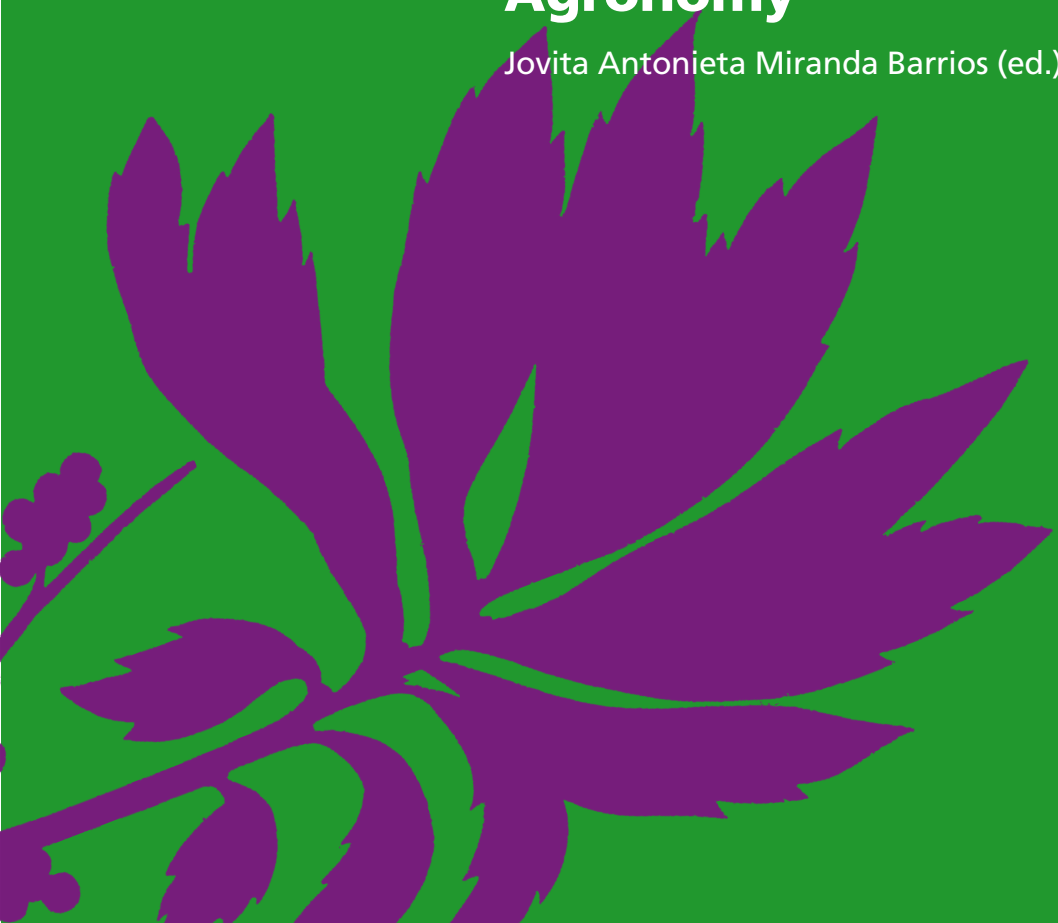
Tuning

Latin America

Higher Education in Latin America: reflections and perspectives on **Agronomy**

Jovita Antonieta Miranda Barrios (ed.)



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Tuning Latin America Project

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Tuning: past, present and future
An introduction

Major changes have taken place worldwide in higher education over the last 10 years, although this has been a period of intense reflection particularly for Latin America, insofar as the strengthening of existing bonds between nations has been promoted and the region has started to be considered as being increasingly close. These last 10 years also represent the transition time between Tuning starting out as an initiative that arose as a response to European needs and going on to become a worldwide proposal. Tuning Latin America marks the start of the Tuning internationalisation process. The concern with thinking how to progress towards a shared area for universities while respecting traditions and diversity ceased to be an exclusive concern for Europeans and has become a global need.

It is important to provide the reader of this work with some definitions of Tuning. Firstly, we can say that Tuning is **a network of learning communities**. Tuning may be understood as being a network of interconnected academic and student communities that reflects on issues, engages in debate, designs instruments and compares results. They are experts that have been brought together around a discipline within a spirit of mutual trust. They work in international and intercultural groups and are totally respectful of independence on an institutional, national and regional level, exchanging knowledge and experiences. They develop a common language to problems in higher education to be understood and take part in designing a set of tools that are useful for their work, and which have been devised and produced by other academics. They are able to take part in a platform for reflection and action about higher education - a platform made up of hundreds of communities

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from different countries. They are responsible for developing reference points for disciplines that represent a system for designing top quality qualifications which are shared by many. They are open to the possibility of creating networks with many regions of the world within their own field and feel that they are responsible for this task.

Tuning is built on each person that forms part of that community and shares ideas, initiatives and doubts. It is global because it has pursued an approach based on worldwide standards while at the same time remaining both local and regional, respecting the specific features and demands of each context. The recent publication: *Communities of Learning: Networks and the Shaping of Intellectual Identity in Europe, 1100-1500* (Crossley Encanto, 2011) takes all the new ideas into consideration which are developed within a community context, whether of an academic, social or religious nature or simply as a network of friends. The challenge facing Tuning communities is to gain an impact on the development of higher education in its regions. Secondly, Tuning is a **methodology** with well-designed steps and a dynamic outlook that enables different contexts to be adapted. The methodology has a clear aim: to build qualifications which are compatible, comparable, are relevant to society and with top levels of both quality and excellence, while preserving the valuable diversity deriving from the traditions of each country involved. These requirements demand a collaborative methodology based on consensus which is developed by experts from different fields who are representatives of their disciplines, and who have the ability to understand local, national and regional situations.

This methodology has been developed around **three core themes**: the first is the **qualification profile**, the second is the **syllabus** and the third refers to the **trajectories of those who learn**.

The qualification profile enjoys a key position in Tuning. After a lengthy period of reflection and debate within Tuning projects in different regions (Latin America, Africa, Russia), the qualifications profile may be defined as being a combination of forces revolving around four core points:

- The region's needs (from local issues to the international context).
- The meta-profile of the area.

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- The taking into consideration of future trends in the profession and society.

- The specific mission of the university.

The question of **social relevance** is essential for the design of profiles. Without doubt, any analysis of the relationship existing between university and society lies at the heart of the matter of relevance in higher education. Tuning's aim is to identify and meet the needs of the production sector, the economy, society as a whole and the needs of each student within a particular area of study – measured by specific social and cultural contexts. With a view to achieving a balance between these different needs, goals and aspirations, Tuning has consulted leading people, key local thinkers and experts from industry, both learned and civil society and working parties that include all those interested. An initial period of this phase of the methodology is linked to general competences. Each thematic area involves the preparation of a list of general competences deemed relevant from the standpoint of the region concerned. This task ends when the group has widely discussed and reached consensus about a selection of specific competences, and the task is also performed with specific competences. Once the means of consultation has been agreed and the process completed, the final stage in this practical exercise involving the search for social relevance refers to an analysis of results. This is done jointly by the group, and special care is taken not to lose any contributions from the different cultural perceptions that might illustrate understanding of the specific reality.

