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FORESTRY CURRICULA AT THE GEMBLOUX AGRICULTURAL UNIVERSITY

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Résumé

La présente note développe la formation forestière telle que conçue à la Faculté universitaire des Sciences agronomiques de Gembloux (FUSAGx). Elle fournit des précisions quant aux études conduisant au diplôme d'ingénieur agronome des Eaux et Forêts et à différents diplômes complémentaires. Elle donne aussi des indications sur le fonctionnement de l'Unité forestière et sur le cadre général de l'enseignement.

Summary

This paper aims at giving detailed information about the studies at the Gembloux Agricultural University (FUSAGx), especially in the field of Forestry (M. Sc. or "ingénieur").

⁽¹⁾ Professor. Unit of Forest management and economics. Gembloux. Agricultural University.

1. General information

1.1. Institutional facts

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	University	Forestry Unit
Year of establishment	1860	1897 (Chair of Silviculture : 1870)
Number of departments	5	-
Number of units (chairs)	25	2
Teaching staff (permanent/part	29/12	4/3(*)
time)		
Student enrolment	1994 : 956	1994 : 53
	1995 : 979	1995 : 55
	1996 : 1022	1996 : 53
Academic year	End of September	Start of the academic year and 1st
-	_	semester
	End of December	Christmas holiday (2 weeks)
	Beginning of January	Start of the first examination period
		(linked to courses fo the 1st semester)
	Beginning of February	Start of the second semester
	During April	Easter holiday (2 weeks)
	Beginning of June	First examination period (continuation)
	July - August	Summer holidays
	End of August and	Start of the second examination period
	Beginning of September	
Semester, trimester or other	Semester	Semester
Languages of instruction	French	French

(*) Staff linked to the Forestry Unit - this figure does not take into account other people teaching very specific courses in forestry and working in other departments or units.

1.2. Other basic information

Founded in 1860 and housed in the prestigious buildings of a former 18th century Benedictine Abbey, the Agricultural University of Gembloux (FUSAGx) is composed of only one Faculty which is the oldest Belgian institution of teaching and research devoted entirely to agricultural sciences and biological engineering. Its activities are organised around four topics : biochemistry and applied biology, plant and animal production, transformation and valorisation of living material and land management. The FUSAGx lecture halls and laboratories are attended by a thousand students from 45 different countries. Gembloux which is located in the French-speaking part of Belgium is becoming an "agrobiopôle" comprising the University, the Federal Agricultural Research Center (7 sections), the Regional Forest Research Center and a High School of Horticulture which are the components of a cooperative network. FUSAGx has always welcomed students from other countries and the great number of students coming from a wide diversity of backgrounds and cultures, has created an important international dimension to the social and academic environment.

After a curriculum of 5 years FUSAGx awards the degrees of :

Master of Science (or "*Ingénieur*") *in Agricultural Sciences*. The students can choose among ten graduate specializations : general agronomy, tropical and subtropical agronomy, animal husbandry, *forestry*, horticulture, plant protection, rural engineering, rural economics and sociology, soil science, land management.

Master of Science (or "*Ingénieur*") *in Chemistry and Bio-industries*. The students are trained in chemistry, biology and biotechnology, science of agro-food industries and bioindustries.

The studies are taught in French, but the thesis may be written and presented in English.

Postgraduate studies lead to a "**DEC**" ("Complementary diploma" - 1 year), a "**DEA**" ("Advanced diploma" - 1 year), a "**DES**" ("Specialized diploma" - 1 year) or a **Doctorate** (Ph.D. level - 3 to 6 years).

2. Forestry Unit

2.1. Status

The Forestry Unit, also called "Water and Forest" Section, belongs to the Department of "Environment, Land planning, Nature and Forest" that encompasses together 5 chairs : Soil science, Applied zoology, Hydraulics and Topography, Silviculture, Forest management and economics.

2.2. List of forestry chairs

Forest management and economics (including Wood technology) [Head : Prof. J. Rondeux] Silviculture of temperate and tropical zones [Head : Prof. W. Delvingt].

2.3. Forestry teaching staff

Qualification	male		ferr	ale	total		total
	(A)	(B)	(A)	(B)	(A)	(B)	
Habilitation	2	4			2	4	6
PhD	4	1			4	1	5
MSc	3	2			3	2	5
Technicians	2		1		3		3
total	9	7	1	_	9	7	19

Table 1. - Qualifications and genders.

