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AGRICULTURE EDUCATION AND TRAINING (AET) SYSTEMS IN CAMBODIA: AN ASSESSMENT OF THE CURRENT STATUS AND FUTURE OPPORTUNITIES



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This document was written as part of a series of InnovATE AET assessment reports. An AET assessment report documents a scoping analysis conducted at the request of a USAID mission. These reports identify gaps in the human and institutional capacity of in-country AET systems. Examples of good practices identified and recommendations for next steps are included in these publications.

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Executive Summary

Agriculture is and will remain an important industry to Cambodia's development, as the agriculture sector contributes 30% of Cambodia's GDP and employs the majority of Cambodia's population. However, agricultural and technical training is of an uneven quality and quantity, despite the importance of agriculture to the economy. There are weaknesses in Cambodia's education system, at the pre-university and university levels as well as in the vocational and non-formal education sector. The needs for increased English language capacity, upgraded agricultural curricula, teacher training, lower repeat/drop-out rates, infrastructure development, and up-to-date equipment all remain obstacles to improvement. Opportunities to connect with the private sector for skills training and job placement exist in part because of the strong agricultural sector. In addition, key institutions, including those in the government, NGO and university sectors, have working relationships that can be built upon to overcome the threats associated with lack of interest in agricultural education and training (AET) in Cambodia.

The challenges associated with lack of capacity in AET in Cambodia have resulted in a significant gap between the skills with which students graduate and the skills that are being demanded by employers. Therefore, a priority for innovATE may be able to help connect vocational and technical schools and agricultural university graduates with potential employers by identifying pathways through which increased dialogue can occur and by informing educational institutions of the skills demanded by employers. InnovATE may also be able to work in conjunction with faculty at Cambodian educational institutions, in particular the Royal University of Agriculture, in order to update and upgrade agricultural curricula, develop a "teaching & research" culture and create English language certification programs.

Background

Introduction

As a largely agrarian society, with 80% of the population living in rural areas and 70% depending on agriculture for a living, the development of the agricultural sector in Cambodia remains a priority to reduce poverty and inequality (USAID). Currently, about a third of Cambodia's population of 15 million lives under the poverty line (USAID). Developing human and institutional capacity to meet the challenges of rural poverty, unemployment, and food insecurity in the aftermath of the genocidal Khmer Rouge regime will require an effective and resilient education system. Core to this education system is the contribution of agricultural training and education from primary to tertiary levels and the linkage of this education and training to the performance of the agricultural sector as a whole. The government of the Kingdom of Cambodia has clearly laid out priorities of human and institutional capacity building and development of agricultural research and education in its 2010-2013 Strategy for Agriculture and Water and its "Rectangular Strategy" for growth, employment, efficiency, and equity. Building capacity in agricultural education and training (AET) will help to stimulate innovation, entrepreneurship, and knowledge-sharing in Cambodia, which in turn will contribute to wider development goals of improved food security and poverty reduction.

Purpose of this report: Cambodia, innovATE and AET systems

innovATE seeks to strengthen the full range of institutions that train and educate agricultural professionals in developing and emerging economies. This capacity building will serve to build an equipped agricultural workforce that can lead to increased social and economic growth. The purpose of this report is to provide background material and initial information to support innovATE work in Cambodia by:

1. Outlining current state of AET in Cambodia, both from the supply side and demand side
2. Identifying key institutions in the ATE system in Cambodia and the roles that they play
3. Assessing the strengths, weaknesses, opportunities and threats for AET in Cambodia
4. Proposing potential ways forward for innovATE to build capacity in AET in Cambodia

Data collection methodologies

This report synthesizes the primary and secondary data sources and findings, to produce a SWOT analysis for AET in Cambodia and to make recommendations for future innovATE activities. The first steps for innovATE program involvement in Cambodia include a country study highlighting best practices and AET capacity building needs. A literature review and associated research was conducted during of the early months of 2013. An initial data collection visit was conducted in Cambodia from June 16-23, 2013, in order to build trust and relationships with stakeholders, to validate and update information found in literature reviews, and to establish an AET network in-country. During this visit, contacts were made with several key institutions in-country, and a focus group was held with students at the Royal University of Agriculture.

Based on the information gathered and analyzed during and after the initial visit, a full scoping visit was conducted Jan. 13-21, 2014, in cooperation with Michigan State University's Global Center for Food Systems innovation (GCFSI). Key sites visited by the scoping team included: Royal University of Agriculture (RUA), Prek Leap National University of Agriculture, Ministry of Education, Youth, and Sport (MoEYS), Ministry of

Technical and Vocational Education and Training (TVET), Ministry of Agriculture, Forestry and Fisheries (MAFF), and the USAID Cambodia Mission.

University visits were focused on round table discussions regarding the present state of Cambodia's AET system, weaknesses, and opportunities for InnovATE and GCSFI support. RUA and Prek Leap staff identified a variety of needs and opportunities regarding improvement of their capacity to provide quality AET. A focus group with AET-related NGO representatives was facilitated to capture their impressions of the current AET landscape in Cambodia and their ideas on future directions. Additional focus groups of mid-career agricultural sector employees, and current-and recent graduates of AET institutions were facilitated in order to capture a sense of how well their training prepared them for success in the workplace, and what necessary changes in their AET would have better prepared them to meet workforce demands.

Current education and training systems in Cambodia: Supply side

Workforce profile

In 2007, Cambodia's workforce was comprised of 8.8 million people who were 15 years and older (employment age) (Economic Institute of Cambodia, 2008). About three quarters of these people are engaged in unskilled labor and are either self-employed or work in family businesses in the informal sector (Table 1), and 81.2% of employed people live in rural areas. Most unpaid family workers have low levels of education (Table 2). Cambodia attracts low-skill, labor-intensive industries due to its large supply of unskilled labor and low wages and labor costs.

The agriculture sector is extremely important in Cambodia; it comprised 30% of Cambodia's GDP in the years from 2004-2007. The majority of Cambodia's workforce (59% of the population) is employed in this sector (Table 3). The agriculture sector in Cambodia is highly natural resource-based and very volatile, as production is tied to weather conditions (i.e. there is not much use of irrigation systems or other types of technology to manage for weather disturbances). Because of low efficiency in agriculture compared to other sectors, there is much room for improvement in productivity and output per worker (Table 4).

Pre-university education

The pre-university education system in Cambodia is perceived to be of low quality, especially in math and science (Tables 5 & 6). There are a number of pathways that a student may take in the Cambodian school system, which is loosely based on the French schooling system (Figure 1). Not all students complete pre-school, primary, secondary, or tertiary education, however, and there are students who repeat grades and/or drop out at all levels. A typical pathway that a student might undertake in pre-university schooling may be to start with pre-school or primary school, and then enter lower secondary school, followed by upper secondary school (Figure 2).

Many students do not attend pre-school, but most do experience some type of primary schooling. The primary level of education in Cambodia is comprised of students in grades 1-6. Learning achievement among primary school students is low, due to issues of teacher availability (the student-teacher ratio in Cambodian primary schools is 49:1) and teacher qualifications (World Bank, n.d.). The Ministry of Education, Youth and Sport (MOEYS) in Cambodia has stated that it would like to "strengthen and expand CFS [Child Friendly School] programs with activities such as effective learning and teaching, social emotional learning, special education,

inclusive education, multi-grade teaching, bilingual education, minimum curriculum standards, library programs, local life-skills, HIV/AIDS prevention, health issues, scholarships, school feeding and block grants for school improvement, especially in border and triangle areas.”

The next step after primary school is to go through general secondary. There are two levels that comprise a complete general secondary education: lower secondary (grades 7-9) and upper secondary (grades 10-12). The MOEYS website states that “the program objective for upper secondary education is to [en]sure equitable access to upper secondary education after students have successfully completed lower secondary education, especially in rural and disadvantaged areas. These students will comprise the human resource for enrolment in technical and vocational education and higher education.”

There are other types of schools that a student may go to after primary school. Colleges (grades 7-9) may be entered after primary school as a lower secondary equivalent. A lycee (grades 10-12) may be entered as an equivalent to an upper secondary school. A student may also have the option to go to a lycee (grades 7-12) which encompasses all grades that comprise a general secondary education.

Higher Education

There are 34 public and 57 private higher education institutes in Cambodia, which include universities, institutes or technical institutes, and a royal academy (World Bank, 2012b). Currently, only ~5% of Cambodians enroll in tertiary education (lowest GER in the SE Asia region), compared to ~70% of people in OECD countries (see Figure 3 and World Bank, 2012b). The MOEYS website declares a goal to “develop a curriculum development framework taking into consideration the capacity of Cambodian higher education lecturers, the job market, and national needs by 2012,” so as to improve employment opportunities for those who obtain a tertiary education. The MOEYS website also states that “some priority will be given to students enrolling for less market-oriented and more socially beneficial programs, especially education, health, agriculture, technology, engineering, science and mathematics,” so that more graduates will have the skills needed to succeed in the job market.

Royal University of Agriculture

There are a number of universities in Cambodia that teach agricultural programs (for university governance: Table 7). One such university is the Royal University of Agriculture (RUA), a semi-autonomous public education institution located in Phnom Penh. Founded in 1964, it is the leading agricultural university in Cambodia (and the only exclusively agricultural higher education institution in Cambodia), and has 5000-6000 students. There are four different degree types offered: an Associate Program (80 credits), a Bachelor’s Program (144 credits, 4 years), a Master’s Program (54 credits, 2 years), and a Doctoral Program (72 credits). It is important to note that women are under-represented in enrollment at RUA; of 304 current Master’s students, only 40 are women, and only 4 of the 288 Master’s students who have graduated so far are women.

RUA has ten faculties (and each faculty is composed of three departments): Agronomy (where courses are taught on subjects such as water for crop production, crop ecology, and soil and water management); Animal Science; Veterinary Medicine; Forestry Science (which has courses on topics including watershed management); Fisheries Science (which includes courses on aquaculture, water quality, and water contamination and treatment); Agricultural Engineering (which includes courses on hydrology, irrigation and drainage systems, groundwater, and pumping for agricultural production); Agricultural Economics and Rural

Development; Agro-Industry; Land Management and Land Administration; and Rubber Sciences. However, many of these faculties lack the proper equipment and lab space to be fully effective programs.

RUA's Graduate School of Agricultural Sciences has five departments (Agricultural Science; Animal Science and Veterinary Medicine; Renewable Natural Resources; Aquaculture and Aquatic Resource Environment; and Agricultural Economic Development), and offers a PhD program, the GIDAR Master, a Special Bachelor Program, a Special Associate Program, and an Associate Program in Agri-education for Extension (AEE). PhD students can choose between 24 specializations and must complete 72 credits and create an original work of research. The GIDAR Master Program (in English it is called the Integrated Management of Agricultural and Rural Development (IMARD) Master Program) is comprised of 54 credits and takes two years to complete. The Special Bachelor Program is intended for government officials with over ten years of experience. It is comprised of 44 credits and takes 1.5 years to complete. The Special Associate Program is also for government officials with over ten years of experience. It is comprised of 44 credits and takes 1.25 years to complete.

RUA has one research division, called the Hun Sen Research Center, also known as the Division of Research and Extension (DRE). The goal of the Center is to build capacity in the agriculture sector. There are a number of laboratories in the DRE: the Lab of Parasitology (under construction), the Lab of Microbiology (under construction), the Lab of Crop Quality, and the Lab of Soil Analysis.

RUA has experience with other donor/funded projects. The institution has been involved with the UC Davis/U-Hawaii Hort CRSP, the USAID-Michigan State extension evaluation, a USDA project for developing an MS in Animal Production and Welfare, FINTRAC/HARVEST, and a CDC collaboration.

University of Battambang

The University of Battambang (UBB) is another prominent Cambodian university with agricultural curriculum. The university opened in 2008, and the degree types offered at UBB are Short Course training programs, a Bachelor Program (4 years) and a Master's Program (2 years). Notably, if a person who has already entered the workforce decides to return and pursue a degree, they may count their experience in the workforce toward their degree and can graduate in 2.5 years. UBB has a main campus, a store, restaurant/cafeteria (on campus), and two farms, among other facilities. There are ~5000 students currently enrolled, but the maximum capacity is really around 2000.

There are five faculties at UBB. These are: Business Administration and Tourism; Arts, Humanities and Education; Science and Technology; Agriculture and Food Processing (majors under this faculty: Horticulture, Animal Science and Veterinary Medicine, Fisheries/Aquaculture, and Food Processing); and Sociology and Community Development (majors under this faculty: Economics, Agribusiness, Rural Development, and Law). UBB also has an Institute of Foreign Languages, which typically takes four years to complete.

