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G. Shinn[1,*], M. Navarro[2] and G. Briers[1]

[1]Texas A&M University, College Station, Texas (USA)
[2]University of Georgia, Athens, Georgia (USA)
*e-mail: g-shinn@tamu.edu

Abstract. An increasing global demand for food security and sustainability places substantial responsibility on higher agricultural education institutions. Quality assurance, accreditation, and innovation are central elements for the development of agricultural curricula. Most scholars agree that student learning is core to the role of the university. Quality judgements are framed around four criteria-academic scholarship, demands of the subject matter, relevance to society, and viability. Quality assurance is enhanced by peer-evaluation, rigorous research, and confirmation by student evaluation data. Quality assurance also recognises the contributions that research makes to the growing body of scientific knowledge. Accreditation strengthens trust affirming the purpose, experiences, organisation, and measured scalable learning outcomes. Policies for accreditation should recognise internal and external standards, provide user protection, provide independently-verified information, and improve and enhance the culture and values of the people. The proposed framework fits national qualifications into a comprehensive common system of quality assurance, learning outcomes, recognised programme standards, cultural values, and accreditation. Innovation is crucial for curriculum viability. Measurement is essential for an improvement strategy in education. Faculty reward systems must match the academic functions. Six crucial concepts underpin the development and execution of innovative agricultural curricula.

Keywords. Agricultural curricula – Bologna Process – Disruptive innovation – Program accreditation – Quality assurance – EHEA.

Rôle de l'assurance qualité et de l'accréditation de programmes pour le soutien au développement de plans novateurs d'études agricoles

Résumé. Une demande mondiale croissante pour la sécurité alimentaire et la durabilité place une responsabilité importante sur les institutions d'enseignement supérieur agricole. L'assurance qualité, l'accréditation et l'innovation sont des éléments centraux pour le développement de programmes agricoles. La plupart des spécialistes conviennent que l'apprentissage des élèves est au cœur du rôle de l'université. Les jugements de qualité sont articulés autour de quatre critères – savoir académique, demande du sujet d'étude, pertinence pour la société, et viabilité. L'assurance qualité est renforcée par une évaluation par les pairs, une recherche rigoureuse, et la confirmation par des données d'évaluation des élèves. L'assurance qualité reconnaît également les contributions que la recherche apporte à la masse croissante des connaissances scientifiques. L'accréditation renforce la confiance en affirmant le but, les expériences, l'organisation et les résultats d'apprentissage évolutifs mesurés. Les politiques d'accréditation doivent reconnaître les normes internes et externes, assurer la protection de l'utilisateur, fournir des informations indépendamment vérifiées, et améliorer et renforcer la culture et les valeurs du peuple. Le cadre proposé intègre, dans un système commun complet d'assurance qualité, les qualifications nationales, les résultats d'apprentissage, les normes des programmes reconnus, les valeurs culturelles et l'accréditation. L'innovation est cruciale pour la viabilité des programmes. La mesure est essentielle pour une stratégie d'amélioration de l'éducation. Les systèmes de récompense des professeurs doivent correspondre aux fonctions académiques. Six concepts cruciaux soustendent le développement et l'exécution des plans novateurs d'études agricoles.

Mots-clés. Plans d'études agricoles – Processus de Bologne – Innovation de rupture – Accréditation de programmes – Assurance qualité – EHEA.

I – Introduction

The opportunity to examine the role of quality assurance and programme accreditation in supporting development of innovative agricultural curricula between two "core" regions, the US and Europe, has been rewarding. As we begin, we should remind ourselves of the founding purpose of higher education. As the oldest university in Europe, founded in 1088, the University of Bologna stated its purpose: to establish a "*societas di socii*" –groups of students– and was declared a place where research could develop independently from any other power" (Università di Bologna, para. 3). However, there has been tension regarding the purpose since its founding. Boyer (1990) began an essay "by looking at the way work of the academy has changed throughout the years –moving from teaching, to service, and then research" (p. xi). Boyer continued, charging that "the faculty reward system does not match the full range of academic functions and that professors are often caught between competing obligations" (p. 1). So, while roles of quality assurance and programme accreditation are purposed to benefit primarily the student and to advance knowledge independently, there are competing interests.

Agricultural curriculum is defined in this paper as the programme of study specified both by the university and the academic level, including the courses and related experiences, necessary for the degree. Tyler (1949), in a classic description of principles of curriculum and instruction, asked four framing questions to guide the development of innovative curricula; they remain relevant: "(i) What educational purposes should the school seek to attain? (ii) How can learning experiences be selected which are likely to be useful in attaining these objectives? (iii) How can learning experiences be organised for effective instruction? (iv) How can the effectiveness of learning experiences be evaluated?" (pp. v-vi).

With that background, we begin to explore and deconstruct the roles of quality assurance and programme accountability.

1. Delimitations and assumptions

This paper is focused primarily on internal quality assurance and external programme accreditation related to agricultural universities and programmes. The paper includes discussion of adapting to disruptive innovations in knowledge transfer. Geographically, this paper is delimited to American (US) and Western European universities and programmes. The authors assume that globalisation, competitiveness and mobility trends will continue to correlate to population growth, impacts of technology, environmental degradation, migration-immigration, and global conflict.