Belonging (A) or not belonging (B) to the Forestry Unit - only courses with special reference to a forest discipline are considered.

. Research

Most of the teachers are both teachers and researchers. On average, 40-50 % of the time is devoted to teaching. Formal courses, supervision of pratical applications and research work in the doctoral programme are counted as teaching.

2.4. Students

. Number of students

Over the last 3 academic years (94-95-96) presented below are the number of students in Forestry per year and their genders. Drop outs are less than 3 %.

Table 2 Number	of students	per year and	genders.
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	Year (semester)	1994 - 1995	1995 - 1996	1996 - 1997
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	Female	Male	Total	Female	Male	Total	Female	Male	Total
3rd year (sem. 6)	2	13	15	2	19	21	3	16	19
4th year (sem. 7+8)	4	15	19	2	13	15	2	17	19
5th year (sem. 9+10)	4	15	19	4	15	19	2	13	15
	10	43	53	8	47	55	7	46	53

. Motivation, social data of first year students

The main motivations expressed during informational interviews are : forest management, ecology, nature conservation, quality of life, reputation of the "school of forestry" (centenary celebrated in 1997), study of forestry within an Agricultural University, environment, natural resources, wildlife. About 70 % of the students come from rural areas.

- . Entrance level, examination
- Admission to the FUSAGx

Prerequisite : secondary school completion (= secondary school diploma or equivalent). An entrance examination is organised for those who don't strictly have the required prerequisite.

- Admission to the Forestry curriculum

Diploma (1st cycle) of "candidat ingénieur en sciences agronomiques". Some students who obtain their degree in another discipline (university level) are accepted provided they follow courses in the forestry curriculum.

Detailed information on admission and fees may be obtained at the :

Service des études – Passage des Déportés,2 – B-5030 Gembloux Tél. : +32(0)81/62.21.08 et 62.23.45 ; Fax. : +32(0)81/62.25.20 E-mail : service_des_etudes@fsagx.ac.be

. Foreign students

Foreign students are accepted on the basis of their curricula and degrees (need of equivalence of diplomas). The university is open to exchange students in the forestry sector through Silva Network, Erasmus-Socrates programmes (research and student exchange) and Tempus programmes (with Eastern European countries) [contact person : J. Rondeux or university academic affairs : Mrs Lambert : phone 32 (81) 62 23 15]. The units and researchers cooperate with several universities in Europe. An international house (student's hall of residence and other facilities) and a committee of foreign students are important assets to make the student's stay enjoyable.

- Admission fees : different for European countries and developing countries (contact : "Service des études").

. Help by the institution in finding employment

A specific office, linked to a strong professional association of graduates(university graduate organisation) :

- manages a database dealing with labour market and employment opportunities,

- organises meetings, interview training/simulation, ...

- dispatches all the information registered about each former student (address, type of jobs, employed or unemployed).

The Forestry Unit regularly updates the files and records the CVs, it plays an active role in finding jobs or contacting employers (what is available and who is available ?).

2.5. Facilities

. Forest

The Forestry Unit has several collaboration agreements with private and public forests for practical applications and field training. Two private forests (30 ha and 300 ha) in 2 different natural regions are available. The first one is managed by the Unit, the second one is studied through students' theses and pluridisciplinary activities. A state forest (500 ha) (located in the Ardenne region) is also at disposal. An arboretum is located inside the campus.

. Class rooms and laboratories

2 class rooms for courses

(1 for courses and practical applications)

1 laboratory for GIS and remote sensing

1 greenhouse

2 laboratories for wood technology

1 computer-room for students.

Other auditoriums and specific laboratories of the University and not located inside the Forestry Unit are also available.

. Library

The Unit runs a forestry library (books, specialized journals) supervised by of a parttime technician.

Furthermore, thousands of printouts are registered in a computerized "self-access" database. The unit is the editor of "*Les Cahiers Forestiers de Gembloux*" (about 4 issues/year, 20 issues available till now, and exchanges with 23 other titles). The university has inter-library facilities with computerized library catalogues and CD-ROM stations. The library also publishes the international journal "*Biotechnology, Agronomy, Society and Environment*". The main sections are : the lending disk, the serials reading room, the books free-access area and the language laboratory.

