

innovATE

Innovation for Agricultural Training and Education

 **FEED THE FUTURE**
The U.S. Government's Global Hunger & Food Security Initiative

 **USAID**
FROM THE AMERICAN PEOPLE



Modernizing Vocational Technical Schools to Develop a 21st Century Credentialed Work Force

John R. Vreyens and Charles Anderas, The University of Minnesota

May 2016

USAID/BFS/ARP-Funded Project

Award Number: AID-OAA-L-12-00002

 **VirginiaTech**
Invent the Future

PENNSTATE

1855


TUSKEGEE
UNIVERSITY

UF | **UNIVERSITY of FLORIDA**
The Foundation for The Gator Nation

Acknowledgements

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

This project was made possible by the United States Agency for International Development and the generous support of the American people through USAID Cooperative Agreement No. AID-OAA-L-12-00002

Table of Contents

| | |
|--|----|
| Introduction | 1 |
| Key Concepts..... | 2 |
| Value-Chains | 2 |
| Competencies, Knowledge and Skills..... | 3 |
| Training gaps | 4 |
| Partnerships with Value-Chains | 4 |
| Entrepreneurial Training for Value-Chain Development | 6 |
| Work Force Credentials | 8 |
| Gender Equity in TVET | 11 |
| Professional Development of Teaching Staff..... | 15 |
| Next Steps | 17 |
| InnovATE Theory of Change..... | 17 |
| Description of the Problem..... | 17 |
| AET Reform | 20 |
| Conclusion..... | 22 |
| References | 24 |

Introduction

Agriculture development requires a new approach to post-secondary education to meet the knowledge and skills for technicians as countries are systematically establishing value-chains to enhance the agriculture sector. In support of this trend, agricultural education needs to be based on the labor market of value-chains for knowledge and skills development in the next generation of workers. Key to the success of this realignment of education programs with labor market needs an initiative to identify skill gaps in educational programs at technical schools to define appropriate credentials for the value-chains. Credentials, co-created within the agricultural innovation system, are one mechanism for establishing quality programs and assuring prospective employers of the caliber of the workers they hire.

This paper focuses on key aspects found in the literature related to developing high quality, postsecondary agricultural education and training programs. The review provides background relevant to AET¹ innovation including value-chains, competencies, knowledge and skills, partnerships, entrepreneurship, gender equity, credentials and professional development. Each of these aspects is explored as related to development of quality educational programs. The paper then explores through the example of the value-chain system developing in the Kingdom of Morocco how to approach AET program reforms. Implementing a re-alignment process will enhance the contribution of agricultural education and training as a key player in work force development for the agriculture innovation system.

¹ This paper uses various acronyms referring to vocational-technical training found in the literature. Among these are: ATE for Agricultural and Technical Education; TVET/VTET for Technical - Vocational Education and Training; and CTE for Career and Technical Education. AET, Agricultural Education and Training is more specific for agriculture. The literature review includes TVET/VTET and CTE given the broader work force development careers of some studies.

Key Concepts

This paper advocates for engaging key agricultural stakeholders to reform AET in the technical schools to align with current industry need for a trained work force for value-chains. There are several concepts within vocational training and program design to be explored. This section explores several foundational concepts. Among the concepts explored are value-chains; knowledge, skills and competencies; partnerships; entrepreneurial training; credentials; and policy issues such as work-based learning, gender and professional development training of teachers as it relates to vocational and technical education.

Value-Chains

The concept of focusing on agricultural development with a value-chain approach is only a few decades old. Historical programs in agricultural development such as the Green Revolution were a system of intensification of production based on scientific research and development. In the late 1980s, USAID began to recognize the importance of the value-chain approach in agricultural development programs (U. S. Agency for International Development, Bureau for Food Security, 2013). This shift to value-chains opens the door for AET to contribute to work force development beyond field production. AET could provide technical and specialist training in support of all segments of the value-chain. To accomplish this however requires an expansion of the education and training programs in post-secondary schools which develop knowledge and competencies of youth matched to the various upstream and downstream links found with a country's developing value-chains.

In the context of international development, USAID describes the value-chain in the following manner:

A value chain encompasses the full range of activities and services to bring a product or service from seed to sale in end markets, where each successive "link" in the chain adds value to the product or series. Thus, a value chain includes input suppliers, producers, processors, traders and buyers, supported by a range of technical, business and financial service producers. (U. S. Agency for International Development, Bureau for Food Security, 2013, p. 94)

To meet current labor market demands, the value-chain approach necessitates moving beyond the production aspects found in the curriculum of traditional vocational and technical training programs. Any AET program developed based on this systematic value-chain integration would need to consciously develop programs to cover the input supply, production, processing, marketing and financing of the industries. As Maclean and Jagannathan (2014) suggest, “Countries are increasingly confronted with the need to build strong and diversified skills training and higher education systems in tune with the contemporary needs of industry, the service sector and trade” (p. 160). In particular, adhering to the larger development impacts of integrating education and training around the value-chain emphasizes the social implications.

The decision of where to intervene in a value chain should be primarily driven by the end goal of sustainable economic growth with poverty reduction. Interventions that target a particular part of a value chain (e.g., processing) or group of beneficiaries (e.g., small-scale producers) must therefore be designed and implemented:

- Within the context, and with an understanding, of the value chain as a whole; and
- With an explicit focus on benefits to micro- and small enterprises and the poor. (microlinks, n.d.)

The US Agency for International Development’s concept of value-chains, as stated above, forms the framework for later sections of this paper.

Competencies, Knowledge and Skills

AET has a unique opportunity to contribute to achieving the vision of value-chain development. The sophistication of an agro-industrial sector that goes beyond primary production into knowledge and skills matched to value-chains requires a comparably sophisticated process to identify the skills required in an integrated value-chain. Work force development in this new value-chain context will need to address competencies as the foundation for the AET training programs. Competence is defined as “...the generic, integrated and internalized capability to deliver sustainable effective (worthy) performance (including problem solving, realizing innovation, and creating transformation) in a certain professional

domain, job, role, organizational context and task situation” (Mulder, 2014). Furthermore, Mulder expands by stating, “Competence consists of various competence domains or competencies. A competency is defined as ‘...a part of generic competence; it is a coherent cluster of knowledge, skills and attitudes which can be utilized in real performance contexts.’ When enacted, competence is expressed in performance” (Education and Competence Studies Group, 2015, p. 6). It is therefore incumbent upon the AET profession to analyze the set of competencies required by value-chains to create training programs for youth which meet the immediate needs of the private sector employers, associations, cooperatives and economic interest groups.