Once lists of the general and specific agreed, consulted and analysed competences had been obtained, a new phase got underway over these last two years that is related to the **development of meta-profiles for the area** under consideration. For Tuning methodology, meta-profiles represent the structures of the areas and combinations of competences (general and specific) that lend identity to the disciplinary area concerned. Meta-profiles are mental constructions that categorise competences in recognisable components and illustrate their inter-relations.

Furthermore, thinking about education means becoming involved in the present, while above all also looking towards the future – thinking about social needs, and anticipating political, economic and cultural

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changes. This means also taking into account and trying to foresee the challenges that those future professionals will have to face and the impact that certain profiles of qualifications is likely to have, as designing profiles is basically an exercise that involves looking to the future. Within the present context, designing degree courses takes time in order for them to be planned and developed and their approval obtained. Students need years to achieve results and mature in terms of their learning. Then, once they have finished their degree, they will need to serve, be prepared to act, innovate and transform future societies in which they will find new challenges. Qualification profiles will in turn need to look more to the future than the present. For this reason, it is important to take an element into consideration that should always be taken into account, which are future trends both in terms of the specific field and society in general. This is a sign of quality in design. Tuning Latin America embarked on a methodology so as to incorporate an **analysis of future trends into the design of profiles**. The first step therefore involved the search for a methodology to devise future scenarios following an analysis of the most relevant studies in education by focusing on the changing role of higher educational establishments and trends in educational policies. A methodology was chosen based on in-depth interviews with a dual focus: on the one hand, there were questions that led to the construction of future scenarios on a general society level, their changes and impact. This part needed to serve as a basis for the second part, which dealt specifically with the features of the area in itself, their transformation in general terms in addition to any possible changes in the degree courses themselves that might have tended to disappear, re-emerge or be transformed. The final part sought to anticipate the possible impact on competences based on present coordinates and the driving forces behind change.

There is a final element that has to be taken into account when constructing the profiles, which is linked to the **relationship with the university where the qualification is taught**. The mark and mission of the university must be reflected in the profile of the qualification that is being designed.

The second core theme of the methodology is linked to **syllabuses**, and this is where two very important Tuning components come into play: on the one hand, students' work volume, which has been reflected in an agreement to establish the Latin American Reference Credit (CLAR), and all studies are based on this and, on the other, the intense

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reflection process into how to learn, teach and assess competences. Both aspects have been covered in Tuning Latin America.

Lastly, an important area is opened up for future reflection about the **trajectories of those who learn** – a system that proposes focusing on the student leads one to consider how to position oneself from that standpoint so as to be able to interpret and improve the reality in which we find ourselves.

Finally, Tuning is a **project** and as such came into existence with a set of objectives and results and within a particular context. It arose from the needs of the Europe of 1999, and as a result of the challenge laid down by the 1999 Bologna Declaration. Since 2003, Tuning has become a project that goes beyond European borders, in so doing embarking on intense work in Latin America. Two very specific problems faced by the university as a global entity were pinpointed: on the one hand, the need to modernise, reformulate and make syllabuses more flexible in the light of new trends, society's requirements and changing results in a vertiginous world and, on the other, which is linked closely to the first problem, the importance of transcending limits imposed by staff in terms of learning, by providing training that would enable what has been learnt to be recognised beyond institutional local, national and regional borders. The Tuning Latin America project thus emerged which, in its first phase (2004-2007), sought to engage in a debate whose goal was to identify and exchange information and improve collaboration between higher educational establishments, with a view to developing the quality, effectiveness and transparency of qualifications and syllabuses.

This new phase of **Tuning Latin America (2011-2013)** started life on already-fertile terrain – the fruits of the previous phase and in view of the current demand on the part of Latin American universities and governments to facilitate the continuation of the process that had already been embarked on. The aim of the new Tuning phase in the region was to help build a Higher Education Area in Latin America. This challenge takes the form of four very specific central working themes: a deeper understanding of agreements involving **designing meta-profiles and profiles in the 15 thematic areas** included in the project (Administration, Agronomy, Architecture, Law, Education, Nursing, Physics, Geology, History, Information Technology, Civil Engineering, Mathematics, Medicine, Psychology and Chemistry); contributing to **reflections on future scenarios for new professions**; promoting the

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joint construction of **methodological strategies in order to develop and assess the training of competences**; and designing **a system of academic reference credits (CLAR-Latin American Reference Credit)** to facilitate recognition of studies in Latin America as a region that can be articulated with systems from other regions.

The Tuning door to the world was Latin America, although this internationalisation of the process wouldn't have gone far if it hadn't been for a group of prestigious academics (230 representatives of Latin American universities), who not only believed in the project, but also used their time and creativity to make it possible from north to south and west to east across the extensive, diverse continent that is Latin America. This was a group of experts in different thematic areas that would go on to study in depth and gain weight in terms of their scope and educational force, and in their commitment to a joint task that history had placed in their hands. Their ideas, experiences and determination paved the way and enabled the results which are embodied in this publication to be achieved.

Yet the Tuning Latin America project was also designed, coordinated and administered by Latin Americans from the region itself, via the committed work carried out by Maida Marty Maleta, Margarethe Macke and Paulina Sierra. This also established a type of *modus operandi*, conduct, appropriation of the idea and of deep respect for how this was going to take shape in the region. When other regions decided to join Tuning, there would henceforth be a local team that would be responsible for considering what to emphasize - specific features, the new elements that would need to be created to meet needs which, even though many of them might have common characteristics within a globalised world, involve dimensions specific to the region, are worthy of major respect and are, in many cases, of major scope and importance.

There is another pillar on this path which should be mentioned: the coordinators of the thematic areas (César Esquetini Cáceres-Coordinator of the Area of Administration; Jovita Antonieta Miranda Barrios-Coordinator of the Area of Agronomy; Samuel Ricardo Vélez González-Coordinator of the Area of Architecture; Loussia Musse Felix-Coordinator of the Area of Law; Ana María Montaño López-Coordinator of the Area of Education; Luz Angélica Muñoz González-Coordinator of the Area of Nursing; Armando Fernández Guillermet-Coordinator of the Area of Physics; Iván Soto-Coordinator of the

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Area of Geology; Darío Campos Rodríguez-Coordinator of the Area of History; José Lino Contreras Véliz-Coordinator of the Area of Information Technology; Alba Maritza Guerrero Spínola-Coordinator of the Area of Civil Engineering; María José Arroyo Paniagua-Coordinator of the Area of Mathematics; Christel Hanne-Coordinator of the Area of Medicine; Diego Efrén Rodríguez Cárdenas-Coordinator of the Area of Psychology; and Gustavo Pedraza Aboytes-Coordinator of the Area of Chemistry). These academics, chosen according to the thematic groups to which they belonged, were the driving forces behind the building of bridges and strengthening of links between the project's Management Committee of which they formed a part and their thematic groups which they always held in high regard, respected and felt proud to represent. Likewise, they enabled there to be valuable articulation between the different areas, showing great ability to admire and listen to the specific elements attached to each discipline in order to incorporate, take on board, learn and develop each contribution – the bridges between the dream and the reality. Because they had to carve new paths in many cases to make the ideas possible, design new approaches in the actual language of the area and the considerations proposed, and to ensure that the group would think about them from the standpoint of the specific nature of each discipline. Following group construction, the process always requires a solid framework based on generosity and rigour. In this respect, the coordinators were able to ensure that the project would achieve specific successful results.

