

Achievements in the formation of competences of the postgraduate in agroforestry for sustainable development

Logros en la formación de competencias del posgrado en agroforestería para el desarrollo sostenible

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Abstract

The present study focused on the assessment of the skills of the students of the Master's Program in Agroforestry for Sustainable Development (MCADS) of the Autonomous University of Chapingo. The objective of this research was to determine, from the perception of the students, the development of competencies acquired during their postgraduate studies in the field of discipline, interpersonal and comprehensive training as a base element for updating the current Study Plan. Surveys were applied to the 2016-2017, 2017-2018, 2018-2019 and 2019-2020 generations once their master's studies were completed in accordance with the current curriculum by competencies. These also included the degree of satisfaction and possible postgraduate recommendation. The questionnaires contained Likert-type items. The results showed that from the students' perception, the MCADS Curriculum is contributing significantly (81.6%, $sd=18.4$) to the development of skills in the field of the Agroforestry discipline, of interpersonal relationships (85.5%, $sd=5.0$) and comprehensive training (79%, $sd=7.5$). The degree of satisfaction (89.5% satisfied) and their possible recommendation of the postgraduate course (84.2% would recommend it) were other key elements in fulfilling the MCADS mission. The formal self-assessment, among other studies, is decisive for updating the current Curriculum and specifying the teaching-learning activities required for the development of committed talents.

Agroforestry, Postgraduate, Competencies assessment, Self-appraisal

Resumen

El presente estudio se centró en la evaluación de las competencias de los estudiantes de la Maestría en Agroforestería para el Desarrollo Sustentable (MCADS) de la Universidad Autónoma Chapingo. El objetivo de esta investigación fue determinar, desde la percepción de los estudiantes, el desarrollo de las competencias adquiridas durante sus estudios de posgrado en el ámbito disciplinar, interpersonal y de formación integral como elemento base para la actualización del Plan de Estudios vigente. Se aplicaron encuestas a las generaciones 2016-2017, 2017-2018, 2018-2019 y 2019-2020 una vez concluidos sus estudios de maestría de acuerdo con el plan de estudios vigente por competencias. Estas también incluyeron el grado de satisfacción y posible recomendación de posgrado. Los cuestionarios contenían ítems tipo Likert. Los resultados mostraron que desde la percepción de los estudiantes, el Plan de Estudios del MCADS está contribuyendo significativamente (81,6%, $sd=18,4$) al desarrollo de competencias en el ámbito de la disciplina Agroforestal, de las relaciones interpersonales (85,5%, $sd=5,0$) y de la formación integral (79%, $sd=7,5$). El grado de satisfacción (89,5% satisfechos) y su posible recomendación del postgrado (84,2% lo recomendaría) fueron otros elementos clave en el cumplimiento de la misión del MCADS. La autoevaluación formal, entre otros estudios, es decisiva para actualizar el Plan de Estudios vigente y concretar las actividades de enseñanza-aprendizaje necesarias para el desarrollo de talentos comprometidos.

Agroforestería, Postgrado, Evaluación de competencias, Autoevaluación

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Introduction

Given the country's current needs and how the sciences, humanities and technologies should contribute to solving Mexico's main problems, it is necessary for postgraduate programmes to develop capacities in their graduates to generate cutting-edge scientific knowledge with respect for the environment, social and cultural diversity, respect for human rights and ethical principles, all for the benefit of the population (CONACyT, 2020; Tünnermann, 2000 and 2008). In other words, professionals are required with a comprehensive training that adapts to changing situations of knowledge.

According to COMEPO (2015), one of the functions of postgraduate programmes is to address problems that so far have not had an adequate solution and that, being a real problem, require viable, congruent and professional proposals. In this sense, it is pertinent that postgraduate programmes develop in students a vision of their environment, both nationally and internationally, in order to understand, for example, national, state and sectoral problems and needs in both the public and private spheres. This is necessary so that postgraduate programmes can propose strategies and actions to solve the problems and needs that arise in these areas. It is also necessary for postgraduate programmes to make contributions to the advancement of knowledge; to use and adapt new technologies; to promote technological development and generate innovations in knowledge. It is clear that, in order to achieve these goals, it is necessary to train different types of competences or capacities in postgraduate students.

