

# Forest high education programs implemented in selected Latin America Countries

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ARTICLE

## Abstract

Paper presents history and current status of the forestry higher education in Latin America. Two examples are analysed in details - Universidad Autónoma Chapingo (Mexico) and Universidad Nacional Agraria La Molina (Peru). Results show growing role of the higher education in forestry in Latin America.

## Streszczenie

Praca prezentuje wybrane zagadnienia dotyczące leśnej edukacji uniwersyteckiej w krajach Ameryki Łacińskiej. Przeanalizowano historię i obecny stan wyższego szkolnictwa leśnego w tej części świata. Stwierdzono rosnącą rolę i znaczenie tej formy edukacji. Mimo znacznego zróżnicowania oferty dydaktycznej poszczególnych jednostek, można wyodrębnić pewne typowe dla całego regionu cechy charakterystyczne, które zostały szczegółowo omówione na przykładzie Universidad Autónoma Chapingo (Meksyk) i Universidad Nacional Agraria La Molina (Peru).

## Introduction

Forestry education is a vital issue of great relevance to the protection and conservation of the environment, meeting the needs of groups of people directly associated with forest resources and forestry involvement in the production of goods and services for the society.

The International Union of Forest Research Organizations (IUFRO) established the project *Task Force on Education in Forest Sciences*<sup>2</sup> in order to improve and strengthen the practice of forestry education in the world and contribute to the development of education standards in forestry, which meet current needs, through the use of IUFRO community experiences and contribution of experts in higher forest education.

The project consists of four stages, being the first *survey of curricula forestry* („*prior practice*”) and an attempt at a *comprehensive analysis of the challenges and opportunities facing Higher Education in Forest Sciences in different parts of the world*<sup>3</sup>.

In this work I am going to present an analysis of the history and current status of forestry education in Latin America. It unveils the process that has been carried out to select the institutions to reflect the state of forest education in Latin America better and report the current state of forestry education in two countries in the subcontinent, i.e. Mexico and Peru.

## Forest education in Latin America

In 1968 there were 17 Institutions in Latin America offering comprehensive programs in the disciplines of forestry or forest industries at the university level: 2 in Argentina, 4 in Brazil, 3 in Chile and Colombia and 1 in Costa Rica, Mexico, Peru, Uruguay and Venezuela. Although, in general, they also offered instruction in forest products, the main attention was focused on silvi-

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<sup>2</sup> IUFRO Task Force on Education in Forest Sciences (EFS), <http://www.iufro.org/science/task-forces/education-forest-science/>

<sup>3</sup> Ibidem.

culture and engineering management. Only one institution offered a graduate course in forest products<sup>4</sup> (see Appendix 1).

After 39 years, in 2007, there were over 110 forestry education institutions in Latin America<sup>5</sup>, 4 in the Caribbean, 9 in Central and 88 in South America and North America (see Appendix 2). However, official registers are either incomplete or outdated and thus it is difficult to report the exact number of such institutions. A lot of forestry education institutions have emerged, changed status or disappeared in recent years and in many cases their current status is unknown, since they might provide forestry education to other denominations. It is difficult to make a complete inventory of the units that provide forestry education without considering the level of education they provide. That is why we prefer to speak of institutions rather than schools of forestry. For example, the number of forestry schools in Brazil<sup>6</sup> equals the total number of all the schools in the region.

At bachelor level, programs of higher forest education enable to obtain the titles of Forest Engineer, Engineer in Forest Sciences, Industrial Forest Engineer, Engineer in Forest Industries, Engineer in Wood Technology, Forest Engineer in Management of Tropical Forests, Engineer in Forest Resources Management, Engineer in Forest Restoration, Forest Agronomist Engineer, Agronomist Engineer Specialist in Forest, Agronomist Engineer in Forestry Production Systems, Engineer in Renewable Natural Resources, Environmental Engineer and various professional related to those programs could illustrate the vast concept of forest education.