Apart from the contribution made by the 15 thematic areas, Tuning Latin America has also been accompanied by a further two transversal groups: the Social Innovation group (coordinated by Aurelio Villa) and the 18 National Tuning Centres. The former created new dimensions that enabled debates to be enriched and an area for future reflection on thematic areas to be opened up. Without doubt, this new area of work will give rise to innovative perspectives to enable those involved to continue thinking about top quality higher education that is connected to the social needs of any given context.

The second transversal group about which one should recognise the major role played comprises the National Tuning Centres – an area of representatives from the highest authorities of university policies from each of the 18 countries in the region. These centres accompanied the project right from the outset, supported and opened up the reality of their national contexts to the needs or possibilities developed by Tuning, understood them, engaged in dialogue with others, disseminated them

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and constituted reference points when seeking genuine anchors and possible goals. The National Centres have been a contribution from Latin America to the Tuning project, insofar as they have contextualised debates by assuming and adapting the results to local times and needs.

We find ourselves coming to the end of a phase of intense work. The results envisaged over the course of the project have succeeded all expectations. The fruits of this effort and commitment take the form of the reflections on the area of Agronomy that will be provided below. This process comes to an end in view of the challenge faced in continuing to make our educational structures more dynamic, encouraging mobility and meeting points within Latin America, while at the same time building the bridges required with other regions on the planet.

This is the challenge facing Tuning in Latin America.

July 2013

Pablo Beneitone, Julia González and *Robert Wagenaar*

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Features of the Area of Agronomy

The Subject Area of Agronomy commenced its participation in the Tuning Latin America Project (TUNING AL) with 11 universities from an equal number of Latin American countries, namely: Argentina, Brazil, Colombia, Costa Rica, Cuba, Guatemala, Honduras, Mexico, Peru, Paraguay and Uruguay.

Agronomy is one of the three new subject areas in the current phase of the TUNING AL, and has taken part in meetings held in Colombia and Guatemala in 2011 and Chile and Brussels in 2012.

Each participant from the Agronomy team expressed interest in and a commitment to improving and analysing the tasks performed by their university, faculty and degree programmes, taking into account the importance placed on the training of professionals who are responsible for aspects such as food safety, sustainability of renewable natural resources and the environment.

The first approximation led to a general characterisation of the Agronomy degree programmes involved in the project, describing a series of common features and diverse aspects that would subsequently emerge in the presentation made by each university (Table 1.1).

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Table 1.1
Common aspects and distinguishing features
in Agronomy degree programmes in Latin America (Bogotá, 2011)

Common aspects	Diverse aspects
1. State-run university. 2. Training of Agricultural Engineers. 3. Curricular flexibility. 4. 16 weeks per semester. 5. Foreign language requirement. 6. The curriculum includes training in both theoretical and practical discipline-specific and professionalising Basic Science and Human Science. 7. Entry to the teaching profession by public entry exam.	1. Assessment scales. 2. The way of expressing the workload in each programme: credits, *unidades valorativas* (UV), hours. 3. Training profile. 4. System for admittance to degree programmes. 5. Not all of them require pre-professional practical training, extramural studies or social service within the curriculum. 6. Enrolment payment and grants system, among others.

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Gestation of the Meta-profile: Contrasting the meta-profile with profiles from the region

As noted above, the subject area of Agronomy groups together 11 universities from an equal number of Latin American countries and, unlike most other subject areas, is new to the TUNING AL.

The team from the Area of Agronomy took an active part during the years 2011 and 2012 in order to formulate the Latin American meta-profile for the Agricultural Engineer, establishing agreements at the various meetings arranged by the Coordinators of TUNING AL.

It is important to take into account the fact that knowledge related to the agriculture and fishing group is, has been and will be strategic for local, national and regional development in the education of the Latin American Agricultural Engineer. This is due to the contribution the area makes to the production of foodstuffs and job creation, without overlooking the fact that natural resources - such as soil and water - and their suitable handling and productivity found in agriculture, depend to a large extent on water reserves for the future production of such foodstuffs and human consumption, and also for the conversation of forests and biodiversity (Seixas y Ardilla, 2002).

However, students need to develop competences that will enable them to ascertain the fact that, although agriculture and fishing activity is carried out in all countries on the Latin American continent, they have to be able to distinguish between different aspects related

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to factors of production such as land, production and work, and technology[1].

TUNING AL meetings were held in different countries. The following was discussed at each of them:

1. Colombia, 2011

    1.1. Presentation of professional profile(s) for the Agricultural Engineer degree programme(s) offered by each participant university.

    1.2. Identification of common and diverse aspects in each curriculum.

    1.3. Establishment of agreements about the design of the competence-based professional profiles.

    1.4. Hierarchical structuring of the generic competences developed during the Tuning Latin America project in 2007 focussed on the education of the Agricultural Engineer.

    1.5. Consensus about the proposal for specific competences for the Area of Agronomy.

    1.6. Establishment of specific competences for the Area of Agronomy.

    1.7. Definition of the broad objective set out in training the Agricultural Engineer as «*…training a professional who has managed to incorporate ethical principles in the tasks they perform from a humanistic standpoint and with a sense of responsibility and social commitment, and with the attitudes, knowledge, abilities and skills required to develop the fundamental competences attached to the Area of Agronomy»,* such as:

        1.7.1. Knowing and scientifically understanding the factors of agricultural and fishing production and combining them with technical, socio-economic and environmental considerations.

[1] http://.telpin.com.ar/interneteducativa/periódicoTEduca/actividsadeseconomicas/la_agricultura_en_américa, 25/03/2013

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1.7.2. Interpreting, disseminating and applying scientific and technological knowledge.

1.7.3. Leading and/or interpreting research and experiments and disseminating their results.

1.7.4. Creating, projecting, analysing and assessing systems, processes and products with entrepreneurial capacity.

1.7.5. Planning, implementing, coordinating, supervising and assessing projects and services.

1.8. Definition of the consultation and validation processes involved in the proposal for specific competences attached to the Area of Agronomy, taking into consideration aspects such as: who and how many to be consulted? In what format? Ranking? Degree of relevance? Degree of attainment?

2. Guatemala, 2011

2.1. Analysis of the consultation process undertaken by Tuning 2007 into generic competences involving employers, students, graduates and academics from participant universities (positive and limiting aspects).

2.2. Analysis of the results of the 2007 consultation with regard to generic and specific competences attached to the Area of Agronomy.

2.3. Analysis of the gap between achievement and importance in the competences taken into consideration by the Agronomy team.

2.4. Consensus within the Agronomy team regarding specific competences.

3. Chile, 2012

3.1. Review of the methodology that enabled the meta-profile for the Agricultural Engineer to be designed and constructed, followed by a comparison with profiles from each university.

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3.2. Definition and agreement about 20 specific competences for the Area of Agronomy.