. Computer service

The computer service provides students with means to acquire a practical knowledge of computer sciences. The students have access to a network of powerful personal computers for training, drawing up course reports and solving practical exercices.

. Linguistic courses

Linguistic courses for foreign students (3rd cycle) are organised by other universities in close co-operation with Gembloux. English courses are given during the second and third semesters (1st and 2nd cycle). Intensive French language courses for speakers of other languages are organised by specialized centres.

. Other

Field trips are organised in Belgium and also in foreign countries/regions. The students who encounter problems during their studies (family problems, difficult relations with teachers or others) can be helped by professional staff (social worker and a psychologist) whose tasks are mainly to advise students in the way to study and to solve problems like lack of communication and stress.

3. Forestry curriculum

Notice : The Section of "Eaux et Forêts" ("Water and Forest") originated in 1897 within the School of agriculture created in 1860. Its objective was to train "ingénieurs" in agricultural sciences at university level. There is currently a choice of several curricula : 2nd cycle ("Ingénieur agronome : option Eaux et Forêts" comparable to a M.Sc. in Forestry), 3rd cycle (Postgraduate studies : DEA and DES - which are two types of advanced studies - and Ph.D.).

3.1. Master's degree

3.1.1. Study objectives

The program of the Forestry Unit is designed to meet the needs of graduates drawn from a wide variety of backgrounds in the field of forestry and environmental studies. It provides education in management and sustainable use of forests and natural resources (in temperate and tropical zones). The knowledge and skills cover the biological, technological and economic foundations of a very extended field from forest management to wood processing industries. Environmental sciences are also taught to give the students high quality expertise in land use planning, soil conservation, water, fisheries, wildlife and management. Gembloux strives, through its own multidisciplinary programme to train students who will become forest and natural resource managers all over the world in research, administration, or international cooperation. The programme duration is generally about 8-10 years before being re-assessed and reorganised in detail (education and training vs needs of the society). Formerly the teaching focussed on training for jobs in forest administration. Due to limitations in that sector and the increasing number of graduate in Forestry in Belgium, the University since 1980 has clearly reorganised the study programme especially in connection with the multi-purpose use of natural resources and tropical forestry which concerns the multiple forestry problems in African, South-Asian and South-American countries. The study programme comprises specific hours in forestry and related disciplines.

Semester 6

- Forest and forest ecosystems
- General silviculture
- Forest ecology
- Dendrology (species from tropical zones)
- Dendrology (species from temperate zones)
- Wood anatomy
- Limnology

Semesters 7 - 8

- Tree physiology and plant growth
- Forest phytosociology
- Forest genetics
- Silviculture (warm wet zones)
- Forest pedology
- Fishery science
- Wood science
- Forest mensuration and inventory
- Forest management
- Forest entomology and pathology
- Agroforestry
- Wood processing industries (I)
- Applied silviculture

Semester 9

- Aerial photo interpretation in forestry
- Forest economics and politics
- Forest geography
- Wildlife biology and game management
- Silviculture (warm dry zones)
- Harvest systems analysis
- Wood processing industries (II)
- Phytopathology applied to forestry
- Forest legislation
- Natural resources management
- Optional courses (60 hours)

Furthermore during these semesters the students attend other courses like :

- Ecology
- Geographic information system
- Topography
- Remote sensing
- Informatics
- Statistics
- etc.

3.1.2. Board

The Forestry Section is guided by an advisory board which is reponsible for advising a curriculum committee (organised at the level of the whole University) about the study programme, its evolution and the organization of teaching. It is composed of 15 people (5 teachers or persons having the same status, 5 scientists and 5 students) the majority of whom work in Forestry.

The curriculum committee or the so-called "teaching council" brings together the chairmans and vice-chairmans of the departments (presently 5) which are a structure of units characterized by a set of teaching and research activities in a well defined field.

This 21 member committee (15 teachers, 2 scientists, 2 administratives, 2 students) is led by the dean. Its main task is to prepare the general programme of studies for the whole University, to anticipate and/or to solve all the academic problems (courses, successions, organization of the year, timetables, jury composition, ...).

The examination committee is composed of all the teachers involved in forestry education. The chairman of the jury is also the chairman of the advisory board.

