Education and human capacity building in Africa have many well-publicized problems, including low enrollment and completion rates. One of the most distressing facts about many African school systems is that they often focus little on teaching students to maximize the opportunities that are available to them in their own communities; rather, they tend to prioritize a set of skills that is less applicable to village life and encourages children to aspire to join the waves of young people moving to urban areas. For some students, this leads to success, but for many more it leads to unfulfilled aspirations, dropout rates, and missed opportunities to learn crucial skills that will allow them to be more productive and have a better standard of living in their villages. It also results in nations passing over a chance to increase agricultural productivity, self-sufficiency, and human resources among their populations.

**Education and Agriculture**

African leaders have the unique opportunity to use the agricultural system as a driver for their economies and a source of pride and sustainability for their populations. About 36% of all African labor potential is used in subsistence agriculture. If that
percentage of the population could have access to methods of improving their agricultural techniques, increasing production, and gaining the ability to transform agriculture into an income earning endeavor, African nations would benefit in terms of GDP, standard of living, infrastructure, and economic stability. One way to accomplish this is to develop systems—both formal and informal—to improve farmers’ skills and abilities to create livelihoods out of agriculture rather than simply subsistence.

These systems start with formal schooling. Schools should include agriculture as a formal subject—from the earliest childhood experience to agricultural universities. They should consider agriculture an important area for investment and work to develop students’ agricultural and technical knowledge at the primary and secondary levels. Universities should also consider agriculture an important research domain and devote staff and resources to developing new agricultural techniques that make sense for their populations and ecosystems. University research needs to stay connected to the farmers and their lifestyles to productively foster agricultural growth.

Decision makers should also look for ways to foster human capacity to make agricultural innovations outside of a traditional classroom. A variety of models incorporate this idea—from experiential and extension models to farmers’ field schools, both discussed later in this chapter. Rural radio programs that reach out to farming communities and networks of farmers’ associations spread new agricultural knowledge. In fact, there is a resurgence of radio as a powerful tool for communication.¹

Governments and schools should treat agriculture as a skill to be learned, valued, and improved upon from early childhood through adult careers instead of as a last resort for people who cannot find the resources to move to a city and get an industrial job. Valuing the agricultural system and lifestyle and trying to improve it takes advantage of Africa’s existing systems and capacities. In this way, many nations could
provide significant benefits for their citizens, their economies, and their societies.

Nowhere is the missed opportunity to build human capacity more evident than in the case of women and agriculture in Africa. The majority of farmers in Africa are women. Women provide 70%–80% of the labor for food crops grown in Africa, an effort without which African citizens would not eat. Female farmers make up 48% of the African labor force. This work by women is a crucial effort in nations where the economy is usually based on agriculture.

Belying their importance to society and the economy, women have traditionally benefited from few of the structures designed to promote human capacity and ability to innovate. UNESCO estimates that only 45% of women in Africa are literate compared to 70% of men; 70% of African women do not complete primary school, and only about 1.5% of women achieve higher education. Of all of the disciplines, science and agriculture attract the fewest women.

For example, in Ghana, women account for only 13% of university-level agriculture students and 17% of scientists. By not focusing on building the capacity of women, African states miss the chance to increase the productivity of a large portion of their labor force and food production workers. The lack of female involvement in education, especially science and agriculture, means there is an enormous opportunity to tap into skills and understandings of agricultural production that could help lead to more locally appropriate farming techniques and more thorough adoption of those techniques.

Gender and Agriculture

Although nearly 80% of agricultural producers in Africa are women, only 69% of female farmers receive visits from agricultural extension agents, compared to 97% of male farmers. Of
agricultural extension agents, only 7% are female. In many places, it is either culturally inappropriate or simply uncommon for male extension agents to work with female farmers, so existing extension systems miss the majority of farmers. Additionally, as the Central American case below demonstrates, having extension workers who understand the experience of local farmers is central to promoting adoption. An important component of successful adoption is including female extension workers and educators in formal and informal settings.

Unequal distribution of education is the other critical factor in the misuse of women’s contributions in agricultural production. Compared to the colonial period and the situation inherited at independence, considerable gains have been realized in general and female school attendance. Still, many countries have not yet achieved even universal primary school attendance. Gender inequality is most severe in contexts where general enrollment is lower.

Furthermore, several countries had a severe setback in the early 1980s, as their enrollment rates were either stagnant or declining. The persistent economic crisis meant that the previously agreed upon targets of universal primary enrollment in 1980 and then 2000 could not be met. Since the Dakar Conference of 2000 and creation of the Millennium Development Goals, new targets have been set for universal primary enrollment by 2015. However, at this stage, there is little doubt that most countries will not be able to reach this goal. By and large, countries with the lowest enrollment ratios from primary to higher education levels have the lowest enrollment ratios for their female populations.