3.3. Identification of relevant generic competences as follows:

- GC.1 Capacity for abstraction, analysis and synthesis.
- GC.2 Ability to apply knowledge in practice.
- GC.4 Knowledge about the area of study and profession.
- GC.7 Ability to communicate in a second language.
- GC.15 Ability to identify, consider and deal with problems.
- GC.23 Ability to work independently.

3.4. When contrasting and analysing the specific competences, the conclusion was drawn that all of them are important. However, emphasis was placed on the specific competence SCA.1 *Knowing and scientifically understanding the factors of agricultural and fishing production.*

3.5. Analysis of the features of each participant degree programme showed that educating the Agricultural Engineer in Latin America covers the development of knowledge in the student and a command of the tools required to practice this in use. Developing professional intellectual capacity (learning how to know) also includes ethical and social issues.

4. Brussels, 2012

4.1. Review of the final version of the Latin American meta-profile for the Agricultural Engineer.

4.2. Comparing the Latin American and African meta-profiles for the Agricultural Engineer.

4.3. Consultation about emerging and future professions related to agronomy and the competences required for these.

4.4. Debate about strategies in order to link the Latin American Reference Credit – CLAR – to graduate profiles in universities.

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4.5. Presentation of the results obtained from the analysis carried out on student workload.

4.6. Preparation of common strategies for the assessment, teaching and learning of competences.

2.1. Comparing the agreed Latin American meta-profile for the Agricultural Engineer with the profiles within the participant universities

1. Initially the competences agreed upon by ARCUSUR[2] were analysed components for the meta-profile proposal.

2. It was agreed that the proposal for the Latin American Agricultural Engineer degree programme should be defined as «*…training a professional who has managed to incorporate ethical principles in the tasks they perform from a humanistic standpoint and with a sense of responsibility and social commitment, and with the attitudes, knowledge, abilities and skills required to develop competences*».

3. Information was also provided from the profile of each degree programme; subsequently, for analytical purposes, the competences from the degree programmes were proposed as follows:

   - Knowing and scientifically understanding the factors of agricultural and fishing production and combining them with technical, socio-economic and environmental considerations.

   - Interpreting, disseminating and applying scientific and technological knowledge.

   - Leading and/or interpreting research and experiments and disseminating their results.

[2] ARCUSUR is a Regional Accreditation Body only focussed in some qualifications (Medicine, Engineering, Agronomy). http://arcusul.mec.gov.br/index.php/es/descripcion/127-sistema-arcu-sur-es

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- Creating, projecting, analysing and assessing systems, processes and products with entrepreneurial capacity.
- Planning, implementing, coordinating, supervising and assessing projects and services.
- Identifying problems and putting forward solutions in their area of competence.
- Developing, assessing and using new technologies.
- Managing, operating and maintaining systems and processes via a sustainable approach.
- Knowing about and acting on markets on which agro-industrial chains operate.
- Understanding and working in business and community organisation and management.
- Knowing and advising about policies in their sphere of professional activity.

4. From this analysis, the Proposal for Specific Competences for the Area of Agronomy was then drafted. These competences were defined at the Colombia meeting in 2011 and constituted the component for consultation purposes that led to the identification of the most important competences that enabled the meta-profile for the Agricultural Engineer to be defined as follows:

   - SCA.1 Knowing and scientifically understanding the basic principles of agricultural and fishing production.
   - SCA.2 Interpreting, disseminating and transferring scientific and technological knowledge to agricultural production.
   - SCA.3 Designing, leading analysis and interpreting research and experimentation projects in agriculture and fishing.
   - SCA.4 Entrepreneurial ability to create, project, analyse and assess systems, processes and products in the area of agriculture and fishing.

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- SCA.5 Planning, implementing, coordinating, supervising and assessing projects and services in the rural sector.

- SCA.6 Ability to identify insects, plagues, pathogens and disease related to crops, flora and fauna.

- SCA.7 Ability to set up, operate and administer agricultural businesses and processes via a sustainable rural approach.

- SCA.8 Ability to know about and act on markets on which agro-industrial chains operate.

- SCA.9 Understanding and working in business and community organisation and management within the rural sector.

- SCA.10 Ability to deal with, preserve and restore physical, chemical and biological properties of farmland.

- SCA.11 knowing about, advising on and applying policies and regulations governing agriculture and fishing.

- SCA.12 Ensuring the sustainable use of water set aside for agricultural use.

- SCA.13 Ability to select and administer agricultural machinery, implements and equipment for agricultural use.

- SCA.14 Designing, implementing and assessing strategies for sustainable rural development.

- SCA.15 Ability to formulate, assess, manage and put into practice productive projects.

- SCA.16 Ability to administer and assess risk and hydraulic drainage systems.

- SCA.17 Ability to provide technical advice and skills and transfer technology to producers and business from the rural sector.

- SCA.18 Ability to develop projects involving the genetic improvement of crops and propagation methods in order to maximise production.

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- SCA.19 Apply sustainable products and technologies in order to deal with and improve agro systems.

- SCA.20 Ability to develop and apply strategies in order to deal with the post-harvesting of agricultural products.

2.2. Comparison and analysis of competences in relation to profiles from the region

The results obtained from this comparison and analysis of the exit profiles of the universities involved in the project, and the analysis of results obtained from consultation with employers, teaching staff, students and graduates from agronomy degree programmes, were used to define a meta-profile for the Agricultural Engineer based on generic and specific competences.

2.2.1. *Generic competences*

a) It was established that all of the generic competences are important in the formation of the Agricultural Engineer, because in the study carried out the average score was above 3 on a scale of 1 to 4 from all groups (students, academics, graduates and employers). However, the conclusion was drawn that the most relevant generic competences are as follows:

   - GC.1 «Capacity for abstraction, analysis and synthesis».

   - GC.2 «Ability to apply knowledge in practice».

   - GC.4 «Knowledge about the area of study and profession».

   - GC.15 «Ability to identify, consider and deal with problems».

b) The study showed that Generic Competence 2 «Ability to apply knowledge in practice» was considered the most important by all groups.

c) The differences in opinion between importance and achievement were also in evidence – a situation that suggests opportunities for improvement.

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d) The features of the differences in rating between importance and achievement were evidenced in the following:

- GC.4 «Knowledge about the area of study and profession» evidenced less of a difference in ratings among all groups interviewed and obtained the lowest score among graduates.
- GC.7 «Ability to communicate in a second language» and GC.23 «Ability to work independently» evidence the largest difference in rating. They are thought to be closely related owing to the fact that graduates respond mainly to the local job market.

e) The process evidenced the fact that the development of the following competences needs to be improved: GC.7 «Ability to communicate in a second language» and GC.23 «Ability to work independently».