Training gaps

The vocational-technical schools located in many countries have not kept abreast of the level of technology found in the agro-industries. The immediate need is to inaugurate a process at the local level which identifies the local value-chains, assesses the work force needs through knowledge and competency skills gaps analysis when compared to the professional training at the local technical school. An approach targeting the regional specialization and work force needs to promote the employment of youth locally in support of agricultural development is required.

While these challenges are identified, a renewed approach to work force development through AET is critical for the long-term success. It will however require accessing the value-chain networks in existence with the intent of developing symbiotic partnerships of educational system with the private sector enterprises as future employers.

Partnerships with Value-Chains

Using the framework of the agricultural innovation system described by Rivera, Hanson and Birner (2006) one identifies the collection of core elements of the system contributing to national innovation points. In this framework, one does not recommend best practices from a different context. One seeks to affect improvement in support of core parts of the systems,

such as markets, processing, and inputs that are outside research and teaching spheres to enhance technical training in post-secondary schools. Using an agricultural innovation system, the dynamics of innovation and change does not come solely from the research institute or the higher education institute alone. To improve or introduce change, one moves beyond introducing best practices. The system or network review includes looking across the multiple actors and organizations to identify key targeted individuals or organizations integral to development of agriculture. Furthermore, Spielman, Ekboir, Davis and Ocheing (2008) advocate for stronger partnership linkages within the agricultural innovation system for not only individual but also for organizational change and innovation. A transition to value-chain-based programs includes organizational transformation as well. The switch to the agricultural innovation system framework opens the possibilities of additional organizations beyond the government institutes to be valued contributors to innovation in agricultural development. Change comes over time through continued professional development, and the training programs need to be adapted and contextualized for specific purposes. Sustained transformation would be dependent on the change of individuals and organizations of the system.

In looking at the system more broadly, the objective of public-private partnerships in the education sector is for the provision of educational facilities, educational services, operational services, management services and professional services (Atsumbe, Emmanuel, Owodunni, & Bargu, 2013). UNESCO (in Atsumbe, Emmanuel, Owodunni & Bargu, 2013) “includes in the definition of technical and vocational education, ‘the study of technologies and related sciences and the acquisition of practical skills, attitudes, understanding and knowledge relating to occupations in various sectors or economic and social life” (p. 56). Atsumbe et al. (2013) state, “TVE is known to increase productivity of individuals, profitability of employers and expansion of national development” (p. 57) which is fundamental to achieving the national goal of agriculture workforce development.

The renewal of the professional practice of education opens opportunities to strengthen programs in AET. Elsewhere, studies show that given time, it is possible to change teachers’ instructional practices and beliefs (Saunders, 2014). In fact, Atsumbe et al. (2013) concluded

that key to successful partnerships was “teachers and stakeholders involved in articulating the framework, holding workshops/seminars to sell benefits, creating an enabling institutional environment for partnering relationships to flourish” (p. 63). Engagement in the partnerships must be approached being aware of the fact while doing a gap analysis that teachers, employers, and human resources people hold different expectations for competencies in cognitive, affective and motor domains (R. Mishra, Alseddiqi, & Pislaru, 2009). This does not preclude the interaction of multiple parties in the process but it does require attention to generating measurement tools meaningful to stakeholders which ultimately are the basis for identifying the gaps analysis across these learning domains based on the value-chain. Likewise, the partnership must be composed of a diversity of players given that this difference in perspectives of skills and competency exists if one seeks to develop effective technical training programs.

An additional value of the partnerships is the involvement of the stakeholders in developing a program of training which would eventually be regulated through a legal statute such as a butcher or pesticide applicator. In this case, the government sets the regulations but frequently relies on professional associations and scientists to define the components and requirements of training for a professional working in that domain. This type of partnership convenes experts and practitioners who collectively design the education and training based on the reality of the industry. The partnership also has the opportunity to define any need for continuing education to ensure that the value-chain remains relevant to the dynamic changes experienced by the private sector companies. Mishra, Alseddiqi and Pislaru (2009) found these partnerships especially important for a well-developed program that incorporates school-based learning and work-based learning aspects in the AET program. The partnership permits the curricular design to include consideration of ethics, specialized knowledge and generic skills to be integrated into the AET program as well (Baqadir, 2001).

Entrepreneurial Training for Value-Chain Development

A key set of competencies for AET relates to the soft skills or the creativity of students. Within this set of competencies are the skills associated with an entrepreneurial spirit. To

respond to rapidly changing employment requirements, some TVET programs have begun to focus not only on technical skills but also on entrepreneurial skills that help students to adapt to constantly evolving economies (Ogowewo, 2012). While there is debate about the theoretical foundations of entrepreneurship training (Henry, Hill, & Leitch, 2005b), it is clear that entrepreneurship can be learned and that education has a positive effect on entrepreneurial activities. (Nkirina, 2010)

Henry, Hill, and Leitch (2005a) describe a lack of “overarching theory” (p. 99) in the study of entrepreneurial training which helps explain the great diversity of programs. Pittaway and Edwards (2012) differentiated between the different types of programs, in descending order from most to least common, as “about,” “for,” “through,” and “embedded” entrepreneurship training. Training “about” entrepreneurship does not train students to be entrepreneurs but rather focuses on didactically transferring information about entrepreneurship to students. Training “for” entrepreneurship seeks to build important competencies for students’ future entrepreneurial activities by engaging in projects and activities. Training “through” entrepreneurship allows students to practice being entrepreneurs in the risk-free environment of the classroom by simulating starting and running a business. “Embedded” entrepreneurship programs integrate entrepreneurship training into other, unrelated disciplines, “for example, by converting a course on polymers in a chemistry programme so that it considers aspects of intellectual property” (Pittaway & Edwards, 2012, p. 781). There can be overlap between these forms of training. Entrepreneurship education in AET could take any of the above forms and be incorporated into content-focused curriculum.