II – Quality assurance

Admittedly, quality is complex, multidimensional, and difficult to measure, but it plays a crucial role in the development of innovative agricultural curricula.

With the notion that form follows function, Boyer (1990) encouraged quality assurance by taking seriously the scholarship of integration, application and, especially, instruction. Helms (2015) argues that "development and operation of international education partnerships and programs should be guided by a multifaceted quality assurance framework" (p. 14).

Van Damme (2002) argued that if academic quality has a meaning, it has to be defined in relation to the core meaning of academic learning. Consequently, student learning (broadly defined as what students do) and teaching (what teachers do) are inextricably linked and interdependent processes (Scott, 2008).

Quality assurance has stakeholders within the academy and external publics beyond the academy. Most, but not all, agree that quality is an essential element and that judgments are framed around four assessment criteria: (i) Academic scholarship (teaching, research, service); (ii) Demands of the subject matter; (iii) Relevance to society; and (iv) Viability.

Van Damme (2002) noted that "twenty years of expertise and operational experience in quality assurance in higher education have not lead [*sic*] to a growing consensus on how the concept of quality should be defined, on the contrary. There is much more diversity in the definition of the concept than ever before, while we need to converge on what we actually mean by academic quality. The current prevalence of the relativist 'fitness for purpose' model and also the 'consumer satisfaction' approach, popular among new providers, only serves to avoid this difficult question" (p. 43).

The European Association for Quality Assurance (ENQA) is committed to respect the fitness for purpose principle (purpose-process alignment) that is at the core of the European dimension of quality assurance.

1. Quality assurance for Faculties

Using Boyer's work, Weiser (1995) developed a quality assurance framework incorporating teaching and learning, discovery, artistic creativity, integration, and application. Weiser recognised mission and responsibilities, saying "scholarship is creative intellectual work that is validated by peers and communicated" (p. 6).

Vukasovic (2014) recognised internal quality assurance as having regulative, normative and cultural-cognitive dimensions. Thune (2009) countered saying, "'quality assurance' is a generic term in higher education which lends itself to many interpretations: It is not possible to use one definition to cover all circumstances" (p. 12).

Rosa *et al.* (2012) recognised five complementary purposes for quality assessment related to internal staff perceptions: communication, motivation, control, improvement, and innovation. In a study of Portuguese academics' perceptions, Rosa *et al.* found strong staff support for improvement, communication and innovation purposes related to quality assessment. They found less support for motivation and control purposes.

Academic quality indicators reveal and confirm the quality and the relevance of the curriculum to society and to improve where necessary. Quality assurance is enhanced by peer-evaluation and rigorous research, as well as student evaluation data. Quality assurance also recognises the contributions that research makes to the body of scientific knowledge. These quality indicators must include Web of Science citation impacts, domain-specific niche research, professional publications in the niche, such as Scopus (SCImago, 2007) and Google Scholar (2015), and practical products with utility for public good. The weights of these indicators should match the philosophy, mission and goals of the faculty.

Relevance to the student and the society is a crucial indicator of quality assurance. Indicators of research rigour include peer review criteria, impact factors, and journal rankings.

Viability is a quality assessment surrounding the strategy that the curriculum intends to pursue in the years ahead and the extent to which it is capable of meeting its targeted needs of students and society during this period.

Van Damme (2002) advised that core concepts of academic quality may differ if used as a regulatory device in different environments. Vukasovic (2014) reported that disciplinary differences matter. Vukasovic found regulative elements were not very important in "hard-applied fields" while the regulative aspects are a necessary condition for further institutionalisation in the "soft-applied fields" (p. 44).

2. Quality assurance for Universities

UNESCO, as an external stakeholder, defined quality assurance in higher education as "a systematic process of assessing and verifying inputs, outputs, and outcomes against standardized benchmarks of quality to maintain and enhance quality, ensure greater accountability and facilitate harmonization of standards across academic programs, institutions, and systems" (UNESCO, 2008, p. 2).

Van Damme (2002) argued, "Only such a concept will be able to survive in the global educational marketplace. It is also the only way to defend the sense of identity and community in the higher education world against the danger of fragmentation entailed by diversification processes. The risk for not developing such a definition is the annihilation of real academic quality interests in a globalised higher education market or their reduction to mere consumer satisfaction concerns. Thus, there is need for a broad international consensus on what actually the core standards of academic quality should be" (p. 11).

The quality concept frequently serves very different purposes. Sometimes the concept of quality is misused in order to standardise and homogenise academic contents and curricula.

3. Summary of quality assurance

Kristensen (2010) examined external quality assurance over a 20-year period and concluded that although external quality assurance has improved, the greatest challenge to future quality in higher education is balance and synergy between internal and external quality assurance while meeting the obligations of internal assurance. She advocated audits be mandatory at the national level. At the same time, Kristensen argued "the role of the external quality assurance is too dominate" [*sic*] (2010, p. 156). In the final analysis, quality assurance benefits from equilibrium between internal and external forces. However, the sway should favor internal influences, innovation, and increased student learning.

III – Accreditation

Accreditation is an idea with 17th Century roots in middle French as "*trustworthiness*." A search for a common framework for higher education accreditation resulted in a diverse set of purposes, processes, actors, and vocabulary –the French might say, "*courir lapins*" or running rabbits. The broader "core" purpose for accreditation is to recognise and endorse quality education at the institutional and programme levels while branding counterfeit entities.