African countries have shown considerable vitality in enrollment in higher education since the mid-1990s, following the lean years of the destructive structural adjustment programs. Nevertheless, African countries still have the lowest higher education enrollment in the world. Although there are a few exceptions in southern Africa (Lesotho is a unique case,
where nearly three-fourths of the higher education students are females), in most African countries female enrollment is lower than that of males. Furthermore, the distribution of higher education students by discipline shows consistently lower patterns of female representation in science, technology, and engineering.

Considering African women’s cultural heritage and continued central role in agriculture, it is a major paradox that their representation is so low in tracks where agricultural extension workers and other technicians and support staff and agricultural engineers are trained. Indeed, if there were any consistency between current educational systems and adequate human resource development, there would be at least gender parity in all the fields related to agriculture and trade. Yet only a few countries, such as Angola and Mozambique, have designed and implemented policies encouraging a high representation of females in science, including those fields related to agriculture. More generally, for both males and females, little effort is made in the educational system to promote interest in science in general and agriculture in particular.

It is vital to put more emphasis on involving women in agriculture and innovation, as well as helping female farmers build their capacity to increase productivity. There are several avenues to reach this goal. The first is women’s training programs that focus specifically on agriculture. Another crucial avenue is emphasizing female participation in extension work—both as learners and extension agents, discussed later in this chapter.

The Uganda Rural Development and Training Program (URDT), which is establishing the African Rural University for women in the Kabala district of Uganda, is an innovative model of a program that focuses on building strong female leaders for careers in agriculture and on involving the community in every step of agricultural innovation. URDT students are fond of quoting the adage: “If you educate a man, you
educate an individual. If you educate a woman, you educate a nation.”

A key component of the program is to view individuals and communities holistically and to help people envision the future they want and to plan steps to get there. Their programming is tailored to locally identified needs that value the communities’ lifestyles and traditions while allowing adoption of new technologies and improvement of production. URDT has had huge success in supporting change in the region since their founding as an extension project in 1987. Their impact has resulted in better food security, increased educational attainment, raised incomes for families across the district, better nutrition, and strong female leaders who engage in peace-building efforts and community improvements, among others. One driving factor is the innovative model of community-university interaction that focuses on women and agriculture.

URDT has a primary and secondary girls’ school that focuses on developing girls’ abilities in a variety of areas, including agricultural, business, and leadership skills, and encouraging them to bring their knowledge out to the community. At URDT Girls School, students engage in “Back Home” projects, where they spend some time among their families conducting a project that they have designed from the new skills they learned at school. Such projects include creating a community garden, building drying racks to preserve food in the dry season, or conducting hygiene education. Parents come to the school periodically to also engage in education and help the girls design the Back Home projects. School becomes both a learning experience and a productive endeavor; therefore, families are more willing to send children, including girls, to school because they see it as relevant to improving their lives.

URDT focuses on agriculture and on having a curriculum that is relevant for the communities’ needs. They have an experimental farm where people can learn and help develop new agricultural techniques, as well as a Vocational Skills
Institute to work with local artisans, farmers, and businessmen who have not had access to traditional schooling. There is an innovative community radio program designed to share information with the broader community. URDT also runs an Appropriate and Applied Technology program that allows people from the community to interact with international experts and scientists to develop new methods and tools to improve their lives and agricultural productivity. A recent example is developing a motorcycle-drawn cart to help bring produce to market and improve availability and use of produce.

Governments can draw on this model to create effective learning institutions to support agriculture, and particularly women’s and communities’ involvement in it. The three key lessons of the model are to make sure that the school is working with and giving back to the community by focusing on its needs, which are often based around agriculture; to create a holistic program that sees how the community and the institution can work together on many interventions—technology, agriculture, market infrastructure, and education—to improve production and the standard of living; and to focus on women and girls as a driving force behind agriculture and community change, benefiting the whole society.

The crucial unifying factor is to integrate education at all levels, and the research processes of higher education in particular, back into the community. This allows the universities to produce technologies relevant to rural communities’ needs and builds trust among the research, education, and farming communities.

Community-based Agricultural Education

Uganda is not alone in adopting this model. The government of Ghana established the University for Development Studies (UDS) in the northern region in 1992. The aim of the university
is to bring academic work to support community development in northern Ghana (Brong-Ahafo, Northern, Upper East, and Upper West Regions). The university includes agricultural sciences; medicine and health sciences; applied sciences; integrated development studies; and interdisciplinary research. It relies on the resources available in the region.