While the form of entrepreneurship education is up for debate, and relative to context, it is certain that it can be very beneficial for students. Particularly in countries with high youth unemployment (Nkirina, 2010; Ogowewo, 2012), entrepreneurial skills are greatly needed to address current challenges and to face an uncertain future (Henry et al., 2005a). Entrepreneurship training can teach important skills that are transferable across different types of jobs, like learning how to learn (Jones & English, 2004) and managerial skills (Ogowewo, 2012). It could also help women to overcome unemployment, discrimination, and unfair wages

in agricultural labor markets (Masri, 2009). Entrepreneurship training could help build competitiveness as more businesses are created in line with agricultural value-chains.

One key problem with embedding entrepreneurial training into vocational subjects is that, while trained in content and instruction, teachers do not often have first-hand experience as entrepreneurs. Nkirina (2010) found that incorporating accomplished entrepreneurs into entrepreneurship programs could address the lack of experience that has caused programs to be too theoretical and impractical to be effective. Partnerships with interprofessional associations could provide entrepreneurs from corresponding value-chains to bolster the capacities of instructors at AET institutions, either as part of professional development programs or as co-instructors. Entrepreneurs could also contribute to curriculum development (Ogowewo, 2012).

Work Force Credentials

The review of the literature documents two reasons for the need for credentials related to work-force development and training: certification of an academic program demonstrating quality of the program or professional proficiency of skills of interest to future employers. For the purposes of this study, we focus on the certification defined as a “criterion referenced assessment” (Carnevale & Desrochers, 2001, p.26). As Carnevale & Desrochers (2001) discuss, the credentials can be indicative of a level of proficiency rather than an indicator of minimal competence. The credentials using this second rationale would be more useful to prospective employers knowing that not only does a graduate have the knowledge, but they have mastered a specific set of skills. Credentials therefore would demonstrate an accepted standard. Sanders (1994) states, “A standard is a principle mutually agreed to by people engaged in a professional practice that, if met, will enhance the quality and fairness of that professional practice” (p. 2). Crow (2000) continues along this thought by stating, “each certificate program...should clearly define the skills, knowledge, or competencies a student should gain and should include methods by which students can demonstrate achievement of them.” (p. 147).

Credentials play a critical role in the transition at the end of the AET program. Kerckhoff (2000) bases his analysis for transition from school to work on two theories: signaling theory

and network theory which are key to success in employment after studies. The first of these theories states that employers make selections based on limited information gathered during interviews which tend to be based on personal qualities. The network theory recognizes that the employer uses outside sources in part to make hiring decisions of prospective employees. This second theory impacts transition from school to work due to the linkages that may or may not exist in a given country. In this case, the linkage between schools and employers can be strengthened through a collaboratively created credential system. General credentials do not indicate the competency of the individual's fit with a given industry. A specific credential indicates a student's success at acquiring knowledge and proficiency with a given set of skills. (Kerckhoff, 2000)

There is little additional published research on credentialing post-secondary agricultural technical school students. The supply of credentials in the wider world of higher education is multiplying and diversifying (Bills, 2003), but the research on vocational education credentials lacks data sources and has returned inconsistent results (Kerckhoff & Bell, 1998). Research does show, however, that students with credentials that match the credential requirements of employers have a closer match between their education and their work (Walters, 2004). This shows that employers best understand their employment requirements and that credentials can be a way to hire the best people for each position (Walters, 2004). Credentials are most important early in graduates' careers because the relevance of credentials fades over time as employees gain valuable work experience and training from their employers (Witte & Kalleberg, 1995). For the employer, credentials can help reduce training costs and the risks associated with hiring unproven recent graduates (Kogan & Unt, 2008). The benefits to employers should provide financial incentives to participate in the creation of credentials that fit their requirements.

In the United States agricultural work force credentials are available through both non-formal and formal education. Credentials via non-formal education are often provided through trade organizations, like the Irrigation Association's credential for Certified Agricultural Irrigation Specialists. A worker who wishes to become a specialist is required to pay a fee, pass

a written exam, comply with a code of ethics, and complete continuing education units. The certification board for the Irrigation Association manages and administers the certification program (“Certification Candidate Handbook,” 2015). The certification board, which is comprised of leaders in the irrigation industry, develops and administers the certification process. The board forms the exam and works with a testing agency in order to keep it current and fair (“Certification Candidate Handbook,” 2015). Credentials centered on non-formal education opportunities like this create a minimum standard of knowledge and help employers to find qualified candidates. It helps job seekers to be able to prove their capabilities and differentiate themselves from other candidates. This follows Dismore (2014) that credentials in the future should be made with the employer in mind as well as the student. Since the certification is built by the industry, it is relevant to employers as a marker of quality. Relevant credentials should make postsecondary technical education more attractive to potential students.

Credentials through formal education in the United States are often done through the accreditation of programs of study by nonprofit non-governmental organizations. The United States Department of Education does not accredit programs itself but instead recognizes accrediting agencies (U.S Department of Education, n.d.). The American Culinary Federation is an example of a nonprofit organization partnering with over 80 private firms and producer organizations to create educational, performance, and employment standards. The American Culinary Federation Certification Commission accredits bachelor’s degree programs in culinary management and associate’s degree, diploma, and certificate programs in culinary arts. Like the Irrigation Association, the Certification Commission is made up accomplished experts to ensure the certification’s validity. The Certification Commission aligns its certification standards with the standards of the National Commission of Certifying Agencies.

Credentials could become an important link in AET students’ school-to-work pathway. This would require strong partnerships between AET institutions and industry leadership. Despite the scant research, collaboratively developed work force credentials that are aligned

with national value-chain development strategies are interesting possibility for developing AET systems.

Gender Equity in TVET

There is also a strong economic incentive for countries to focus on gender equality in TVET systems and as a central focus of value-chain development strategies. This equality issue is widespread globally and not limited to any particular country, region, or culture. Equality for women in education, training, and employment is a basic human right and is worthy of pursuing for that reason alone (Rubin & Manfre, 2014). Women constitute around 43% of the agricultural work force throughout the world (World Bank, 2012), but discrimination in education and the labor market continues to stifle the productivity of women workers (Rubin & Manfre, 2014). Gender equality has a positive correlation with economic growth (Rubin & Manfre, 2014), and restrictions on women's access to education only serve to limit economic output and global competitiveness. Targeted efforts to promote gender equality in value-chain development will be critical to prevent the further marginalization of women and to increase equitable female participation in agricultural value-chains (Rubin & Manfre, 2014). While gender equality has been achieved in other educational levels female enrollment in TVET is still markedly lower than males (Masri, 2009), limiting value-chain development that is comprehensive of rural communities.

