

Educational System of Forestry in Japan, on the example of the University of Tokyo

Janusz M. Sowa

ARTICLE

Abstract

The paper presents a system of the university forest education in Japan on the example of the University of Tokyo. Based on data published in official documents of the University and on websites as well as author's own observations carried out during a visit to the University of Tokyo in 2010, the author has presented analyses of the forest education system at the bachelor's and master's level, including features of different courses and rules for their implementation by the students of forestry and the requirements to obtain the degree of a Bachelor and Master of Forestry.

Key words: educational system, teaching program, University of Tokyo, bachelor course, master course

Streszczenie

Praca przedstawia system nauczania wyższego w Japonii w zakresie leśnictwa na przykładzie Uniwersytetu w Tokio. Analizę systemu edukacji leśnej wykonano w oparciu o dane opublikowane w oficjalnych dokumentach Uniwersytetu w Tokio oraz na stronach internetowych, a także biorąc pod uwagę własne obserwacje autora przeprowadzone podczas misji profesorskiej na Uniwersytecie w Tokio w 2010 roku.

Autor przedstawia analizy systemu edukacji leśnej na poziomie licencjata i magistra, opisuje cechy różnych kursów i zasady ich realizacji przez studentów leśnictwa oraz wymagania do uzyskania stopnia licencjonowanego leśnika oraz magistra leśnictwa.

Zestawienia tabelaryczne obrazują m.in. roczny poziom dyplomowania w zakresie leśnictwa w porównaniu do ogólnej liczby dyplomantów w całym Uniwersytecie. W końcowej części opracowania przedstawiono szczegółowe programy nauczania wraz z ilością kredytów koniecznych do uzyskania zaliczenia poszczególnych kursów bądź uzyskania dyplomu odpowiedniego stopnia.

W podsumowaniu przedstawiono analizę przyczyn, które powodują bardzo wysoką lokatę Uniwersytetu w Tokio w międzynarodowych rankingach uczelni wyższych świata.

1. Introduction

The University of Tokyo is commonly known as "Todai" in Japan, which is an abbreviation of the Japanese characters that make up the Japanese name of the University. The full Japanese name of the University is composed of four characters that spell out Tokyo Daigaku. Taking the first character of Tokyo (home city) and the first character of Daigaku (which means university) results in Todai. The abbreviation UT is no longer used for several reasons. Firstly, to avoid confusion with other excellent overseas universities which use that abbreviation. Secondly, to create a single brand image

and identity across the University, both visually and among all of the university members, irrespective of language. Thirdly, and perhaps most importantly, because Todai is a Japanese university and Japanese people are proud of their heritage and unique character, especially in this global age (phot.1).(Public Relation ... 2010a,c)

2. Basic data of University of Tokyo

The University of Tokyo was established in 1877 as the first national university in Japan. As a leading research university, Todai offers courses in all essential academic disciplines at both undergraduate and graduate levels and conducts research across the full spectrum of academic activity. The university aims to provide its students with a rich and varied academic environment that ensures opportunities for both intellectual development and the acquisition of professional knowledge and skills. In 2011 the University of Tokyo took 21st place on international ranking of Universities in the World and the first place among Japanese universities.

At present The University of Tokyo consists of 10 Faculties: Faculty of Law, Faculty of Medicine, Faculty of Engineering, Faculty of Letters, Faculty of Science, Faculty of Agriculture, Faculty of Economics, College of Arts and Sciences, Faculty of Education, Faculty of Pharmaceutical Sciences and 15 Graduate Schools: Graduate School of Humanities and Sociology, Graduate School of Education, Graduate Schools for Law and Politics, Graduate School of Economics, Graduate School of Arts and Sciences, Graduate School of Science, Graduate School of Engineering, Graduate School of Agricultural and Life Sciences, Graduate School of Medicine, Graduate School of Pharmaceutical Sciences, Graduate School of Mathematical Science, Graduate School of Frontier Sciences, Graduate School of Information Science and Technology, Graduate School of Interdisciplinary Information Studies, Graduate School of Public Policy and also 11 Institutes: Institute of Medical Science, Earthquake Research Institute, Institute for Advanced Studies on Asia, Institute of Social Science, Institute of Industrial Science, Historiographical Institute, Institute of Molecular and Cellular Biosciences, Institute for Cosmic Ray Research, Institute for Solid State Physics, Atmosphere and Ocean Research Institute, Research Center for Advanced Science and Technology. (Public Relation ... 2010b)



Phot.1. Ones of the main gates to „Todai” (phot. by author)

Graduate School of Agricultural and Life Sciences has a history of more than one hundred and thirty years. The Agricultural Training School of the Ministry of Home Affairs was established in 1874. In 1882 it was turned into the Komaba School of Agriculture and then merged with the School of Forestry to form the Tokyo School of Agriculture and Forestry in 1886. The Tokyo School of Agriculture and Forestry became the the College of Agriculture of the Imperial University consisting of three Departments: Agriculture, Forestry and Veterinary Science. It was then renamed the Faculty of Agriculture of the Imperial University of Tokyo in 1919. In 1935, the Faculty moved from Komaba to its present location. In 1947, the Imperial University of Tokyo was renamed University of Tokyo which was reorganized under the new educational system.