Accreditation includes an array of public and private relationships that affect students, faculties, governments, professions, and the larger public. Separately we will examine the purposes, processes and stature, and actors, including accreditation organisations versus private ranking agencies in Europe and the US.

Among European and US higher education, there are three principal frameworks that influence quality assurance and accreditation: (i) external agencies in the US; (ii) internal governmental agencies in Europe; and (iii) privy councils or sovereign bodies in the UK. GOV.UK (2015) listed institutions that can offer degrees by virtue of their own degree awarding powers or those powers of another institution.

1. Purposes of accreditation: Europe

The evolution of the European vocabulary of accreditation includes synonyms that must be interpreted carefully. Assessment, audit, benchmarking, certification, competencies, EQAR, indicators, learning outcomes, licensing, outcomes, qualification frameworks, REHEQA, and standards

each have special and occasionally unique meaning (Vl! sceanu, Grünberg and Pârlea, 2007). Accreditation, like quality assurance, is complex, multidimensional and is sometimes difficult to manage, but it plays an essential role in the development of innovative agricultural curriculum.

In most European countries the function of educational accreditation for higher education is conducted by a governmental organisation, such as a ministry of education. For example, the University of Bologna holds its accreditation from the Ministry of Education, Universities and Research in Italy.

Thune (2009) warned, "Quality assurance can be undertaken by external agencies for a number of purposes, including: safeguarding of national academic standards for higher education; accreditation of programmes and/or institutions; user protection; public provision of independently-verified information (quantitative and qualitative) about programmes or institutions; and improvement and enhancement of quality" (p. 15).

Thune (2009) reported that during the July 2003 Graz Declaration of the European University Association (EUA), 13 countries agreed that "the purpose of a European dimension to quality assurance is to promote mutual trust and improve transparency while respecting the diversity of national contexts and subject areas" (p. 13). Thune (2009) reported the 2003 Berlin communiqué invited the European Network for Quality Assurance in Higher Education (ENQA), in cooperation with the EUA, EURASHE, and ESIB, to develop an agreed-upon "set of standards, procedures and guidelines on quality assurance and to explore ways of ensuring an adequate peer review system for quality assurance and/or accreditation agencies or bodies, and to report back" (Thune, 2009, p. 5) to the Bergen ministerial conference in 2005. Since that time, the recent Montenegrin Qualifications Framework (MQF, 2014) reported that "higher education is an activity of public interest and, therefore, all institutions have to have an accreditation and a license, regardless of their ownership" (p. 17).

The MQF (2014) announced, "System monitoring and evaluation at the higher education level is also carried out by means of external and internal quality assessment mechanisms, i.e., through procedures implemented in various stages, starting from initial accreditation, through monitoring of teaching process to reaccreditation of higher education institutions in Montenegro" (p. 36). ENQA (2015) declared a commitment to respect the fitness for purpose-process alignment is at the core of the European dimension of quality assurance and accreditation. Thune (2009) noted that "agencies should pay careful attention to their declared principles at all times, and ensure both that their requirements and processes are managed professionally and that their conclusions and decisions are reached in a consistent manner, even though the decisions are formed by groups of different people" (p. 26).

Stensaker (2011) warned, however, that "the range of accreditation in European higher education may be more complex than is often imagined, and that one should be careful about drawing quick or straightforward conclusions about the role accreditation plays, with respect to internationalisation, globalisation, and 'Europeanisation'" (p. 764).

Stensaker (2011) reported that, "although accreditation is mentioned in these [*sic*] central Bologna process, it is worth noting that the concept of accreditation is only put forward as one of several possible elements the countries participating in the Bologna process were expected to consider. If we consult the European Standards and Guidelines..., there are no references made to specific methods for quality assurance: it calls for external 'quality assurance mechanisms designed specifically to ensure their fitness to achieve the aims and objectives set for them.' Regarding methods, these standards only specify the need for 'periodic reviews', based on 'explicit published criteria'" (p. 759).

A second and closely related issue is that both US and European external quality assurance is facing increasing criticism for failing to address issues concerning student learning outcomes (Ewell 2008; Tremblay, Lalancette, and Roseveare, 2012/2013; Alexander, 2015; Stensaker, 2011).

"A third issue, involving the different contexts surrounding accreditation in Europe and the US, is that while accreditation is criticized for not being improvement-oriented enough in the US it could be argued that the current spread of accreditation in Europe is an indication of increasing interest in control and compliance with academic standards" (Stensaker, 2011, p. 765).

Thune (2009) advised, "All external quality assurance processes should be designed specifically to ensure their fitness to achieve the aims and objectives set for them" (p. 9). In this case, external quality assurance may well include accreditations or audits. Thune continued, "The need for external quality assurance to be fit for its purpose and to place only an appropriate and necessary burden on institutions for the achievement of its objectives" (p. 11). Stensaker (2011) posited, "Accreditation is becoming one of the most popular methods for external quality assurance worldwide" (p. 757).