In 2008, there were only 30 students enrolled in agriculture; now, there are over 200. UBB has pretty well-equipped lab facilities, including the largest tissue culture lab in Cambodia, where they have produced 20,000 banana plantlets. On the data collection trip, the rector stressed further developing the MS program in Sustainable Agriculture as a priority, as well as the need for more technically and practically trained faculty and staff in topics like plant production, soil science, and pest management.

Prek Leap National School of Agriculture

Prek Leap National School of Agriculture (PNSA) in Phnom Penh is another Cambodian institute of higher learning that offers degrees in Short Course training programs, an Associate Program (2 years), and a Bachelor Program (4 years).

The Short Course training programs are offered for 22 different specialized agriculture courses. Specialized courses include topics like “Agricultural Extension,” “Disease and Treatment for Chicken, Pig and Cattle,” “Integrated Pest Management,” “Rural Credit Management,” and “Vegetable Growing Techniques,” among others.

Eight degrees are offered under the Associate Program. These are: Agribusiness/Economics; Agricultural Extension and Rural Development; Agronomy; Animal Health and Production; Fisheries; Food Processing; Forestry; and Horticulture.

Nine degrees are offered under the Bachelor’s Program. These are: Agricultural Economics; Agricultural Extension and Rural Development; Agricultural Management; Agronomy Science; Animal Science and Veterinary Medicine; Aquatic Resource Management and Aquaculture; Forestry Science; Horticulture; and Food Technology.

Institute of Technologies in Cambodia and other institutions

The Institute of Technologies in Cambodia (ITC) in Phnom Penh offers programs related to rural engineering and hydrology. Course topics include rural infrastructure improvement and maintenance. ITC is one of the only universities in Cambodia to offer courses related to water.

Other institutions that have some agriculture courses include Kampong Chham National School of Agriculture, Moharussey Vedic University, and Build Bright University.

Non-formal education and TVET

The non-formal and vocational/technical education systems can be improved in Cambodia. The MOEYS website describes how MOEYS would like to “increase support for the provision of local life skills and vocational training and basic/required professional skills responsive to the needs of the social and labor market.” MOEYS is hoping to place a strong focus on literacy and partnerships with NGOs, community centers, and other organizations in order to obtain this goal.

Only 1% of employed Cambodians have formal technical and vocational education and training (TVET), and less than 6% of Cambodians ages 20-24 have attended TVET schools (World Bank 2012a). TVET can be understood as the study of technologies and technical sciences, as well as the practical skills and knowledge that are related to such studies. When compared regionally, Cambodia has one of the smallest shares of students currently enrolled in TVET at the upper-secondary and tertiary levels (Figure 3) (World Bank, 2012b). Existing TVET programs are of a limited quality due to a lack of skilled trainers, a lack of proper equipment/technologies, and poor building facilities. However, private schools/centers are perceived to be better as they likely have better-quality trainers and facilities.

In the 2005-2006 year, 27,487 students graduated from 40 public technical/vocational institutes and 170 NGO or private training centers. In the public schools, only 50% of students receive technical training, and the other 50% learn management and computer skills. Those enrolled in private schools mostly learn English, business, and computer applications, and those at NGO training centers can learn any variety of skills, including agriculture, business, mechanics, and handicrafts.

A number of agricultural research institutions are at work in Cambodia. Some of the most important are RUA (discussed in the “Higher education” section), the Cambodian Agricultural Research and Development Institute (CARDI), and the Centre d’Etude et de Développement Agricole Cambodgien (CEDAC), also known as the Cambodia Center for Study and Development in Agriculture. CARDI is involved in research plant breeding and protection, soil and water sciences, agri-engineering, socio-economic development, and agronomy and farming systems. CEDAC takes part in work relating to local development, training and research, and health and the environment. CEDAC’s Local Development Program is its largest program, and encompasses projects on linking small farmers to markets, ensuring that children have access to primary schools, and creating community-based solutions for climate-smart agriculture and resource management. CEDAC’s Training and Research Program activities involve providing consultancy services on topics related to agricultural production, agricultural cooperatives, and community organization. The Health and Environment Program at CEDAC has the roles of monitoring Cambodia’s agro-chemical situation, to educate the public about the negative effects of overuse of chemicals in agriculture, and to develop organic standards (Centre d’Etude et de Développement Agricole Cambodgien, 2012).

Labor market and employer needs: Demand side

Agricultural industry

The main agricultural commodity in Cambodia is rice, and therefore the rice market is important in the Cambodian agricultural sector. Other important commodities include maize, cassava, sweet potato, and some types of vegetables (World Food Programme, n.d.). Types of produce that could become increasingly important include including mangos, bananas, oranges, and chili peppers (Fresh Studio Innovations Asia, 2009).

There is little information available regarding agricultural employers/employment outcomes for agricultural students. Based on the literature review and information gathered during scoping visits, Table 8 lists some important employers in agricultural sectors in Cambodia.

Skills shortages/gaps

Growing demand

There is a growing demand for skilled labor (people with technical skills) in Cambodia. In 2007, 15.5% of firms reported skills as a major constraint to growth (Table 9); 22% of foreign firms said skills were a “severe” or “very severe” constraint to growth. Employers identify a structural imbalance in skills supply, including a shortage in TVET graduates as compared to those who graduate from a university. In 2011, 73% of employers said that those graduating from a university are graduating with the wrong skills, and in the same year 62% of employers also said that vocational training graduates do not have the right skills.

Skills that are lacking

Soft skills are noted as the most important skills that are lacking by employers. These skills include management, analytical thinking and decision-making, and so forth. Employers also value skills in literacy and numeracy, as well as behavioral skills. These skills are learned in a school setting and in early development, reinforcing the need for good nutrition and pre- and primary schooling programs that are effective during early childhood development as these programs have a high payoff. There is also a skills gap related to technical skills in Cambodia: there is a lack of training in technical competencies (including skills related to agriculture and technology), a lack of proper facilities and equipment to upgrade and develop such technical skills, a lack of up-to-date curricula to teach cutting-edge material and technologies, etc.

Reasons that skills are lacking

There are a number of causes of Cambodia's skills gaps and employment mismatches. First, Cambodia's current primary education system has issues with completion rates and learning more generally, as many students repeat or drop out. This is an obstacle to early childhood development, as many skills are formed early in life in a school setting. Acute malnutrition is another major obstacle to early childhood development, as early developmental setbacks (mental and skills-related) from malnutrition are difficult and/or impossible to remedy later in life.

Additionally, less than one half of students actually complete secondary education in Cambodia. Some primary reasons for dropping out or skipping include chores, poverty, and the need to make additional income. Also, technical/vocational training systems are undervalued and suffer from low attendance and poor-quality resources (perhaps as a result of social bias) even though returns to post-secondary TVET are nearly equal to the returns from tertiary education (Figure 4). There is a need for household interventions to promote school attendance and retention, as well as a need for more consistent basic education and improved vocational programs.

Another cause of the skills gap is misinformation/miscommunication among higher education institutions and a multitude of other actors. Employers lack appropriate channels within which to make their desires known for certain skills in successful future job candidates, and there are no labor market information systems/institutions to survey labor market demand and connect it with supply (i.e. coordination mechanisms, employment services, quality assurance, accreditation, licensing, and regulation). To rectify this, schools and companies need to be brought together to promote quality and relevance to the demands of the market. The National Training Board needs to better allow for firms to convey their needs to the government and the provider community, because currently the Cambodian economy is focused on low-skill production (surplus) but the unmet need/gap is for higher-level skills (shortage).

A fourth reason that the skills gap exists is that students often base their decision on what subject to study in tertiary schools on the advice, wishes, and interests of their parents rather than on their own future labor market prospects, opportunities, and outcomes. A 2008 survey by BDLINK Cambodia Co. shows that only 20% of graduating secondary seniors based their decision on what to study on the labor market, while 70% followed their parents' advice, and only a third of university and TVET students chose their subject because of market demand. Additionally, there is no reliable report of employment outcomes of recent tertiary graduates.

The results of the mismatch between graduate supply and market demands are high structural unemployment, productivity and economic growth constraints, and the stifling of Cambodia's attempts to diversify its sources of growth.

Ways to address the skills gap

To advance Cambodia's economy, disciplines in the hard sciences are necessary (i.e. engineering, science, and math) but they aren't receiving the needed resources throughout the education system. Only a small proportion of graduates have these types of degrees (Table 10) but they are the most in-demand. Low numbers of graduates in engineering and sciences along with low numbers of TVET graduates with post-secondary training will limit Cambodia's ability to upgrade its agricultural and industrial sectors. A World Bank study indicates that Cambodia will see an over-supply of higher-education graduates in business and law but shortages will persist in science and engineering. Progress in training and education will remain limited by continued weaknesses in teacher training and a lack of graduates in education-related disciplines. To try to rectify this skills gap, the World Bank has developed a plan of action and proposed solutions to overcome skills shortages (Figures 6 & 7).

To try to address the gap in the unmet demand in workers with a mix of hard and soft skills, many employers have started to attempt to provide formal training, despite the fact that almost a third of employers also reported that it is hard to train or upgrade their workforce. Employers pursue the following in formal training: technical skills, decision-making and problem-solving, communication, teamwork and leadership, and marketing, sales, and customer service skills.

Notably, 80% of economic activities in Cambodia take place in the informal sector. "These activities do not really require skills in the field of social sciences - including accounting, finance, and management - as provided by the universities, but rather call for skills provided by vocational training institutions" (Sopheap, 2012).

SWOT Analysis

Based on the primary and secondary data collected through a two scoping visits and a desktop study, below is a SWOT analysis of the current state of the Cambodian AET system. (For a SWOT analysis of Cambodia's agriculture and water management strategies more generally, see Figure 8 in Appendix A.)

Strengths

Leadership and interest in building AET capacity: Based on conversations with government officials, academic administrators, faculty and students at RUA, there is a very high level of energy and enthusiasm for addressing Cambodia's pressing AET needs among governmental leadership, administrators, faculty and students. RUA faculty has strong leadership and trust amongst colleagues, and have experience working with donors and other collaborators to build capacity. At Prek Leap there were farm experiments, available machinery and training, and practical skill learning.

High rates of post-secondary education enrollment and job placement in agriculture: Enrollment rates at Cambodian universities are continually high, and have been increasing at RUA in recent years. A high percentage of AET graduates who find employment do so within government or NGO's, and the linkages

between the universities, and government and NGO offices provide job opportunities for graduates of AET system.

Weaknesses

Inadequate or inappropriate AET curricula: Key weaknesses of the AET curricula as they currently stand include a lack of connection between theory and practical education, a lack of English language training, and a lack of training in skills that meet workforce demands. The quality of vocational agricultural training remains low and the engagement of the private sector is not routinely practiced, especially with agricultural producers. Across the entire agricultural education and training system, there is a huge disconnect between what is taught to students and what skills are needed. For example, agricultural employers note that they cannot find Cambodians with the skills they need for the jobs they have. New and current extension workers need relevant, hands-on training, which is not currently available. In addition, curricula need to be upgraded. RUA has been run under several different systems in the past (Russian, Japanese, French, Khmer, etc.), so curricula is disjointed and outdated.

Insufficient AET infrastructure: Infrastructure upgrades related to a variety of specific AET programs remains a significant challenge. Several key labs need to be upgraded. Certain facilities need new equipment, and staff members need to be trained on how to properly utilize new equipment and integrate the technology into the curriculum. There is a lack of funding for labs and equipment, as well as the support staff to fully utilize the facilities.

Lack of diversification in types of AET to meet diverse needs: While RUA and other universities provide a strong option for tertiary AET, there is a lack of agricultural education and training at primary, secondary and post-secondary school levels, as well as in informal settings. When compared regionally, Cambodia has one of the smallest shares of students currently enrolled in TVET at the upper-secondary and tertiary levels. Adult learning opportunities are needed for farmers and farmer groups to connect with agricultural university short course trainings. In addition, more documents and training materials need to be produced in Khmer and other local languages to facilitate informal and primary education.

Opportunities

Demographic, political and technological trends show growth potential in agriculture: After decades of civil strife, Cambodia is on the road to economic recovery. Annual GDP growth is consistently exceeding 7% annually, and agriculture accounts for 30% of GDP. In addition, the majority of the population based their livelihood on agriculture, meaning that there are untapped skills and resources to build agricultural enterprises to support AET and job creation. Across the economy, there is a growing demand for skilled labor (people with technical skills) in Cambodia. Advances in Information and Communications Technology (ICT) technologies can be harnessed in order to bring more cutting edge and effective AET to local populations. This may take the form of distance learning, real-time market information, or pest management support services via Short Message Service (SMS) texting, smart phones, etc. More integration of technology into AET will not only supply farmers with current, competitive information but also promote the agriculture sector youth who are focused on other, more attractive industries.