2.2.2. *Specific competences*

a) The conclusion was drawn that all specific competences are important. However, SC.1 «Knowing and scientifically understanding the basic principles of agricultural and fishing production» obtained the highest ranking.

b) Taking into account the study as a whole, the most important competences mentioned by the different groups (students, academics, graduates and employers) are as follows:

- SC.1 «Knowing and scientifically understanding the basic principles of agricultural and fishing production»;
- SCA.2 «Interpreting, disseminating and transferring scientific and technological knowledge to agricultural production»;
- SCA.3 «Ability to design, lead analyse and interpret research and experimentation projects in agriculture and fishing»;
- SCA.4 «Entrepreneurial ability to create, project, analyse and assess systems, processes and products in the area of agriculture and fishing»;
- SCA.6 «Ability to identify insects, plagues, pathogens and disease related to crops, flora and fauna»;

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- SCA.7 «Ability to set up, operate and administer agricultural businesses and processes via a sustainable rural approach»;
- SCA.10 «Ability to deal with, preserve and restore physical, chemical and biological properties of farmland; and
- SCA.15 «Ability to formulate, assess, manage and put into practice productive projects».

c) The groups consulted coincided in the following:
   - SCA.2 «Interpreting, disseminating and transferring scientific and technological knowledge to agricultural production»; employers, students and graduates.
   - SCA.3 «Ability to design, lead analyse and interpret research and experimentation projects in agriculture and fishing»; academics and employers.
   - SCA.6 «Ability to identify insects, plagues, pathogens and disease related to crops, flora and fauna»; students and graduates.
   - SCA.5 «Planning, implementing, coordinating, supervising and assessing projects and services in the rural sector»; academics and graduates.

d) Employers place the least importance on the competences SCA.5 «Planning, implementing, coordinating, supervising and assessing projects and services in the rural sector» and SCA.7 «Ability to set up, operate and administer agricultural businesses and processes via a sustainable rural approach».

e) The specific competences that have not been mentioned should be taken into account, owing to the fact that they will be considered complementary activities in the education of the Agricultural Engineer.

f) The specific competences attached to the Area of Agronomy that most universities considered important are:
   - SCA.2 Interpreting, disseminating and transferring scientific and technological knowledge to agricultural production.
   - SCA.3 Ability to design, lead analyse and interpret research and experimentation projects in agriculture and fishing.

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- SCA.4 Entrepreneurial ability to create, project, analyse and assess systems, processes and products in the area of agriculture and fishing.
- SCA.5 Planning, implementing, coordinating, supervising and assessing projects and services in the rural sector.
- SCA.6 Ability to identify insects, plagues, pathogens and disease related to crops, flora and fauna.
- SCA.7 Ability to set up, operate and administer agricultural businesses and processes via a sustainable rural approach.
- SCA.10 Ability to deal with, preserve and restore physical, chemical and biological properties of farmland.

Analysis of the features of each of the degree programmes enabled evidence to be provided that education of the Agricultural Engineer in Latin America covers the development of capacities in the student and a command of the tools required to do so which, in addition to developing their professional intellectual capacity (learning how to know), also includes ethical and social issues. These capacities are developed in such a way that the student steadily acquires them as part of the university processes (Table 2.1).

Table 2.1
Competences of the Agricultural Engineer in Latin America in accordance with academic, professional and social competences (Guatemala, 2011)[3]

Academic dimension	Professional dimension	Social dimension
GC.1 Capacity for abstraction, analysis and synthesis.	GC.4 Knowledge about the area of study and profession.	GC.15 Ability to identify, consider and deal with problems.
SCA.6. Ability to identify insects, plagues, pathogens and disease related to crops, flora and fauna	GC.23 Ability to work independently.	GC.7 Ability to work in a second language.

[3] Not all the generic and specific competences analysed by the group are included. They are known to be taken into consideration in the education of the Latin American Agricultural Engineer to a greater or lesser extent.

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<table>
<tr><th>Academic dimension</th><th>Professional dimension</th><th>Social dimension</th></tr>
<tr><td>SCA.10 Ability to deal with, preserve and restore physical, chemical and biological properties of farmland.</td><td>GC.2 Ability to apply knowledge in practice.</td><td>SCA.3 Ability to design, lead analyse and interpret research and experimentation projects in agriculture and fishing.</td></tr>
<tr><td rowspan="3">SCA.15 Ability to formulate, assess, manage and put into practice productive projects.</td><td>SCA.1 Knowing and scientifically understanding the basic principles of agricultural and fishing production.</td><td>SCA.4 Entrepreneurial ability to create, project, analyse and assess systems, processes and products in the area of agriculture and fishing.</td></tr>
<tr><td rowspan="2">SCA.2 Interpreting, disseminating and transferring scientific and technological knowledge to agricultural production.</td><td>SCA.5 Planning, implementing, coordinating, supervising and assessing projects and services in the rural sector.</td></tr>
<tr><td>SCA.7 Ability to set up, operate and administer agricultural businesses and processes via a sustainable rural approach.</td></tr>
<tr><td colspan="3">SC.1 Knowing and scientifically understanding the basic principles of agricultural and fishing production.</td></tr>
</table>

2.3. Meta-profile for the Agricultural Engineer

The field of work in which graduates from the Area of Agronomy work is the agricultural production sector, together with that of natural resources and the environment and the academic sector, and to this end it is important for the graduate to demonstrate capacities in knowledge, abilities and skills as well as attitudes and values in exercising their profession.

Knowledge of the context of each participant university evidenced the reality of the situation regarding each formative process.

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Latin American meta-profile for the Agricultural Engineer

The Agricultural Engineer who graduates from a Latin American university will be capable of:

1. Understanding, dealing with and transforming production in agricultural and fishing systems in order to contribute towards social wellbeing and sustainable development.

2. Embarking on, managing and assessing agricultural and fishing and natural systems attached to humanistic and environmental ethics, focusing on their benefit to society.

3. Acting flexibly and critically under different conditions of agricultural and fishing systems, and in the conservation and use of natural resources.

4. Becoming involved in processes aimed at defining public policies that contribute towards the development of agriculture and fishing.

5. Contributing towards the generation and passing on of knowledge in the field of agrarian science.

6. Working with groups from different cultures, on different socio-economic levels and in national and International environments.

7. Promoting the transformation and commercialisation of agricultural and fishing products that entail the development of value added at source.

However, common aspects were discovered within such diversity that enabled a meta-profile to be considered for the Agricultural Engineer.

Taking into consideration the fact that communication is one of the most relevant competences in the professional sphere of activity, degree programmes need to improve the «Ability to communicate in a second language», as the Agricultural Engineer interacts in very diverse areas in terms of discipline-specific ethnic groups, cultures, countries and languages – both local and international.

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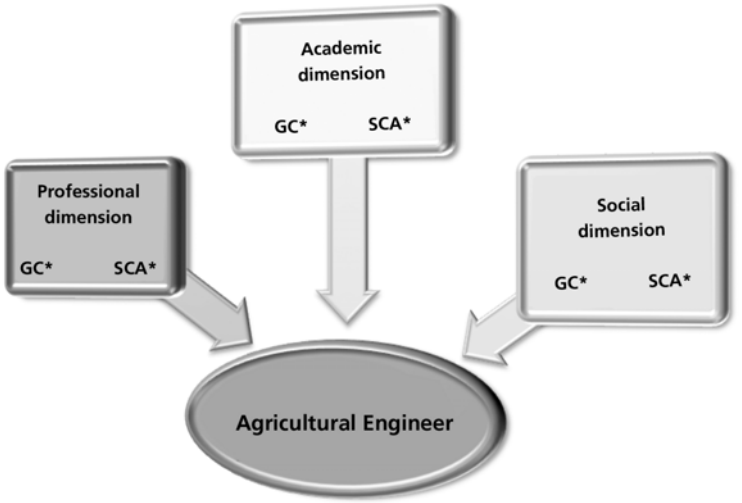
The debate, analysis and reflection that were carried out enabled a group of competences to be identified that characterise the Agricultural Engineer in cognitive, procedural and affective dimensions. As a result of this analysis, reflection and sharing of knowledge, experience and different contexts, the Latin American Meta-profile for the Agricultural Engineer was formulated within the framework of TUNING AL.