2. Purposes of accreditation: US

In the United States the 100 year-old quality assurance process is independent of government and performed by private associations, but it is interrelated to the US Department of Education (USDE). There are four types of accrediting organisations: (i) regional accreditors, (ii) national faith-related (i.e., religious) accreditors, (iii) national career-related accreditors, and (iv) programmatic accreditors. Each has a unique mission and audience. Alexander (2015) noted, "Accreditation is, at its core, an effort by colleges and universities to self-regulate. As the landscape of higher education evolves –from the students served, to the providers that deliver education, to the expectations of consumers– so too must accreditation" (p. 11).

Eaton (2009) reported, "In the United States, accreditation is carried out by private, nonprofit organizations designed for this specific purpose" (p. 1). Contrary to internal quality assessments, "Accreditation is a process of external quality review created and used by higher education to scrutinize colleges, universities and programs for quality assurance and quality improvement" (p. 1). Further, she wrote that accreditation carries out the following roles: assuring quality; enabling access to federal and state funds; engendering private sector confidence; and easing credit transfer (mobility)" (pp. 2-3).

Recognition in the United States is about scrutiny of the quality and effectiveness of accrediting organisations. It is carried out by the higher education enterprise through the Council on Higher Education Accreditation (CHEA), a private body, and by government (USDE) (Eaton, 2009).

As an umbrella organisation, the CHEA provides recognition in the private, nongovernmental sector and is associated with 52 recognised national accrediting bodies and six principal regional agencies. There is a plethora –more than 75– of specialised and professional accreditors, some with excellent credentials, which are loosely associated with CHEA.

USDE (2015) described accreditation in the United States as "a voluntary, nongovernmental process, in which an institution and its programs are evaluated against standards for measuring quality" (para. 1). CHEA recognition is funded by institutional dues while USDE recognition is funded by the US Congress.

The goals of the two entities are different: CHEA assures that accrediting organisations contribute to improving and maintaining academic quality; USDE assures "that accrediting organisations contribute to maintaining the soundness of institutions and programmes that receive federal funds" (Eaton, 2009, p. 9) "The two recognition processes are similar: self-evaluation based on standards, site visit and report, and the award of recognition status. Recognition adds value to society as a vital part of accreditation accountability or 'accrediting the accreditors'" (Eaton, 2009, p. 9).

The University of California-Davis, recognised for excellence, is accredited by the Accrediting Commission for Senior Colleges and Universities of the Western Association of Schools and Colleges (WASC). WASC is an institutional accrediting body recognised by the Council for Higher Education and the US Department of Education. Additionally, the UC-Davis (2014) General Catalog reported programmes accredited by 20 separate accrediting boards or commissions. The 20 agencies represent medicine and nursing (9), law (3), education and teacher credentialing (2), and engineering and technology (1), and five others.

As a regional accrediting agency, the Southern Association of Colleges and Schools Commission on Colleges (SACSCOC, 2015) posts its mission is "to assure the educational quality and improve the effectiveness of its member institutions" (para. 1). Further, the association lists six core values: "integrity, continuous quality improvement, peer review/self-regulation, accountability, student learning, and transparency" (para. 3).

3. Processes and stature of accreditation

Accrediting agencies, which are private educational associations of regional or national scope, have developed evaluation criteria over time and conduct peer evaluations to assess whether or not those criteria are met.

Accreditation signals to the public that the institution and/or programme meet recognised standards of quality and is a symbol of prestige. The process begins with a request for a rigorous internal and external evaluation and institutions or programmes that meet an agency's criteria are then "accredited" by that agency.

A. EHEA / Bologna Process

European higher education quality is a national responsibility and the statutory powers reside within national or sub-national legislation. To fully understand the processes, it is necessary to first understand the higher education policy developed and implemented at the individual national level by the relevant ministry of the country (ECApedia, 2015).

However, European cooperation was strengthened with the promotion of the Bologna process and the Lisbon Strategy. This cooperation has led to gradual common targets and initiatives, which are supported by a number of funding programmes. Funding bodies, such as the EU, have no legal power, but rather are subordinated to national legislation and policy.

As an EU initiative, the overarching European Qualifications Framework (EQF) fits national qualifications into a comprehensive common system of quality assurance, learning outcomes, recognised program standards, and accreditation (ECApedia, 2015).

While 47 signatories and eight consultative members of the European Higher Education Area (EHEA) committed to developing National Qualifications Frameworks (NQF, 2010; (EHEA, 2015a), considerable work remains to be done. The NQF is undergirded by individual national qualifications frameworks that reflect the NQF as well as cultural conventions, students, academic freedoms, and economic policies. These are contentious issues. A current progress report is available at the EHEA website (EHEA, 2015c). EHEA members generally benefit from increased recognition and prestige for their institutions, a sense of collective engagement and ownership, and increased mutual trust, control, professional autonomy, and accountability. However, this is not undisputed.

The EQF external quality assurance included eight ENQA criteria. "Activities may involve evaluation, review, audit, assessment, accreditation or other similar activities and should be part of the core functions of the member" (ENQA, 2014, p. 1).