Space in existing curricula to incorporate AET: Secondary schools in Cambodia typically have a “life-skills” program as part of their curricula, under which agricultural knowledge could be taught, but often is not. There is

an opportunity to develop methods to integrate agricultural education into pre-university-level education in Cambodia so that all students entering RUA (and other universities for agricultural programs) have some standard agricultural knowledge prior to university education. Existing TVET institutions have a framework within which to develop short-term training courses and AET programs. In addition, there is an English language center at RUA that could be strengthened to address language needs, which in turn would make the large body of English based AET course material more accessible to students.

Building upon existing inter-institutional connections and imperatives to expand AET: AET institutions such as RUA, University of Battambang and Prek Leap would benefit from improved linkages with a variety of academic and NGO organizations engaged in agricultural development projects. Projects such as HARVEST and Horticulture Innovation Lab could directly contribute to AET curriculum revision and other needed reforms. Linkages to international universities could build capacity in research methods while also conducting research that supports AET programming. Linkages with the private sector exist as well; for example, opportunities exist to partner with innovative outreach projects such as the public-private training program developed in Siem Reap Province by GIZ and East-West Seed. In addition, Cambodia will need to adapt to upcoming ASEAN university standards set to be implemented in 2015, which will not only push present capacity of AET universities beyond their capabilities, but also put graduating students in more direct competition with more advanced ASEAN students.. This indicates that primary and secondary AET need to support upcoming tertiary ASEAN specific education curricula guidelines.

Threats

Variability in government, donor and university support for AET: There is a consistent, if low-level, threat of changes in governance affecting funding and stability for educational infrastructure in general, and in AET in particular, since it is already of low import. In addition, there is the ongoing threat of funding cuts or changes from international donors, as programming and priorities shift. One threat to AET institutions securing their own funding is the lack of English language capacity of many agricultural experts in the university system in Cambodia. Limited English language skills preclude the possibility of these institutions being competitive in soliciting foreign research funding.

Lack of interest in AET by youth, employers and educational institutions: Youth disinterest in AET causes significant agriculture brain drain to other, more lucrative and attractive industries, such as information technology. For example, a plan exists to field a significant number of new agricultural extension workers, however their projected salary is less than that of factory garment workers. This reinforces the allure of non-agricultural sector jobs and illustrates systemic problems related to governmental priorities and resource allocation. The university AET system and other key sectors also need better synchronization in order to restore relevance and effectiveness. Relationships need to be restored between higher education and employers, companies and research institutions. In addition, disconnects exist among higher education institutions themselves and between training providers (horizontal disconnect across skill providers) and between higher education and earlier education (vertical disconnect across skill providers).

Next steps in strengthening AET in Cambodia

“Cambodia has more than enough workers to supply emerging sectors, but thus far demand and supply have been mismatched due to the low quality and capacity of the labor force” – Economic Institute of Cambodia, 2008, p. 28

While Cambodian AET institutions vary widely in capacity and performance, there is great opportunity for improvement through implementation of even small-to-moderate changes and modest sustained investment. Continued assessment of needs and opportunities for reforming and reinventing AET programs and institutions to reflect the current realities will go a long way toward building lasting human and institutional capacity that will continue to operate after donor funding has ended. The needs of the AET system in Cambodia are extensive, from physical infrastructure and information technology, to the academic curriculum, the upgrading of the quality of faculty, reforming higher education administration and governance, and effective international engagement. However, modernizing and strengthening the AET system in Cambodia will require more than just upgrading laboratories, classrooms, and related physical infrastructure. The more pressing need is to re-establish across the spectrum of AET organizations a new type of totally integrated living-learning academic experience that generates fertile discourse and critical academic engagement outside as well as inside the typical academic classroom (for a complete summary of issues in higher education in Cambodia, see Figure 9).

The Cambodian government’s “rectangular strategy” calls for improvement to and enhancement of the agricultural sector as one of its strategic “growth rectangles”, which indicates that there is a demand for and government support for agricultural development (Figure 10). Each growth rectangle has four sides, and the four sides of the “enhancement of the agricultural sector” growth rectangle’s four sides are: improved productivity and diversification of agriculture; land reform and clearing of mines; fisheries reform; and forestry reform. Another “growth rectangle” in the Cambodian government’s rectangular strategy is capacity building and human resource development. The four sides of this growth rectangle are: enhanced quality of education; improvement of health services; fostering gender equity; and implementation of population policy (Royal Government of Cambodia, 2004). This indicates that the government also supports institutional and human capacity-building and education reform.

Some of the most prominent problems facing agricultural education and training in Cambodia are the need for further curriculum development and staff capacity-building at schools, the development of proper infrastructure, the need for equipment and teaching materials, improvement in English language capacity, and the addition of practically-based courses to supplement theoretical classes (see Figure 13 for identification of skill gaps in the Cambodian agricultural workforce). Additionally, a significant skills gap is evident in Cambodia when considering the skills of the workforce supply and the demands of employers. There are low numbers of graduates in agricultural science and technology despite there being a high demand for such employees. The results of this mismatch have led to high structural unemployment, productivity and economic growth constraints, and undiversified sources of growth. To close the skills gap, it is vital that linkages between higher education institutions and other sectors of the Cambodian economy (i.e. employers, research institutions, companies, early education providers, and other higher education institutions) are created and strengthened (see Figure 14 for a depiction of the process of closing the skill gap). The suggestions and recommendations, while not a comprehensive listing, offer concrete steps forward for Cambodia’s AET system based upon the above SWOT analysis.

Increase private sector involvement. Moving AET forward in Cambodia will require a comprehensive approach. The private sector represents an essential piece of the strategy for modernizing the system. Through increased connections with the private sector AET can move from its supply driven model to a more viable demand driven model. Private sector will be crucial in dictating what skills the market is looking for and what knowledge will be adequately reimbursed. Increased involvement of the private sector will help bring an entrepreneurial side to AET that will help to attract younger generations to the field which will help to solve the issue of the aging expert base. Private sector participation can also help address the sustainability of USAID efforts. If private sector is involved then the AET projects will have an independent source of funding other than the international donors whose funding is always tentative at best.

Create and strengthen inter-institutional connections. To close the skills gap, it is vital that linkages between higher education institutions and other sectors of the Cambodian economy (i.e. employers, research institutions, companies, early education providers, and other higher education institutions) are created and strengthened. Effective AET works through all private, public, university, and NGO institutions to build capacity and sustainability. Currently, the opportunity exists to connect with several organizations that have been doing exemplary work, which could provide models and be strengthened with USAID assistance.

Partner with NGOs to leverage their experience for AET improvement. Cambodian NGOs are involved in a variety of agricultural and rural development programs and many are contributing significantly to enhance food security among the poor who live in rural areas. NGOs with whom we met appear to be successfully implementing a variety of valuable projects. Their staff are well-trained, they seem to organize and manage their programs and project activities in a very professional manner, and they are dynamic and entrepreneurial – matching programs to local needs and market conditions. The human resources and networks developed by NGOs, and their experiences, ideas and lessons learned about ways to address the challenging problems of food security in deficit areas, should be shared throughout the AET system and incorporated in curriculum development, and other training.

Diversify AET opportunities beyond university degree programs. The pressing need for trained agriculture-related professionals offers the opportunity to move AET out from university campuses to a broader client base to engage in broad support of the industry. This could take a variety of forms all of which would include a more practical, applied approach to agricultural education and would likely include programs less than 24 months duration. By supporting technical and vocational schools or centers for modern agriculture that attract both experienced and young farmers as well as other youth and those already employed in the sector, these centers can bring AET knowledge to a broader audience. Such centers would cater to the practical agricultural education needs of the sector – training technicians, entrepreneurs, and farmers. This would allow the education to be demand-driven and let the trainees make themselves increasingly valuable to employers. In addition, by casting a wider net and giving more specific training the AET efforts may empower a worker to better their wage earning potential but not so great that the worker would be able to peddle the new knowledge elsewhere, as with past focus on PhD programs. This would keep the knowledge learned from the trainings at the local level where it can be of greatest benefit.

Update curriculum and key resources. Like the physical infrastructure, much of the curriculum being offered in Cambodian agricultural universities is seriously outdated. Faculty lack access to the newest books and journals with which to educate themselves, as well as to update their teaching materials. The problems with obsolete curricula materials however are over-shadowed by an emphasis on rote learning and a lack of

experiential education opportunities. Cambodia's AET system needs to educate students to be much more capable of critical thinking and innovation. Additionally, faculty need to be unencumbered to teach more than an assigned curriculum.

Strengthen partnerships with governmental ministries which have similar goals. The Ministry of Education, Youth and Sport (MOEYS), for example would like to increase support for the provision of local life skills and vocational training and basic/required professional skills responsive to the needs of the social and labor market. InnovATE might potentially collaborate with MOEYS and AET institutions to place a strong focus on literacy and partnerships with NGOs, community centers, and other organizations in order to bridge stronger relationships to meet AET needs.

Increase the capacity of RUA to attract and manage outside funding. RUA is currently engaged with donor organizations and is managing funds from outside sources such as USAID. Improving the institution's ability to efficiently managing extramural funding will improve its competitiveness going forward, and position the institution towards more sustainability.

Engage a new generation of agricultural professionals. It is critical to develop a strategy and action plan to expand the understanding of how Cambodian youth perceive and interact with agriculture. Moving away from agriculture's perception of hard work toiling on a farm to cutting edge scientific research in state-of-the-art laboratories, or marketing and distribution of goods, will have greater appeal on today's technology-driven youth. The AET system and partner institutions can push to develop interdisciplinary curriculum for agriculture students that focuses not only on the more traditional aspects of farming but also business development, marketing, non-profit management, environmental issues, bio-engineering and other technological aspects. A broadened understanding of what agriculture is can open up avenues of research and understanding that will strengthen AET institutions in Cambodia and help them to be more sustainable in the long run.

Develop programs to link AET institutions with public and private sector employers. This initiative could be part of a larger effort to develop effective career services for AET institutions. Positive outcomes could include a closer alignment of education and training supply with current workforce demand. A pilot program in commercial horticulture could link with current USAID investments such as HARVEST and the Horticulture Innovation Lab.

Enhance English language capacity. An important element of change will be to improve the capacity of the academic staff and students to teach and learn effectively in English. In the long-term, this will rest on the commitment of the entire education system in Cambodia to developing English language capacity. However, in the short-term, there are a variety of steps that can be taken to improve the capacity of current faculty and staff.

Recommended action plan for innovATE in Cambodia

Agriculture is and will remain an important industry to Cambodia's development, as the agriculture sector contributes 30% of Cambodia's GDP and employs the majority of Cambodia's population. However, agricultural and technical training is of an uneven quality and quantity, despite the importance of agriculture to the economy. There are weaknesses in Cambodia's education system, at the pre-university and university levels as well as in the vocational and non-formal education sector. The needs for increased English language capacity, upgraded agricultural curricula, teacher training, lower repeat/drop-out rates, infrastructure development, and up-to-date equipment all remain obstacles to improvement. These challenges have resulted in

a significant gap between the skills with which students graduate and the skills that are being demanded by employers. In Cambodia, a priority for InnovATE may be able to help connect vocational and technical schools and agricultural university graduates with potential employers by identifying pathways through which increased dialogue can occur and by informing educational institutions of the skills demanded by employers. InnovATE may also be able to work in conjunction with faculty at Cambodian educational institutions, in particular RUA, in order to update and upgrade agricultural curricula, develop a “teaching & research” culture and create English language certification programs.

The first proposed activity for innovATE work in Cambodia is to **Develop a ‘Center of Excellence’ (CoE) model system for sustainable AET improvement.** An overview of the proposed project follows.

Commercial Horticulture Center of Excellence – Pilot Project

To realize the vision and engage the opportunity of Cambodia becoming a net exporter of quality horticultural products, AET institutions must develop the necessary research, education and training capacity in order to lead the way. As the flagship AET institution in Cambodia, the Royal University of Agriculture (RUA) would house the proposed Commercial Horticulture Center of Excellence (CoE). At its core the CoE would become an innovation incubator for commercial horticulture development, and would transform the RUA horticulture program into a demand-driven, responsive and efficient support for commercial horticulture production for domestic and international markets.

Commercial Hort CoE Objectives:

1. Develop and strengthen linkages among key components of the Cambodian AET and research system including CARDI and other educational institutions engaged in AET; network development would also extend to private sector, agriculture related NGO’s, USAID-sponsored projects, and public/private extension efforts.
2. Build capacity of RUA to offer educational/training programs necessary to develop and sustain the nascent commercial horticulture industry, engage in research, and offer Extension/outreach programs to develop horticulture enterprises and value chains.