Young women's participation in AET is constrained by a multitude of issues. There are many challenges that girls and women face when making career decisions, and gender continues to be a reliable predictor of career choice in many parts of the world (Kithyo & Petrina, 2002). Societal forces have a major impact on gender enrollment (Akor, Bakar, Hamzah, & Rashid, 2014; Asimwe & Taban, 2014; Williams, Russo, & Kernaghan, 2014). Parents often encourage daughters to participate in more traditionally female programs (Akor et al., 2014), and parental pressure can be so influential that students enter a program of their parents' choosing rather than their own (Kithyo & Petrina, 2002). In many parts of the Arab world families are unwilling to allow their young daughters to be involved in the internships or apprenticeships that often accompany TVET programs (Masri, 2009). In impoverished

communities, families often have to choose between which children continue in school, and boys are often favored over girls for a family's limited funds (Aderemi, Hassan, Siyanbola, & Taiwo, 2013; Asiimwe & Taban, 2014). Many women's burden of balancing family and career responsibilities can be exacerbated by the lack of childcare facilities at TVET institutions (Aderemi et al., 2013; A. Mishra, Khanna, & Shrivastava, 1999). Sexual harassment (Aderemi et al., 2013) and discrimination (Aderemi et al., 2013; Akor et al., 2014) are also large factors discouraging women from participating in vocational education, particularly in male-dominated fields.

Policy structures also contribute to lower female participation in TVET. Gender bias is often present in educational planning (R. Mishra et al., 2009). Kithyo and Petrina (2002) stated that Kenyan schools have inherited colonial attitudes towards girls, and the curriculum differences between girls', boys', and mixed-gender schools constrain student choices and contribute to both genders internalizing gender norms by the time they choose a career. In many instances girls lose the confidence necessary to engage in math and science subjects because the biases in the system teach them that girls are better suited for other subjects (Akor et al., 2014). The subjects offered at TVET institutions can also discourage female participation as they often do not support the skills necessary for the kinds of trades and self-employment opportunities that may be more attractive to females (Masri, 2009). These and many other issues contribute to restricting female participation in TVET programs around the world. The reforms necessary to eliminate many of the aforementioned barriers go beyond the boundaries of TVET systems, but much can be done within those systems to create a safe and welcoming environment that encourages greater female participation in TVET and the labor market.

The obstacles listed above contribute to fear and a lack of confidence among female students to participate in science or technology education. This fear is often cultivated in female students throughout primary and secondary school through the biases of teachers and curriculum (Akor et al., 2014). A key way to address this lack of confidence is to provide mentors to female students (Aderemi et al., 2013; Akor et al., 2014; Kithyo & Petrina, 2002; Smith & Dengiz, 2010). Women students interviewed for studies have shown a keen awareness

of the lack of mentors available to them (Akor et al., 2014; Smith & Dengiz, 2010). Among female TVET students in Nigeria “the yearning for female mentors and role models was palpable” (Akor et al., 2014, p. 20). Having women professors or professionals as mentors for female students can help to address the gender-based isolation and alienation often felt by women in male-dominated fields (Smith & Dengiz, 2010), and recruiting women professors should be a priority (Akor et al., 2014). Formation of women’s professional networks could encourage and organize structures for mentoring to take place (Aderemi et al., 2013; Smith & Dengiz, 2010). Intentionally fostering an environment for girls to be mentored in AET could be a critical step in overcoming some of the barriers to female participation in agricultural education and training.

Media both creates and subverts gender roles surrounding AET systems but could be a force for reform. Research has shown that views of what careers are suitable for women are influenced by print and television media (Akor et al., 2014; A. Mishra et al., 1999). Publicizing successful examples of women in non-traditional occupations could help create role models for girls (Aderemi et al., 2013). Participants in a study in Nigeria noted that media representations of vocational fields exclusively portrayed men, and that the students internalized the message that TVET fields are for boys (Akor et al., 2014). An Indian TVET institution sought to create the opposite effect with promotional videos that addressed gender bias, and interviews with successful women entrepreneurs proved to create new female role models (A. Mishra et al., 1999). Media can be a powerful tool to influence views of gender roles in society. Governments seeking to enhance female participation in value-chains could develop media strategies publicizing the achievements and capabilities of women in non-traditional fields.

Within the TVET school structure, support services help to reverse gender imbalances. In addition to media and mentoring, gendered guidance counseling can be another way that female students can be encouraged to enroll in traditionally male-dominated fields (A. Mishra et al., 1999). In places like Kenya where guidance counseling is rare, students often make career decisions with almost no information (Kithyo & Petrina, 2002). In India, female students and their parents are regularly unaware of vocational education and employment options (A.

Mishra et al., 1999). Lack of guidance limits options for both boys and girls to what they have heard others talk about, peers' expectations, and the vocations of the adults in their communities (Kithyo & Petrina, 2002). Guidance counseling could help to communicate a wider range of training and employment options to girls than is presented to them by social networks. But even in a country like Finland that is considered among the most equal societies, guidance counseling has its limits. The students' cultural assumptions about gendered areas of study often challenged schools' official efforts to encourage enrollment across gender lines (Lappalainen, Mietola, & Lahelma, 2013). Additionally, guidance counselors often focused on current realities rather than on reshaping gender perceptions (Lappalainen et al., 2013).

Additionally, women's full participation in the labor market is reduced due to discrimination. Many women are discouraged from pursuing vocational education because they fear discrimination in the job market (Akor et al., 2014). While the proportion of women working in agriculture fell in every other part of the world from 1997 to 2007, it rose from 31.2% to 32.6% in the Maghreb (UNDP, 2009). Though participation is increasing, women's impact on agricultural development in the Middle East and North Africa is limited by a lack of opportunities and control over resources (Abdelali-Martini, 2011). Even when interested in male-dominated fields, women have often chosen more traditionally female career paths out of fear of discrimination in the labor market (Kithyo & Petrina, 2002). In this way, the labor market can control female students' choice of program as much as culture or society (Asiimwe & Taban, 2014). Without equal opportunity in employment women's participation in male-dominated fields of study will remain low. Governments can work to facilitate fair wages (Aderemi et al., 2013; Asiimwe & Taban, 2014; A. Mishra et al., 1999) and self-employment options for women (A. Mishra et al., 1999) to encourage broader female participation in value-chains and the educational systems that support them. AET systems cannot be separated from their social, economic, and cultural contexts (Baqadir, Patrick, & Burns, 2011), and the need to address gender inequality within AET systems is inseparably connected to the need to address wider socioeconomic inequalities.