Graduate School of Agricultural and Life Sciences consists of 12 departments and 8 affiliated institutions and covers wide fields of research that constitute the fundamentals for developing the agricultural life sciences in the 21st century.

Department of Forest Science (Phot.2) consists of 8 laboratories: Silviculture, Forest Plants and

Forest Health, Forest Zoology, Forest Management, Forest Policy, Forest Hydrology and Erosion Control Engineering, Forest Utilization and Forest Landscape Planning and Design. Besides there are 2 cooperative courses (University Forests and Asian Natural Environmental Science Center) and graduate students can study and research under the supervision of the staff (professors and associate professors) of both 8 laboratories and 2 cooperative courses.

Each researcher in the department uses their specialized individual research as a main tool and at the same time they follow an interdisciplinary approach, so as to obtain an overall view of the relationship between forests and human beings not only in Japan but on a global scale. Thus, a new future-oriented academic field is created. That department aims at promoting world-class education and research in the fields of forest-related biological science, environmental science, resource science and social science. It also aims at training expert professionals who can cope with and solve basic and applied issues in relation to natural activities and sustainable management of forests.



Phot. 2. The main building of Forest Department at the University of Tokyo (phot. by author)

„The University of Tokyo Forests” of the University of Tokyo were established in 1894 in order to contribute to education and research of forest science and forestry in Japan. The University owns seven university forests in various parts in Japan (The University of Tokyo Chiba Forest, The University of Tokyo Hokkaido Forest, The University of Tokyo Chichibu Forest, The University of Tokyo Tanashi Forest, Ecohydrology Research Institute, Forest Therapy Research Institute, Arbicultural Research Institute and one Education and Research Center). The forests cover 32,300 ha of area ranging from the subarctic zone to the warm temperature zone. Each forest has unique nature and history, containing various species of plants, animals, insects and fungi. University Forests have provided excellent fields for researchers and educators who are concerned with natural forest ecosystems or reproductive forest resources since their establishment. The education program is designed for graduate students in master and doctoral courses.

2.1. Present Situation of Graduates (Public Relation ... 2010a,b)

The present situation of graduates in University of Tokyo is shown in tables 1, 2 and 3.

Table 1. Graduates on Undergraduate Studies

(As of May 1, 2011)

Faculty	2010 graduates	Continuing education		Entering employment	Other	Total
		Graduate School	Faculty			
Agriculture and Life Sciences Department (incl. Forestry)	234	172	4	52	6	234
Total University of Tokyo	3,142	1,762	30	1,023	243	3,144

Table 2. Graduates on Graduate Studies

(As of May 1, 2011)

Graduate School	Program	2010 graduates	Continuing education			Entering employment	Other	Total
			Graduate School	Faculty	Other			
Agriculture and Life Sciences	MA	281	73	3	0	185	22	283
	PhD (Agric.)	134	1	0	0	41	92	134
Total University of Tokyo	MA	2,948	933	9	9	1,765	246	2,962
	PhD	1,582	11	2	8	637	920	1,582

Table 3. Degrees Conferred in 2010

(As of May 1, 2011)

Field of study	Bachelor's	Master's	Professional	Doctorate	Dissertation PhD
Agriculture	234	281	-	111	28
Total University of Tokyo	3,142	2,948	412	1,075	154

It is worth emphasizing the fact of intensive training for doctoral studies (over 30% numbers of master degrees). This situation clearly differs from the standard of university education in agriculture and forestry in Poland.

2.2. Laboratories of the Department of Forest Science

Teaching of forestry at the University of Tokyo is conducted on the basis of scientific and research activities of the Department of Forest Sciences. The current organizational structure of the Department is presented in Table 4.