A complete description of the CoE can be found in the concept note *Commercial Horticulture Center of Excellence – Pilot Project*, prepared by the InnovATE scoping mission team.

Appendix A: Figures

Figure 1. A flow chart of some possible education pathways for Cambodian students, from pre-school to tertiary education. Students may repeat/drop out at any level.

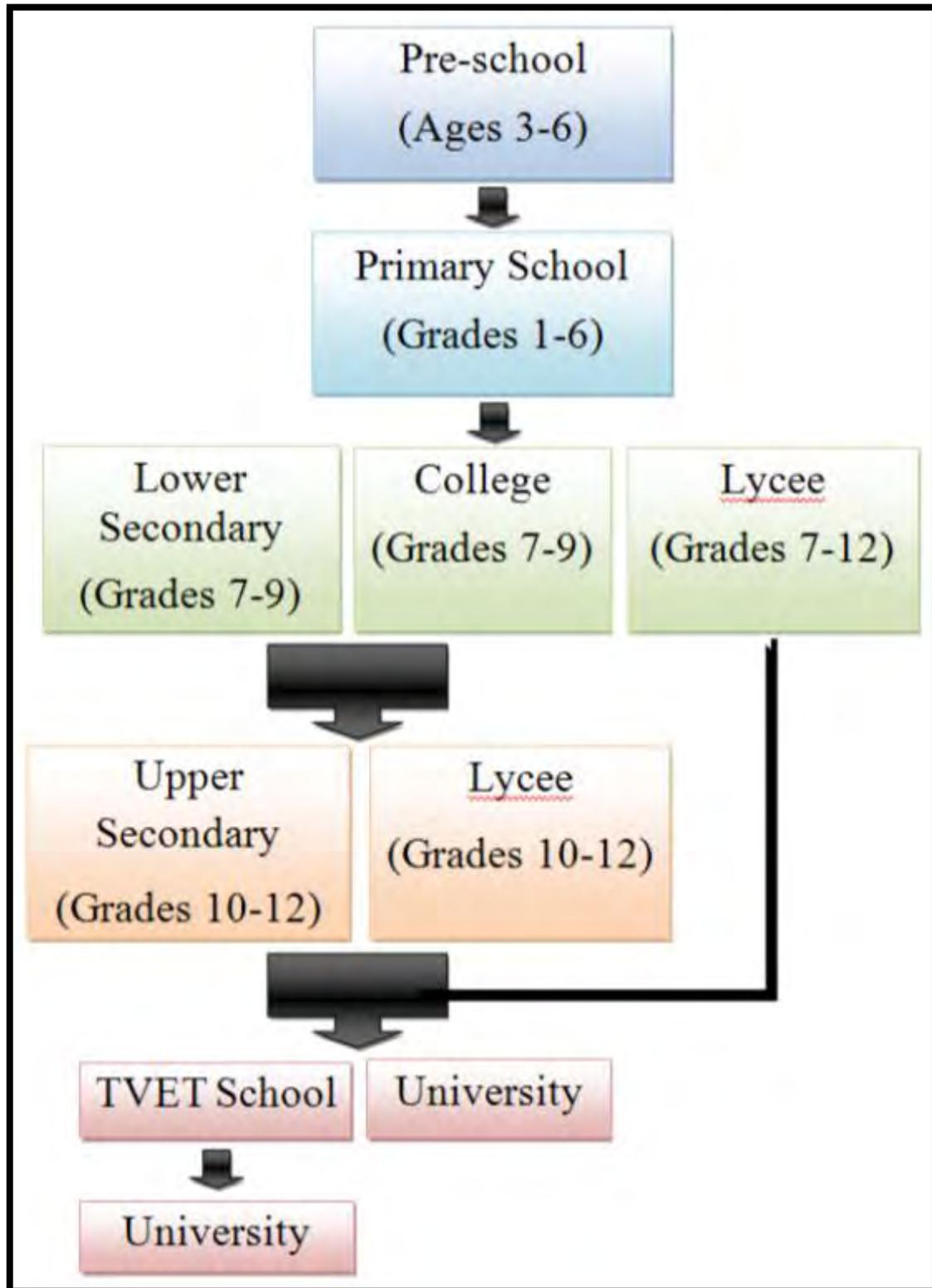


Figure 2. A flow chart of what could be considered a somewhat typical pre-university education pathway for a Cambodian student, along with how many students were enrolled at each level in 2011/2012. It is clear that many students have some primary schooling and that enrollment rates decline as students drop out at secondary levels. Mean years of schooling, according to the CIA World Factbook (2013), for students in Cambodia is 10 years.

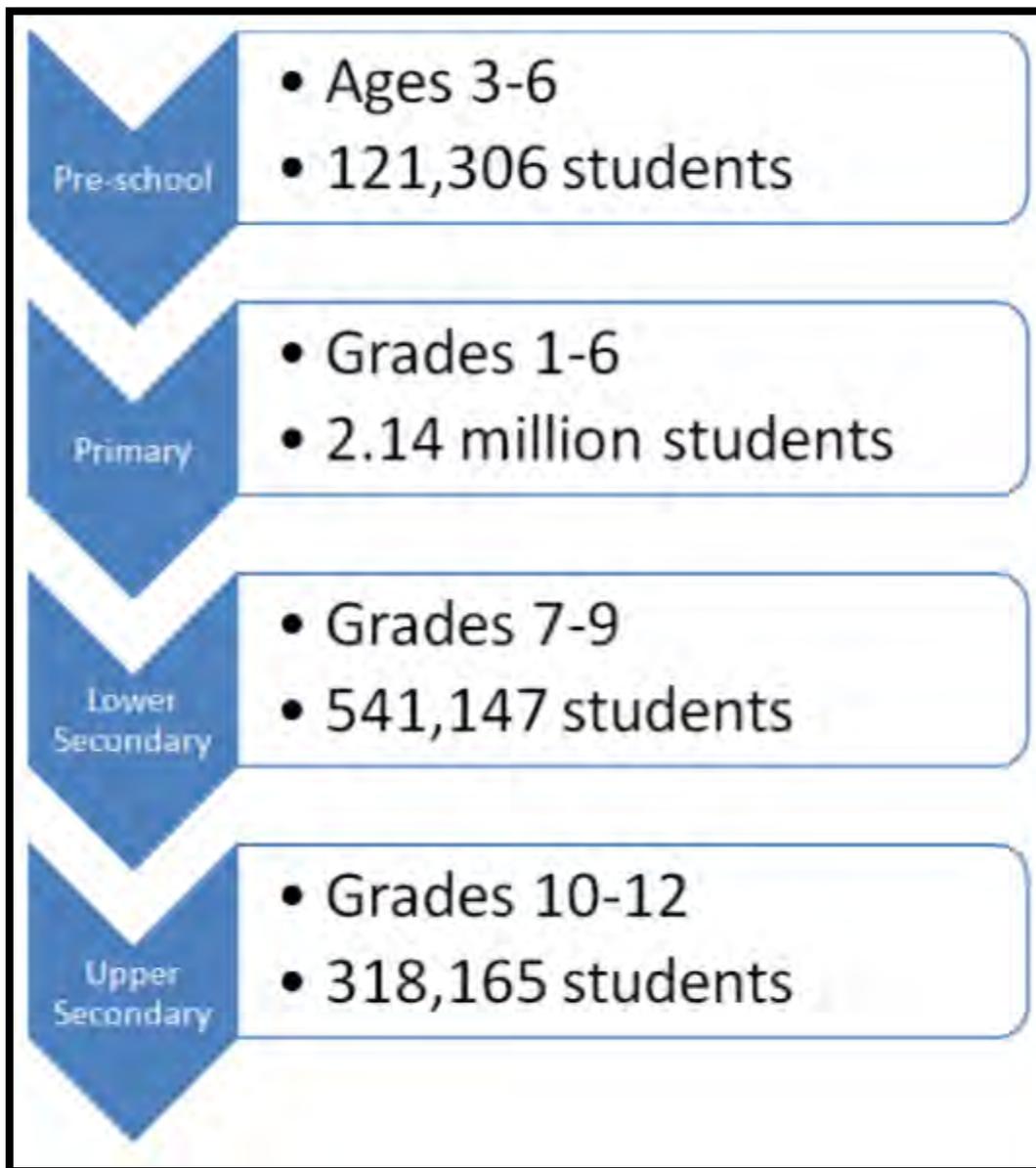


Figure 3. Share of upper-secondary and tertiary students enrolled in TVET in Cambodia. Taken from the World Bank (2012b) p. 71.

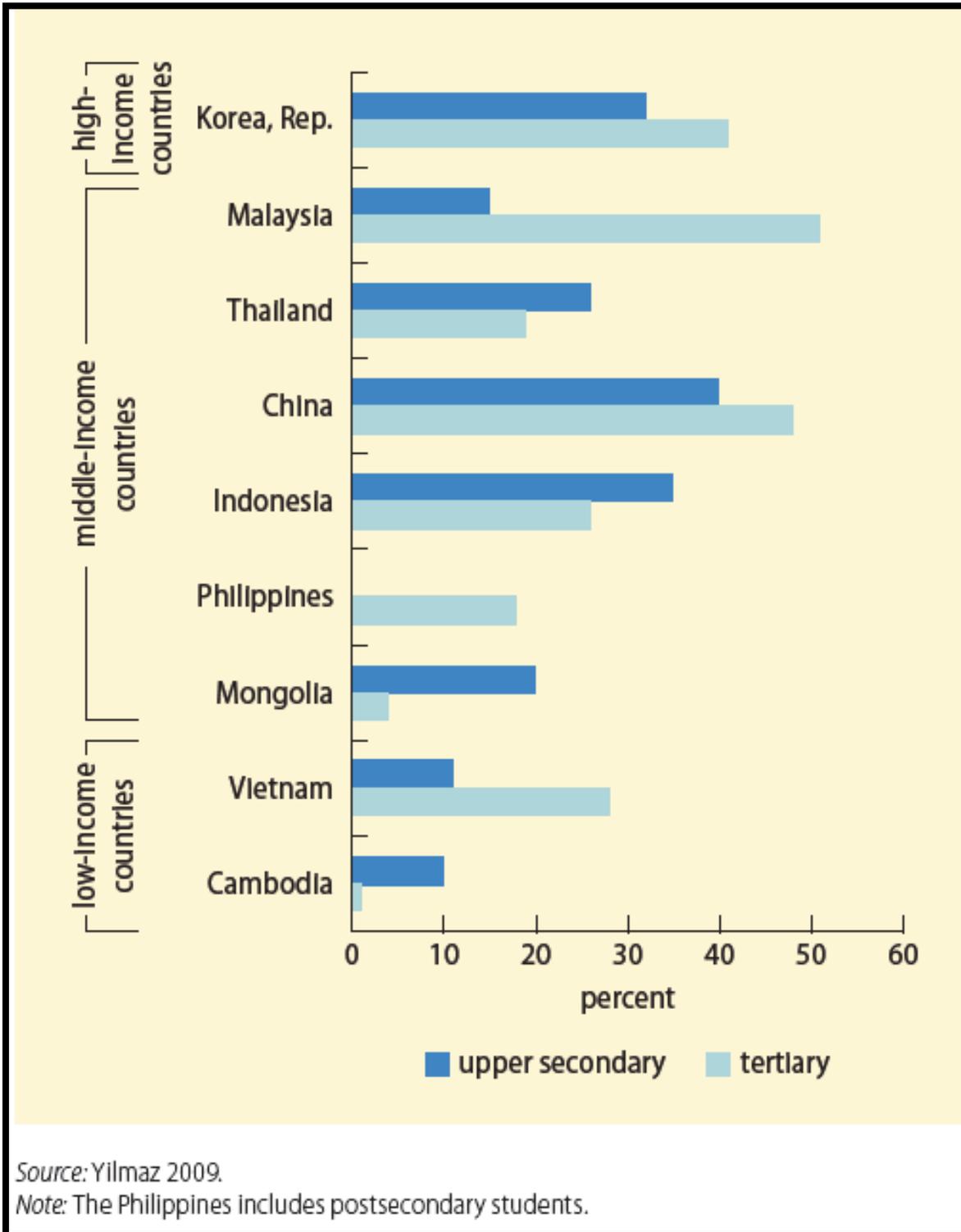


Figure 4. Monthly wages by level of education and occupational groups in Cambodia, 2009. Taken from the World Bank (2012a) p. 14.