2.4. Outline of the Meta-profile for the Agricultural Engineer

GC Generic Competence SCA Specific Competence Agronomy



Dimensions of the meta-profile for the Latin American Agricultural Engineer:

1. *Professional dimension. Set of* Set of Set of competences related to the exercising of the profession.

2. *Academic dimension.* Competences related to the field of knowledge.

3. *Social dimension.* Competences linked to social and community development.

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3

Teaching, learning and assessment strategies for generic and specific competences

The student is considered to be an active participant in learning and the lecturer an enabler according to the competence-based approach promoted by TUNING AL. In this respect, it is important to take into account the fact that the practice of four major elements needs to be fostered. These are: the knowledge, abilities and skills required to pursue the profession and the attitudes demonstrated in doing so.

The practice of generic and specific competences also needs to be promoted and defined for each of them, together with the different methodologies, techniques and strategies required to achieve them.

Using a competence-based approach, the aim is for the student to undertake three vital processes for learning: motivation, interpretation and practice. These are processes that transform the student into the main actor who is responsible for their own learning and also enables them to interact with others by fostering co-learning, encouraging them to practice theory, discovering experiences and rating the activity permitted within each learning experience.

In the case of the competence-based approach promoted and taken into consideration by TUNING AL, it should be pointed out that the following needs to be taken into account in teaching, learning and assessment.

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- Learning techniques/methods:
  - — Case-based learning.
  - — Problem-based learning.
  - — Project-based learning.
  - — Existential learning stage.
  - — Participative learning stage.
- Teaching approaches/methods:
  - — Joint planning among lecturers as a way of guiding the contribution made by each subject to attainment of the competence.
  - — Integrating, action-oriented projects constructed among lecturers.
  - — Active student participation.
  - — Guided lectures, group discussions, and practical laboratory and field work.
  - — Individual and independent work with organisation of time.
  - — Carrying out of exercises that simulate real experiences.
- Assessment techniques:
  - — Continuous assessment based on previously-defined indicators and according to the competence to be developed.
  - — Reports, monographs and essays,
  - — Written tests and oral presentations.
  - — Application of teamwork techniques.

3.1. Summary of the different institutional perspectives regarding the teaching, learning and assessment of the competences chosen in the area

The Agronomy team carried out an analytical exercise on one generic and one specific competence attached to Agronomy, the results of which are shown below.

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GC.15 Ability to identify, consider and deal with problems

Definition of the competence

«Set of knowledge, abilities/ skills and attitudes that enable the graduate to find a response to a problem identified that has been identified».

This competence is linked to knowledge about the problems referred to, i.e. ability to identify solutions to it and also suitable attitudes to ensure that the solution implies benefits and opportunities, lending confidence and support to those who take part in solving the problem (Table 3.1).

Table 3.1
Learning, teaching and assessment strategies for identifying, considering and dealing with problems
(Chile, 2012)

Teaching strategies	Learning strategies	Assessment strategies
Reading bibliographic material Conferences Dynamizing oral presentations Experiences in real situations Projects Theoretical training Active methodologies: Problem-based learning, case studies and cooperative learning Use of ICTs	Teamwork Cooperative learning Attributes developed by students: capacity for abstraction, observation, analysis and synthesis. Research Communication Use of ICTs Approach to alternative solutions	Knowledge Written and oral tests and interviews Performance Abilities, skills, attitudes, practice of values: responsibility, punctuality, honesty, discipline, teamwork and independent work, among others Products Written document, projects designed, making of videos and photographic report, among others

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SCA.7 Knowing and scientifically understanding the basic principles of agricultural and fishing production

Definition of the competence

«*Set of knowledge, skills and attitudes that enable the graduate to find a response to the basic principles of agricultural and fishing production*»

This competence was chosen by the participant universities, and the professional will demonstrate the ability to scientifically respond to matters related to agricultural and fishing production.

Table 3.2
Strategies for knowing and scientifically understanding the basic principles of agricultural and fishing production (Chile, 2012)

Teaching strategies	Learning strategies	Assessment strategies
• Joint planning among lecturers as a way of guiding the contribution made by each subject to attainment of the competence • Action-oriented subject / integrating project constructed among lecturers • Definition of materials, tools and back-up materials • Definition of evidence of the competence • Theoretical classes with debates • Participation in academic working parties, rural communities, business, projects and programmes geared to development	• Active student participation • Guided lectures, group discussions, and practical laboratory and field work • Individual independent work, organisation of time and responsibility • Carrying out of exercises to simulate real experiences • Application of teamwork techniques: workshops, seminars. • Theoretical classes with debates • Participation in academic working parties, rural communities, business, projects and programmes geared to development	• Continuous assessment based on previously-defined indicators according to the competence to be developed • Products: reports, monographs and essays • Implementation of agricultural and fishing practice • Knowledge: written tests, oral presentations and interviews • Values: responsibility, growth of knowledge • Attitudes: commitment, ethics, organisational capacity, quality

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4

Future scenarios for the Area of Agronomy and the Agricultural Engineering Profession

Information in the Area of Agronomy was provided by informant interviewees - academics, graduates and employers – some with posts in Public Administration in the different countries, except for Mexico and Peru (Table 4.1):

Table 4.1
List of interviewees according to country for the purpose of assessing future scenarios for the Area of Agronomy in Latin America (Chile, 2012)

Country	Interviewee (a)
Argentina	Gustavo Adolfo Orioli Andrea Ivana Bolletta Germán Pablo Balbarrey
Colombia	Fabio Rodrigo Leiva Barón Pedro Alfonso Alarcón Gómez
Costa Rica	Luis Fernando Ramírez Alfredo Alvarado Hernández
Cuba	Osvaldo Fernández Martínez Miguel rodríguez Orozco
Guatemala	Efraín Medina Guerra José Pablo Prado Córdova
Honduras	Carlos Domingo Posas Padilla Erlindo Calix

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The opinions emerging from the interviews showed that the general perception is to:

- Continue training Agricultural Engineers.
- Orientate training of the Agricultural Engineer towards:

    1. Agribusiness, fair markets and sustainable agrarian policies.
    2. Biotechnology.
    3. Intercultural communication and sustainable development.
    4. Infrastructure logistics and services for commercialisation of agriculture and fishing.
    5. Effect of climate change on agricultural and fishing production.
    6. Effect of climate change and sustainability of natural resources.
    7. Food safety.
    8. Precision agriculture.
    9. Agro-ecology and good agricultural practices.
    10. Human geography.
    11. Ethics.