Table 4. The structure of Departments of Forest Science (<http://www.u-tokyo.ac.jp/>)

Forest Life and Environmental Science:	
Forest Botany	Ecology and physiology of trees. Symbiology and pathology in forest.
Forest Zoology	Ecological studies of animals in forest ecosystems. Studies on management of animal populations in forests
Silviculture	Biology for forestation. Physiology and ecology of forest trees. Pedology and edaphology in forest.
Forest Resources and Environmental Science:	
Forest Management	Research on integrated management and utilization of forest area. Research on forest inventory and monitoring technique using satellite remote sensing data.
Forest Policy	Study on policies in order to manage and utilize forests. Social scientific study on relation between human being and forest.
Forest Utilization	Planning and design of forest-road networks. Forestry mechanization and operational efficiency.

Forest Hydrology and Erosion Control Engineering	Hydrological research on the relationship between forests and the environment. Soil conservation, landslide and mud flow and disaster-prevention science.
Forest Landscape Planning and Design	Planning methods about conservation and creation of living environment. Planning, design and management of forest landscape.
Asian Environmental Science (*1):	
Regional Resources Planning	Evaluation of regional resources for nature conservation planning. Methodological studies on sustainable tourism.
Tree Physiology and Tropical Silviculture	Tolerant mechanism of trees to environmental stresses. Development of reforestation methods of deteriorated land in Asian tropics.
Forest Molecular Ecology	Population genetics and reproduction ecology of forest tree species. Ecology and physiology of ectomycorrhizal fungi.
Forest Ecosystem Science and Management (*2):	
Forest Ecosystem	Loge-term monitoring of forest ecosystem. Wildlife management.
Forest Functional Biology	Utilization of biological function of woody plant.
Forest and Human Society Relationship	Monitoring and management of forest information.
Forest and Water	Long-term monitoring of hydrological cycle with forest development.
Resources Management	Sustainable forest resource management.

*1 Cooperative course. The laboratories and their staff belongs to Asian Natural Environmental Science Center.

*2 Cooperative course. The laboratories and their staff belongs to the University Forests.

3. Teaching program

3.1. Undergraduate Education System (<http://www.u-tokyo.ac.jp/>)

A key feature of the undergraduate education at the University of Tokyo is that the first two years (referred to as the Junior Division) are devoted to the acquisition of the fundamental skills necessary for further study. At the time of admission, students are assigned to one of six streams in either the Humanities and Social Sciences or the Natural Sciences and they study a broad spectrum of liberal arts subjects in the Junior Division. Afterwards they proceed to one of the 50 departments within ten faculties of the Senior Division (the third and fourth years of study) in accordance with their preference, aptitude, and performance.

The pathways between the Junior Division and the Senior Division are, as shown below, set so that students in each Junior Division stream generally proceed to certain Senior Division faculties linked to that stream. A newly introduced system, however, allows students to proceed to any faculty regardless of their Junior Division assignment provided they fulfill certain requirements. It should also be noted that depending on their performance students may be assigned to a faculty other than that of their preferred choice. This also applies to those wishing to proceed from Humanities and Social Sciences I to the Faculty of Law or from Humanities and Social Sciences II to the Faculty of Economics, or from Natural Sciences III to the Faculty of Medicine.

Junior Division (first and second years of study)

Humanities and Social Sciences I. The students are required to acquire the basics of social sciences focusing on law and politics, to deepen their understanding of the related fields of the humanities and natural sciences and to develop a broad perspective on people and society.

Humanities and Social Sciences II. The students are required to acquire the basics of social sciences focusing on economics, to deepen their understanding of the related fields of the humanities and natural sciences and to develop a broad perspective on people and organizations.

Humanities and Social Sciences III. The students are required to acquire the basics of the humanities focusing on language, thought and history, to deepen their understanding of the related fields of social and natural sciences and to develop a broad perspective on people and socio-cultural activities.

Natural Sciences I. The students are required to acquire the basics of mathematical, material and life sciences focusing on mathematics, physics and chemistry, to foster an interest in the basic laws of nature and to deepen their understanding of society's relationships with science and technology.

Natural Sciences II. The students are required to acquire the basics of mathematical, material and life sciences focusing on biology, chemistry and physics, to foster an interest in the basic laws of nature and to deepen their understanding of society's relationships with science and technology.

Natural Sciences III. The students are required to acquire the basics of mathematical, material and life sciences focusing on biology, chemistry and physics, to foster an interest in human beings and to deepen their understanding of the relationships between life and society.

All undergraduate students are enrolled in the Junior Division of the College of Arts and Sciences for their first two years of study, where they experience a broad and unique liberal arts education. In their first three semesters (one and a half years) in the Junior Division of the College of Arts and Sciences students are enrolled in one of the six streams: Humanities and Social Sciences I, Humanities and Social Sciences II, Humanities and Social Sciences III, Natural Sciences I, Natural Sciences II, or Natural Sciences III. Here they receive liberal arts education intended to foster a broad and deep cultural sensitivity and a well-rounded character, and to endow them with the fundamental skills required for specialized study in the Senior Division. In the fourth semester, students take specialized courses in order to acquire the basics of the fields of their specialization in preparation for their studies in the Senior Division.

