

# **Animal Nutrition**

Organized by

Mediterranean Agronomic Institute of Zaragoza

# Animal Nutrition

Jointly organized by: **CIHEAM-IAMZ, University of Zaragoza (UZ) and Spanish Foundation for the Development of Animal Nutrition (FEDNA)**, with the collaboration of **Polytechnic University of Madrid (UPM)**

Scientific coordinators: **Prof. Dr. José Antonio Guada, Prof. Dr. Gerardo Caja**

IAMZ coordinator: **Dr. Armando Occón**

The programme is held every two years. Next edition starts in October 2011.

This Master is also an official Master of the Spanish University system.

**Aims:** Nowadays, in the light of the need to vary the traditional bases of livestock production, animal nutrition should adapt and continue to guarantee high productivity whilst paying attention to its influence on product quality and safety. Furthermore, it should minimize environmental impact and continue to contribute to the management of natural and rural areas, particularly fragile in the Mediterranean region. Therefore it is necessary to train young professionals and scientists in this field, so that from both the public and private sectors they can accommodate these changes and develop sustainable production systems.

**Learning outcomes:**

- To understand the scientific basis and fundamental mechanisms of modern animal nutrition, and to know the relevant methods and techniques contributing to a greater efficacy of animal nutrition processes and of associated research.
- To be able to integrate the different components of an animal nutrition programme, considering the interaction of nutrition processes with animal health and welfare and minimizing the impact on the environment, and to assess the advantages and drawbacks of using different strategies and methodologies from a perspective based on the sustainability of production and on securing safe and quality animal food.
- To know how to plan and implement animal nutrition programmes in different situations and environments, drawing up specific nutrition strategies according to the type of feed sources, their components and nutritional value, the programme objectives settled, and the species-related, environmental and socioeconomic conditions.
- To assume the responsibility of planning and carrying out, under the supervision of a tutor, but in a manner that must be largely autonomous, a work of initiation to research in animal nutrition and feeding, whose results may be potentially publishable.
- To prove knowledge of the scientific and technical information underpinning the research conducted, command of the techniques and methodologies relevant to such research, and capacity to objectively evaluate the significance of its results and conclusions.
- To know how to communicate the reasoning and conclusions of tutored works carried out in a group or autonomously, to develop skills in the preparation of informative and synthetic documents, and to acquire experience in the preparation and presentation of oral communications delivered and defended before an audience.

# Part 1

## Postgraduate specialization programme

The programme is organized in 7 Units (60 ECTS)

### Unit 1

05 Oct.-  
13 Nov. '09

#### PRINCIPLES OF ANIMAL NUTRITION (10 ECTS)

**Content:**

Feed composition, nutrient digestion and metabolism  
Feed evaluation  
Nutrient requirements  
Feed intake

**Learning outcomes:**

- To be updated on the scientific basis and fundamental mechanisms of feed digestion and nutrient metabolism.
- To know the factors determining feeding quality, and to gain experience in the evaluation of energy and protein supply.
- To know how to estimate nutrient requirements and their balance in the different stages of growing and production.
- To know how to apply the appropriate methodology to estimate intake, and to be able to predict its variation.

### Unit 2

16 Nov.-  
18 Dec. '09

#### FEEDSTUFFS AND FEED TECHNOLOGY: COMPOSITION, QUALITY AND SAFETY (10 ECTS)

**Content:**

Feed components and feed categories  
Feed technology  
Raw material and compound feed quality  
Feed safety

**Learning outcomes:**

- To be able to characterize the different categories of feedstuff and their components.
- To gain experience in determining the nutritional value of animal feedstuff and in elaborating and using feed composition tables.
- To gain further insight into applied feed production technology and the economic implications of such production.
- To be able to analyse the quality standards for feed and compound feed, and to develop competences in the use of the methodology applied for standard assessment.
- To know how to apply methods to control feedstuff safety, measurement techniques and evaluation systems.

### Unit 3

11 Jan.-  
26 Feb. '10

#### ANIMAL FEEDING, AND FOOD QUALITY AND SAFETY (15 ECTS)

**Content:**

General aspects about animal product quality and safety  
Feeding for milk production: cattle, sheep and goats  
Feeding for meat production in ruminants: cattle, sheep and goats  
Feeding for meat production in monogastrics: pigs, poultry and rabbits  
Feeding for egg production

**Learning outcomes:**

- To be able to determine the optimal feeding systems according to the species, its biological cycle, production type and production system.
- To gain practical experience in feed formulation and in developing feeding strategies.
- To know the animal nutrition factors influencing animal product quality, and to be able to modify this quality according to market requirements.
- To further develop aspects linked to animal food safety and those concerning the implementation of systems for quality assurance and product traceability.
- To gain practical experience in the detection of contaminants and pathogens in animal products.
- To assess the economic implications of different nutrition strategies.