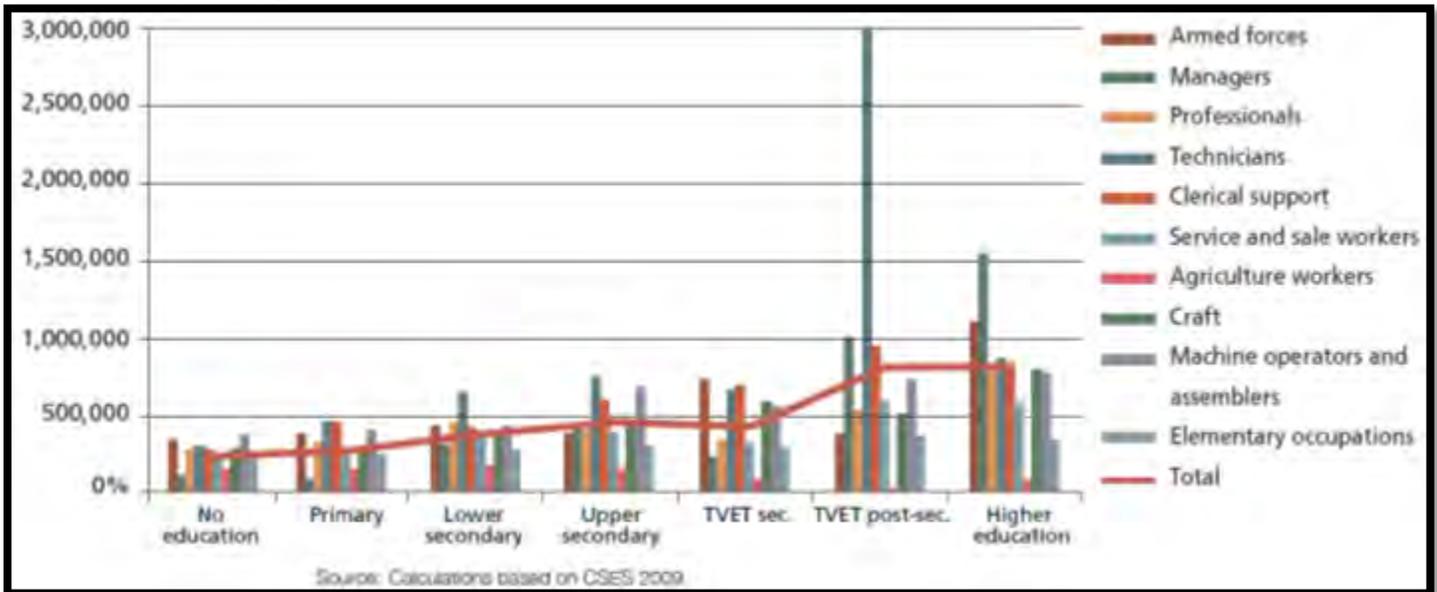


Figure 5. Share of tertiary graduates by discipline internationally. Taken from the World Bank (2012a) p. 16.

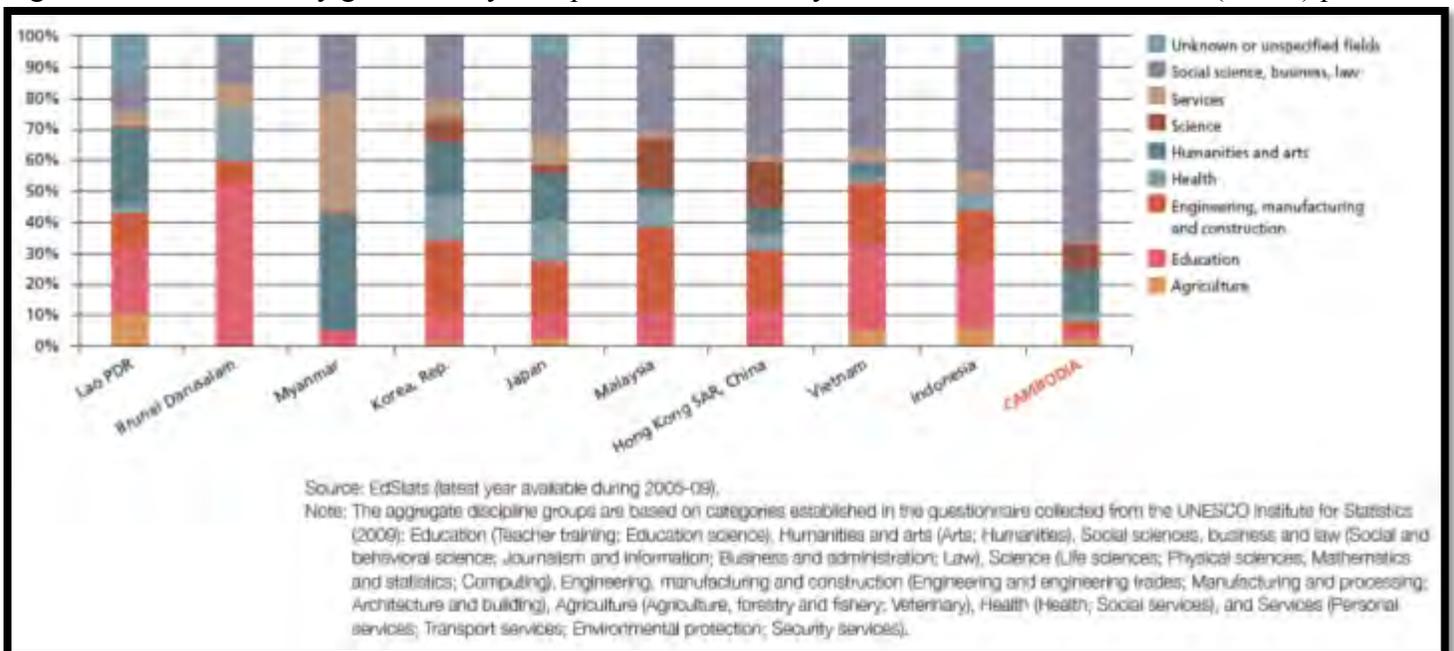


Figure 6. Skills development action plan: Immediate priorities and laying the foundation for the future. Taken from the World Bank (2012a), p. 3.

Objective	Skills supply	Laying the foundation for the future
1 Information access	<ul style="list-style-type: none"> Enhance employment counseling and job search services Use media to show study and career opportunities, promote TVET 	<ul style="list-style-type: none"> Enhance the NEA's capacity and partnership with the private sector
2 Coverage in the "missing middle"	<ul style="list-style-type: none"> Mainstream good TVET programs 	<ul style="list-style-type: none"> Strengthen the capacity of the NTB to deliver employer-focused reform of education and training Consider ways to encourage employers to invest in training their workforce
3 Quality and market relevance	<ul style="list-style-type: none"> Begin upgrading a small number of skills providers, including non-formal training centers, in collaboration with local industries 	<ul style="list-style-type: none"> Reform secondary curriculum to improve the teaching of science, math, engineering and other technical disciplines, entrepreneurship, and soft skills Strengthen accountability of communities and schools as part of the D&D process
4 Financing efficiency	<ul style="list-style-type: none"> Expand household-oriented financing instruments for school retention 	<ul style="list-style-type: none"> Increase expenditure on cost-effective interventions early in the life cycle Explore different financing tools to promote incentives toward good results among skills providers, including higher education institutions

Figure 7. Employers' proposed solutions to overcome skills shortages in the Cambodian workforce. Taken from the World Bank (2012a), p. 10.

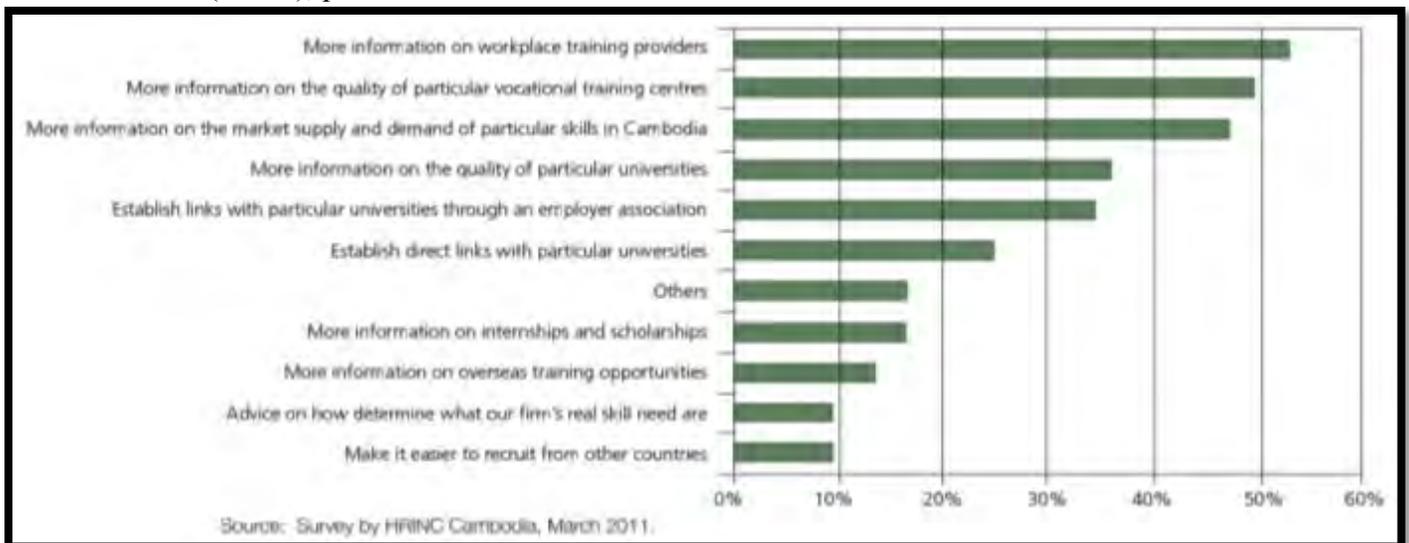


Figure 8. SWOT analysis related to agriculture and water in Cambodia. Taken from the Kingdom of Cambodia (2007), p.6.

Agriculture and Water Management: summary SWOT Analysis	
<p>Strengths</p> <ol style="list-style-type: none"> 1. Land resources are available 2. Water resources are available 3. Abundant manpower is available in rural areas at low labour cost 4. MAFF and MOWRAM have good human resources potential 5. Policy and/or strategic frameworks are developing for MAFF and MOWRAM 6. Stakeholders are committed to and recognise the importance of the sector (Government, EDPs, NGOs and farmers) 7. Diverse agro-ecosystems are available, with many land-types and cultivars 8. Developing focus on community empowerment and engagement, through inter alia Community Councils, FWUCs and FOs 9. Agri-business is developing 	<p>Weaknesses</p> <ol style="list-style-type: none"> 1. Institutional capacity, management and project implementation by MAFF and MOWRAM are weak 2. Water resources are highly variable in time and space, and agricultural water management technology is poorly developed 3. There is limited investment capacity or interest in investing in agriculture 4. Technology transfer is weak and farmers and extension workers have a low level of knowledge, access to technology, and skills 5. Soil fertility is low in many the areas. 6. Socio-cultural weaknesses include low community solidarity, vulnerability of farmers to landlessness, a cultural focus on subsistence agriculture: "Rice first, fish second" 7. Information asymmetry (inconsistency) among stakeholders 8. The productivity of agricultural labour, land and water is low (resources are used inefficiently) 9. There is weak access to markets 10. Legal instruments for A&WR are inadequate.
<p>Opportunities</p> <ol style="list-style-type: none"> 1. Improvement of governance, including RGC commitment (the GAP), policy definition and political stability. 2. Market development and integration with the regional and global economy. 3. Strong support from External Development Partners for investment in A&W 4. Science and new technologies 5. More fully exploit natural resources (water and land) that presently are under- or un-utilised 6. Availability of investment funds, including incentives, private funds, and rural credit services 7. Decentralization and de-concentration policy 	<p>Threats</p> <ol style="list-style-type: none"> 1. Market changes, including highly competitive international markets 2. High cost of oil and gas. 3. Political circumstances, including competing demands for RGC funds from other sectors 4. Legal circumstances, including continued failure to enforce laws on land, water, forests etc. 5. Natural disasters 6. Degradation of the environment 7. Failure to implement governance, judicial and other reforms 8. Social and political changes, e.g. social conflict over access to water and land, Labour migration. 9. Decreasing EDP support for A&W

Figure 9. Issues in Cambodia's higher education system. Taken from the World Bank (2010), p. 2.