3.1.1. Undergraduate Courses and Majors (general)

Place of study: College of Arts and Sciences (1st - 2nd year)

- Main Subjects include: Population and Food, Ecology and Human Being, Utilization and Production of Bioresources, Utilization of Biomechanisms for Human Life, Microbial World, Soilsphere Sciences, Environmental Science of Water, Environmental and Landscape, Biological Diversity and Evolution, Life and Amenity, Nature and Culture, Agronomy and Human Society, Communication Science between Organisms and Environment, Diversity and Biological Function of Chemical Compounds
- Basic Subjects include: Plant Taxonomy, Animal Taxonomy, Plant Morphology, Plant Physiology, Animal Physiology, Plant Ecology, Animal Ecology, Genetics, Cell Biology, Biochemistry, General Introduction to Animal Sciences, Basic Organic Chemistry, Applied Mathematics, Structural Analysis, Hydraulics, Meteorology, Environmental Security Management, Information Technology, Introduction to Agricultural and Resource Economics, International Agricultural Economics, History of Comparative Agriculture.

Place of study: Faculty of Agriculture (3rd - 4th year)

- Applied Life Science subjects include: Biological Chemistry and Biotechnology, Applied Biology, Forest Life Science, Aquatic Life Science, Animal Life Sciences, Biobased Materials Chemistry.
- Environmental and Resource Science subjects include: Landscape Ecology and Planning, Forest Environmental and Resource Science, Aquatic Production and Environmental Science, Wood Science and Timber Engineering, Biological and Environmental Engineering, Agricultural and Resource Economics, Field Science, International Sustainable Agriculture Development.

Curriculum for vocational credits toward a subsequent term is shown in Table 5. Student must obtain a total of 84 units to graduate, in Komaba (four-semester College of Liberal Arts) 18 units; in specialized courses students must obtain at least 28 course units.

3.2. Graduate Education System (<http://www.u-tokyo.ac.jp/>)

The graduate education system at the University of Tokyo pursues leading-edge education and research in each field at their 15 graduate schools: Law and Politics, Medicine, Engineering, Humanities and Sociology, Science, Agricultural and Life Sciences, Economics, Arts and Sciences, Education, Pharmaceutical Sciences, Mathematical Science, Frontier Sciences, Information Science and Technology, Interdisciplinary Information Studies, Public Policy. Table 5 presents General Program of Forest Study on the graduate level (MC).

Table 5. General Program of Forest Study - Graduate level (MC) (<http://www.u-tokyo.ac.jp/>)

Subject	Semester	Time
1. Basic Forestry	winter	3
2. Advanced Forest soil science	summer	3
3. Environment Phytology	summer	Intensive course
4. Tree Physiology	winter	Intensive course
5. Forest Entomology	summer	3
6. Soil Zoology	winter	Intensive course
7. Advanced Forest Metrology	summer	3
8. Forest Economics	summer	3
9. Forest Resource Environmental Economics	winter	3
10. Forestry History	winter	Intensive course
11. Advanced Forest Utilization	summer	3
12. Forest Civil Engineering	winter	3
13. Forest Machinery and Operation	summer	3
14. Advanced Forest Hydrology	summer	3
15. Earth and Sand Hydraulics	winter	3
16. Erosion Control Project	summer	Intensive course
17. Forest Landscape Planning	summer	3
18. Advanced Environmental Design	summer	3
19. Advanced International Forestry	winter	Intensive course
20. Advanced Forest Ecosystem Management	summer	3
21. Forest Ecology	winter	Intensive course

22. Forest Hydrological Processes	summer	Intensive course
23. Forest Functional Biology	summer	Intensive course
24. Research in Forest Science (Natural Science)	summer/winter	Nonscheduled

4. Summing up



Phot. 3. Staff Members of Laboratory of Forest Utilization - 2010 (2 professors, 1 visiting professor, 1 assistant professor and 1 secretary, and 9 doctoral, master and bachelor students) (phot. by author)

The analysis of the higher education system in the Tokyo University Forest shows similarities of the Japanese educational system to American and Western European systems. An important and characteristic element of that system is very active participation of undergraduate, graduate and doctoral students, which takes place in various laboratories. Practically, the most active research staff of the Department of Forest Laboratories are students, performing research under the guidance of professors and lecturers. The results of that work are most often used for the preparation of students' dissertations, required for graduation from specified level. (for example, see Phot.3).