At master's level, it is possible to obtain a Master degree (Magister Scientiae or Master of Sciences) in Forest Sciences, Science and Technology of Wood, Forest Development Science, Management and Conservation of Natural Resources and Environment, Forest Products Sciences, Renewable Natural Resources, Forest Management, Forest Products Technology, Watershed Management and Environmental Sciences.

As regards the number of hours to be covered to meet the credit requirements, the variation is very large. In order to fulfill those requirements 30 hours are needed in Argentina, 6 hours in Bolivia, 15 hours in Brazil. It is varied in Chile (1, 2 or 3 hours per credit), Colombia (16, 40 or 48 hours) and Mexico (1, 4 or 6 hours). In Costa Rica it is 4 hours per credit, in Ecuador 2 hours, in Honduras 3 hours, in Nicaragua 48 hours, in Paraguay 15 hours, in Peru 1 or 8 hours and in Venezuela it is 16 hours. There is no homogeneity in the region to establish a number of credits and the equivalent in credit hours. That factor complicates the comparative curricular analysis and eventual approval of curricular materials in higher forest education institutions in Latin America, which is an essential aspect of the system of accreditation at national or international level<sup>7</sup>.

In higher forest education institutions in Latin America there is not a constant proportion between the basic subjects and the specific forestry subjects. In some cases the load of basic subjects is higher and in other cases there are institutions that pay more attention to technical matters and little attention to the basic subjects. The proportions range from 1:1 to 1:3 or 1:4 in the first case and in the second case reported ratios are 2:1 and even 3:1. Naturally it is essential to do a complete revision of curriculum content in order to balance its charge of credit units and hourly load of each credit. Finally, the time devoted by each teacher to each student is found to be between two to four hours per week.

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<sup>4</sup> Shirley, H. L. y Prats Llauradó J. Enseñanza y capacitación forestales en América Latina. FAO. Unasylva No.96, Vol. 24 (1) 1970.

<sup>5</sup> Universidad de Los Andes, Mérida, Venezuela, Organización de las Naciones Unidas para la Agricultura y la Alimentación, Universidad de Concepción, Chile. Estado Actual y Perspectiva de la Educación Forestal en América Latina, Santiago de Chile. 2007. p.8.

<sup>6</sup> Ibidem.p.35

<sup>7</sup> Ibidem. p.25-26.

At present we are unaware of many aspects concerning higher forest education institutions in the region and the purpose of this report is to present the current status of higher forest education in Latin America.

Latin American subcontinent comprising 42 countries constitutes complex reality in the field of higher forest education. In 2007 FAO<sup>8</sup> conducted a survey with the intention of presenting the current situation of forestry education in Latin America and the views of forestry service users and professionals in the field.

The results show the current status of forestry education in a number of respected forestry education institutions in fifteen countries, ie. Argentina, Bolivia, Brazil, Chile, Colombia, Costa Rica, Cuba, Ecuador, Guatemala, Honduras, Mexico, Nicaragua, Paraguay, Peru and Venezuela. Those institutions are assumed to be representatives of all forest education institutions in Latin America covering 36% of the total survey respondents.

However for the purposes of this study, we decided to select six forestry education institutions that represent the situation in Latin America to the fullest extent. In the survey conducted by FAO in 2007 respondents pointed out three basic indicators: number of curricular revisions made by those institutions in the last 15 years (see Appendix 3), the frequency in which those revisions were made (see Appendix 4) and the foundation year of those institutions (see Appendix 1). In the first approach nine countries were reviewed according to those criteria - one Caribbean country, one from Central America, one from North America and six from South America (see second part of Appendix 4).

In the second approach we decided to include in this study a proportional number of countries representing each region and thus it is one country from the Caribbean (Cuba), one from Central America (Honduras), three from South America (Chile, Brazil and Peru) and one from North America (Mexico). The selected institutions include the University of Guantanamo, Cuba, National School of Forestry, Ciguatopeque, Honduras, Universidad Austral de Chile, Valdivia, Chile, Universidade Federal do Paraná, Curitiba-PR, Brazil, Universidad Nacional Agraria La Molina, Peru and Universidad Autónoma, Chapingo, Mexico.

