INTERNATIONALISATION OF CURRICULA IN ANIMAL BREEDING :
A CHALLENGE FOR THE EMPLOYABILITY OF GRADUATES IN EUROPE


(AFANet – Animal Breeding Group)

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CONSTITUTION AND AIM OF THE AFANET ANIMAL BREEDING GROUP
All the above partner institutions are in some way involved with bilateral agreements for exchange of BSc/MSc students. From the experience, however, it is clear that the exchange of students is limited, partly due to insufficient knowledge among institutions on each others curricula. Moreover, animal breeding is rapidly growing to a world-wide business, requiring the internationalisation of curricula in order to enhance employability of graduates. Therefore, there is a need for (i) exchanging and discussing current curricula, for (ii) shared development of curricula and course materials, and for (iii) enhanced didactical and technical skills in teaching. The former are the main purposes of the working group "Curriculum development in animal breeding and genetics" which is one of the work-packages of a European project called "AFANet" – Socrates Thematic Network for Agriculture, Forestry, Aquaculture and the Environment. The group, represented by the authors’ list, includes people daily involved in teaching animal breeding, from elementary to advanced levels.

OVERVIEW OF CURRICULA IN SOME EUROPEAN COUNTRIES

BSc/MSc or equivalent curricula. Several countries now propose a BSc/MSc curriculum, with Bachelor and Master diploma 3-4 and 4-5 years, respectively, after starting higher education. Italy changed its system to a BSc/MSc system in 2001, Germany (at least in some universities), Norway and The Netherlands are currently going towards this system, and discussions on that way occur in Austria, France and Greece.
Figure 1. Simplified view of the sequential structure of BSc/MSc curricula in animal sciences, and/or animal breeding, in some European countries

General = Mathematics, Biology, Physics, Chemistry, etc.; Agr. = idem + agricultural sciences, including core and optional courses in animal sciences and animal breeding, and one or two training periods; Anim. = animal sciences/animal breeding specialised courses, including a minor thesis; Thesis = MSc research project. Countries are classified by increasing number of years before specialisation in animal sciences. Years are given after the degree of secondary education.

In all countries, obtaining the MSc diploma, or an equivalent diploma, takes 4 to 5 years. There is a large variety of structure of the studies between countries and even between universities from the same country (e.g., Germany, Italy, UK). Especially, there are large differences in the earliness of specialisation in the field of animal sciences or animal breeding (figure 1). Some countries, such as Germany, Greece, Sweden and The Netherlands, offer a specialisation from the beginning or the middle of the third year. On the other hand, a broad education and a late specialisation are some of the peculiarities of the French curriculum. Moreover, in some countries (Finland, Greece, Norway, Spain), the situation cannot be described in such a simple way as in figure 1, because curricula combine different kinds of courses in a given year. Most countries offer a MSc in the field of animal sciences (i.e., not restricted to animal breeding), with in some cases (e.g., The Netherlands) specialisations, among others animal breeding. In United Kingdom and France, MSc or equivalent-MSc diplomas are offered in animal sciences, on one hand, and in quantitative genetics, on the other hand.

The content is comparable from one university to the other up to the BSc level: basic molecular biology, biometry, basic population and quantitative genetics, breeding goal, index theory, genetic gain, crossbreeding, breeding plans. In some universities (e.g., Kiel, Vienna) these courses are given at two levels, at an introductory one where the content is the very basics of animal breeding, and at a more advanced level, while in others both levels are combined. Courses on linear models, variance components, and genome analysis are offered at the MSc level. Species related courses exist in several countries (e.g., the Nordic countries).
In most cases, courses are given in the native language of the country. The main exceptions are MSc courses given in English, in The Netherlands systematically, and in Sweden in the case of foreign students, within the exchange programmes, attending the course.

**PhD curricula.** In all countries, PhD studies take 3 to 4 years and are mainly based on a long research project. In most countries, relevant courses on the PhD level are required, and some of these courses are offered by the universities themselves. As the number of PhD students in our field is generally small, several ad hoc doctoral courses are regularly organised on an international scale (Erasmus, Nordic or Western/Central European frameworks) and given in English. PhD student exchange may occur, in the case of bilateral agreements, within the scope of the European Marie-Curie programme, or otherwise. To obtain the degree of PhD, in some countries, a specific monograph is required, while in others (e.g., the Nordic countries, The Netherlands) the thesis is based on a summary integrating a number of published papers.

**NEEDS AND WAYS TO PROMOTE EXCHANGE AND COLLABORATION**

**Limitations of student exchange.** The main consequence of the differences in curricula is related to the possibilities for student exchange. It is, however, possible to overcome the induced difficulties, if attention is paid to the differences in the degree of specialisation, especially at the BSc level where these differences are the largest (see figure 1). Generally, this requires to define a personal curriculum for each student applying for an exchange, taking into account his/her background and his/her project.

**Going towards European Curricula?** A move towards harmonisation of European curricula in animal sciences/breeding is a praiseworthy but ambitious goal. One difficulty is that the structure of curricula does not depend only on the universities themselves and does not concern only agricultural universities. Therefore, when looking at the opportunities for harmonisation and collaboration, one should be pragmatic and take into account the degree of specialisation:

- **BSc** – Definition of what should be the basic knowledge and skills in animal breeding and genetics and in related areas. Harmonisation of schedule.
- **MSc** – Detailed information about prerequisites. Definition of what to teach at advanced level. Courses given as block courses. Joint organisation of some courses. Organisation of a European study trip.
- **PhD** – Intensification of collaboration for joint organisation of international courses. Development of joint PhD diploma.

Any European student obtaining a MSc or an equivalent diploma should have spent a full semester outside of his/her country. This could be a realistic goal in the short term.

**Languages.** A wider use of the English language could be useful to promote student exchange. However, this question has to be examined in detail. In Europe, speaking and writing both the native language and English (when it is not the native language) is essential for employability of graduates. Speaking another more or less international language, such as Spanish, German or French, could also be useful, especially when employed outside research institutions. Therefore, it could attract some student if countries where the native language is one of these three languages keep some courses in their mothers tongue.
Internet as a tool to progress. Internet is a tool of choice for information exchange (see references). A web-site for teaching animal breeding could be built, including links to home pages of each institution. Much information concerning animal breeding and genetics could be offered on such a site: student exchange possibilities, course announcement, possibilities for staff mobility, exchange of ideas and experiences on teaching activities, examples of practicals, computer programmes, lecture notes, etc. Here again, current heterogeneity in languages across sites is a problem. All these questions are currently under examination, taking into account which information is available on the web in this field at present.

How to attract students and to promote animal breeding jobs? In Western Europe, some conditions make animal breeding jobs less attractive than in the past: (i) students come more often from urban areas, lacking agricultural roots, (ii) agriculture and especially animal production have a negative public image and (iii) salaries in farmer organisations are less attractive. On the other hand, there is an increasing motivation among students for nature preservation, environmental issues and animal health and care. Therefore, there is a real challenge to make animal breeding and genetics more attractive by improving teaching methods and course content. Due to the multiple ways students choose a specialisation and how early this is done, efforts for that purpose have to be made in priority on the BSc level.

CONCLUSION
International collaboration and innovations in teaching are good ways to improve the quality of education and the employability of students in Europe, despite differences in curricula. Efforts are needed to promote and facilitate student and staff mobility and to improve internationalisation of teaching and learning in animal breeding. Establishment of the AFANet animal breeding group is one step in this direction. Collaboration and innovations in teaching, in any scientific field, also require that the criteria used to evaluate teachers will not only be limited to scientific publications.

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