B. CHEA/USDE Process

Accreditation in American higher education began as a peer review process in the late 19th century concerned about articulation among secondary schools and college entrance requirements. The post-WWII focus shifted more to regional agencies, in concert with the federal government, as examiners for quality assurance and protection for federal funding. Today the process is a collaboration among private non-government accrediting agencies to affirm and enhance academic quality and the Secretary of Education to publish an approved list of quality institutions of education. Although accrediting agencies may accredit foreign institutions, USDE has no jurisdiction outside the United States. CHEA (2010) reported that more than 19,000 programmes and 7,000 institutions were accredited by 80 recognised organisations in 2008, impacting more than 24 million students.

The step-wise process for accreditation begins with the application by the institution. The accreditation agency reviews and accepts/rejects the application based on compliance with principles of integrity, core requirements, comprehensive standards, federal requirements and the policies of the agency. The initial regional accreditation begins "four phases in the process for securing initial accreditation – (1) building a foundation of understanding as the institution starts the process, (2) preparing the Application for Membership, (3) hosting the Candidacy Committee, and (4) hosting the Accreditation Committee" (SACSCOC, 2011, p. ix). The typical timeline for initial accreditation is four years.

Like EHEA, US accreditation provides greater recognition of their institutions, assurance to students, a feeling among faculties of ownership, collective engagement, and trust a professional autonomy and control, as well as accountability (SACSCOC, 2011).

4. Accreditation actors

European actors in the quality assessment and accreditation of higher education included the respected Ministers and their staff and an array of governmental and stakeholder acronyms including, but not limited to, BFUG, BUSINESSEUROPE, Education International, EQAR, and the E4 group (EHEA, 2015b). These governmental actors are responsible for quality assurance, involving stakeholders, and encouraging dialogue on funding and governance of higher education.

Individual country-states have bodies with authority and responsibility of quality and accreditation. An example is The Accreditation Organisation of the Netherlands and Flanders. As an independent accreditation organisation, the organisation "was set up by the Dutch and Flemish governments. It evaluates the quality of higher education in the Netherlands and Flanders according to objective criteria" (Niessen, 2012, para. 7).

There is a tension between accreditation holding accreditors accountable and directing and prescribing the process (CHEA, 2011). Fritschler (2008) reported "Accreditors and the universities with which they work face a daunting challenge: They are responsible for assuring accountability to the public through traditional methods of self-regulation and they are facing increasing pressure from the federal government to impose prescribed accountability measures" (p. 1).

A. Private ranking agencies

Private world rankings may be a disruptive innovation. The QS World University Rankings by Subject in 2015 "evaluated 3,467 universities and ranked 971 institutions. The rankings are prepared by Quacquarelli Symonds (QS), a British firm that previously was the data provider for the annual Times Higher Education rankings. The firm is widely considered to be one of the most influential international university rankings providers" (UC-Davis, 2015). World rankings are also reported by US News & World Report (2015) and methodologies are reported by Morse and Foster (2014).

Western Europe has chosen to endorse programmes using external quality assurance constructs –with quite different approaches. Wageningen University and Research Centre, founded in 1918, ranked the best global university for agricultural sciences by *US News & World Report* and third by QS World University Rankings, is institutionally accredited by the Dutch-Flemish Accreditation Organisation (NVAO).

Niessen (2012) reported the NVAO evaluated Wageningen UR "on five standards, including the institution's vision on the quality of education, the policy it develops in this area (including the attention for facilities) and the embedding of education in the international professional field. Other criteria are the systematic manner in which the university improves its education and the presence of an effective decision-making structure for educational quality, which includes input from students" (para. 4).

QS World University Rankings recently ranked University of California-Davis number 1 in the world for teaching and research in agriculture and forestry for the second consecutive year (*US News & World Report* ranked UC-Davis second in the agricultural sciences). The UC-Davis Biological Systems Engineering programme was ranked second best global programme by QS World University Rankings. The Biological Systems Engineering programme is accredited by ABET.

ABET is a professional, non-governmental and non-profit organisation, recognized by CHEA, that accredits individual programmes of study, rather than evaluating an institution as a whole, and provides assurance that a college or university programme meets the quality standards established by the profession for which the programme prepares its students. ABET accredits over 3,100 programs in applied science, computing, engineering, and engineering technology at more than 670 colleges and universities in 24 countries (ABET, 2015). ABET accreditation is voluntary, fee-based, and achieved through a peer review process.

6. Current status of accreditation

A. EHEA – Yerevan Ministerial Conference

Accreditation hinges on two issues: (i) the development of international competitiveness through integrated policies and programmes; and (ii) adjustments resulting from student mobility, mutual recognition agreements, and new delivery modes. Accreditation as a quality assurance model can provide at least a part of the answer to these two challenges.

In its 16th year, The EHEA Bologna process held its Ministerial Conference and 4th Bologna Policy Forum in Yerevan Armenia (Klemenčič and Ashwin, 2015). In the conference, ministers and stakeholders discussed the NQF, self-certification of the MQF, youth employment, and future challenges of the MQF (2014) "based on learning outcomes and its key role is to reform and modernise the qualifications system by connecting education and labour market and by ensuring quality of attained qualification" (p. 75).

B. US – Reauthorisation of HEA

While accreditation in the United States is more than 100 years old, there are challenges calling for change related to three major concerns: accountability, costs, and the changing structure and delivery of higher education.