<p>Access</p>	<ul style="list-style-type: none"> • Number of fee paying students has been increasing significantly, while ratio of scholarship students has been reduced. • In 2008 the national HE enrolment rate was 11.1% which is low compared to other developing countries in South East Asia (Thailand (31.9%), Malaysia (28.3%), and the Philippines (29.4%)). This is still considered insufficient to yield significant improvements in economic competitive.
<p>Equity</p>	<ul style="list-style-type: none"> • Disparities persist between urban and rural areas, male and female and rich and poor. Although the gender gap has declined in recent years, inequalities have proven fairly resistant to interventions.
<p>Quality</p>	<ul style="list-style-type: none"> • Low proportion of doctor degree holders among teaching staff/researchers across all fields. • Rapid expansion of the HE system over the past decade creating a 'compressed' time dynamic, has had a negative impact on the quality of some institutions. • The science and engineer curriculum needs to be further strengthened and expanded. • Accreditation system needs to be streamlined and overall monitoring of the quality of institutions needs more attention.
<p>Financing</p>	<ul style="list-style-type: none"> • The share of Higher Education budget was 3.3 percent of total public education expenditure. • Public expenditure for HE is estimated at 0.09 percent of GDP, while private expenditure accounts for 0.49 percent. Combined the total expenditure ratio reaches 0.58 percent, still well below the world average of 1 percent.
<p>Governance/ Management</p>	<ul style="list-style-type: none"> • Ministry of Education has limited power to governance and steer the higher education sector due to the lower portion of public financing. • There is a need to have a strategic framework to guide the development of the sub-sector which link between growth, labor market, and skills required. • There is need to develop and strengthen a higher education management information system to bring higher education administration, registration, and information systems up to an international standard.

Figure 10. Cambodian government’s “rectangular strategy” – pillars 1 (enhancement of the agricultural sector) and 4 (capacity-building and human resource development) are very relevant to USAID and innovATE’s missions. Taken from the Royal Government of Cambodia’s “*Rectangular strategy for growth, employment, equity, and efficiency in Cambodia.*”

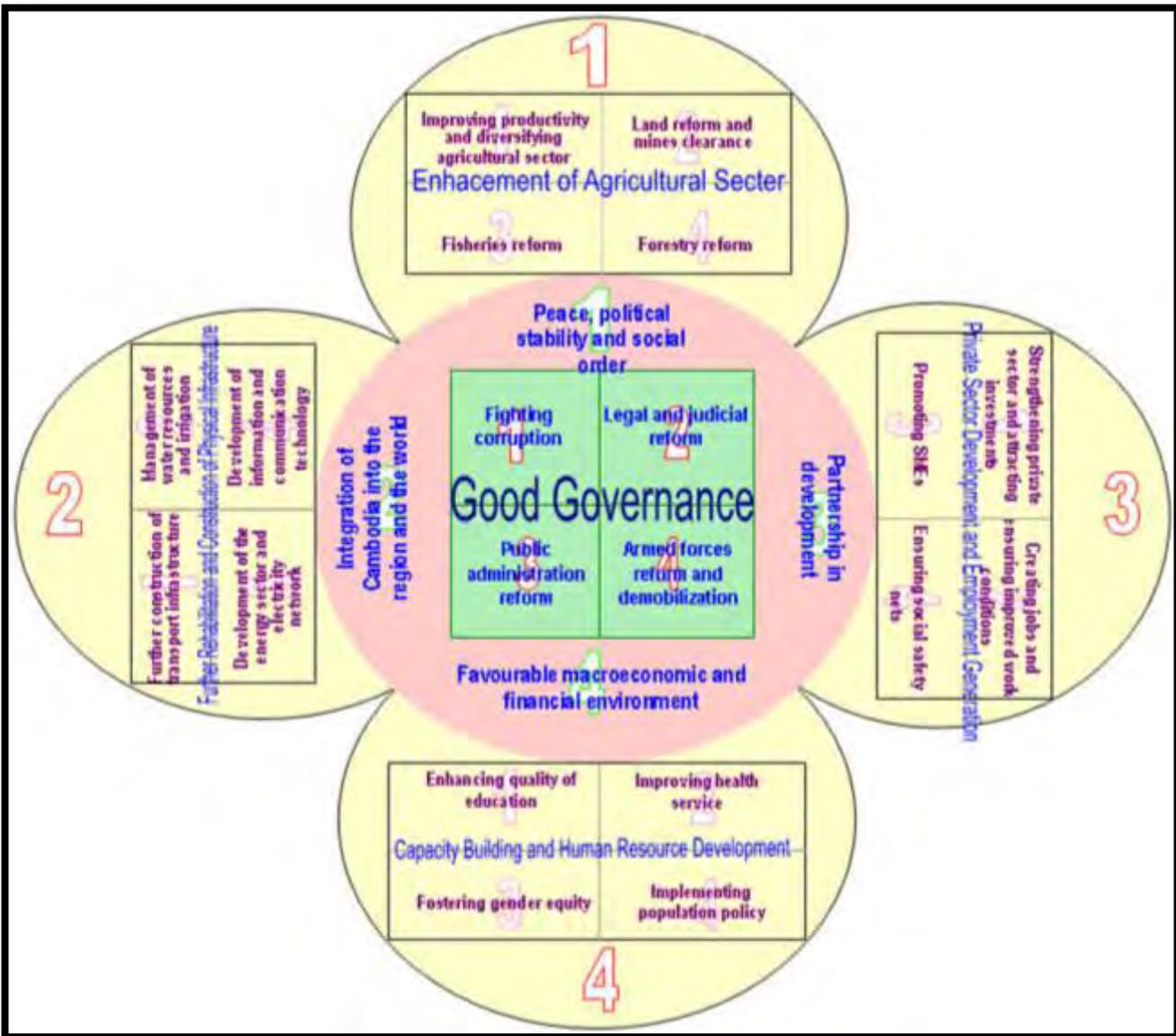


Figure 11. A depiction of potential activities that universities (RUA specifically) could adopt to improve curriculum and teaching method development. Taken from RUA Strategic Development Workshop.

- Activities*
- Develop methods to adapt the curriculum and possibly create new programmes according to the job market
 - Define mechanisms and periodically implement tracer studies in every faculty
 - Develop a consortium gathering the main employers for RUA graduates and involve them in regular meeting and survey
 - Organize periodical workshop for curriculum development involving both the consortium of main employers and the alumni association
 - Set up an internal accreditation committee for RUA programmes
 - Set up minimum standard according to the recommendations of the Ministry of Education, Youth and Sport and ACC.
 - Plan a student intake in synchrony with the absorption capacity of the job market
 - Regular back checking with the consortium of main employers about their current number of professionals and their perspectives of employment
 - Regular analysis of government and donor policies related to agricultural development
 - Assessment of the budget and the human resources at RUA (capacity to provide a given quantity of graduates)
 - Enforce government quota for females, poor students and remote-area origin.
 - Integrate professional and practical skills in teaching methods
 - Increase practical trainings in the RUA curriculum (including in particular lab/station/in-class practical trainings as well as visits collective field trips/study tours, short-term apprenticeships in the farm)
 - Increase cross-cutting capacities (communication, organization, planning, job research...)
 - Increase the number of guest lectures/modules given by external experts by developing links with the consortium of employers and other external stakeholders.
 - Implement a project-based teaching approach for RUA programs enhancing team work, project management and other professional capacities
 - Progressively drive curriculum toward international standards
 - Improve mechanisms for students evaluation by defining strict rules for student assessment and graduation that guarantee academic quality of graduates
 - Select a credit system and academic requirements used by universities that are most likely to exchange students with RUA; gradually develop parallel standards in collaboration with these partners.
 - Rationalize RUA educational system at the University level
 - Rationalize the training in the faculties by identifying common core skills that could be addressed jointly and the resources saved to be used to develop more practical training
 - Revise the curriculum of the foundation year by including all cross-cutting and common capacities required for the Bachelor studies.
 - Diversify the training at the Msc. level toward fisheries, aquaculture, animal production, animal health and veterinary, natural resources management, environment, and food processing
 - Improve the language skills of RUA graduates (English and French)
 - In particular, design the new integration of French language in RUA curriculum and programmes
 - Develop and implement a teacher capacity assessment and development through continuous training

Figure 12. A depiction of potential activities that universities (RUA specifically) could adopt to improve networking and communication development. Taken from RUA Strategic Development Workshop.

- Activities*
- Increase appropriate interactions and network with private companies, NGOs, donors, national and international academic and research institutions, government bodies and extension services, farmer groups
 - In particular, RUA will integrate itself within value-chains of agricultural products and develop links with MSM enterprises
 - Establish regular and close links with stakeholders working at the field level i.e. more farmers and private sectors and local authorities
 - Organize regular meetings with PDAs, NGOs, farmer organizations to understand and assess local issues
 - Communicate about RUA
 - Importantly, RUA will share its strategy and planned activities with appropriate partners (RGC, donors, scientific community) and communicate about its needs
 - Improve website
 - Publish annual activity report
 - Organize and participate in symposia/workshops for presentation of research results
 - Publish a scientific journal
 - Publish fields of expertise of RUA staff
 - Participate in online journal networks
 - Organize regular events such as open-house, farmer and student fair...
 - Organize national day for research for agriculture and related field
 - Involvement of RUA's partners in its regular activities and decisions
 - Involvement with RUA Research Development Team
 - Participation in RUA regular curriculum development
 - Involvement with RUA board of directors
 - Development of joint research projects
 - Define clear responsibilities and provide appropriate resources (both human and financial) for bodies involved in RUA relations with external stakeholders
 - Research Development Team
 - Planning and International Cooperation Office
 - Write proposals and submit to partners for both research and education
 - Develop and formalize or join specific networks
 - Alumni association
 - Consortium of RUA graduates' main employers
 - Research network with national and regional universities
 - Lab network for research sample analysis
 - Network for education activities with regional and international universities
 - Include criteria related to networking activities in the performance-based promotion system to enhance participation of RUA staff in communication and networking activities
 - Improve the information and knowledge sharing within RUA by designing a realistic system, easy to update

Figure 13. A depiction of the skills gaps and mismatches and their causes in Cambodia. Taken from the World Bank (2012a), p. 18.