According to the National Association of Universities and Higher Education Institutions of the Mexican Republic (ANUIES), the competency-based education model includes a set of knowledge, skills and abilities, both specific and transversal, that a graduate must fully manage in the face of social demands (Guzmán, 2012). These components can be combined, coordinated and integrated for "knowing how to do and be" in professional practice (Tejada and Navío, 2005; Guzmán, 2017).

The postgraduate programme in Agroforestry for Sustainable Development,

which is inserted in the field of agronomy as part of the productive sector, was created in 1996 to meet production, social, ecological and cultural needs in accordance with the transformations and economic growth of the country. The postgraduate, as well as the rest of the upper secondary and higher levels, have traditionally carried out their mission by applying the educational model by objectives, characterised by a high degree of specialisation, i.e. "knowledge", with little development of "know-how". Specialisation has shown its insufficiency to understand, analyse, explain and comprehensively address current and future rural development problems, including those of a purely productive nature. The weaknesses of specialisation are currently accentuated by the transformations of the contemporary world, calling for more holistic and integral visions of the rural world and society in general, which make it possible to understand the relationships that prevail between processes of different natures, with high levels of complexity and contradictions (PDI 2009).

In compliance with the work of Agroforestry as a discipline and the commitment to meet the current knowledge needs expressed in the PDI (2009) and the CONACyT (2020), in 2015 the Postgraduate Study Plan in Agroforestry for Sustainable Development was restructured to the Competence Model, which has been applied since the beginning of 2016.

The development potential of a postgraduate programme in terms of quality depends on the degree of satisfaction of recent graduates, as well as their job performance. These indicators are a direct way of verifying the relevance of the programme, resulting from the training given to students and the skills they acquired (COMEPO, 2015). Regular formal self-evaluation, course evaluation and teacher performance evaluation provide a series of key indicators to verify that the curriculum is in line with the needs that are required at the time and to be able to update or modify the programmes of the subjects (COMEPO, 2015). These actions contribute to strengthening the quality of postgraduate programmes which, otherwise, may condemn them to maintain a decontextualised vision of the needs they may have in the academic and work environment.

The purpose of this study was to determine, from the students' perception, the development of competences within the ÁLVAREZ-SÁNCHEZ, María Edna & MALDONADO-TORRES, Ranferi. Achievements in the formation of competences of the postgraduate in agroforestry for sustainable development. Journal of Teaching and Educational Research. 2022

professional field of the discipline (specific or professional), interpersonal and systemic, acquired during their postgraduate studies, as a basis for updating the current Syllabus.

Methodology

The two-year MCADS competency-based curriculum began to be implemented in January 2016, and its evaluation included the opinion of four generations (2016-2017, 2017-2018, 2018-2019 and 2019-2020), with a total of 19 surveys. The instrument consisted of 15 items aimed at measuring the degree of conformity or opinion regarding the competences acquired during their postgraduate studies in the field of the discipline, identified as specific or professional competences (ability to conduct research, ability to search for and analyse information, oral and written communication, knowledge specific to the postgraduate programme, entrepreneurial and innovative capacity); interpersonal competences (teamwork, ability to relate, self-confidence, leadership) and systemic competences (citizenship competences: knowledge of the social and political reality of the country, ethical competences, global perspective: respecting diversity, understanding different cultures, commitment to sustainable development). A Likert-type rating scale (very important, important, not very important, not important at all) was used to measure these competences. The questionnaire also included items to measure the degree of satisfaction (very satisfied, satisfied, not very satisfied, not at all satisfied) and recommendation of the postgraduate course. One section of the survey considered the opinion expressed by the graduates. The information obtained was used to calculate the scores and frequency of each item evaluated for presentation in a table or graph.

Results and Discussion

Specific or professional competences

The master's degree programme in agroforestry for sustainable development (MCADS) falls into the category of school-based postgraduate programmes, i.e. oriented towards research and professional practice with an emphasis on technological development and innovation (PNPC-CONACyT, 2022).