While it is true that subjective indicators have been used, it must be admitted that all sub-regions are represented in the study by at least one country. The proportion of number of institutions included here doesn't reflect the real numbers in the regions, however it reflects the interest expressed by respondents in the survey promoted by FAO in 2007<sup>9</sup>.

As mentioned above, there are wide differences and similarities between the programs offered by various institutions in forest education and content, manner and format in which related information is disseminated shows the reason why the disclosed progress now reflects constraints imposed by those large differences and similarities.

### **Mexico, Division of Forest Sciences. Universidad Autónoma Chapingo<sup>10</sup>**

Forest education in Mexico has pre-Columbian origins, in the modern sense. It began in 1909 and was subject to frequent changes until in 1935, forestry education was consolidated at the professional level with the creation of the career of Agronomist Engineer Specialist in Forest at the National School of Agriculture in Chapingo. This institution was transformed into Universidad Autónoma Chapingo and currently houses the Division of Forest Sciences. 2,382 students gradu-

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<sup>8</sup> Universidad de Los Andes, Mérida, Venezuela, Organización de las Naciones Unidas para la Agricultura y la Alimentación, Universidad de Concepción, Chile. Estado Actual y Perspectiva de la Educación Forestal en América Latina, Santiago de Chile. 2007.

<sup>9</sup> Ibidem. p. 11.

<sup>10</sup> <http://www.chapingo.mx/dicifo/>

ated from that university in the period of 1935-2007.

That institution offers four undergraduate programs: Forest Engineer, Industrial Forest Engineer, Engineer in Forest Restoration and Bachelor in Statistics and at the master degree level it offers the title of Master in Forestry. It teaches a total of 142 different subjects in three degree programs in forestry, of which 108 (77%) are mandatory and 33 (23%) are optional.

Three degree programs share six subjects, ie. Mathematics, Statistics, Sampling, Forestry, Development and Evaluation of Projects and Business Training.

Programs of Forest Engineer and Industrial Forest Engineer share (in addition to the mentioned six subjects) another 13<sup>11</sup> subjects, ie the total of 19 subjects share in the first case 40% and in the second 35 % of the total material of their respective programs.

Programs of Forest Engineer and Engineer in Forest Restoration share, besides the previous six, another 10 subjects<sup>12</sup>, ie 16 subjects in total share in the first case 33% and in the second 30% of the total material of their respective programs.

Finally the programs of Industrial Forest Engineer and Engineer in Forest Restoration share (apart from those six originally mentioned subjects) only two subjects, ie a total of 8 subjects<sup>13</sup> share in both cases, about 15% of the total material of their respective programs.

These figures show that the three programs supply a powerful mathematical and statistical basis, which constitutes a common denominator between a business training and training in the field of forestry.

It is also noticeable that the Forestry Engineer program has an important academic conceptual proximity to Industrial Forestry Engineer and the Engineer in Forest Restoration while among the latter two there is only a very small academic coincidence.

Although the structure of plans and programs of study has a well consolidated basis, it is clear that the main thrust of the courses draws attention at cool temperate forests, bypassing which necessarily requires wet and dry tropical, semiarid and arid ecosystems.

For example, in the subject Silviculture<sup>14</sup>, which one of the most important and related to the three programs and consists of a total of 80 hours of theory and practice, only the last unit, Special Forestry (silviculture of tropic forests and silviculture of tropical semi-arid forests) devotes 8 hours to teach students silvicultural systems applied in the management of tropical vegetation and arid areas in Mexico and other parts of the world (sic). That situation is only partially confirmed in the bibliography that supports the course because of a total of 26 elements that it comprises, only four (15% of bibliography items) make express reference to humid tropical ecosystems and none to the arid and semiarid ecosystems although nearly 50% of the country is covered by arid and semi-arid areas.

A similar situation concerns the subjects relating to the inventory of forest resources, ie. Epidrometría and Denrometría, in the programs of Forest Engineer and Industrial Forest Engineer and Mensuration in the Engineer in Forest Restoration program there is not an explicit differentiation of the techniques applied at different types of forest vegetation, such as vegetation in arid, semiarid zones and in wet and dry tropical forests.