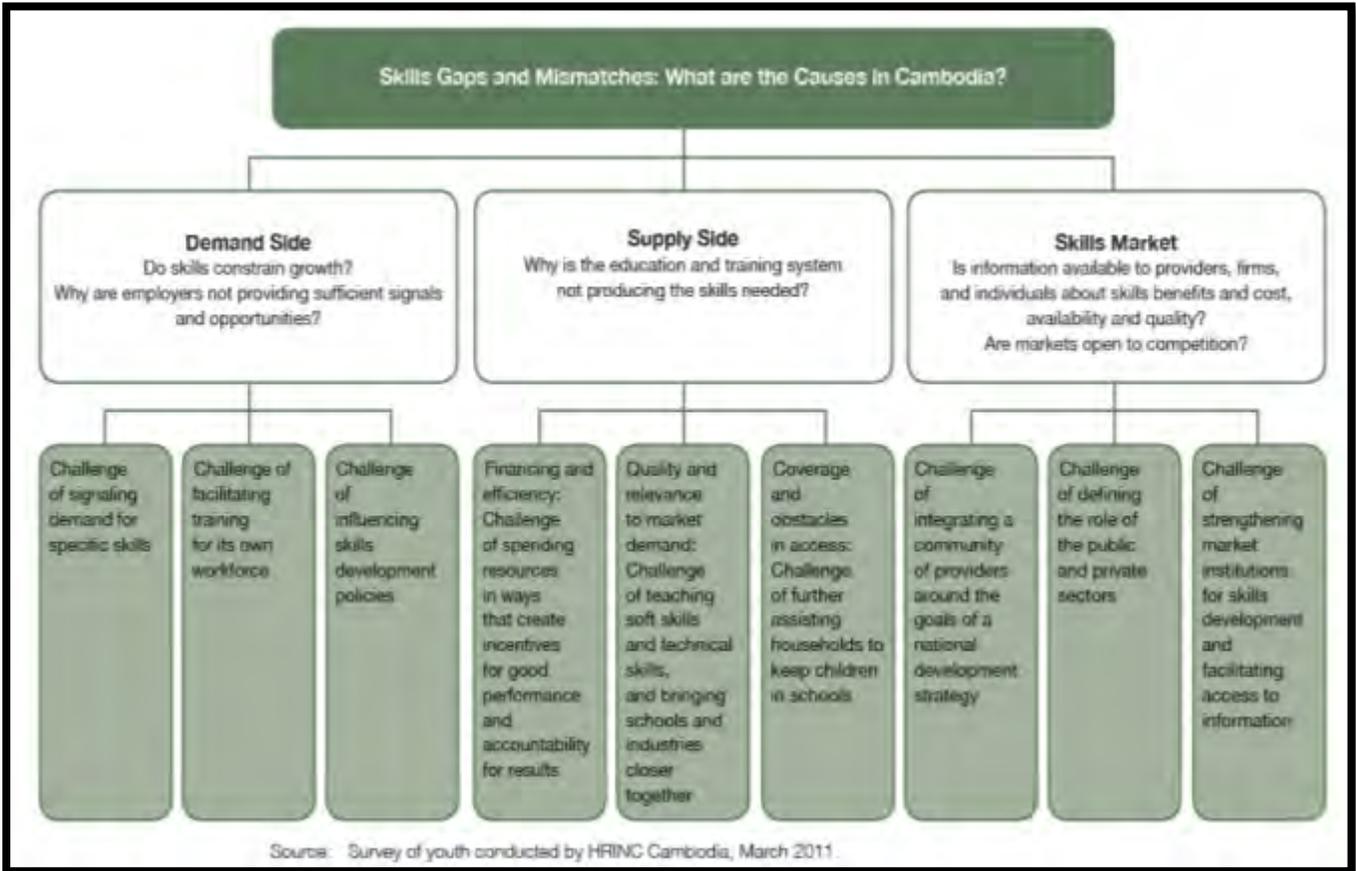
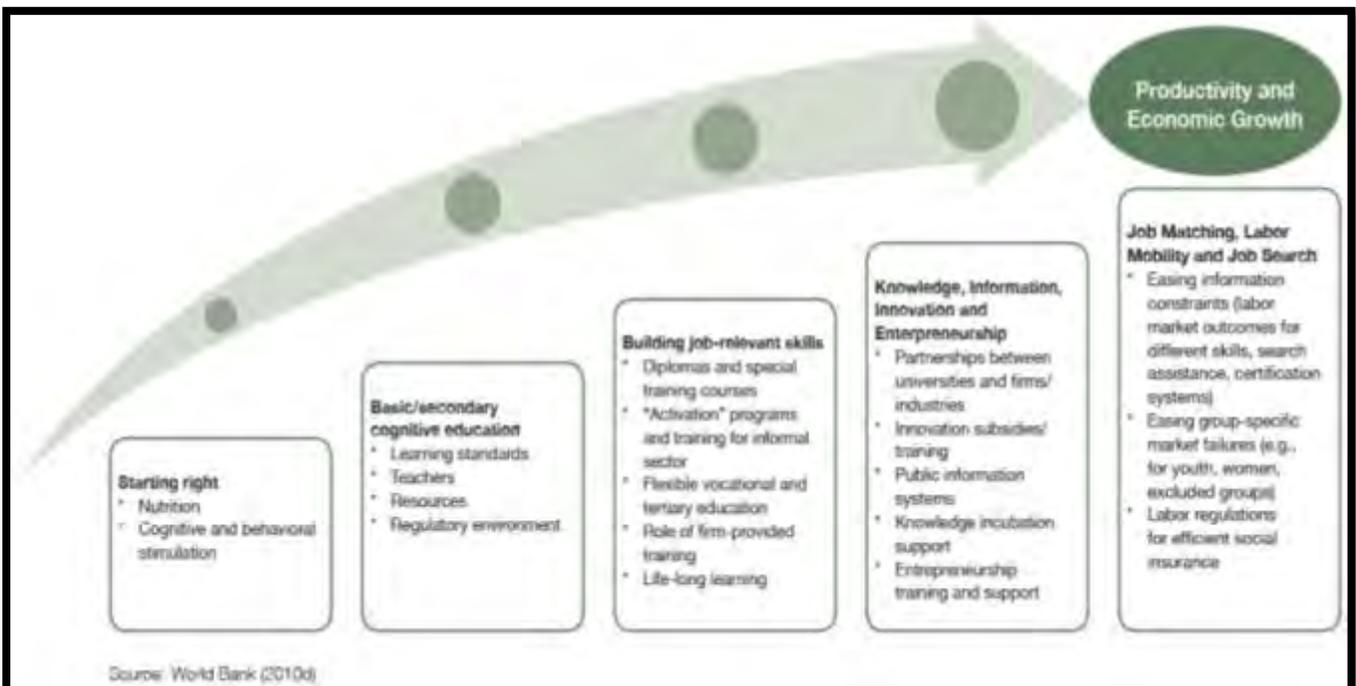


Figure 14. A flowchart that depicts a pathway through five stages that will lead to skills development and therefore increased productivity and economic growth in Cambodia. Taken from the World Bank (2012a), p. 27.



Appendix B: Tables

Table 1. Share of employment by employment status in certain regions of Cambodia in 2004 and 2007. Taken from Economic Institute of Cambodia (2008), p. 13.

Employment Status	Cambodia		Phnom Penh		Other Urban		Rural	
	2004	2007	2004	2007	2004	2007	2004	2007
Paid Employee	22.5%	25.0%	50.2%	50.8%	29.0%	39.3%	18.8%	20.4%
Employer	0.1%	0.1%	0.1%	0.1%	0.2%	0.5%	0.1%	0.0%
Own Account Worker	38.7%	38.7%	28.4%	27.2%	37.8%	38.2%	39.9%	40.1%
Unpaid Family Worker	38.2%	36.2%	20.5%	21.8%	32.8%	21.9%	40.8%	39.4%
Other	0.5%	0.1%	0.8%	0.0%	0.2%	0.1%	0.5%	0.1%
Total	100%							

Sources: Data compiled from CSES 2004 and CSES 2007

Table 2. Share of employed Cambodians by educational level in each employment status in 2004 and 2007. Taken from Economic Institute of Cambodia(2008), p. 16.

Level of Education	Paid Employee		Employer		Own Account Worker		Unpaid Family Worker	
	2004	2007	2004	2007	2004	2007	2004	2007
Never/Some Education	0.4%	0.1%	0.0%	0.0%	0.7%	0.8%	0.6%	0.3%
Primary	46.3%	47.2%	52.8%	31.8%	65.5%	64.8%	65.6%	61.1%
Lower Secondary	30.1%	27.7%	16.5%	1.2%	26.0%	26.6%	25.5%	28.7%
Upper Secondary	16.1%	15.3%	30.7%	53.7%	6.2%	6.9%	7.3%	8.9%
Technical/Vocational Trainings	3.0%	3.2%	0.0%	6.8%	0.3%	0.2%	0.4%	0.0%
Post-Secondary Education	3.5%	6.4%	0.0%	6.5%	0.2%	0.3%	0.2%	0.9%
Others	0.6%	0.1%	0.0%	0.0%	1.2%	0.4%	0.5%	0.1%
Total	100 %	100 %	100 %	100 %	100 %	100 %	100 %	100 %

Sources: Data compiled from CSES 2004 and CSES 2007

Table 3. Employment by sector in certain regions of Cambodia in 2004 and 2007. Taken from Economic Institute of Cambodia (2008), p. 13.

Sector	Cambodia		Phnom Penh		Other Urban		Other Rural	
	2004	2007	2004	2007	2004	2007	2004	2007
Agriculture	58.7%	58.1%	2.3%	1.1%	39.3%	30.9%	67.0%	67.8%
Industry	13.8%	14.7%	20.2%	13.5%	11.5%	15.4%	13.4%	14.8%
Service	27.5%	27.2%	77.5%	85.3%	49.2%	53.7%	19.6%	17.4%
Total	100%							

Source: Data compiled from CSES 2004 and CSES 2007

Table 4. GDP, employment, and output/worker by sector in 2007. Taken from Economic Institute of Cambodia (2008), p. 28.

Sector	GDP	Employment	Output/worker(US\$)
Agriculture	31.9%	58.1%	511
Industry	26.8%	14.7%	1,691
Service	41.3%	27.2%	1,417
Total	100.0%	100.0%	931

Source: Data compiled from NIS and CSES 2007

Table 5. Schools, classes, students, and staff statistics for the Kingdom of Cambodia. Taken from the Kingdom of Cambodia (2012), p. 2.

Particulars	Number of Schools	Ready Schools	Number of Classes	Classrooms in Pagoda	Enrollment		Registered		Teaching Staff		Non-Teaching Staff		Total Staff	
					Total	Girl	Total	Girl	Total	Female	Total	Female	Total	Female
<i>Whole Kingdom</i>	11,046	138	81,601	260	3,123,082	1,491,344	144,545	57,797	86,404	39,299	17,376	4,325	103,780	43,624
<i>By Area of Location</i>														
- Urban Area	1,239	13	14,537	25	561,072	265,947	18,557	6,698	22,094	12,379	3,351	1,321	25,445	13,700
- Rural Area	9,807	125	67,064	235	2,562,010	1,225,397	125,988	51,099	64,310	26,920	14,025	3,004	78,335	29,924
<i>By Type of School & Edn. Level</i>														
- Pre-School	2,575	30	4,006	70	121,306	60,643	0	0	3,881	3,703	151	141	4,032	3,844
- Primary School	6,849	103	58,594	140	2,142,464	1,021,591	127,068	52,352	45,296	21,772	11,048	2,856	56,344	24,628
- College (Grade 7-9)	1,196	5	7,120	36	304,484	149,588	4,775	1,647	14,348	5,408	2,717	519	17,065	5,927
- Lycee (Grade 10-12)	25	0	385	0	19,703	9,035	668	212	648	197	113	32	761	229
- Lycee (Grade 7-12)	401	0	11,496	14	535,125	250,487	12,034	3,586	22,231	8,219	3,347	777	25,578	8,996
- Lower Secondary Level (Grade 7-9)	1,597	5	12,251	36	541,147	263,593	10,003	3,215	27,067	10,813	4,631	963	31,698	11,778
- Upper Secondary Level (Grade 10-12)	426	0	6,750	14	318,165	145,517	7,472	2,230	10,160	3,009	1,546	365	11,706	3,374

Table 6. Enrollment by level of education in the Kingdom of Cambodia, 2011/2012. Taken from the Kingdom of Cambodia (2012), p. 14.

Province	Number of Schools	Pre-school		Primary		Lower Sec.		Upper Sec.		Total		% Female	
		Total	Girl	Total	Girl	Total	Girl	Total	Girl	Total	Girl	Primary	All Level
Banteay Meanchey	707	9,923	4,991	104,609	50,433	25,026	12,608	13,796	6,690	153,354	74,722	48.2	48.7
Battambang	882	7,865	3,954	172,380	82,677	38,092	19,665	22,892	11,280	241,229	117,576	48.0	48.7
Kampong Cham	1,272	14,390	7,194	283,270	135,301	63,918	32,145	30,834	14,766	392,412	189,406	47.8	48.3
Kampong Chhnang	416	4,690	2,340	77,297	37,343	20,646	10,397	11,351	5,475	114,184	55,455	48.3	48.6
Kampong Speu	495	5,247	2,661	124,729	59,526	29,249	13,318	13,374	5,323	172,599	80,828	47.7	46.8
Kampong Thom	711	7,169	3,605	112,049	54,255	25,235	13,032	14,490	6,726	158,943	77,618	48.4	48.8
Kampot	538	5,020	2,533	98,425	46,441	28,170	13,570	15,904	7,222	147,519	69,766	47.2	47.3
Kandal	680	10,982	5,383	155,517	73,093	46,241	21,877	31,803	14,660	244,543	115,013	47.0	47.0
Kep	44	559	266	5,733	2,693	1,802	899	1,038	511	9,132	4,369	47.0	47.8
Kob Kong	142	1,306	641	20,612	9,552	4,509	2,097	2,509	1,139	28,936	13,429	46.3	46.4
Kratie	337	2,197	1,084	56,783	27,454	10,855	5,455	5,846	2,855	75,681	36,848	48.3	48.7
Mondul Kiri	105	474	261	11,637	5,607	2,021	931	794	332	14,926	7,131	48.2	47.8
Otdar Meanchey	244	1,199	588	36,247	17,121	6,597	3,259	2,863	1,260	46,906	22,228	47.2	47.4
Psailin	75	572	298	10,536	4,997	2,288	1,089	1,422	653	14,818	7,037	47.4	47.5
Phnom Penh	353	9,235	4,529	133,120	63,251	50,801	23,622	46,007	21,591	239,163	112,993	47.5	47.2
Preah Sihanouk	134	1,377	721	29,230	13,860	7,525	3,547	5,459	2,365	43,591	20,493	47.4	47.0
Preah Vihear	315	1,921	1,006	36,054	17,738	6,926	3,578	3,462	1,549	48,363	23,871	49.2	49.4
Prey Veng	790	5,884	2,909	166,263	78,709	42,573	20,137	20,130	8,430	234,850	110,185	47.3	46.9
Pursat	439	4,306	2,151	66,488	31,999	14,922	7,695	9,442	4,613	95,158	46,458	48.1	48.8
Ratanak Kiri	224	740	379	33,123	14,990	3,518	1,463	1,455	584	38,836	17,416	45.3	44.8
Siemreap	864	13,425	6,815	170,509	82,048	36,048	18,870	17,795	8,758	237,777	116,491	48.1	48.0
Stung Treng	177	564	298	20,184	9,688	3,508	1,795	2,219	1,031	26,475	12,812	48.0	48.4
Svay Rieng	434	3,925	2,039	76,649	36,365	23,434	10,608	12,441	4,899	116,449	53,911	47.4	46.3
Takeo	668	8,336	4,097	141,020	66,450	47,243	21,936	30,639	12,805	227,238	105,288	47.1	46.3
<i>Whole Kingdom</i>	11,046	121,306	60,643	2,142,464	1,021,591	541,147	263,593	318,165	145,517	3,123,082	1,491,344	47.7	47.8
- Urban Area	1,239	27,421	13,546	309,162	147,091	112,982	53,632	111,507	51,678	561,072	265,947	47.6	47.4
- Rural Area	9,807	93,885	47,097	1,833,302	874,500	428,165	209,961	206,658	93,839	2,562,010	1,225,397	47.7	47.8

Table 7. University governance in East Asia. Taken from the World Bank (2012b), p. 139.