3.1.3. Structure

. Forestry studies

Forestry studies require 5 years which lead to the title of "Ingénieur" (Ir) comparable to a Master of Science degree. The academic year is divided into 2 semesters which means that the entire curriculum covers 10 semesters. The degree in Forestry comprises a basic 2-year programme and a 3-year programme made up of courses in advanced aspects of forestry and other topics useful to the Forestry graduates.

 1^{st} cycle = 2 years undergraduate courses (general courses in sciences) common to all incoming students in agricultural sciences. The students are awarded the degree of "candidat ingénieur en sciences agronomiques" (Bachelor level).

 2^{nd} cycle = 3 last years masters courses dealing with specialized studies beginning with general courses. The training in forestry starts during the third year of the whole cycle at the beginning of the sixth semester and the specialization itself increases more and more during the 4 following semesters. The tenth and last semester is entirely devoted to the preparation of the thesis. The students are awarded the degree of "ingénieur agronome - option Eaux et Forêts" (Master of science - Forestry option).

3rd cycle - at the end of the 2nd cycle, postgraduate studies may be started : DEC, DEA, DES and doctoral thesis (= Ph.D. level) [see also Postgraduate curriculum - point 3.2].

. Length of curriculum and courses

The duration of the whole curriculum (1st cycle + 2nd cycle) of the forest "ingénieur" is 5 years (10 semesters) and concerns compulsory courses that now represent 3,880 hours. The last five semesters are more forestry oriented. Specific forest courses total 975 hours which represent about 45 % of the whole program.

Sixty hours are selected by the student among all the courses offered (2 nd cycle) but in relation with the thesis and submitted to the agreement of the advisory board. All the courses are multiples of 15 hours (equivalent to about 1 credit) from 15 to 60. Every course is given

during a same semester. ECTS (European Community Course Credit Transfert System) credits are allocated to course units according to their relative importance. One academic year represents 60 credits.

Table 3. - Number of semesters and hours for the 2.5 years (5 semesters) specialization.

	3rd year	4th year	5th year	Thesis(¹)	Total
Semesters	1	2	1	1	5
Hours	$405/210(^{2})$	840/510(²)	330/255(²)	400	1975
Credits	30	60	36	24	150

(¹) No courses are scheduled for the 2nd semester of the 5th year which is devoted entirely to the thesis.

(²) Specific hours in forestry and related courses (210, 510, 255).

. Teaching forms and methods

The courses include theoretical and practical aspects, some of them dealing with personal reports and exercises whose importance generally depends on the type of discipline. Practical aspects never exceed 50 %. Some days in a week are reserved for more practical applications (field trips or on site activities). The importance attributed to practical exercises increases progressively during studies and varies from 30 to 50 % in the final marks. Seminars are organised in silviculture, forest technology and forest management. Placements spent in enterprises and professional areas are recommended during the holidays (April, July, August).

. Some typical courses (see also 3.1.1).

The whole curriculum (2 nd cycle) in Forestry consists of 6 main disciplines roughly divided (in 1997) as follows :

- soil and environmental sciences : 11 %
- plant production and animal husbandry : 21 %
- economy : 11 %
- industrial transformation of natural resources : 9 %
- engineering : 26 %

. Practical period

A practical period is not strictly defined. Field trips, exercises and practical applications are spread over the last 5 semesters. The organization of studies ensures that 1 or 2 days per week are reserved for the forest oriented courses so that it is easier to make arrangements between teachers.

. Thesis

A research thesis has to be defended at the end of the studies (fifth and last year). Its main purpose is to ensure that the student has gained suitable know-how in scientific analysis, research methods and decision-making; he must be able to conceive and implement a research project. The dissertation is defended at an open meeting and is evaluated by a jury composed of at least 3 teachers including a moderator (the same person for all the jurys). During one academic year (sometimes the 2 last years), the students work with the help of assistants and

⁻ in-depth biology : 22 %

professors under the supervision of a promoter. The subject (if possible the title too) has to be proposed to the teaching council by the end of January of the last year. The thesis is normally written in French but it may be written in English.