Professional Development of Teaching Staff

A well-trained professional staff of teachers and trainers is an integral part of an outstanding AET network. Professional development is a critical part of improving TVET systems (Bakah, Voogt, & Pieters, 2012; Mustapha, 2001). The main goal of professional development programs is to improve teacher effectiveness (Paleocrassas et al., 2009), but it is difficult to make generalizations about particular characteristics of professional development that change teacher practice (Saunders, 2014). The recommendations below, derived from the literature, build a framework for professional development programs that align teacher capabilities with skills requirements for value-chain development.

A critical issue in education and training is having a professional staff with appropriate experience in teaching and training. The literature states that in countries such as Egypt (Barrick, Myers, & Samy, 2015), are not formally prepared to teach but instead have received degrees in technical agricultural fields. Many researchers have found that effective professional development programs focus on both technical content and pedagogical training (Baqadir et al., 2011; Birman, Desimone, Porter, & Garet, 2000; Ingvarson, Meiers, & Beavis, 2005; Kerre, 2009; Paleocrassas et al., 2009), as well as creating teachers who are critical thinkers and life-long learners (Kerre, 2009; Paleocrassas et al., 2009). Ingvarson et al. (2005) stressed the importance of relating aspects of educational training back to content. Birman et al. (2000) also found that educational training divorced from content focus is less effective. Content knowledge and teaching skills are both necessary components of professional development and are best taught together.

Lack of teachers' industrial experience can be one of the main barriers to improving technical education (Mustapha, 2001). Partnerships with the private sector can contribute to providing industrial experience for instructors and can be a crucial element of successful professional development programs (Baqadir et al., 2011; Kerre, 2009; Mustapha, 2001; Stier, 2001). Instructors' content knowledge can be increased through contact with the private sector ranging from attending industry workshops (Baqadir et al., 2011) to semester long internships (Stier, 2001). Contacts gained from these experiences can help provide opportunities for field

trips for students (Stier, 2001) and internship placements. At times, companies have even provided skilled technical instructors who work together with teachers (Mustapha, 2001). These partnerships can help teachers keep up to date with rapid changes in industry (Mustapha, 2001) and provide practical knowledge (Baqadir et al., 2011), particularly for teachers who enter the profession without first-hand experience (Stier, 2001). Relationships between individuals at schools and businesses are one of the most important factors in developing and maintaining fruitful partnerships (Pillay, Watters, Hoff, & Flynn, 2014). Incorporating increased contact between instructors and industry into professional development programs could be an important way to build these beneficial relationships.

For formalized professional development programs, one of the most important principles identified in the literature is active learning. Broadly, active learning includes reading, writing, discussion, and problem solving activities (Barrick et al., 2015). Four key elements of active learning are “observing and being observed teaching; planning for classroom implementation; reviewing student work; and presenting, leading, and writing” (Garet, Porter, Desimone, Birman, & Yoon, 2001, p. 925). Ingvarson et al. (2005) contrasted active learning with professional development programs where teachers are passive audience members. Instead, active learning programs engage teachers in reflecting on their practice, identifying areas of their practice that need to develop, and testing out new teaching practices (Ingvarson et al., 2005). This helps teachers to analyze their current practice in relation to professional standards and to relate what students are currently learning to what they are capable of learning (Ingvarson et al., 2005). Active learning in professional development programs increases knowledge and skills and changes classroom practice (Birman et al., 2000). One of the main purposes of active learning principles is that teachers then use the same strategies in their classrooms, resulting in more engaged students with better problem-solving and critical thinking skills (Barrick et al., 2015).

Next Steps

InnovATE Theory of Change

This study follows the InnovATE Theory of Change (Moore, 2015) incorporating Learning, Designing, Training to achieve Impact on the AET systems and value-chains in agriculture. This paper turns now to the example of change in Morocco to propose an approach to integrate AET alignment with value-chains. The underlying philosophy targets the need to approach work force development to meet a dynamic labor market in newly created value-chains on a national level. Key to the importance of the value-chain is the global nature of the markets to which a value-chain may be associated. The Green Morocco Plan—described below—provides the requisite environment to incubate a robust agricultural innovation system based on nineteen identified value-chains. The AET system needs investment to join the stakeholders. Stakeholders would contribute through a multiple step process of competency identification, reform of curriculum aligned with value-chain work force needs and partnerships within the educational system to update the skills of the teachers and students to the level seen in the private sector. In context of the strategic plan in Morocco from production orientation to value-chain approaches to agriculture development including aggregation, this paper proposes key factors to successfully identify the labor market and develop skills gap analyses to connect agricultural technical school curriculum aligned with value-chains.

Description of the Problem

In 2009, the Ministry of Agriculture and Maritime Fisheries inaugurated a new strategic plan called *Plan Maroc Vert (PMV)*—or Green Morocco Plan (Ministere de l’Agriculture et de la Peche Maritime, 2009). This strategic plan for the development of agriculture in the country established a value-chain approach identifying nineteen value-chains. These value-chains cover the major agricultural industries found in the Kingdom. According to the Moroccan Agricultural Development Agency (2013), agriculture includes 4 million jobs with 100,000 jobs in the agro-industries. The Green Morocco Plan identifies value-chains with contractual arrangements

between the government and private sector associations known as interprofessional associations to enhance development of multiple sectors of the agricultural economy.