UDS seeks to make tertiary education and research directly relevant to communities, especially in rural areas. It is the only university in Ghana required by law to break from tradition and become innovative in its mission. It is a multi-campus institution, located throughout northern Ghana—a region affected by serious population pressure and hence vulnerability to ecological degradation. The region is the poorest in Ghana, with a relatively high child malnutrition rate. The university’s philosophy, therefore, is to promote the study of subjects that will help address human welfare improvement.

The pedagogical approach emphasizes practice-oriented, community-based, problem-solving, gender-sensitive, and interactive learning. It aims to address local socioeconomic imbalances through focused education, research, and service. The curricula stress community involvement and community dialogue, extension, and practical tools of inquiry.

Students are required to internalize the importance of local knowledge and to find effective ways of combining it with science. The curricula also include participatory rural appraisal, participatory technology development, and communication methodologies that seek to strengthen the involvement of the poor in development efforts.

An important component of the emphasis on addressing sustainable development is the third trimester practical field program. The university believes that the most feasible and sustainable way of tackling underdevelopment is to start with what the people already know and understand. This acknowledges the value of indigenous knowledge. The field program brings science to bear on indigenous knowledge from the outset.
Under this program, the third trimester of the academic calendar, lasting eight weeks, is exclusively for fieldwork. Students live and work in rural communities. Along with the people of the community, they identify development goals and opportunities and design ways of attaining them. The university coordinates with governmental agencies and NGOs in the communities for shared learning in the development process. The field exposure helps students build up ideas about development and helps them reach beyond theory. The impact of this innovative training approach is already apparent, with the majority of UDS graduates working in rural communities.

Early Agricultural Education

For children to engage in agriculture and understand it as a part of their life where they can build and develop skills and abilities to improve their future, it is necessary to continue their exposure to agricultural techniques and skills throughout their education. Equally important is the need to adapt the educational system to reflect changes in the agricultural sector. Many rural African children will have been to the family farm or garden, and done some small work in the field, before they ever arrive at school. Children go with their mothers into the field from a very young age and so are likely to be familiar with local crops and the importance of the natural world and agriculture in their lives. Schools can capitalize on this early familiarity as a way to keep children engaged in the learning process and build on skills that will help them increase their production and improve their lives for the future.

School Gardens

One model to achieve early engagement is by having a school garden. Schools all over the world, from the United States and
the United Kingdom, to Costa Rica and Ecuador, to South Africa and Kenya, use school gardens in various guises to educate their students about a set of life skills that goes beyond the classroom. School gardens come in many forms, from a plot of land in the school courtyard, to the children visiting and working in a broader community garden, to planting crops in a sack, a tire, or some other vessel. These gardens can use as many or as few resources as the community has to devote to them. The sack gardens especially require very few resources and can be cultivated in schools with little arable land and in urban areas. Students can also bring the sack garden model back home to their families to improve the family’s income and nutrition.

Labor in the school garden should certainly not replace all other activities at the school, but as a complement to the other curriculum it can provide a place where students learn important skills and feel that they are productive members of their community. Children who participate in school gardens learn not only about growing plants, food, and trees—and the agricultural techniques that go along with this—but also about nutrition, food preparation, responsibility, teamwork, and leadership. As students get older, they can also use the garden and the produce it generates as a way to learn about marketing, economics, infrastructure needs, and organizing a business. Many schools have student associations sell their produce in local markets to learn about business and generate income.

School gardens have the added benefit of showing communities that the government recognizes agriculture as an important aspect of society and not as a secondary endeavor. Schools that provide education in gardening often overcome parents’ reluctance to send children to school, as they teach a set of skills that the parents recognize as being important for the community—and parents do not see schooling as a loss of the child’s potential labor at home. A government can increase this impact by involving the community in educational programs
and curriculum decisions. Promoting buy-in from the community for the entire educational process encourages families to enroll more students and allows children to learn important skills.

Also, by valuing agriculture and enabling more productive work in the community, school gardens decrease the incentive for large migrations to urban areas. This also calms many parents’ fears that a child who goes to school will leave home and not continue to work on the family farm. This emphasis on agriculture benefits both children and parents, by giving them access to a formal education and a way to increase agricultural productivity.

Semi-formal Schooling

Another model that can work to encourage children and young people to learn agriculture is a semi-formal schooling model. Here, children spend part of the day at school learning math, literacy, and traditional subjects, and part of the school day working in a field or garden. This second part of the day is a chance to generate some income for families as well as to learn new agricultural and marketing techniques. Generally, these kinds of programs are for older children who have never gone to primary school; they are taught in local languages instead of the official English or French of many formal school systems. This model can be adapted for adults as well to encourage literacy and the development and adoption of new agricultural techniques. In South Africa, this model is often referred to as a Junior Farmer’s Field School, to get young people involved early in the experiential process of learning and creating new agricultural techniques.