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<sup>11</sup> Management, Forest Resources Management, Dendrology, Dendrometría, Digital Technical Drawing, Forest Ecology, Epidrometría, Forest Physiology, Phytogeography, Marketing, Statistical Methods, Forest Policy, Forest Supply Systems.

<sup>12</sup> Urban Dasonomy, Conservation and Management of Wildlife, Training Camp I, Training Camp II, Training Camp III, Environmental Impact Assessment, Forest Genotecnics Operations Research, Forest Protection, Agroforestry Systems.

<sup>13</sup> Informatics, Engineering of Systems

<sup>14</sup> Program of the subject Silviculture in the School Year 2009 - 2011 <http://www.chapingo.mx/dicifo/>

A similar situation occurs in the course of Phytogeography, Forest Ecology, Forest Genotecnics Management and Wildlife Conservation, Agroforestry Systems, Forestry Supply Systems and Training Camp I, II, III.

For the attention of the three programs, the Division of Forestry Sciences has a professional staff of 58 full-time professors and 16 part-time and full-time teachers. All of them work in five departments as follows:

Department	Total of professors		With doctor degree		With master degree/		With bachelor degree/		Master degree candidates	Doctor degree candidates
	Nr	%								
Ecology and Silviculture	23	40	5	9/22/38	10	16/43/48	8	14/35/33	4	3
Forest Engineering	14	24	2	3/14/15	5	9/36/24	7	12/50/29	3	2
Forest Products	9	15	1	2/11/8	3	6/34/14	5	9/55/22	3	1
Management of Forest Resources	8	14	4	6/50/30	2	3/25/9	2	3/25/8	1	
Statistics, Mathematics and Computing	4	7	1	2/25/8	1	2/25/5	2	3/50/8	1	
Total	58	100	13	22/-/100	21	36/-/100	24	42/-/100	12	6

\* % Of Professors DiCiFo

\*\* % Of the total of professors of the Department

\*\*\* % Of the total of professors with this degree

Source: Own elaboration, based on data from <http://www.chapingo.mx/dicifo>

As shown in the table above, the majority of full-time professors are concentrated in the Department of Ecology and Silviculture. The same number work in the departments of Forest Engineering and Forest Products put together, leaving the Statistics, Mathematics and Computing Department with the lowest number of full-time professors in the teaching staff.

In relation to the academic level, 22% of the total number of full-time professors have doctoral degree, 36% master degree and 42% bachelor degree. The Department of Ecology and Silviculture falls within these proportions and the largest number of graduate professors work there but if we consider the number of graduate professors within each department, relatively the Department of Management Forest Resources is the one with the largest percentage of those (75%). On the other hand the Department of Forest Products is the only one (of the other four remaining departments) with the percentage of graduate professors falling below 50% of the total number within the department.

Finally, it can be said that in all departments there is a significant academic and professional encouragement since half of the professors who have bachelor's degree are eligible to obtain a master's degree and nearly 30% of professors with Master's degree are candidates for obtaining a doctorate.

## Peru, Faculty of Forest Sciences. Universidad Nacional Agraria La Molina<sup>15</sup>

The Faculty of Forest Sciences at the Universidad Nacional Agraria La Molina, was created in 1963 with support from the special fund of the United Nations, through the Project for Training and Research Forest in Peru (FAO Project 116 UNDP). Currently the School is teaching over 1000 undergraduates with the percentage of graduates at the level of at least 65%.

The Faculty of Forest Sciences is composed of two departments, ie. the Department of Forest Management and the Department of Forest Industries.

The Department of Forest Management is responsible for programming courses geared to the knowledge of forest ecosystems and focuses on three academic areas, integrating professors with the affinity towards their specialties of Forest Planning and Evaluation, Ecology and Silviculture and Wildlife and National Parks.

The Department of Forest Industries teaches at three academic areas, ie. Mechanic Processing of Wood, Utilization of Forest Products and Forest Economics and Chemical Processing of Wood.