Some typical subjects :

- . Study of the competition in a young stand of *Picea abies* (L.) KARST through a CCT experiment
- . Use of a GIS in order to define a strategy of valorisation of agricultural marginal lands
- . Analysis of the variation of some wood properties of *Picea abies* (L.) KARST in thinned and non thinned stands
- . Management of heterogeneous hardwood stands : evaluation of the production function
- . Towards a agroforestry approach in forest villages of Thailand
- . Eco-tourism perspectives in the protected zone of Sangboa (Central African Republic)
- . Oak decline in Western Slovakia

. Examination

Examinations are oral or written or more often both. There are 2 examination sessions : one after the 1st semester (January) and the other in June. A second chance is offered to the student in September. Each year the student must pass between 15 and 20 examinations.

. Form of records, systems of grades

The grades are based upon a weighted mean of all the marks obtained ;the weight of a course is related to its number of hours. Concerning the last year a weight of 40 % is given to the thesis [thesis/(thesis + courses) = 0.40]. The system of grades is based on the following scale of marks : < 12/20 (not accepted) ; 12 = satisfaction ; 14 distinction ; 16 = great distinction ; 18 = greatest distinction]. Foreign students may be awarded grades according to the European Community Course Credit Transfer System (ECTS).

. Conditions for passing from one year to the next

To be admitted into the next year, students must sit all their examinations of the previous year and be accepted by the adequate jury. It is however possible (with the agreement of the curriculum committee) to be registred in 2 successive years of study during a same academic year and a "credit" system is applied. That means the possibility to keep the note (at least 12/20 and a general mean of all the notes > 50 %) from one year to the next. Marks may be transfered from a session to an another during the same academic year (conditions : at least 12/20 and general mean \geq 50 %), furthermore the student must pass all the examinations at least once for the concerned year of studies).

3.2. Postgraduate curriculum

3.2.1. Studies and Ph.D.

Three types of postgraduate studies are organised : DEC, DEA and DES (1 year, organised in 7 specialized areas). For the non agronomists a customized curriculum allows topics to be selected for furthering a professional career.

DEC means a post-graduate course focusing on complementary studies in agricultural sciences and biological engineering.

DEA means a post-graduate course designed to develop a high level qualification or competent understanding of research.

DES is a post-graduate course where the objective is to acquire or reinforce a particular competence at a professional level. Some DES are organised with other universities in Belgium. These degrees are organised on a basis of 300 hours (or equivalent) of courses and seminars, a thesis and research activities.

The deadline for applications is October 15th each year. Before starting the studies in postgraduate curriculum, students have to prove they have adequate financial means (written commitment).

For the Ph.D. degree (officially in Agricultural Sciences and Biological Engineering, and in Environmental Sciences) the student has to meet pre-requisites which are a Master degree or a DEA. The doctoral thesis must demonstrate extensive reading and a thorough understanding of appropriate use of advanced or sophisticated techniques. It must also show a critical analysis in a research problem.

The candidates must have a basic degree in Agronomy or have been awarded a degree from other universities which the FUSAGx deems equivalent. The role of an ad hoc commission is to evaluate whether applications submitted are receivable.

Each postgraduate student is assigned one or two study advisers. The study plan must be introduced to the "teaching council" by the candidate's advisory commission. A detailed procedure that determines the examination body (at least 3 teachers and 1 foreign examinator) is set up to assess the receivability and ensure the quality of the work. The thesis must be written in French or English.

3.2.2. Short term training

Customized short term training in a number of fields is organised according to demand to help interested organizations lacking the expertise, technology and resources (languages : French or English).

4. Labour market for forestry graduates

4.1. Labour market

The level of the graduates is the university level. They take up professional positions in a wide range of activities due to an eclectic scientific training during the studies. Only general trends are available (internal note) and concern the period 1990-1995. 70 % of the graduates are working in Belgium and the neighbouring countries in the following positions :

- teaching and research : 14%
- administration : 17 %
- independant expert : 6 %
- private companies : 15 %
- applied research, development : 30 %
- European agencies : 2 %
- wood chain : 4 %

- others : 12 %

Most graduates take up professional positions in teaching, research and development (44 %).

In developing countries and European countries the main employers are : international organizations (40 %) ; research departments and private offices (40 %) ; Belgian cooperation and other bilateral foreign cooperations (20 %).

Unemployement amounts to about 10 %. It is in part higher due to the abolition of the military service.

A survey of the labour market is regularly updated by the association of graduates issued from FUSAGx.

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