Interprofessional associations are a form of collective organization in a capitalist economy in contrast to entrepreneurs (Reviron, Thevenod-Mottet, El Benni, & others, 2009). The interprofessional association system is based on a European model. Reviron, et al. (2009), state that this type of collective organization is well suited for small-size producers and artisan enterprises, allowing economies of scale without losing their decisional power. An interprofessional association gathers members from various levels in the supply chain; it has no commercial activity. The mission of an interprofessional association is to co-ordinate the member's action in order to ensure that the common objectives are reached; decisions are made collectively. The implementation of the Green Morocco Plan involves aggregation of small farmers into associations, cooperatives and economic interest groups. Implementation of the Green Morocco Plan involves aggregation of systems which includes careful analysis of upstream (production) and downstream (industry and commercialization) components of the sector (Agricultural Development Agency, 2012). As a result, interprofessional associations have been created for the following value-chains:

| | |
|------------------|---------------------|
| Olives | Oil crops |
| Market gardening | Rice |
| Citrus | Sugar |
| Seeds | Grains |
| Fruit Trees | Milk |
| Date palm | Red Meats |
| Argan | Apiculture |
| Saffron | Poultry |
| Perfume Roses | Camels |
| | Organic agriculture |

The nineteen interprofessional associations in Morocco are divided into fourteen plant value-chains and five livestock value-chains. The interprofessional association advocates for the value-chain through the contracts between the private sector entities and the government. In Morocco, five roles are listed as essential for the interprofessional associations.

1. Take action to benefit their members: building research and development, improvement of upgrading and adapting quality to the market demand.
2. Become the unique and representative interlocutor of actors in the sector with the public authorities.
3. Contribute to the implementation of program contracts of the sectors concluded with government.
4. Consolidate all links in the chain around a unified vision.
5. Combine the efforts of all operators of a sector in key areas such as coaching, research and technology transfer. (Ministere de l'Agriculture et de la Peche Maritime, 2015)

In this case, the Ministry of Agriculture and Maritime Fisheries works in partnership with interprofessional associations to define the training, research and support programs required by each value-chain to succeed in the global economy.

The Green Morocco Plan includes professional training in support of this newly structured agricultural sector. Within the Ministry of Agriculture and Maritime Fisheries, there is a system of 52 vocational-technical schools offering preparation at four levels of qualification: apprenticeship, qualification, technician, and specialized technician. (Ministere de l'Agriculture et de la Peche Maritime, Direction de l'Enseignement, de la Formation et de la Recherche, 2013) More recently, Morocco established professional baccalaureate degrees at the secondary school level of which agriculture is one of these new diplomas. The technical schools are located in all regions of the country offering an opportunity to have immediate impact on the development of the value-chains located in each region.

While this network exists, AET capacity in Morocco is limited and does not align with the value-chain at the heart of the Government of Morocco's agricultural sector development strategy. Enhancing AET's contribution to workforce development needs to begin by aligning value-chain knowledge and competencies required by the private sector with the AET programs preparing youth at the Ministry of Agriculture and Maritime Fisheries post-secondary vocational schools.

AET Reform

As presented earlier, the value of partnerships is the first key step to pursue in reforming the agricultural education and training programs offered through the network of technical schools. The schools need to convene stakeholder representatives of the value-chains in each region of the country including members from the interprofessional associations. The goal of convening the group is to identify opportunities for work force development training in agriculture. The group must put in process an analysis of labor needs by value-chain. Each value-chain related working group would begin by defining competencies needed in each value-chain for the work force.

Vreyens & Shaker (2005) describe the process of two survey instruments developed using an iterative process. The first step is to develop a list of skills for graduates in fields of agriculture entering the private sector developed from the literature and the documented curriculum of agriculture from the training institutes. The initial list of knowledge and competencies are then analyzed by the joint working groups with the interprofessional associations and the educational community from the technical schools. This list is refined. The third iteration of the instrument is done with academic and ministry officials creating the final list of competencies to be evaluated. The survey can be ground-truthed by random observation in the businesses or organizations at the various parts of the value-chain to confirm knowledge or skill needs from the work place.

The survey instrument should consist of two categories of skills: general skills and technical skills. The general skills include: communication, management and computer—similar to areas of entrepreneurship education for thinking skills. The technical skills should include those required by each respective value-chain or component of the chain including production, inputs, processing, marketing, etc. The content in the gap survey would be the basis for the major areas of study currently found in the workforce.

Two surveys need to be completed. The first survey is by graduates of the technical schools who rank the knowledge or skill based on how well they perform that to prioritize the knowledge or skill they use on the job. Each graduate also ranks the importance of that skill based on the work they do daily. The second survey is distributed amongst members of the interprofessional

associations. In this case, the employers rank the importance of the knowledge or skill based on her/his operation or business. Each employer also ranks the level of ability of new employees hired from technical schools.

These results are cross tabulated to determine the gap in knowledge and skills as determined by the graduates and the employers. In addition, the importance of the list of knowledge and skills are assessed by both groups. The final analysis will be the beginning point for determining where the educational programs need to be re-aligned or co-created with the interprofessional associations to have relevant AET programs in technical schools of Morocco. The next step is to determine through the reform, how to integrate appropriate training in the competencies into the school programs.

The alignment of the curriculum includes a step identifying the venue for each activity. Through the partnerships, an integrated approach to workforce development would include learning (knowledge and skills) in a school-based environment distinguished from learning that is to happen in a work-based environment. The working group of post-secondary school and interprofessional association would need to discuss when the work environment is the best alternative for the actual learning to occur. Through potential internships or placements in companies, these skills may be acquired. Alternatively, where the working group determination is that the learning should be in the school, it would indicate where investment in equipment is necessary for training all students or potentially guide interprofessional associations to donate the type of equipment used in the industry for training purposes. In both reform processes, the investment in equipment or personnel development through professional training or work-placements must be considered in the design process.

The value of a well-trained staff in the technical schools cannot be emphasized enough. As pointed out in the literature review, a confident, knowledgeable and skilled staff is necessary to prepare students for employment in the private sector with sufficient experience in the value-chain. The motivation of the teaching staff remains higher when they have confidence that they are preparing students for work in a dynamic private sector system. The linked partnership between the interprofessional organizations and technical schools through the

competency skills gap can now provide the bridge for continuous interaction among key decision makers and actors. AET schools need to support and encourage continuous interaction to ensure teacher knowledge and skills remain relevant to the workforce needs of the value-chains. Professional development of teachers is sustained through this much needed collaboration. This interaction lays the foundation for the credentialing of the level of proficiency deemed by the ministry, the educational community and the private sector required within the agricultural innovation system. This may lead to identification of certain jobs within the workforce needing to be formally credentialed.