Economy	Leadership of board selected by	Members of board selected by	Vice chancellors, presidents, rectors selected by	Senior management of universities selected by	Composition of board
<i>High-income</i>					
Japan	Governing board (public universities) Presidential selection committee (national universities)	Governing board	Internal selection	Appointed by vice chancellors, presidents, or rectors and internal selection	Academic staff, nonacademic staff, external stakeholders
Singapore	Governing board	Government	Governing board	—	Academic staff, nonacademic staff, external stakeholders
Hong Kong SAR, China	Government	Mixed ^a	Professional selection	Professional selection and appointed by vice-chancellors, presidents, or rectors	Academic staff, nonacademic staff, external stakeholders (2:1 ratio of external stakeholders to university members)
Korea, Rep.	Boards not allowed by law (in public universities)	n.a.	n.a.	n.a.	n.a.
<i>Middle-income</i>					
Malaysia	—	Mixed ^b	Government	Vice chancellors, presidents, rectors	Academic staff, nonacademic staff, external stakeholders
Thailand	Governing board	Mixed ^c	Professional selection	Professional selection	Academic staff, nonacademic staff, external stakeholders
China	Internal university bodies	Internal university bodies or government	Government	Professional selection	Academic staff, nonacademic staff, external stakeholders
Indonesia	Governing board	University senate	Internal selection ^d	Vice chancellors, presidents, rectors	Academic staff, nonacademic staff, external stakeholders
Philippines	Government	Mixed ^e	Internal selection	Vice chancellors, presidents, rectors	Mix of government officials and private citizens appointed by the president; students, and faculty
<i>Low-income</i>					
Vietnam	Government	Government	Professional selection	Professional selection	—
Lao PDR (National University of Laos)	Government	Government	Government	Government	—
Cambodia	Mixed ^f	Government	Mixed	Mixed	Academic staff, nonacademic staff, external stakeholders

Sources: Raza 2010 based on Expert Survey; OECD 2008b.
 Note: Most institutions are public. — = not available; n.a. = not applicable.
 a. Some members are selected by the chief executive (often the chancellor) of the university, and others are elected.
 b. Members of the governing board are appointed by the government and the governing board.
 c. Differs by institution.
 d. Internal election involving the entire university community.
 e. Members of the governing board are appointed by the government and university.
 f. Appointed by the government (public) and the university owner (private).

Table 8. Employers in the agricultural sector in Cambodia, by type of employer

Private sector
Cambodia Biologicals Co., Ltd.
Emerging Markets Consulting
East-West Seeds
Non-governmental organizations
Aphivat Strey
Centre d'Etude et de Développement Agricole Cambodgien (CEDAC)
Environmental Protection and Development Organization (EPDO)
Farmer Livelihood Development (FLD)
GERES Cambodia
IDE Cambodia
JVC Cambodia
Lom Orng Vocational Training Centres
Prom Vihear Thor Organization
Skill, Knowledge, and Information for Life (SKIL)
Srer Khmer
Village Support Group (VSG)
Wathnakpheap Organization (WP)
Educational institutions
Royal University of Agriculture (RUA)
University of Battambang (UBB)
Prek Leap National School of Agriculture (PNSA)
Institute of Technology Cambodia (ITC)
Build Bright University (BBU)
Research institutes
Cambodian Agricultural Research and Development Institute (CARDI)
Inland Fisheries Research and Development Institute (IFReDI)

Table 9. Comparative skills gaps among professionals in select Asian countries. Taken from the World Bank (2012b), p. 54.

	Creativity	Information technology	English	Leadership	Communication	Problem solving	Work attitude	Technical skills	Numeracy/literacy
Cambodia	—			Decision making		Lack of analytical skills			
Vietnam	—	—		—		—			
Mongolia									
Philippines									
Indonesia									
Thailand									
Malaysia									

Source: Appendix J (employer and employee surveys).
 Note: The darker the shade, the stronger the gap (within each country only). Dotted cells indicate gaps that become less serious, and hashed cells indicate gaps that became more serious, in relation to the current demand for that skill.
 — = not available

Table 10. Disciplines studied by bachelor students in Cambodia, academic year 2009/2010. Taken from the World Bank (2012a), p.17.

Discipline of study	Share	Number of students	Share of female students
Accounting, and Accounting and Finance	13.0%	20,978	74.7%
Finance and Banking	11.0%	17,760	41.1%
Business Management and other Business and Management	10.3%	16,694	36.4%
English Language and Literature	11.3%	18,325	54.4%
Management and General Management	7.2%	11,640	28.2%
Computer Sciences and other computer related sciences	6.4%	10,323	7.4%
Medicine, Nursing, Pediatrics, Dentistry and Pharmacology	5.8%	9,407	46.8%
Law, and Law Science	5.4%	8,787	22.4%
Economics and related disciplines	5.3%	8,485	34.9%
Education and related disciplines	2.4%	3,808	29.1%
Agriculture, including Fishery and Forestry Sciences, and Rural Development	2.3%	3,753	29.1%
Khmer Literature and Science	1.7%	2,794	43.6%
Marketing and Marketing Management	1.7%	2,694	26.5%
Tourism, Hotels and Hospitality	1.7%	2,771	39.3%
Civil Engineering	1.5%	2,371	1.7%
Other Social Sciences (Public Administration, Political Science, and Sociology)	1.4%	2,310	39.5%
Architecture and Design	1.3%	2,058	21.3%
Mathematics	1.3%	2,071	21.5%
Biology and Chemistry	0.9%	1,386	40.8%
Engineering and related disciplines	0.9%	1,399	4.5%
Arts, Humanities and Languages, and Philosophy and Religion	0.8%	1,306	30.9%
Human Resources Management	0.6%	991	17.0%
Physics	0.6%	908	24.3%
Animal Science and Veterinary Medicine	0.5%	879	19.1%
Other languages (Korean, Japanese, French, and Thai)	0.5%	873	47.1%
Geology	0.3%	476	39.9%
History	0.3%	558	32.8%
Science and Technology	0.1%	201	6.0%
Other disciplines (Military, Police Academy etc.)	3.4%	5,510	33.0%
<i>Total</i>	<i>100.0%</i>	<i>161,516</i>	<i>39.4%</i>

Source: Calculations based on EMIS data.

Appendix C: Summary of RUA student focus group discussion, June 21, 2013

6 students in focus group; 4 girls/2 boys; 4 from provinces/2 from Phnom Penh

How did they become interested in ag?

- Through family members; growing ornamentals; fish farming in her home area; homegarden interest

Programs they are studying?

- Agronomy x3, Ag tech and management; Fisheries, Ag Econ and Rural Development

Strengths of RUA programs

- Experienced instructors
- Practical fields for Agronomy training
- Study tours (e.g. to Kampong Thon province to study mulching for erosion control; e.g. Siem Reap visit to Israeli greenhouse and dragonfruit farm)
- Opportunities to study abroad (one student went to Japan for 10 days)
- Many international partners with RUA – visiting faculty teach about new techs
- RUA staff can be helpful in placing students in summer internships

Challenges

- Faculty lack technical skills
- Instructors too busy – sometimes have to have make-up classes on Saturdays
- Not enough lab opportunities or other practical skill-building opportunities
- Sometimes knowledge is not clearly communicated
- English classes only in years 1 & 2 and not in years 3 & 4
- Students were not well prepared for their programs following high school

What do they want to do following graduation?

- MS programs (farming systems; ornamental plants – Thailand; environmental science – Thailand; ag development – Thailand or Vietnam)
- Ag administration job while running own fish farm business
- Work for organization in agriculture for a short time before graduate studies

What else are you involved in at RUA?

- Volunteer teach English part-time
- Teach Thai
- Work @ the Cambodian student association

What would they do as Rector of RUA with \$ to invest in capacity building?

- Start international class for students to encourage them to learn English
- Encourage opportunities for students to study abroad
- Upgrade labs and equipment
- Train teachers/staff (abroad?) on how to use labs and equipment
- Train students at MS level abroad with condition that they return to RUA and teach for 5 years
- Upgrade/restore English language center

Appendix D: List of contacts made during scoping visits

Name	Title/Organization	Contact Info (phone, email)
H.E. Dr. Ngo Bunthan	Director, RUA	855 11 891 085; bunthan_rua@camnet.com.kh
Dr. Men Sarom	Vice Director of Research, RUA	855 23 219 849; msarom@gmail.com
Mr. Lor Lytour	Vice Dean of Graduate School, RUA	Lor_lytour@yahoo.com
Dr. Borarin Buntong	Postharvest Technologist, RUA	855 12 822 910; bborarin@rua.edu.kh
Mr. Theng Kuch	Head of International Cooperation, RUA	
Dr. Seng Mom	Vice Director for International Cooperation, RUA	855 23 219 753; mseng@rua.edu.kh
H.E. Lord Reasmey	Secretary General, MAFF	855 23 211 351; saromreach@gmail.com
H.E. So Khan Rithykun	General Director of General Department of Agriculture (GDA), MAFF	855 12 833 777; kunso@camnet.com.kh
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Dr. Ouk Makara	Director of Cambodian Agricultural Research & Development Institute (CARDI)	Tel: 023 631 969
Dr. Sen Sovann	Prek Leap National School of Agriculture	Tel:089 277 773
Philip Charlesworth	IDE Cambodia	Tel: 023 223 541
Peter Roggekamp	CAVAC	Tel: 023 218 310
Nina Branstrup	FAO	Tel: 023 216 566
Brett Ballard	Formerly from AusAID	Tel: 012 819 562
Paavo Eliste	World Bank Cambodia	Tel: 023 217 301
Curtis Hundley	Winrock International	Tel: 017 559 307
Dennis Lesnick	Chief of Party, Cambodia HARVEST	Tel: 077 755 956
Chan Sophal	DCF, Cambodia HARVEST	Tel: 077 665 425
Susan Novak	Cambodia HARVEST	Tel: 077 665 425
Theng Vuthy	CDRI	Tel: 012 383 887
Murari Suvedi	MSU Food Security III	Tel: 092 621 875, suvedi@anr.msu.edu
Dr. Rebecca Black	USAID-Cambodia, Mission Director	
Dr. Kimberly Lucas	USAID-Cambodia, Director, FSE	Tel: 023 728 310; KLucas@usaid.gov
Dr. Khin Chantha	Director of Vocational Training, TVET	Tel: 012 866 080; chantha_khin65@yahoo.com
Bill Bradley	USAID-Cambodia, Agricultural Officer	855 (0)12 841 598; wbradley@usaid.gov
Salik Farooqi	USAID-Cambodia, Monitoring & Evaluation Specialist	202 712 5852; sfarooqi@usaid.gov

Appendix E: Photo gallery

Select photos from the June 16-June 23, 2013 data collection trip to Cambodia by a group of Penn State researchers. All photos courtesy of Dana James and Tom Gill.



Research/trial fields on RUA's campus, located in Phnom Penh. (Dana James)



A new, under-construction facility being built on RUA's campus. (Dana James)



Student focus group discussion undertaken at RUA. (Dana James)



Facilities on UBB's campus. (Dana James)



The Food Processing laboratory at UBB. (Tom Gill)



Penn State researcher Rick Bates (left) talking with UBB Rector Touch Visalsok in UBB's Tissue Culture laboratory, which houses thousands of plantlets, including orange and banana plantlets. (Tom Gill)



UBB's outdoor greenhouse facilities. (Tom Gill)



A variety of Cambodian fruits in the Battambang central market. (Dana James)



A fish and seafood stand in the Battambang central market. (Tom Gill)



Flooded rice paddy fields. (Tom Gill)



Flooded rice paddy fields with seed transplant stations in the foreground. (Tom Gill)



The researchers visited the Choeung Ek killing field outside of Phnom Penh in order to better understand the context of Cambodia's development in light of the genocidal Pol Pot regime of 1975-1979. Pictured here is the memorial stupa at the site. (Dana James)

Appendix F: References

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