With regard to the competences required in the education of the Agricultural Engineer, the opinion of those interviewed led to the following general attributes being defined:

a) Solid scientific training in order to analyse and interpret problems regarding ecological, social and economic sustainability by putting forward relevant solutions.

b) Proactive attitude towards embarking on, managing and assessing agricultural and fishing and natural systems attached to humanistic and environmental ethics, focusing on their benefit to society.

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c) Ability to intervene in processes aimed at defining public policies that may contribute towards sustainable development.

d) Ability to become involved in processes aimed at defining public policies that may contribute towards sustainable development.

e) Capacity for interdisciplinary and intercultural communication on different socio-economic levels.

f) Proactive attitude towards promoting the transformation and commercialisation of products that may contribute towards sustainable development.

g) Ability to use available technology to improve the efficiency of productive systems.

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4.1. Summary of perspectives gathered from interviews and consultation conducted

Country	Interviewees' training	Job post/position	Future scenarios	Challenges	Competences
Argentina	Agricultural Engineer, MSc in Agriculture, PhD USA	Associate lecturer; researcher; consultant at the Universidad Nacional del Sur; external management professional	• Depopulating of rural areas towards belts on urban fringes. • Highly-computerised society in terms of rural activities. • Reduction in labour requirements in the rural milieu. • Serious environmental problems. • Depletion of soil and pollution of soil and water. • Agriculture with serious ecological and environmental problems.	• Working towards sustainable agricultural production that takes agro-ecological systems as a whole into consideration. • Promoting agricultural and fishing policies for small and medium-sized farmers.	• Ability to interact with other professions. • Ability to analyse and generate the handling of issues in order to ensure sustainable production.
Brazil	Agricultural Engineer, MSc and PhD Harvard University	University lecturer; intervenes with agro-ecological farmers.	• A trend is emerging in the USA and Europe as to who produces and who buys. • Recycling of residue. • Impact on consumption and the need for consumers to know about the production process with regard to sustainability.	• Economic and ecological impact on agricultural and environmental activities. • Thinking about the impact of people more than on the technological impact. • Ability to use and exploit agricultural tools in genetics, phytopathology and plant nutrition.	• Ability to integrate and exploit previous agronomical knowledge with current and future knowledge. • Capacity for dialogue among the actors involved. • Command of foreign languages, especially English.

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Country	Interviewees' training	Job post/position	Future scenarios	Challenges	Competences
Colombia	Both interviewees are Agricultural Engineers and university lecturers: the first holds a PhD in Machinery and the second an MSc in Phytopathology	1. Senior lecturer at the Universidad Nacional de Colombia, in Bogotá; Director of a research group; ex-President of the ACOFIA* group and currently advisor to the latter. 2. Lecturer at the Universidad de Cundinamarca, Ex-Administrative Vice-Rector of the same university and Ex-Dean of the Faculty of Agricultural and Fishing Science at the latter; member of the Technical Committee attached to the Andean Regional Forum for Dialogue and Integration Agricultural and Fishing and Rural Education. * ACOFIA: Colombian Association of Faculties with Agricultural Engineering and Agronomy Syllabuses.	• Major social changes tending to improve respect and value towards others. • Growth of social networks. Favourable effect on the population's quality of life thanks to technological advances in agriculture, the quality of foodstuffs and advances in ICTs. Drastic reduction in biodiversity owing to the effect of climate change.	• Diversifying agricultural knowledge on postgraduate programmes. • Emphasis on knowledge of mathematics, ecology, administering of markets and agrarian policy. • Great attention on transdiciplinarity. • Greater professional independence on the part of the Agricultural Engineer and integration with technological advances.	• Ability to be independent in their training. • Capacity for abstraction. • Ability to work with multidisciplinary teams. • Ability to deal with problems. • Capacity for entrepreneurship and self-management in order to provide independent services.

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Country	Interviewees' training	Job post/position	Future scenarios	Challenges	Competences
Cuba	Agricultural Engineer, MSc in Science and PhD.	Ex-Faculty Dean, member of the National Commission for Agronomy Degree Programmes, Director of the Biotechnology Centre and of the Agriculture and Fishing Research Centre.	• Greater globalisation of information, supply of jobs and technology. • Decentralisation of land ownership to a greater extent. • Need for greater ability to design and administer projects as an employment alternative. • Improvement in the work carried out by the Agricultural Engineer towards technological advisory work, technological transfer; qualification within the framework of the environmental concept in order to preserve natural and genetic resources. • Funding policies for agricultural development projects. • Price policy on markets with its effects on economic management of agricultural enterprises.	• Food safety and sovereignty via sustainable local development as a solid basis for the social and economic development of the country. • Training of agricultural engineers that implies plant and animal production. • Training of agricultural engineers that implies the design and exploitation of agricultural machinery and equipment. • Veterinary surgeon and zoo technician.	• Ability to apply knowledge in practice. • Knowledge about the area of study and profession. • Ability to identify, consider and deal with problems. • Specific competences determined in the Thematic Area of Agronomy.
Costa Rica	Agricultural Engineer, Ph D. North Carolina State University	• Executive attorney, Agricultural Engineers' Association of Costa Rica. • Chair at Universidad de Costa Rica.	• Changes in climatic conditions will mean changes in behaviour of social groups and their interactions (changes in consumption patterns of agricultural goods) will be mandatory. • Pressure on the State to improve the attention given to local producers.	• «Learning again». Educational models will need to review the path pursued to alleviate the ecological impact on agriculture. • The university will need to pay attention to moral and ethical aspects, as these are really given little importance.	• Ability to adapt to diverse working conditions (adaptability). • Positive attitude in meeting the real needs of producers and consumers. • Using available technology to improve the efficiency of production systems.

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Country	Interviewees' training	Job post/position	Future scenarios	Challenges	Competences
Cuba	Agricultural Engineer, Engineer in Agricultural and Fishing Machining, MSc in Science and PhD in Agricultural Policy	Ex-Faculty Dean; member of the National Commission of Agronomy Degree Programmes; Director of the Biotechnology Centre and the Agricultural and Fishing Research Centre.	• Greater globalisation of information, supply of jobs and technology. • Decentralisation of land ownership to a greater extent. • Need for greater ability to design and administer projects as an employment alternative. • Improvement in the work carried out by the Agricultural Engineer towards technological advisory work, technological transfer; qualification within the framework of the environmental concept in order to preserve natural and genetic resources. • Funding policies for agricultural development projects. • Price policy on markets with its effects on economic management of agricultural enterprises.	• Food safety and sovereignty via sustainable local development as a solid basis for the social and economic development of the country. • Training of agricultural an engineer that implies plant and animal production. • Training of agricultural engineers that implies the design and exploitation of agricultural machinery and equipment. • Veterinary surgeon and zoo technician.	• Ability to apply knowledge in practice. • Knowledge about the area of study and profession. • Ability to identify, consider and deal with problems. • Specific competences determined in the Thematic Area of Agronomy.