In this process of program reform and design, as Morocco moves to aggregate the agricultural sector, an analysis of employment opportunities and appropriate training for women needs to be considered. There are many issues with the cultural and social environment which are not insurmountable to provide opportunities for young women to be employed in the value-chain system. Awareness of discrimination is important to support the participation of women in the technical schools. By offering training in inputs or marketing channels associated with value-chains, technical training would be on the cutting edge of supporting new opportunities for young women to enter the work force beyond the production aspects a value-chain. As pointed out in the research, a support network of career advising and media campaign of women in the value-chain workforce is instrumental for this level of change to occur.

Conclusion

To summarize this paper presents several key concepts for consideration in technical education programs. It uses the Kingdom of Morocco as an example of a well-structured framework of industries and policy environment in support of the agricultural development of the country. This structure includes nineteen value-chains as the foundation for development and increased participation by the population in rural communities towards the national goals. The need now is for the post-secondary technical schools to reform their programs to align with the work force needs of the value-chains. Partnerships need to be formed. The partnerships require the interprofessional associations joining with the technical schools to analyze

competency needs in the workforce, skills and knowledge gaps existing between industry and educational programs and rethinking policies to encourage and support gender equity through participation in technical training programs. The collaborative process based on key concepts for high quality technical training explored in this paper creates a partnership across the agricultural innovation system that is indicative of a well-prepared workforce for the 21st century.

References

- Abdelali-Martini, M. (2011). Empowering women in the rural labor force with a focus on agricultural employment in the Middle East and North Africa (MENA). In *Enabling rural women's economic empowerment: institutions, opportunities and participation*. Accra, Ghana.
- Aderemi, H. O., Hassan, O. M., Siyanbola, W. O., & Taiwo, K. (2013). Trends in enrollment, graduation and staffing of science and technology education in Nigeria tertiary institutions: A gender participation perspective. *Educational Research and Reviews*, 8(21), 2011–2020. <http://doi.org/10.5897/ERR08.084>
- Akor, R., Bakar, A. R. B., Hamzah, A. B. H., & Rashid, A. B. M. (2014). Exploring the misrepresentation of Nigerian women in technical and vocational education in polytechnic institution. *International Journal of Education and Literacy Studies*, 2(4), 12–23. <http://doi.org/10.7575/aiac.ijels.v.2n.4p.12>
- Asiimwe, J. A., & Taban, M. M. (2014). The gender gap in technical and vocational education: Perspectives from South Sudan. *International Journal of Vocational Education & Training*, 22(1), 37–45.
- Atsumbe, B. N., Emmanuel, R., Owodunni, A. S., & Bargu, B. S. (2013). Implementation of public private partnerships in technical and vocational education in Nigeria. *International Journal of Vocational Education & Training*, 21(1), 55–67.
- Bakah, M. A. B., Voogt, J. M., & Pieters, J. M. (2012). Curriculum reform and teachers' training needs: The case of higher education in Ghana. *International Journal of Training and Development*, 16(1), 67–76. <http://doi.org/10.1111/j.1468-2419.2011.00389.x>
- Baqadir, A., Patrick, F., & Burns, G. (2011). Addressing the skills gap in Saudi Arabia: Does vocational education address the needs of private sector employers? *Journal of Vocational Education & Training*, 63(4), 551–561. <http://doi.org/10.1080/13636820.2011.589533>
- Barrick, R. K., Myers, B. E., & Samy, M. M. (2015). Adoption of innovative teaching strategies in active learning and experiential learning by Egyptian agricultural technical schools instructors. *Journal of Agricultural Extension and Rural Development*, 7(2), 48–55. <http://doi.org/10.5897/JAERD2013.0680>
- Birman, B. F., Desimone, L., Porter, A. C., & Garet, M. S. (2000). Designing professional development that works. *Educational Leadership*, 57(8), 28.
- Carnevale, A. P., & Desrochers, D. M. (2001). Help wanted... credentials required: Community colleges in the knowledge economy. Retrieved from <http://eric.ed.gov/?id=ED451832>
- Certification candidate handbook. (2015, July). Retrieved from <http://www.irrigation.org/uploadedFiles/Certification/Certification%20Candidate%20Handbook.pdf>
- Dismore, H. (2014). From apprenticeship to higher education: Navigating the credential landscape. *Journal of Vocational Education & Training*, 66(3), 386–405. <http://doi.org/10.1080/13636820.2014.916737>

- Henry, C., Hill, F., & Leitch, C. (2005a). Entrepreneurship education and training: Can entrepreneurship be taught? Part I. *Education + Training*, 47(2), 98–111. <http://doi.org/10.1108/00400910510586524>
- Henry, C., Hill, F., & Leitch, C. (2005b). Entrepreneurship education and training: Can entrepreneurship be taught? Part II. *Education + Training*, 47(3), 158–169. <http://doi.org/10.1108/00400910510592211>
- Ingvarson, L., Meiers, M., & Beavis, A. (2005). Factors affecting the impact of professional development programs on teachers' knowledge, practice, student outcomes & efficacy. *Professional Development for Teachers and School Leaders*, 13(10), 1–26. <http://doi.org/10.14507/epaa.v13n10.2005>
- Jones, C., & English, J. (2004). A contemporary approach to entrepreneurship education. *Education + Training*, 46(8/9), 416–423. <http://doi.org/10.1108/00400910410569533>
- Kerckhoff, A. C. (2000). Transition from school to work in comparative perspective. In M. T. Hallinan (Ed.), *Handbook of Sociology of Education* (pp. 453–474). New York: Kluwer Academic/Plenum Publishers.
- Kerckhoff, A. C., & Bell, L. (1998). Hidden capital: Vocational credentials and attainment in the United States. *Sociology of Education*, 71(2), 152–174. <http://doi.org/10.2307/2673246>
- Kerre, B. W. (2009). A technical and vocational teacher-training curriculum. In D. R. Maclean & D. Wilson (Eds.), *International Handbook of Education for the Changing World of Work* (pp. 1319–1332). Springer Netherlands. Retrieved from http://link.springer.com.ezp1.lib.umn.edu/chapter/10.1007/978-1-4020-5281-1_88
- Kithyo, I. M., & Petrina, S. (2002). Gender in school-to-school transitions: How students choose career programs in technical colleges in Kenya. *Journal of Industrial Teacher Education*, 39(2), 21–43.
- Kogan, I., & Unt, M. (2008). The role of vocational specificity of educational credentials for labour market entry in Estonia and Slovenia. *International Sociology*, 23(3), 389–416. <http://doi.org/10.1177/0268580908088898>
- Lappalainen, S., Mietola, R., & Lahelma, E. (2013). Gendered divisions on classed routes to vocational education. *Gender & Education*, 25(2), 189–205. <http://doi.org/10.1080/09540253.2012.740445>
- Masri, M. (2009). Policy process and education reform in the Arab world. *Mediterranean Journal of Educational Studies*, 14(1), 129–144.
- microlinks. (n.d.). Value chain development. Retrieved July 27, 2015, from <https://www.microlinks.org/topics/value-chain-development>
- Ministere de l'Agriculture et de la Peche Maritime. (2009). Plan Maroc vert. Ministere de l'Agriculture et de la Peche Maritime, Rabat, Morocco.
- Ministere de l'Agriculture et de la Peche Maritime. (2015). Contrats programmes: Pour le developpement des filieres de production.