ACE (2015) reported, "Since the original Higher Education Act (HEA) was created in 1965, the sweeping law governing federal financial aid programs has been rewritten eight separate times. The current HEA was set to expire at the end of 2013 but has now been extended through 2015 while Congress prepares for the next reauthorization. Among the issues that likely will be includ-

ed in the final bill are affordability and college costs; access, persistence and completion; better information for consumers; student loan programs; accreditation and oversight; innovation; and the burden of federal regulations" (para. 1). ACE has worked with Congress on each reauthorisation and has already taken initial steps on the current process.

Recently, the US Senate released white papers in an effort to focus attention on accreditation to the upcoming reauthorisation of the HEA. The papers focused on student consumer information requirements, risk-sharing in the student loan programmes, and accreditation.

Knoester (2015) reported "The US Senate seems intent to refocus accreditation to become mostly aimed at improvement and to scrap some of its accountability functions. In white papers released by the Senate Committee on Health, Education, Labor and Pensions, accountability functions such as the link between accreditation and institutional eligibility for federal student aid and the powers of the Department of Education when it comes to the recognition of accrediting agencies are questioned. To promote competition it is suggested to eliminate the geographic-based structure of regional accrediting agencies, thereby ending the monopoly on institutional accreditation that these agencies have in their region. Innovation should be encouraged by opening up accreditation to non-college providers of higher education" (para. 1).

General consensus points to the need to "redesign and reform accreditation to strengthen the quality of colleges and universities, promote competition and innovation in higher education, and provide accountability to government stakeholders and taxpayers" (Berkes, 2015, para. 3).

7. Analysis

A. Pro –European EHEA / Bologna process

The original 1999 Bologna meeting set in motion goals for comparability of standards and quality of higher education qualifications. In the implementation report of the Bucharest Ministerial Conference (EHEA, 2012), Commissioner Vassiliou concluded that "the Bologna process has transformed the face of European higher education" (p. 7). The report continues, saying, "the Bologna Process has induced change at systems level through the implementation of trust building tools aimed at increasing transparency across national jurisdictions and at bringing about convergence of systems" (p. 9). Areas of noted accomplishment include degrees and qualifications, quality assurance, social dimensions, effective outcomes and employability, lifelong learning, and mobility. With optimism, Klemenčič and Ashwin (2015) reported significant progress from the Yerevan Ministerial Communiqué. "One is fostering employability of graduates. The other objective is to make higher education systems more inclusive" (p. 2). "New is the objective of enhancing the quality and relevance of learning and teaching" (p. 3). Klemenčič and Ashwin praise the ministers saying "This is the first time that quality of teaching and learning has been emphasized in such strong and unambiguous terms" (p. 3).

B. Con –European EHEA / Bologna process

Grove (2012) wrote to conclude that "Bologna not to taste of German critics" (para. 1). Arguments included Grigat charging "that changes introduced under the programme to harmonise European higher education systems had undermined institutional autonomy and universities' ability to educate students to high standards" and "this notion of 'competence'...is only about markets, not about developing what is special about the person" (para. 5), "It has missed all its objectives – student mobility has not increased, study time has not decreased and employers complain about graduate skills" (para. 7). Sturm, in Groves article, declared, "Bologna had added an extra layer of bureaucracy for academics" (para. 8). In a counterpoint, Schulze said, "the changes in German higher education were not down to Bologna" (para. 11). "We are responding to something that

has been happening for 30 to 40 years–the massification of universities. Those who graduate from these 'competence' universities are not doing any worse than those from more traditional educational universities" (para. 12).

Coleman (2006) citing Block and Cameron, warned that "Globalization influences both language use and the economics of HE. It is a complex phenomenon, with positive and negative social impacts, embracing economics, culture, identity, politics and technology" (p. 1), (Block and Cameron, 2002, pp. 2-5).

Van Damme (2002) expressed concern that variations in QA systems in different countries make it unlikely that mutual recognition arrangements would be valid without some streamlining and alignment of systems. Those who rely on recognition or validation arrangements to signify "equivalence" need to be reassured that valid comparators underpin such arrangements. Progress over the past 13 years has reduced QA variations while recognising and accommodating the unique culture, values and investments of individual EHEA members.

Fritschler (2008) recognised accreditations' dilemma of serving two masters: universities and governments.

C. Pro –US accreditation process

CHEA (2013) argues that accreditation is a highly successful and well-tested system of quality assurance and quality improvement. Further, it is an outstanding example of an effective public-private partnership and of reliable and responsible self-regulation. There is substantial argument for non-governmental accreditation with a minimum of partisan influence.

D. Con –US accreditation process

The US publics have moved from an era of historical trustworthiness and judgments to a culture of measurement, evidence, performance and impact. The Higher Education Act of 1965 (PL 89-329) was sweeping legislation that has been rewritten eight times. Congress is preparing for complex reauthorisation, including accreditation, in 2015.

Today's vocal critics argue that accreditation in its present form, particularly regional accreditation, must be changed. (Alexander, 2015; Berkes, 2015; Broad, 2015; Dickeson, 2006; Leef and Burris, 2002; Lucas, 1996; Schray, 2006; Spellings Commission, 2006).