School gardens, the inclusion of agriculture in the formal curriculum, and technical training models are all ways to promote children’s experience with agriculture and help them
develop the skills they need to improve their livelihoods into adulthood. These models place value on agriculture, the local community, and the process of experience to encourage children to learn new skills and engage in the natural world in a productive way.

**Experiential Learning**

There are several examples of how farmers can play a role in experimenting with new innovations, making them feel a sense of ownership of related tools and increasing the chance that other farmers will use the techniques. These examples also show how innovations work in the field and what changes are needed for better results.

Nonformal educational systems are crucial for reaching the population that is past the age for traditional primary schools and for encouraging local adoption of new techniques. Even if revolutionary new technologies exist at the research level, they can improve economies only if farmers use them, so getting information into the hands of local farmers, and especially women, is vital to the success of research endeavors and should be part of any plan for agricultural growth.

Two of the persistent obstacles to the adoption of new peanut varieties are the difficulty of obtaining the seeds and the reluctance to use new seeds without being sure how they will grow compared to the traditional variety. Farmers want many of the benefits that new seed varieties can bring—they typically prefer high-yield, high market value, pest-resistant, and high oil-content varieties—but often they cannot get the seeds or they are afraid the new seeds will fail. Without some guarantee that the new seeds will work, farmers are often unwilling to risk planting them, even if they are readily available, and these farmers are certainly unwilling to make the substantial investment of time and capital that is usually required to seek
out and acquire new seed varieties. Not many rural farmers have the resources to go to the capital city and purchase experimental seed varieties from a research institute, and the risk of an unknown variety is often too high for a family to take.

One way of addressing this challenge is to give trial seed packages to pilot farmers or members of the local farmers’ association to try on a portion of their land or on a test plot. This is a variation of the early adopters’ model, which searches for members of a community who are willing and able to take some risk, and who then spread an idea to their peers. This strategy addresses both difficulties, since it allows for a trial with minimal risk, as well as a local source for new seed. Once the pilot farmer or association members grow the new variety of seed, they can sell it to their neighbors.

The International Crops Research Institute for the Semi-Arid Tropics (ICRISAT), in partnership with the Common Fund for Commodities has developed a trial package for new varieties of peanut in the Sahel (tested in Mali, Niger, and Nigeria) and disseminates it through pilot farmers and farmers’ associations. These farming associations are often women’s associations, since women traditionally need cash crops to be able to meet their families’ economic needs but have even less access to improved seed varieties than men. In all of the countries, ICRISAT provided 17 kilograms of new seed varieties to their pilot farmers, as well as training in field management techniques that maximize the yield for their crop. The project’s agents then asked local farmers to help distribute the new seed varieties through the members of their associations.

Although the management techniques were imperfectly applied, and there is a cost associated with the new varieties and techniques, farmers using the new varieties experienced substantial returns on their investment. New varieties were 97% more profitable than traditional ones, so farmers earned almost twice as much on their investment as they would have with the types of seed already in use.
This is a story that has repeated itself often over the trials. ICRISAT has learned that the people most likely to adopt new peanut varieties—and who therefore make good pilot farmers—are those who are slightly younger, have smaller family sizes, and have relatively more access to resources, such as labor and land. These are the people who can afford to take a risk at the beginning, and when that risk pays off, they serve as a model for the other farmers in their community. They will then also serve as a source of local seed, which is very important, since farmers are most likely to use either their own seed stocks or stocks available from local markets.

Through this model, small investments can spread the use of modern seed varieties that have much higher yields and are more profitable to sell. These higher yields and profits ensure food security, including much-needed protein in rural diets, while improving the quality of life for the farmer.

As mentioned earlier, sending extension workers—either from governments or NGOs—into the field is a common practice that can be more or less effective, depending on who the extension agents are and how they handle the situation in the villages. Extension agents who are the peers of local villagers and practice the lessons they teach in a way that the other farmers can observe are usually the most effective.

Many countries in Africa have a variety of ethnic groups and regional subgroups who have different habits, speak different languages, and have different resources.

The further removed an extension agent is from the population with which he or she works—by barriers of language, socioeconomic status, gender, education, or tradition—the more difficult it is to convince people to adopt the technique. There is a tendency for people to decide that the idea is appropriate for someone like the extension agent, but not someone like themselves, even if they think that the idea is a good one. The comment, “That may be how that group does it, but it could never work in our village” is a common one for formal
educators who come from a city or a different population subgroup. However, if the teacher is a peer, it is harder to make the distinction between their success and the potential success of each village farmer.