Ministere de l'Agriculture et de la Peche Maritime, Direction de l'Enseignement, de la Formation et de la Recherche. (2013). Concours d'accès aux établissements de formation professionnelle agricole au titre de l'année scolaire 2013/2014. Ministère de l'Agriculture et de la Pêche Maritime, Rabat, Morocco.

Mishra, A., Khanna, P., & Shrivastava, N. (1999). Promoting equal access of girls/women to technical and vocational education, 1–6.

Mishra, R., Alseddiqi, M., & Pislaru, C. (2009). An improved employability skills model and its compliance through vocational educational system in Bahrain. *International Journal of Learning*, 16(9), 699–717.

Moore, K. M. (2015, June). *Confronting the challenge of agricultural education and training [PowerPoint slides]*. Presented at the MEAS Symposium, Washington, DC. Retrieved from <http://www.slideshare.net/MEAS1/confronting-the-challenge-of-agricultural-education-and-training>

Mulder, M. (2014). Conceptions of professional competence. In S. Billett, C. Harteis, & H. Gruber (Eds.), *International Handbook of Research in Professional and Practice-based learning* (pp. 107–137). Dordrecht, The Netherlands: Springer Netherlands.

Mustapha, R. B. (2001). The best practices for professional development of vocational educators in teaching competencies among APEC economies: A case study of Malaysia. Presented at the Seminar on the Best Practices for Professional Development of Vocational Teachers among Asia Pacific Economic Cooperation (APEC) Economies, Chiang Mai, Thailand. Retrieved from <http://eric.ed.gov/?id=ED462574>

Nkirina, S. P. (2010). The challenges of integrating entrepreneurship education in the vocational training system. *Journal of European Industrial Training*, 34(2), 153–166. <http://doi.org/10.1108/03090591011023998>

Ogowewo, B. O. (2012). Integrating entrepreneurship education into vocational and technical education curricula. *International Journal of Learning*, 18(9), 13–25.

Paleocrassas, S., Tsiantis, K., Dimitropoulos, V., Pagkalo, S., Pavlidis, G., Nikolopoulos, A., & Tsaliagou, X. (2009). Reforming TVET teachers' professional development in Greece: A needs-based policy. *International Journal of Vocational Education and Training*, 17(2), 84–100.

Pillay, H., Watters, J. J., Hoff, L., & Flynn, M. (2014). Dimensions of effectiveness and efficiency: A case study on industry–school partnerships. *Journal of Vocational Education & Training*, 66(4), 537–553. <http://doi.org/10.1080/13636820.2014.961524>

Pittaway, L., & Edwards, C. (2012). Assessment: Examining practice in entrepreneurship education. *Education + Training*, 54(8/9), 778–800. <http://doi.org/10.1108/00400911211274882>

Rubin, D., & Manfre, C. (2014). Promoting gender-equitable agricultural value chains: Issues, opportunities, and next steps. In A. R. Quisumbing, R. Meinzen-Dick, T. L. Raney, A. Croppenstedt, J. A. Behrman, & A. Peterman (Eds.), *Gender in Agriculture* (pp. 287–313). Springer Netherlands. Retrieved from http://link.springer.com/chapter/10.1007/978-94-017-8616-4_12

- Saunders, R. (2014). Effectiveness of research-based teacher professional development. *Australian Journal of Teacher Education*, 39(4). <http://doi.org/10.14221/ajte.2014v39n4.10>
- Smith, A. E., & Dengiz, B. (2010). Women in engineering in Turkey - a large scale quantitative and qualitative examination. *European Journal of Engineering Education*, 35(1), 45–57. <http://doi.org/10.1080/03043790903406345>
- Stier, K. W. (2001). Updating course content and instruction through a practicum experience. *Technology Teacher*, 61(1), 27–30.
- United Nations Development Programme. (2009). *Arab human development report 2009: Challenges to human security in the Arab countries*. United Nations Development Programme Regional Bureau for Arab States. Retrieved from <http://www.arab-hdr.org/publications/other/ahdr/ahdr2009e.pdf>
- U. S. Agency for International Development, Bureau for Food Security. (2013). USAID's legacy in agricultural development. U. S. Agency for International Development.
- U.S Department of Education. (n.d.). The database of accredited postsecondary institutions and programs. Retrieved August 19, 2015, from <http://ope.ed.gov/accreditation/>
- Vreyens, J. R., & Shaker, M. H. (2005). Preparing market-ready graduates: Adapting curriculum to meet the agricultural employment market in Egypt. *Proceedings of the 21st Annual AIAEE Conference*, San Antonio, Texas, 227–235.
- Walters, D. (2004). The relationship between postsecondary education and skill: Comparing credentialism with human capital theory. *Canadian Journal of Higher Education*, 34(2), 97–124.
- Williams, R., Russo, S. L., & Kernaghan, N. J. (2014). Lost in the education roadmap: Gender roadblocks from primary school through agricultural vocational training. Retrieved from http://www.oired.vt.edu/innovate/documents/Cross-cutting%20Studies/InnovATE_UF_a_gender_cc_study.pdf
- Witte, J. C., & Kalleberg, A. L. (1995). Matching training and jobs: The fit between vocational education and employment in the German labour market. *European Sociological Review*, 11(3), 293–317.
- World Bank. (2012). *Gender equality and development*. Washington, DC: World Bank.