The objectives of this postgraduate programme are: to develop knowledge, skills and abilities in master's degree students through basic and applied scientific research in the field of agroforestry in order to adapt production to the ecological, social, economic and cultural conditions of producers; to promote sustainable rural development and contribute to the advancement of agroforestry in accordance with the MCADS 2015 Syllabus. In order to assess compliance with these objectives, the following competences were included Ability to conduct research, Ability to search for and analyse information, Oral and written communication, Knowledge of the discipline of Agroforestry, Entrepreneurship and innovation.

The results of the surveys (Table 1) showed that 94.8% of the recent graduates recognised that the postgraduate course made a very important and important contribution to developing their research capacity and 94.7% (as important and very important) to their ability to search for and analyse information as a pillar for the development of scientific research. In today's world, it is necessary to be able to search for relevant information at all times, to select it from a vast range of possibilities, to be able to process it, treat it, interpret it and appropriate it in order to generate the necessary knowledge that allows them to solve the situations that arise.

Competence in the field Professional	Very important	Important	Sum ¹	Not very important	Nothing important	Sum ²
	%					
Ability to conduct research	73.7	21.1	94.8	5.3	0	5.3
Ability to search for and analyse information	78.9	15.8	94.7	0	5.3	5.3
Oral and written communication	47.4	47.4	94.8	0	5.3	5.3
Postgraduate knowledge	57.9	21.1	79	15.8	5.3	21.1
Entrepreneurship and innovation	42.1	36.8	78.9	5.3	15.8	21.1
Average			88.4			11.6

Table 1 Professional competencies valued from the perspectives of students (2016-2020) of the Master's Programme in Agroforestry for Sustainable Development, Universidad Autónoma Chapingo

In the acquisition of knowledge specific to the discipline of Agroforestry, 79 % of the graduates stated that they had acquired it in a very important and important way.

Although a percentage higher than 80% could have been expected, it is quite possible that this referendum is related to the evaluation of the teacher's performance in the subject corresponding to the knowledge area of Agroforestry Components and in the knowledge area of Design, evaluation and implementation of agroforestry technologies (Report of the workshop on Teaching Strategies for the competences of the MCADS graduate profile, 21-24 January 2020).

Oral presentations and written reports of practices and tasks included in the subjects as teaching-learning activities (Álvarez-Sánchez et al., 2018) indicate that graduates feel more able to apply them in their professional work. These activities are obliged to be developed within the research progress seminars, in which students present orally, as well as the written thesis progress at the end of each school session. This type of activity encourages and confirms that they apply the last step of the scientific method, i.e. the dissemination of knowledge for the service of society and the contribution to science, in this case, to the discipline of Agroforestry. Likewise, the thesis work written in the format of scientific articles contributes to their capacity for analysis, synthesis and facilitates the prompt publication of the information.

The entrepreneurial and innovative capacity acquired by graduates provides the possibility of developing fruitful scientific activity, capable of generating new ideas, being proactive, persistent, having drive and initiative; generating solutions and alternatives to address the main problems facing our country and contributing to comprehensive and sustainable rural development (Institutional Programme (CONACyT, 2020). Compliance with this requirement should be measured through indicators of the impact of the research on the solution of problems in the productive or rural sector.

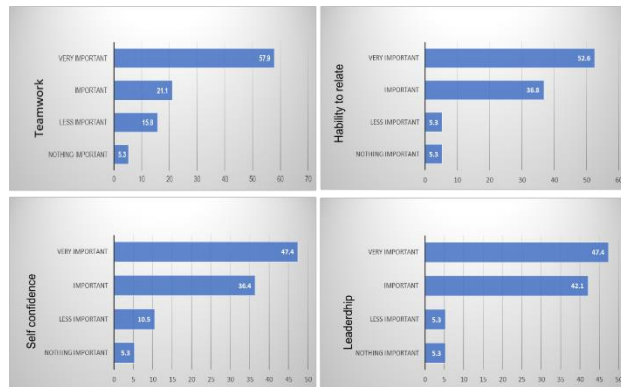
The Area of Knowledge Research Methodology (within the current Study Plan) whose purpose is to provide the methodological bases of scientific research and techniques for the development of research projects, as well as the generation of skills for the communication and dissemination of scientific knowledge, comprises subjects (vertically linked) in which the scientific method is analysed and applied to propose the thesis project and subsequently in the development of this same research, which allows important advances and products to be achieved to conclude in the period of 2 years (maximum 2.6 years) these are: AF- 643 Research Methodology, AF- 634 Seminar, AF- 687 Research I, AF-688 Research II, AF- 685 Special Problem, AF- 686 Special Problem 2; horizontally it is complemented with subjects that provide indispensable techniques for the development or validation of the research. AF- 635 Statistical Methods, AF-684 Research Stay, AF- 638 Experimental Designs, AF- 650 Geographic Information Systems. The research activities related to the thesis project and its development, as well as the teaching and learning activities included in each subject, indicate that they favour the development of research skills at Master's level.