The high position of the University of Tokyo in international university rankings, resulting inter alia from the large index of citations of research carried out there, very high activity in basic research (a relative large number of Nobel prize winners) and numerous publications in high ranking bulleted list of Philadelphia are also achieved thanks to a very large activity and quality of education, particularly in promoting science PhDs. A high percentage completed in 2010 at the University of Tokyo Ph.D. theses seems to confirm that trend. (Tab.3).

Both the topics and the quantity of educational disciplines of forestry programs implemented in undergraduate and graduate studies in Japan are similar to European programs, including programs in the Polish forest university departments. The important difference is the elite nature of forestry studies at the University of Tokyo, a very high content requirements for recruitment to study forestry, high autonomy of students in the program of education and the unusual (in terms of European involvement in the learning process and identification of students with a research unit in which they exercise thesis. According to the author, those elements, in addition to a high level of substantive teaching, are essential to the success of the Japanese education system at university level of forestry.

Table 5. General Program of Forest Study - Undergraduate level (BC) (<http://www.u-tokyo.ac.jp/>)

Year	course - major		Course of Applied Life Science	Course of Environmental Resource Science	Required credits
	subject		Major of Forest Science	Major of Forest Environmental Resource Science	
2	Optimal subject	Agriculture subject	- The population, food, the mankind in the ecosystem and science in soil sphere		Above 18 to 22
			- Environmental Science and Environmental Biology of Water and Landscape		
			- Environmental and biological information science and evolution of biological diversity		
			- Diversity and Biological Functions of Chemical Compounds		
			-Biomass Utilization for Global Sustainability		
			- Food Safety Sciences		
		Agriculture basic subject	- Environmental Safety-Plant taxonomy-Plant Physiology- Genetics		Inside agriculture subject more than 6
			- Meteorology-Plant Morphology-Animal Ecology-Zoological Resource		
			- Chemical Physics -Plant Ecology-Applied mathematics-Applied physics		
			- Information engineering -Introduction to Agricultural and Resource Economics		
			- Foreign Agriculture and International Cooperation-Comparative History on Agriculture-Introduction to International Cooperation		
			-Animal Resource Sciences etc		
3 and 4	Optimal subject	Course Common subject	- Environmental Ethics-Environmental Safety -Safety Management Abroad		Above 2
		Required subject	Course special subject	- Forest Management-Silviculture-Forest Policy-Forest Conservation	Above 12
- Forest Utilization-Forest Botany-Forest Zoology and Entomology					
- Forest Landscape Planning					
Major special subject		- Practice in Forest Management-Experiments in Silviculture-Seminar in Forest Policy	Above 12		
	-Practice in Forest Conservation-Practice in Forest Utilization				
	-Experiments in Forest Botany -Experiments in Forest Zoology				
	-Practice in Forest Landscape Planning				

	Optimal subject	Course	-Forest Soil Science-Forest ecology-Forest Hydrology-Dendrology	According to the choice		
	special subject	special subject	-Nature Conservation-Asian Natural Environmental Science-Forest Ecosystem Science and Management	Above 28		
			-An introduction to Natural Environmental Studies			
			- Forest Genetics and breeding		- Forest Remote sensing	
			- Forest Ecophysiology		- Forest Mensuration	
			- Tree Health		- Forest Valuation	
			- Forest Protection		- Forest Environmental Economics	
			- Population Genetics		- Forest Resource Economics	
			- Wild-life Management		- Forest Sociology	
					- International Forests	
					- Erosion Control Engineering	
					- Forest Civil Engineering	
					- Forest Engineering	
					- Forest Machinery	
					- Landscape Analysis	
					- Recreation Planning	
					- Introduction to Biomaterial Science	
			Major special subject		-Experimental forest soil science	-Forest Practice metrology
						- Surveying Practice
		- Civil Practice Forestry Science				
		- Enviromental Design Exercises				
4	Required subject	Major special subject	Graduation thesis	8		

Bibliography

- Public Relation Press University of Tokyo. 2010a. Graduate School of Agriculture and Life Sciences/Faculty of Agriculture The 2009 - 2010. Compiled by Relation Group, University of Tokyo.
- Public Relation Press University of Tokyo. 2010b. The University of Tokyo. Databook 2010. Compiled by Relation Group, University of Tokyo.
- Public Relation Press University of Tokyo. 2010c. The University of Tokyo. Guidebook 2010. Compiled by Relation Group, University of Tokyo.
- Web page: <http://www.u-tokyo.ac.jp/>

Janusz M. Sowa
Forest Faculty
University of Agriculture in Cracow
rlsowa@cyf-kr.com.pl