income for the SAFE program at the university. It remains vital to build constituencies that can pressure decision makers on behalf of the university; some administrators continue to regard SAFE as extra work rather than a strategic

necessity (Maguire, 2012). In Haramaya, it is over a decade since the SAFE funding for program ceased. The university continues to run the program, allocating budget for the program like other regular programs. Based on Haramaya's experience some universities in Ethiopia adopted the program without direct support of SAFE. The agricultural ministry and different project initiatives also continue to support students' SEPs, in some cases covering students' costs for accommodation, meals and medical fees during their study period (2.5 years).

Ensuring the need for qualified and committed core staff is of paramount importance to sustain such programs. The lack of such staff has been a big constraint, affecting not only the implementation but the long-term sustainability of the program (Maguire, 2012). Good intention and commitment has been central for involvement of senior staff in field supervision of the SEPs, especially in countries like Ethiopia where the off-campus supervision time overlaps with the end of academic year vacation. To ensure this, designing a mechanism to provide incentive is vital to the university.

Institutional memory has been a challenge from the side of students' organization, especially in the first 10 years of the program at Haramaya. Providing the mid-career students, a study leave with pay and funding support for SEP implementation has been agreed by the Ministry of Agriculture according to the MoU that was signed in the launching of the program. In due course quite often students could not get the expected support. This has been solved with frequent contact with employers in writing letters, phone calls, and face-to-face contact whenever possible.

Low numbers of female students also remains a challenge. This has been among priority discussion questions in annual SAFE regional workshops. In some countries such as Ethiopia, affirmative action has been considered for the entrance examination, a requirement to join the program. SAFE has been soliciting scholarships for female candidates from different organizations. However, the female student intake still remains low. Only a few candidates turn up for entrance exam. This could be due to family responsibility and cultural barriers. The ongoing process of developing a semi-distance learning version of the program is expected to solve such problems.

Maintaining the quality of SEPs with changing research themes is another important challenge. Recently the curriculum of the SAFE program is being re-oriented toward value chain analyses. To make this adaptation, SAFE has supported teaching material development and staff

training. However, whether the SEPs being implemented by students are addressing the real value chain issues is uncertain. As could be observed during annual regional workshops, this challenge cuts across all countries where the SAFE program is being implemented.

### Research gaps and implication for future interventions

In general, reforming AET in Africa calls for looking beyond "a single model fits all" approach and it should be implemented with the understanding that it is a long-term undertaking (Eicher, 2006; Spielman et al., 2008). In an attempt to reform the AET organizations in the region, application of innovation system approach, as a complement to ongoing reform, would provide a systematic and contextual approach to address key challenges underlying poor performance or underachievement of AET. However, empirical evidence on application of an innovation system approach to AET reform in Africa is still lacking and thus needs further research (Spielman et al., 2008).

At the stage of context analysis of an AET organization, contextually important factors that need to be determined may include issues pertaining to the prevailing philosophy of teaching, research and extension; network and linkage with knowledge source (inside and outside the AET organization) and with actors in the AIS (farmers, research institution, private and public sector); available resources; pedagogical knowledge and skill gap of staff; culture of the AET organization at different levels such as at departmental, college and overall institutional. These factors affect individuals' initiative to take innovative actions linking students to ongoing research and extension activities, initiating cross-disciplinary research and partnerships with organizations outside the AET institution (e.g., an overseas university), etc. Depending on the outcome from the context analysis, the intervention may consider different activities. For example, introducing a new model or adapting available experiences (within sub-Saharan Africa or from other successful programs) that can fit the context of the AET organization to improve the link between extension and education. This may require other complementary actions such as training staff in pedagogical skills; writing teaching material with blended theory and local authentic examples; establishing functional links within AET organizations and with farmers and other stakeholders outside the organization.

Specific to the themes of this study, linking extension and education is imperative, regardless of the level of reform (system-wide, institution or program level) an intervention is designed to achieve. If effectively done, an attempt to improve the link between extension and

education (for example, focusing on a program in an AET organization) can be a good entry point to initiate long-term institutional level and system wide reform. Because, if a functional link is established between extension and education, as could be seen from experience from SAFE and other programs reviewed above, it will provide feedback on the relevance of the curriculum, its delivery and research focus, and the overall strategic links between the tri-mandates of an AET organization. However, intervention undertakings to improve the link between extension and education need to be guided by contextual assessment. Information from contextual assessment that adheres to the innovation system approach will guide the intervention to the underlying factors to adapt suitable pathways for a specific AET action, as well as required complementary actions.

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