Governments can use the peer educator or farmer-to-farmer method to help spread information and new agricultural innovations across their entire rural population. By funding a few formal extension workers who train and help support a large network of peer educators, a government can reach most or all of the rural population, even if the groups are segregated by language, ethnicity, geography, or traditional farming techniques. Thus, a relatively small investment can have huge impacts on a country’s agricultural processes and therefore on food security and the national economy.

Farmer Field Schools (FFS) provide a way for communities to test a new technique and adapt it to their own specific needs. Many agricultural technologies need to be adapted to local contexts once they leave the lab to ensure that they are practical for farmers and that people can adopt them into their current agricultural practices. The FFSs also allow for easier dissemination of new information because peers, as opposed to outsiders, are the teachers. This model also develops community ownership by encouraging local participation in new processes and leads to better adoption among participants.5

Local farmers participating in FFSs are often selected through local leadership structures or village farming associations. They plant one plot using the techniques that they currently use and a second plot with the new technology. At the end of the growing season, the farmers then come together to compare the costs, revenues, and profits between the old way and the new technology. In this way, farmers can see what works for them and can adapt the new method as seems appropriate during the growing season. Farmers also become invested in the process and have reason to believe that it will work for them.
Any organization—private or public—can start a Farmers’ Field School. The resources needed are access to the new technology, be it a seed variety, a new fertilizer, or a new irrigation technique; a few extension agents to train a cadre of local farmers to spread the innovation; and a few follow-up visits to monitor the process and help villages interpret the results. These results should then move up to the national level to inform state policy and research. The following is an example of how an FFS can be used to address a specific problem.

*Striga*, often called witchweed, is a plant that grows in millet, sorghum, and other cereal fields across West Africa and causes a myriad of problems. It can reduce crop yields between 5% and 80%, reduce soil fertility, and erode soil, all of which decrease the durability and profitability of rainy season–based agricultural systems. A single weed can produce more than 200,000 seeds, which remain viable in the soil for up to 10 years, making the plant very hard to eradicate. There are places where *Striga* infestation means that farmers lose money on every cereal crop they plant and are unable to feed their families or earn a living.

Nevertheless, there is a solution. In 2007, the International Crop Research Institute for the Semi-Arid Tropics (ICRISAT), the International Fund for Agricultural Development, and several European agricultural research organizations partnered with the Tominion Farmers’ Union in Mali to implement a project that uses an integrated management system combining intercropping with beans or peanuts, reduced numbers of seeds per hole planted, and periodic weeding to control *Striga*. Using the FFS model, a few agricultural experts trained 75 local farmers to train their peers in integrated management techniques. These farmers then trained 300 others, and implemented the test plot procedure for their areas.

The results are impressive. *Striga* plants decreased, crop yields and profits increased, and many farmers decided to implement the process in their own fields. Farmers discovered
that it was necessary for them to conduct three cycles of weeding rather than the two that the project originally recommended. This change has been formally adopted into the integrated management system. With these three weeding cycles, the incidence of *Striga* in the field went to zero in the test plots. Profits per hectare increased from $47 to $276, an improvement of nearly 500%. In some cases, villages went from a loss to a profit on their fields. The return on investment more than tripled, so while there was a slightly increased cost of the new methods, they more than paid for themselves. Many of the farmers involved in the 2007 study used the new methods in their own fields in 2008, and spread the message about the new techniques to their neighbors. This encouraged an enabling environment for the adoption of new technologies.

Another model is that of radio education—mentioned in the URDT case above—where extension education sessions are recorded in the appropriate local languages and played periodically on the radio. For many rural communities with low access to television and low literacy, this can be a crucial way to spread information to local farmers, especially if done in conjunction with another model, like the technical training or extension models that allow farmers to ask follow-up questions.

**Innovation in Higher Agricultural Education**

America’s land-grant colleges pioneered agricultural growth by combining research, education, and extension services. The preeminent role of universities as vehicles of community development is reflected in the U.S. land-grant system. The system not only played a key role in transforming rural America but also offered the world a new model for bringing knowledge to support community development. This model has found expression in a diversity of institutional innovations around the world. While the land-grant model is largely associated
with agriculture, its adaptation to industry is less recognized. Universities such as the Massachusetts Institute of Technology (MIT) and parts of Stanford University owe their heritage to the land-grant system. The drift of the land-grant model to other sectors is not limited to the United States. The central mission of using higher education to stimulate community development is practiced around the world in a variety of forms.