Alexander (2015), as chair of the committee to reauthorise 2015 legislation, issued a challenging white paper. He criticised current accreditation policy for failing to document student learning, lacking academic rigour, limited student engagement, a lack of basic skills, student attainment and achievement, and workforce skills. Further, Alexander charged that accreditation can inhibit innovation and competition, citing anti-competitive policies and resistance to change using massive open online courses (MOOCs), technology, distance delivery, hybrid curricula, and student-centered learning as examples. His declared strategy was to "redesign and reform accreditation to strengthen the quality of colleges and universities, promote competition and innovation in higher education, and provide accountability to government stakeholders and taxpayers" (p. 1).

Alexander (2015) concluded the critical white paper with three options for restructuring accreditation: (i) refocus accreditation on quality; (ii) redesign accreditation to promote competition and innovation; and (iii) keep recognition of accrediting agencies independent and free from politics. If approved as part of the 2015 Congressional reauthorisation of higher education act, there will be massive changes in actors, policy, authority, limits, costs, and practice.

8. Summary of accreditation

While the purpose of quality assurance expanded over a 20-year period, the expectations of accreditation have also increased. Quality assurance is of broad interest between internal and external stakeholders. Likewise, the process of accreditation is of interest by a diverse audience. Clearly, accreditation trends have increased the roles, scope and actors. Accreditation faces the challenge of integrity, balance, and synergy while recognising tradition, change, and innovation. There is an expectation that accreditation go beyond nominal attributes (e.g., counting students, books, credits, and compliance) and measure ratio attributes (e.g., purpose, experience, critical thought, learning outcomes, reflection, pedagogical innovation, democracy, and values).

> *"If you can measure that of which you speak, and can express it by a number, you know something of your subject; but if you cannot measure it, your knowledge is meager and unsatisfactory."* – William Thomson, (Lord Kelvin)

IV – Innovation and the development of agricultural curricula

Innovation, sometimes disruptive, in curriculum development is essential for progress and often comes from the margins of the academy. Innovation (n.d.) with roots from Latin "*innovationem*," is defined as, "a new method, idea, product; something new or different introduced" (para. 1). The capacity to measure innovation is key to improvement in education.

Christensen and Eyring (2012) posited, "Historically, higher education has avoided competitive disruption. One reason for this past immunity is the power of prestige in the higher education marketplace, where the quality of the product is hard to measure" (p. 47). Further, Christensen and Eyring predicted, "Universities that survive today's disruptive challenges will be those that recognize and honor their strengths while innovating with optimism. University communities that commit to real innovation, to changing their DNA from the inside out, may find extraordinary rewards. The key is to understand and build upon their past achievements while being forward-looking" (p. 47).

Rogers (1962/2003) introduced systematic theories of diffusion arguing that diffusion is communicated through certain channels over time among participants within a social network. Rogers identified the principles, including adopter categories, characteristics of social structures, characteristics of innovations, decision stages, and consequences while recognising challenges of bias and equality that influence the rate of adoption of innovation. Recent advances in social network analysis (SNA) further explain and expedite innovation. Gladwell (2002) acknowledged, "The success of any kind of social epidemic is heavily dependent on the involvement of people with a particular and rare set of social gifts" (p. 33). Historically, agricultural sciences exemplified innovation and the social networking that accelerated innovation in agriculture and education.

Govindarajan and Trimble (2010, 2012, 2013) have a decade of research examining innovation and transformations in global business and industry. In their parable, "*How Stella saved the farm: A tale about making innovation happen*", they warned, "the idea is only the beginning" and "just go make it happen" is a woefully inadequate approach for innovation. Further, they describe the importance of "building the team" and "planning and assessing progress" (2013, p. 157). Govindarajan and Trimble (2010) expound on six crucial concepts that underpin the parable and offer valuable insight on the development and execution of innovative agricultural curricula.

Christensen (2015) explored "disruptive innovation" from a business perspective and described "a process by which a product or service takes root initially in simple applications at the bottom of a market and then relentlessly moves up market, eventually displacing established competitors" (para. 1). Christensen, Horn, Soares and Caldera (2011) examined online education as an emerging disruptive innovation and concluded, it "presents an opportunity to rethink many of the age-old

assumptions about higher education" (para. 2). Bush and Hunt (2014) convened more than 19 renowned global thinkers to explore economics and access to higher education in a conference focused on globalisation of higher education. They too recognised the many opportunities, including scale, access, and costs. Christensen (2014) asked, "Why do we care?" (42:30). He explained if we assume that one vector drives prices down and the second vector represents non-consumption in the marketplace; there will be huge changes in economic growth, competition, technology. Christensen concluded to the faculties, "God bless you; you are the front line" (46:30).

V – Promising practices

Our overarching purpose was to respond to the global challenge in knowledge transfer in order to meet world demands for food security and sustainability. This paper examined the role of quality assurance in supporting the development of innovative agricultural curricula. Peripheral issues included accountability, control, professional autonomy and trust. Seven promising quality assurance practices emerged from this inquiry:

– Curriculum is the guidebook for student learning and it begins with purpose, experiences, systematic organisation, and measured learning outcomes. Faculties are the process leaders on the front line.

– While student learning is the raison d'être, quality is the defining element for higher education.

– Student learning and quality teaching are inextricably linked and interdependent processes.

– Ultimately, four assessment criteria explain university priorities–academic scholarship (teaching, research, service), demands of the subject matter, relevance to society and viability.