The curriculum consists of 10 semesters and comprises the total of 63 theoretical and practical subjects<sup>16</sup> with 60 of them required and three electives. There are two sets of field practice at the end of the sixth and eighth semesters and the exercise of professional practices in the last two semesters of the program. Graduating from the program requires the accumulation of 200 credits and the number of credits which account for the subject in question are deducted from them (that goes from zero to seven).

It is not referred to the criteria used for allocating the number of credits per subject. It can be appreciated that optional subjects are awarded with higher number of credits.

Of the 63 subjects, the Department of Forest offers 13 compulsory and five elective courses, while the Department of Management delivers 17 mandatory and 10 optional ones. The courses offered by those departments reach the total of 54 and the remaining 18 courses are generally included in core subjects. For the delivery of those courses, the Faculty employs 42 professors, of whom 36 have advanced degrees of Master and/or PhD.

A postgraduate program at the Faculty offers four specialist Masters: Forest Resources Conservation, Forests and Forest Resources Management and Engineering Wood Ecotourism. All of them, besides the participation of prominent professors of the University, are also taught by Peruvian and foreign visiting professors of recognized scientific and professional careers.

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<sup>15</sup> <http://www.lamolina.edu.pe/facultad/forestales/web2007/Presentacion/Presentacion.php>

<sup>16</sup> Forest Protection, Physical and Mechanical Properties of Wood, Forest Statistics, Chemistry, Silviculture, General Administration, Peru in the International Context, Elective, Fundamentals of Wood Preservation, Building with Wood, Sawn Timber, Products of the Mechanical Processing of Wood, Chemical Transformation of Forest Products, Fundamentals of Drying of Wood, Forest Economics, Tropical Silviculture Systems, Ethics, Strategic Planning, Pre-professional Practices (two months), Elective, Forest Enterprises Planning, Forest Management, Development of Enterprises, Watershed Management, optional, Pre-professional Practice (two months).

Table 1 Schools of Forestry and Wood Technology in Latin America exist in 1968

Country	City	Founding date	Duration of the course	Number of graduates per year	Total graduates
Argentina	Santiago del Estero	1958	5	6	31
	La Plata	1960	<sup>2</sup> 3+2	5	25
Brazil	Viçosa	1960	4	20	33
	Curitiba	1963	4	30	81
	Piracicaba	1963	<sup>2</sup> 4+1	<sup>3</sup> ...	<sup>3</sup> ...
	Río de Janeiro	1967	<sup>3</sup> ...	<sup>3</sup> ...	<sup>3</sup> ...
Chile	Santiago	1952	5	9	53
	Valdivia	1954	5	5	60
	Valparaíso <sup>4</sup>	1961	6	1	5
Colombia	Medellin	1950	5	9	54
	Bogotá	1951	5	18	199
	Tolima	1962	5	<sup>3</sup> ...	17
Costa Rica	Turrialba	1944	<sup>5</sup> 1-2	9	40
México	Chapingo	1909	<sup>2,6</sup> 3+4	15	667
Peru	La Molina	1963	5	6	21
Uruguay	Montevideo	1960	5	2	6
Venezuela	Mérida <sup>7</sup>	1948	5	11	140
TOTAL				145	1 432

<sup>1</sup> Approximate figures. - <sup>2</sup> Specialization courses forest after agriculture. - <sup>3</sup> ... No information available. - <sup>4</sup> Forest Chemical Industries. - <sup>5</sup> School graduate. - <sup>6</sup> includes part of secondary education. - <sup>7</sup> undergraduate and graduate schools.

Source: Shirley, H. L. y Prats Llauradó J. Enseñanza y capacitación forestales en América Latina. FAO. Unasyuva No.96, Vol. 24 (1) 1970.