There are three models for entrepreneurial education in Brazil that have advanced to different stages of creating an “entrepreneurial university.” The Pontifical Catholic University of Rio de Janeiro, the Federal University of Itajubá, and the Federal University of Minas Gerais have all started to include entrepreneurship in the educational experience of their students. This experience often complements and coordinates with private sector initiatives, and in some cases companies fund parts of the curriculum. The interaction between academia, government, and industry allows for a broader approach and for a shifting of program goals.

The lessons from these three schools are that flexibility in curricula and the openness to partnering with other organizations—especially industry—allow universities to develop successful entrepreneurship programs that provide employment opportunities for their students as well as a chance to experience the culture of starting a business. The stimuli that lead universities to these activities might be an external change—lack of funding from the government—or an internal decision to shift focus. An institution that is more flexible, whose staff supports the change in a more unified way, is more likely to make the change toward becoming an “entrepreneurial university,” which allows students to focus on not just having business know-how and the ability to work for or with large companies, but also on how to create jobs and opportunities for themselves and their peers. Universities must have the autonomy and the flexibility to adopt these programs as well
as the ability to build networks with local actors. Ultimately, this will contribute to the nation’s development.

African countries would be better served by looking critically at these variants and adapting them to their conditions. These institutional adaptations often experience opposition from advocates of incumbent university models. Arguments against the model tend to focus on the claim that universities that devote their time to practical work are not academic enough. As a result, a hierarchy exists that places such institutions either at the lower end of the academic ladder or simply dismisses them as vocational colleges.

The land-grant model is being reinvented around the world to address such challenges. One of the most pioneering examples in curriculum reform is EARTH University in Costa Rica, which stands out as one of the first sustainable development universities in the world. It was created in 1990 through a US$100 million endowment provided by the U.S. Agency for International Development (USAID) and the Kellogg Foundation. Its curriculum is designed to match the realities of agribusiness. The university dedicates itself to producing a new generation of agents of change who focus on creating enterprises rather than seeking jobs.

EARTH University emerged in a context that mirrors today’s Africa: economic stagnation, high unemployment, ecological decay, and armed conflict. Inspired by the need for new attitudes and paradigms, EARTH University is a nonprofit, private, international university dedicated to sustainable agricultural education in the tropics. It was launched as a joint effort between the private and public sectors in the United States and Costa Rica. The Kellogg Foundation provided the original grant for a feasibility study at the request of a group of Costa Rican visionaries. Based on the study, USAID provided the initial funding for the institution. The original mission of the university was to train leaders to contribute to the sustainable development of the humid tropics and to build
a prosperous and just society. Located in the Atlantic lowlands of Costa Rica, EARTH University admits about 110 students a year and has a total student population of about 400 from 24 countries (mainly in Latin America and the Caribbean) and faculty from 22 countries. Through its endowment, the university provides all students with 50% of the cost of tuition, room, and board.

In addition, the university provides scholarships to promising young people of limited resources from remote and marginalized regions. Nearly 80% of the students receive full or partial scholarship support. All students live on campus for four intensive years.

EARTH University has developed an innovative, learner-centered, and experiential academic program that includes direct interaction with the farming community. Its educational process stresses the development of attitudes necessary for graduates to become effective agents of change. They learn to lead, identify with the community, care for the environment, and be entrepreneurial. They are committed to lifelong learning. There are four activities in particular within the curriculum that embodies EARTH University’s experiential approach to learning.

**Learning from Work Experience and Community Service**

The first is the Work Experience activity, which is taken by all first-, second-, and third-year students and continues in the fourth year as the Professional Experience course. In the first and second years, students work in crop, animal, and forestry production modules on EARTH University’s 3,300-hectare farm. In the first year, the work is largely a routine activity and the experience centers on the acquisition of basic skills, work habits, and general knowledge and familiarity with production. In the second year, the focus changes to management strategies
for these same activities. Work Experience is later replaced with Professional Experience. In this course students identify work sites or activities on campus that correspond with their career goals. Students are responsible for contacting the supervisors of the campus operations, requesting an interview, and soliciting “employment.” Upon agreement, supervisors and students develop a joint work plan that the student implements, dedicating a minimum of 10 hours per week to the “job.” The second activity is an extension of the Work Experience course. Here third-year students work on an individual basis with small, local producers on their farms. They also come together in small groups under the Community Outreach program that is integral to the learning system. Community outreach is used to develop critical professional skills in students, while at the same time helping to improve the quality of life in nearby rural communities. The third-year internship program emphasizes experiential learning. The 15-week internship is required for all students in the third trimester of their third year of study. It is an opportunity for them to put into practice all they have learned during their first three years of study. For many of them it is also a chance to make connections that may lead to employment after graduation. The international character of the institution allows many students the opportunity to follow their interests, even when they lead to internship destinations other than in their home country.