– Quality assurance is enhanced by peer-evaluation and rigorous research, as well as student evaluation data. Baseline indicators include teaching, research and public good.

– Improvement, communication and innovation are drivers of quality among professors, while motivation and control have less impact.

– The two greatest challenges to future quality in higher education are balance between continuity and change and synergy between internal and external assurance while meeting the obligations of public trust.

This paper also examined the role of programme accreditation in supporting development of innovative agricultural curricula. Six promising accreditation practices emerged from this inquiry:

– Accreditation is a bond of trust affirming the purpose, experiences, organisation and measured, scalable learning outcomes.

– Accreditation should accurately delineate standards using qualitative and quantitative measurements and boundaries.

– Policies for accreditation should recognise internal and external standards, provide student protection, provide independently-verified information, and improve and enhance quality.

– All external quality assurance processes should be designed to guarantee their suitability to achieve the aims and objectives of the institution.

– Institutional accreditation should be free of political influence while being responsible to stakeholders.

– Framework should fit national qualifications into a comprehensive common system of quality assurance, learning outcomes, recognised programme standards, cultural values, and accreditation.

Innovation is essential for curriculum viability. This paper examined innovation as a process that brings together novel ideas in a way that have a positive impact on society. Five promising innovation practices emerged from this inquiry–

– Innovation is crucial to the development of curriculum.

– The ability to measure innovation is key to a long-term improvement in education.

– Faculty reward systems often do not match the academic functions and professors are often caught between competing obligations.

– Six crucial concepts underpin the development and execution of innovative agricultural curricula.

– Technology, including online education, is well positioned as a disruptive innovation.

Figure 1 illustrates the role of quality assurance and programme accreditation in supporting development of innovative agricultural curricula.
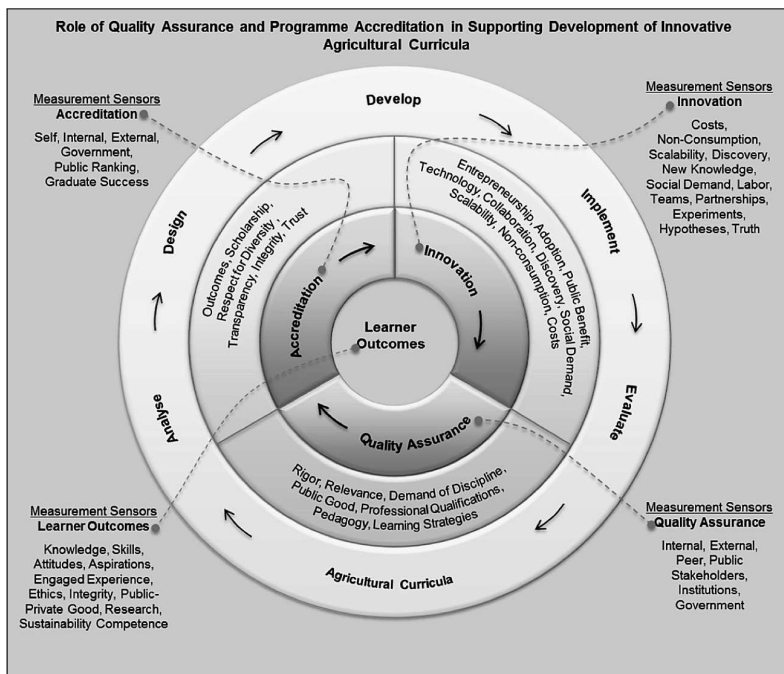

Fig. 1. Integrating quality assurance, programme accreditation and innovation into curriculum development.

VI – Conclusion

We are living in turbulent times. The challenges of 2050 call for innovation unlike any of the past century. Dobbs, Manyika and Woetzel (2015) explained four global forces breaking all the trends –urbanization, accelerating technological change, an aging world population, and global connections. Many of these challenges can be tackled through higher agricultural education –"protecting our environment, enriching our youth, improving our health, growing our economy, and

feeding our world" (Texas A&M University, 2015, para. 2). Developing innovative agricultural curricula is at the heart of the solutions. Innovation begins with exploiting Tyler's model (1949) by determining the purpose, identifying the experiences related to the purpose, organizing the experiences, and evaluating the outcomes. As tools for curriculum designers, the phases require designers to analyse, design, develop, implement and evaluate. Forrest (2014) describes each step in the development process.

Drucker (2005) advised, "The greatest challenge to organizations is the balance between continuity and change. You need both. At different times, the balance is slightly more over here, or slightly more over there, but you need both. And balance is basically the greatest task in leadership. Organizations have to have continuity, and yet if there is not enough new challenge, not enough change, they become empty bureaucracies, awfully fast" (para. 1). Drucker (1980) cautioned, "The greatest danger in times of turbulence is not the turbulence – it is to act with yesterday's logic" (para. 1). Engaging the future requires asking the right questions while nurturing communication and collaboration. Pollard (n.d.) posited, "Learning and innovation go hand in hand. The arrogance of success is to think that what you did yesterday will be sufficient for tomorrow" (para. 1). Norman Borlaug (personal communication, May 27, 2008) encouraged our team when facing agricultural development challenges saying, "be bold."

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