Table 2. Countries and Regions of Latin America and forestry schools they have (FAO 2007)

Region	Country	Number
Caribbean		4
	1. Antigua y Barbuda	
	2. Aruba	
	3. Bahamas	
	4. Barbados	
	5. Cuba	3
	6. Dominica	
	7. Grenada	
	8. Guadalupe	
	9. Haiti	
	10. Islas Caiman	
	11. Islas Turcas y Caicos	
	12. Islas Virgins	
	13. Jamaica	
	14. Martinica	
	15. Puerto Rico	
	16. The Dominican Republic	1
	17. San Bartolomé	
	18. San Cristóbal y Nieves	
	19. San Vicente y las Granadinas	
	20. Santa Lucía	
21. Trinidad y Tobago		
Central America		9
	1. Belice	
	2. Costa Rica	3
	3. El Salvador	
	4. Guatemala	3
	5. Honduras	1
	6. Nicaragua	2
7. Panamá		
South America		88
	1. Argentina	9
	2. Bolivia	6
	3. Brazil	40
	4. Chile	11
	5. Colombia	7
	6. Ecuador	1
	7. Guyana	1
	8. Guyana Francesca	
	9. Paraguay	1
	10. Peru	9
	11. Suriname	1
	12. Uruguay	
13. Venezuela	2	
North America		10
	1. México	10



Table 3. Year of curriculum revision to the graduate (engineer) and postgraduate level, FAO (2007)

Curriculum review	Year	No. of Inst.	NC	Countries
Engineer	2006	1	1	Chile
	2005	9	6	Bolivia, Brazil, Chile, Colombia, Cuba, Paraguay
	2004	7	5	Bolivia, Chile, Colombia, Honduras, Mexico
	2003	2	2	Guatemala, Honduras
	2001	2	2	Brazil, Mexico
	2000	3	2	Bolivia, Mexico
	1999	3	3	Argentina, Mexico, Nicaragua
	1996	1	1	Venezuela
	1994	1	1	Colombia
Postgraduate	2006	2	2	Bolivia, Venezuela
	2005	6	5	Chile, Colombia, Cuba, Mexico, Peru
	2004	2	1	Chile
	2003	3	2	Honduras, Mexico
	2002	2	2	Bolivia, Mexico
	2001	1	1	Mexico
	1998	1	1	Mexico
	1992	1	1	Argentina

Table 4. Countries and Regions of Latin America that have forestry schools, number and year of curriculum review, (FAO 2007)

Region	Country	Number	Review curricula	
			Engineer	Postgraduate
Caribbean		4		
	1. Antigua y Barbuda			
	2. Aruba			
	3. Bahamas			
	4. Barbados			
	5. Cuba	3	1, 2005	1, 2005
	6. Dominica			
	7. Grenada			
	8. Guadalupe			
	9. Haiti			
	10. Islas Caiman			
	11. Islas Turcas y Caicos			
	12. Islas Vírgenes			
	13. Jamaica			
	14. Martinica			
	15. Puerto Rico			

16. The Dominican Republic 1			
17. San Bartolomé			
18. San Cristóbal y Nieves			
19. San Vicente y las Granadinas			
20. Santa Lucia			
21. Trinidad y Tobago			
<b>Central America</b>	<b>9</b>		
1. Belice			
2. Costa Rica	3		
3. El Salvador			
4. Guatemala	3	1, 2003	
5. Honduras	1	2, 2003, 2004	1, 2003
6. Nicaragua	2	1, 1999	
7. Panamá			
<b>South America</b>	<b>88</b>		
1. Argentina	9	1, 1999	1, 1992
2. Bolivia	6	3, 2005 2004 2000	2, 2006 2002
3. Brazil	40	2, 2005 2001	
4. Chile	11	3, 2006 2005 2004	2, 2005 2004
5. Colombia	7	3, 2005 2004 1994	1, 2005
6. Ecuador	1		
7. Guyana	1		
8. Guyana Francesa			
9. Paraguay	1	1, 2005	
10. Perú	9		1, 2005
11. Suriname	1		
12. Uruguay			
13. Venezuela	2	1, 1996	1, 2006
<b>North America</b>	<b>10</b>		
1. México	10	4, 2004 2001 2000 1999	5, 2005 2003 2002 2001 1998

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