**Sharpening Entrepreneurial Skills**

The fourth activity is the Entrepreneurial Projects Program. EARTH University’s program promotes the participation of its graduates in the private sector as a critical means by which the institution can achieve its mission of contributing to the sustainable development of the tropics. The development of small and medium-sized enterprises (SMEs) is a powerful way to
create new employment and improve income distribution in rural communities. For this reason, the university stresses the development of an entrepreneurial spirit and skills. Courses in business administration and economics combined with practical experience prepare the students to engage in business ventures upon graduation.

This course provides students the opportunity to develop a business venture from beginning to end during their first three years at EARTH University. Small groups of four to six students from different countries decide on a relevant business activity. They conduct feasibility studies (using financial, social, and environmental criteria), borrow money from the university, and implement the venture. This includes marketing and selling the final product. After repaying their loan, with interest, the group shares the profits. This entrepreneurial focus has permeated all aspects of the university’s operations and prepared students to become job creators and agents of change rather than job seekers. About 17% of the university’s 1,100 graduates run their own businesses. The university also manages its own profitable agribusiness, which has resulted in strong relationships with the private sector. When the university acquired its campus, it decided to continue operating the commercial banana farm located on the property. Upon taking over the farm, the university implemented a series of measures designed to promote more environmentally sound and socially responsible production approaches.

### Going Global

EARTH University has internationalized its operations. It signed an agreement with U.S.-based Whole Foods Market to be the sole distributor of bananas in their stores. The university also sells other agricultural products to the U.S. market. This helps to generate new income for the university and for small farmers while providing an invaluable educational
opportunity for the students and faculty. In addition to internships, students have access to venture capital upon graduation. The university uses part of the income to fund sustainable and organic banana and pineapple production research. Over the years the university has worked closely with African institutions and leaders to share its experiences. Following nearly seven years of study through workshops, discussions, training courses, and site visits, African participants agreed to the importance of reforms in their own university systems, especially through the creation of new universities along the lines of the EARTH model. The case of EARTH University is one of many examples around the world involving major collaborative efforts between the United States and east African countries to bring scientific and technical knowledge to improve welfare through institutional innovations. Such experiences, and those of U.S. land-grant universities, offer a rich fund of knowledge that should be harnessed for Africa’s agricultural development and economic growth.

Such models show how to focus agricultural training as a way to improve practical farming activities. Ministries of sustainable agriculture and farming enterprises in east African countries should be encouraged to create entrepreneurial universities, polytechnics, and high schools that address agricultural challenges. Such colleges could link up with counterparts in developed or emerging economies as well as institutions providing venture capital and start to serve as incubators of rural enterprises. Establishing such colleges will require reforming the curriculum, improving pedagogy, and granting greater management autonomy. They should be guided by the curiosity, creativity, and risk-taking inclination of farmers.

**Policy Lessons**

The challenges facing African agriculture will require fundamental changes in the way universities train their students. It
is notable that most African universities do not specifically train agriculture students to work on farms in the same way medical schools train students to work in hospitals. Part of the problem arises from the traditional separation between research and teaching, with research carried out in national research institutes and teaching in universities. There is little connection between the two in many African countries. This needs to radically change so that agricultural education can contribute directly to the agricultural sector.

A number of critical measures are needed at the regional and national levels to achieve this goal. The first should be to rationalize existing agricultural institutions by designating some universities as hubs in key agricultural clusters. For example, universities located in proximity to coffee production sites should develop expertise in the entire value chain of the coffee industry. This could be applied to other crops as well as livestock and fisheries. Such universities could be designed around existing national research institutes that would acquire a training function as part of a regional rationalization effort. Such dedicated universities would not have monopoly over specific crops but should serve as opportunities for learning how to connect higher education to the productive sector.

Internally, the universities should redefine their academic foci to adjust to the changes facing Africa. This can be better done through continuous interaction among universities, farmers, businesses, government, and civil society organizations. Governance systems that allow for such continuous feedback to universities will need to be put in place.

The reform process will need to include specific measures. First, universities need a clear vision and strategic planning for training future agricultural leaders with a focus on practical applications. Such plans should include comprehensive road maps on how to best recruit, retain, and prepare future graduates. These students should be prepared in partnership with key stakeholders.
Second, universities need to improve their curricula to make them relevant to the communities in which they are located. More important, they should serve as critical hubs in local innovation systems or clusters. The community focus, however, will not automatically result in local benefits without committed leadership and linkages with local sources of funding. The recent decision by Moi University in western Kenya to acquire an abandoned textile mill and revive it for teaching purposes is an example of such an opportunity.