Although this area of knowledge provides the methodological tools to train students in the rigour of scientific research, the guidance and supervision of the Thesis Director and the Advisory Committee in general complement this training and the postgraduate mission. It is acknowledged that the satisfaction rating instrument does not evaluate the performance of the Advisory Committee and it is necessary that it includes.

Interpersonal skills

These competences are social skills that enable graduates to integrate into different groups and work effectively (Bisquerra and Pérez, 2007). With regard to the importance of developing teamwork, 79 % of students consider that the postgraduate course has made a very important and significant contribution to developing this skill in its graduates (Graph 1), as well as in their ability to relate to others (98.4 %). These social skills enable them to work with other people, collaboratively and constructively, and their behaviour is oriented towards the group and interpersonal understanding (knowing how to be).

These skills are a must in the discipline of Agroforestry, since the planning and intervention of agroforestry technologies requires interdisciplinary work, which is achieved through the formation of working teams or research groups. Theoretical-practical subjects, mainly, promote these abilities.



Graphic 1 Students' perception (2016-2020) of the Interpersonal Competences acquired during their studies in the Postgraduate Programme in Agroforestry for Sustainable Development

Self-confidence (84.2 %) together with those of a social nature, contribute to the development of leadership, indicating that the graduate knows how to participate in the organisation of their position and in their work environment; that they are able to organise, decide and show willingness to accept responsibilities (Jiménez et al., 2013); to have an effective management of interpersonal relationships. The MCADS graduates confirmed that the postgraduate course has contributed significantly and very significantly (89.5%) to achieving this talent.

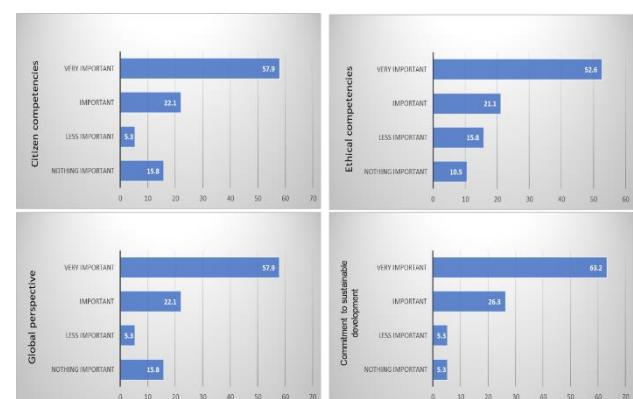
Integral training competences

The competences that contribute to integral training become a challenge because they are a reflection of the integration of the talents acquired by the graduates, discussed previously. When they have been acquired and, in addition, there is knowledge of the social and political reality of the country (citizenship competences), it is possible to propose more than one solution from different approaches (technological, scientific, economic, financial, social, ethical, etc.). In the opinion of the graduates (Graph 2), 73.7% confirmed that the MCADS contributed (significantly and very significantly) to the formation of citizenship competences, as well as acting with solidarity and responsibility.

In accordance with the latter, 73.7% recognised (very important and important) the contribution of the postgraduate course to the development or strengthening of ethical competences (ability to identify, analyse and evaluate on ethical grounds those related to their person, their profession and their environment).

Respecting diversity, understanding different cultures and protecting this knowledge (global perspective) are part of the mission of the institution and of course of the postgraduate course, as it is immersed in the concept of sustainability for rural development. These principles are rigorously included in the institutional project set out by CONACyT, which postgraduate programmes must include in their syllabus. 73.7% of the graduates consider that the MCADS fulfilled this development in an important and very important way.