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Country	Interviewees' training	Job post/position	Future scenarios	Challenges	Competences
Guatemala	Agricultural Engineer, MSc in Science, PhD MA in Urban Primary Education; Agricultural Engineer in Sustainable Natural Resources; MSc in Environmental Sustainability, University of Edinburgh; PhD in Ecology of Conservation, University of Copenhagen	Senior lecturer, researcher, ex-Faculty Dean; ex-University Rector; ex-Secretary of Central American University Council, Minister of Agriculture, Livestock and Food. Senior lecturer, Director of Post-graduate Faculty of Agronomy.	• Sphere of technology that will become established as the main reference point for the social and economic life of the middle classes. • Transformation of society in the following senses: mass development of the sense of inter-connectivity, reinforcement of sedentary lifestyles and increasing dependency on the computer and electronic devices, reduction in community life as a result of electrical impulses capable of recreating fantasy in the virtual world. • Climate change; vulnerability, excessive rains, frosts and drought; landslides. • Adaptation, prevention and mitigation.	• Pressing need for training of professionals in the area of environmental adaptation. • Support for research centres in thematic areas such as: climate change, management of renewable natural resources, professional corporate outlook, growth of the managerial approach as a core aspect of professional development. • View of influencing international agriculture. • Biosafety, biotechnology, town and country planning, among others.	• Ability to ascertain in depth the technical considerations required to design strategies for addressing environmental concerns. • Ability to design contingency strategies in view of climate adversities. • Ability to found technical action on a pragmatic basis.

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Country	Interviewees' training	Job post/position	Future scenarios	Challenges	Competences
Honduras	BSc in Agronomy, Expert in Rural Development, Agricultural Engineer, MA in Business Administration	General manager of national advisory firm specialising in development; consultant, university lecturer, President of the Agricultural Engineers' Association of Honduras.	• Dramatic growth in population. • Great demand for foodstuffs. • Difficult access to basic services such as health, housing and public services; less available farmland. • Lack of water, desertification, hurricanes and drought and greater vulnerability owing to the effect of climate change. • Prevalence of the market economy; agricultural technology and use of areas for growing up to their maximum capacity.	• Agricultural Engineers who focus on business, production with sustainability and markets, and biotechnology. • Farm administrators who focus on agro-industry and rural development.	• Ability to use technologies that increase production and productivity according to area at lower cost and in less time. • Ability to promote sustainable development in agriculture and fishing. • Ability to use resources efficiently.

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Country	Interviewees' training	Job post/position	Future scenarios	Challenges	Competences
Uruguay	Training in Agronomy on a post-graduate level with experience in investment and development project management on both a national and international level Two interviewees were members of the Executive Council of the Faculty of Agronomy and one of them is currently a member in their capacity as graduate	1. Private consultant and also consultant for multilateral bodies; businessman; ex-university lecturer. 2. Director of a national agricultural and fishing research centre; national and international consultant. 3. Private consultant; ex-member of international body acting as the person in charge of agricultural and fishing development projects in other Latin American countries.	Three possible scenarios: • Economic and powerful internationalisation delayed on a national level. • Economic and ecologically-sustainable development. • Stagnation of the economy and general lack of sustainability.	• Responding effectively and in a sustainable manner to the effects of climate change. • Promoting sustainability and development in the field of food safety. • Promoting integral rural development.	• Ability to analyse, consider and deal with problems. • Ability to communicate orally and in writing. • Ability to communicate in other languages. • Ability to apply theoretical knowledge in practice. • Capacity for proactivity and multidisciplinary teamwork in different fields.

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5

Observations concerning student workload from the Agronomy perspective

In most higher educational establishments in Latin America, only the time set aside for the student to interact in the classroom, i.e. contact time, is taken into account, without including the fact that they carry out activities outside the classroom such as: performance of tasks, bibliographic reviews, preparation of essays, monographs, essays, reports and reading, among others.

Being aware within the TUNING AL of the importance of «work developed» by the student both in the classroom and outside it, it was suggested that an exercise be carried out known as «Common strategies for measuring student workload and their link to learning results in syllabuses», in which it was agreed to pursue the following in the Area of Agronomy:

a) Carry out the exercise on a third stage or semester course.

b) Interview students and lecturers.

c) Apply an online tool in which information related to the following was requested: number of study hours and work in the classroom, outside the classroom, and planning for the carrying out of activities, among others.

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The exercise enabled the following information to be gathered:

1. 10,086 questionnaires answered.

2. 2. 189 establishments/periods taken into consideration.

3. The number of hours estimated by lecturers from participant universities ranged between 932 and 457. In the case of students, this was 715 (Cuba) and 480 (Honduras) respectively.

4. The total number of hours per academic period for the Area of Agronomy was 677 according to lecturers and 624 according to students.

5. The average number of weeks of face-to-face teaching activities in countries taking part in the Area of Agronomy, including assessments, was 16.5 hours.

6. For the Area of Agronomy, the average number of hours set aside per week for face-to-face and non-face-to-face activities was considered to be 40 hours according to lecturers and 62 hours according to students, there being a difference of 22 hours between these results.

7. Academics set aside a significantly higher percentage number of hours for reading texts compared to that set aside by students to do so. The percentage number of hours needed by students to carry out non-face-to-face work was not taken into account by the lecturer when planning timetables.

8. The results obtained in the Area of Agronomy with regard to field work obtained the same percentage.

From the results obtained regarding student workload, the following conclusions can be drawn:

a) Students' time needs to be planned, organised and administered by taking into account the time they devote to different activities – both in the classroom and outside it.

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b) There are no unique reference points to students' academic workload existing in Latin America, bearing in mind that there are differences in weekly hours per semester and number of hours per academic credit.

c) Teaching work needs to be planned and organised integrally by taking into account a Credit Reference, which in this case would be the Latin American Reference Credit (CLAR).

d) d) All degree programmes offered within the Area of Agronomy by the universities taking part in the Tuning Latin America Project include units that measure students' face-to-face academic activity.

e) Several degree programmes use the term «credit» for the unidad valorativa (UV) except for Honduras, where it is referred to directly as a «unidad valorativa».

f) Different procedures are used to measure student academic workload.

g) The time set aside for measuring a degree programme is compatible among the different universities, because those hours that can be devoted to performing tasks (classroom teaching, laboratory and practical work) can be taken into account.

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6

General conclusions

Advantage should be taken of the wealth of knowledge, experience and innovation proposals existing in higher education put forward, fostered and nurtured by TUNING LA.

A methodological change in higher education should be promoted via a competence-based approach in which student learning is given prominence over teaching by the lecturer.

Making the change in paradigm viable in each university and degree programme taking part in the project requires knowledge of the most active methods, techniques, strategies and procedures in the teaching, learning and assessment processes.

The student should be regarded as a participant learner and the lecturer as its enabler, via teaching.

Sustainability should be reinforced as being central in the education of the Agricultural Engineer and knowledge, population, natural resources, energy and market in the curriculum need to be reviewed.

Student academic workload and time need to be assessed according to the time organised and set aside by the lecturer for academic activities.

The methods that favour active learning are: case-based learning, project-based learning, problem-based learning, existential learning stage and participative learning stage.

In an approach based on the development of competences, the student needs to be motivated, to interpret and then put their learning into practice to ensure that their learning will be significant.

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