Third, universities should give students more opportunities to gain experience outside the classroom. This can be done through traditional internships and research activities. But the teaching method could also be adjusted so that it is experiential and capable of imparting direct skills. More important, such training should also include the acquisition of entrepreneurial skills.

Fourth, continuous faculty training and research are critical for maintaining high academic standards. Universities should invest more in undergraduate agricultural educators to promote effective research and teaching and to design new courses.

Finally, it is important to establish partnerships among various institutions to support and develop joint programs. These partnerships should pursue horizontal relationships and open networking to generate more synergy and collaboration, encourage sharing of resources, and foster the exchange of students and faculty. This can be done through regional exchanges that involve the sharing of research facilities and other infrastructure.

Providing tangible rewards and incentives to teachers for exemplary teaching raises the profile of teaching and improves education. In addition, establishing closer connections and mutually beneficial relationships among all stakeholders (academia and industry, including private and public institutions, companies, and sectors) should generate further opportunities for everyone.
Lifelong Learning through the Private Sector

The roles of the private and public sector in lifelong learning opportunities are illustrated by the case of Peru’s relatively high-tech asparagus industry. Both public and private programs offer industry-specific training for employees and build on the skills that many workers get from experience in the formal education sector. Those working at the managerial level tend to receive training from La Molina—the national agricultural university. There is a tension between private and public sector training, as hiring managers tend to perceive graduates of private education as being of higher quality, although the public sector is able to produce more graduates and therefore better meet the industry demand for workers. Ultimately, the best arrangement is some combination of public and private sector education and training, as Peru has high secondary and tertiary school enrollment compared to many other Latin American countries.

Asparagus exporting requires a high level of skill because of the need to keep the asparagus under controlled conditions and package it in appropriate weights. The success of this industry relies upon investment in long-term learning for employees. There is a great emphasis on on-the-job training, whereby employees learn a specific set of job-related skills. In addition, there are both private and public vocational training programs for adults. Employers give consistently better reviews to those workers who receive on-the-job training or who complete the private sector training programs than to those who graduate from government-run programs. Students are willing to pay for private training because the curriculum and schedule are more flexible, and they allow the students to continue their employment, in contrast to the more rigid structure in public institutions. These private institutions also generally include an internship—which serves as both student training and a relatively low-cost way for employers to recruit skilled students.
Nevertheless, these programs are not without problems; they produce fewer students than the industry needs, and they rely on employees having at least primary or some secondary education, largely as a result of Peru’s relatively high levels of enrollment in secondary schools.

A high proportion of managers graduate from La Molina with degrees in agronomy or engineering. La Molina not only trains many of the skilled workers in management and agronomic skills, but it also conducts much of the research that the industry uses to have its crops meet international export standards. La Molina also conducts technology transfer with countries like the United States and Israel to adapt new techniques to local realities.

There are several training models to help farmers and plant workers acquire the skills they need. First are the private models of on-the-job training, which range from informal mentoring in the first two weeks of work to Frio Aéreo’s (a consortium of 10 partners that is concerned with managing the cold chain) formalized internship program and weekly training sessions during the slower seasons. Second are private universities such as Universidad Privada Antenor Orrego that train technicians and managers; there are also public institutions with similar goals, whose graduates tend to be less valued by employers. Additionally, there is a public sector youth training program that aims to help young graduates become successful agricultural entrepreneurs. Finally, there is El Centro de Transferencia de Tecnología a Universitarios, which uses holistic approaches to develop agricultural entrepreneurs, either by giving students plots of land that they must pay for over several years, or working with small farmers who already own land. The model that works with smallholders requires an investment of about US$33,000 per farmer.

Private sector initiatives have so far been more successful at training older workers in the necessary techniques. However, much of the system depends on workers having initial basic
public education, as well as the managerial expertise and public goods that La Molina provides. Successful training for high-skill industries requires a combination of private sector initiatives and a solid foundation of public education and research.

**Conclusion**

The current gaps in educational achievement and the lack of infrastructure in many African school systems are an opportunity for governments to adopt more community-driven models that prioritize education in a holistic way that improves community involvement, child achievement, agricultural production, and the standard of living for rural populations. Acknowledging that agriculture is both a valued traditional lifestyle and a huge potential driver of economic growth, and changing educational programming to respect these goals, will go a long way toward encouraging basic education and improving people’s lives.

No new agricultural technology, however cutting-edge and effective, can improve the situation if people are unable to access it and use it. Farmers need to have the capacity to adopt and understand new technologies, and the system needs to develop to meet their needs and to enable them. Since most of the farmers in Africa are women, an important component of these systems will be including women in all parts of the process: education, capacity building, and technology innovation.