Finally, in the opinion of the graduates, the postgraduate course succeeded in increasing their commitment to sustainable development (understood as development that meets the needs of present generations without compromising the possibilities of future generations). This awareness is only achieved when they feel that they have received the basis to solve problems in real contexts, which requires a systemic vision, formal knowledge, creativity, practice and judgement; a product of the confidence of having acquired a high level of performance in the discipline of Agroforestry (Días-Barriga, 2006).



Graphic 2 Students' perception (2016-2020) of the comprehensive training competences acquired during their studies in the Postgraduate Programme in Agroforestry for Sustainable Development

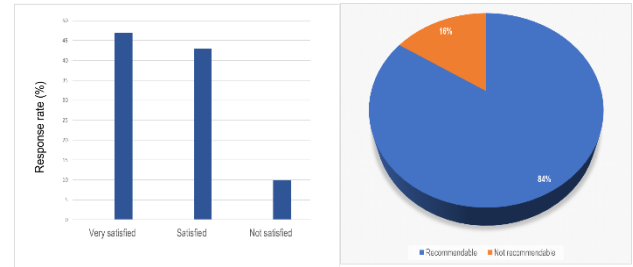
Degree of satisfaction and recommendation of the postgraduate course

Students who graduated with the current curriculum (2017-2020) indicated that they were satisfied (47.4 %) and satisfied (42.1 %) with the knowledge, skills and abilities acquired at the postgraduate level (Figure 3, Table 2). It is worth noting that, while the postgraduate programme must fulfil its mission, there is also a high degree of recognition by students that it is the responsibility of the student to make the most of the learning opportunities provided by the postgraduate programme (Table 2).

1)	It develops the capacity for ethical competence.
2)	It strengthens organisational capacity, teamwork and, above all, provides competences for efficient work under pressure.
3)	It is aligned to the priority issues for the country regarding the generation of goods and services in a less aggressive way for the environment, generating at the same time actions for the adaptation and mitigation of climate change.
4)	The range of subjects allows us to have a comprehensive training in Agroforestry and the range of optional subjects allows us to orientate our training towards personal interests.
5)	The work is pleasant and the necessary tools and facilities are provided to make the most of our stay in this postgraduate course; it is up to each student to know how to use all these means to carry out good research in line with the established standards and to carry out an excellent academic performance.
6)	The direction of research theses needs to be analysed or valued, and there needs to be a better relationship between thesis topics and the discipline itself.
7)	There is a need to strengthen postgraduate studies at an interdisciplinary level, and to foster the ability to solve problems.

Table 2 Student views of agreement (2016-2020) in the surveys regarding competence development

With these results and the analysis of the above indicators, it is conclusive that the mission and objectives of the Master's Programme in Agroforestry Sciences for Sustainable Development is fulfilling the graduate profile of its students and is therefore relevant to the current context of the country. Likewise, it is also in line with the fulfilment of the orientation of a school-based programme and the objectives expected by CONACyT within the PNPC postgraduate programmes. Finally, 84.2% stated that they would recommend the postgraduate programme to other colleagues who wish to study this discipline.



Graphic 3 Level of satisfaction and recommendation of the Postgraduate Degree in Agroforestry for Sustainable Development according to students' perception (2016-2020)

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Conclusions

The results of the study showed that from the perception of the students who completed the MCADS curriculum of the UACH restructured by competences since 2015, it is contributing significantly to the development of these skills in the field of the discipline of Agroforestry (ability to conduct research, ability to search for and analyse information, oral and written communication, knowledge specific to the postgraduate course, entrepreneurial and innovative capacity), interpersonal relations (teamwork, ability to relate, self-confidence, leadership) and comprehensive training (citizenship skills, ethical skills, global perspective, commitment to sustainable development). The degree of satisfaction and possible recommendation of the postgraduate course were other key elements in the fulfilment of the MCADS mission.

This study, as well as the one on the evaluation of the teachers' performance, are key to updating the current curriculum and the teaching-learning activities that need to be applied for the optimal development of the talents required in this postgraduate course.

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