**Unit 4**  
01-26 Mar. '10

**REPERCUSSIONS OF NUTRITION ON THE ENVIRONMENT AND ON ANIMAL HEALTH AND WELFARE (6 ECTS)**

**Content:**

Health and nutrition  
Welfare and nutrition  
Animal production and environmental interactions  
Reducing environmental impact in intensive systems through nutritional management  
Livestock/environment interactions in extensive systems  
Environmentally friendly production systems

**Learning outcomes:**

- To be able to analyse the nutritional aspects influencing animal health and welfare.
- To know how to apply alternative nutrition systems that minimize disease risks, guaranteeing animal food safety at the same time.
- To minimize stress risk and to improve animal welfare by applying adequate feeding strategies.
- To know the interaction of animal nutrition practices with the environment and the sustainability of production systems.
- To know how to assess the impacts of nutrition in intensive and extensive systems, and to consider feed resources to be used and nutrition management strategies to be applied to minimize those impacts.
- To be aware of the role played by grazing in landscape management and conservation.
- To be able to analyse the possibilities offered by alternative production systems, such as organic production and other environmental-friendly certification systems.

**Unit 5**  
12-30 Apr. '10

**MATHEMATICAL AND STATISTICAL METHODS IN ANIMAL NUTRITION (5 ECTS)**

**Content:**

Data analysis and experimental design  
Meta-analysis of experimental data  
The use of modelling as a tool in animal nutrition

**Learning outcomes:**

- To know the statistical principles relevant to data analysis and to the experimental design of animal nutrition programmes.
- To be familiar with the use of the appropriate computer software for such programmes.
- To gain practical experience in data introduction and analysis by means of the appropriate software.
- To know how to integrate and statistically analyse results coming from a long series of experiments conducted in subjects related to animal nutrition.
- To evaluate the potential use of models and aid-to-decision systems in animal nutrition, and to develop skills in their practical use.

**Unit 6**

05 Oct. '09-  
11 June '10

**INDIVIDUAL PROJECT (7 ECTS)**

**Content:**

Throughout this part of the Master, participants carry out an individual project either on an innovative topic related to animal nutrition or on the design of a feeding programme for a species of their choice, applied to a specific farming system and the conditions of their country of origin

**Learning outcomes:**

- To know how to apply the principles and methodology presented throughout the different units of the first part of the Master.
- To develop skills in the search for technical and scientific information, as well as in its selective treatment.
- To critically assess the different alternatives for the optimal and sustainable nutrition of a particular species, in specific environmental and socioeconomic conditions, and according to the pre-established production objectives.
- To be able to define and integrate the different components interacting in the design and implementation of a nutrition plan.
- To develop skills in the preparation of documents of synthesis and in the presentation of results.
- To gain experience in the preparation and delivery of oral communications and in their public defence.

**Unit 7**

10 May-  
9 June '10

**PROFESSIONAL TRAINING STAGE RELATED TO ANIMAL NUTRITION (7 ECTS)**

**Content:**

The last month of the course is devoted to putting into practise the knowledge acquired in previous units. A professional stage carried out in feed industries, modern farms or other type of institution related to animal nutrition or agro-food products allows participants to better understand the whole process and the day to day problems, as well as to develop skills in the use of current methods and techniques

**Learning outcomes:**

- To gain experience in a real professional environment, connected to an industry, farm or other type of institution in the animal nutrition or agro-food product sectors.
- To develop skills in the analysis of situations, in decision taking processes and in the management of real problems.
- To favour the exchange of ideas with professionals of the sector directly involved in development activities.
- To evaluate the activities carried out by the host institution, and to develop the capacity of assessment and the critical analysis.
- To be competent in the elaboration of reports that synthesize the characteristics of the host institution, its strategies and the activities carried out in the field of animal nutrition, as well as in the assessment of the learning and personal value of the work carried out during the internship.

**EXAMINATIONS**

Participants take 1 written examination for each Unit, except for Unit 3 where they take 2. Written exams consist of a set of questions that require a concise answer. Some of the questions are multiple choice. Lengthy questions are avoided.

Participants may retake failed exams once.

For the evaluation of Unit 6, participants must elaborate a written document that is presented and defended orally before a jury for its assessment. For the evaluation of Unit 7, participants must present a report assessing the work carried out in the host institution and valuing the professional and personal contribution of this training stage to their education.

**LANGUAGE OF INSTRUCTION**

The working languages are English, French and Spanish. Lecturers can teach in any of the three languages. Simultaneous translation into Spanish is provided when lecturers speak English or French, therefore participants should prove knowledge of Spanish at the start of the course. From the beginning of July to the end of September IAMZ organizes an intensive course of Spanish for those who require it. Participants can answer the exams in Spanish, French or English. In the selection of candidates, knowledge of English and French is nevertheless valued, as part of the documentation distributed may be written in either of these languages.

**ACADEMIC STAFF**

Some 85 invited lecturers from about 8 countries participate in the M.Sc. programme of which, 60% come from Higher Education Institutions, 25% from Research Centres, 11% from Private Companies and 4% from International Centres.

## **Part 2**

### **The Master of Science thesis**

**Project (10-12 months duration, 60 ECTS)**

**This part is organized in 2 Units**

#### **INTRODUCTION TO RESEARCH (30 ECTS)**

The aim of this unit is to provide the prior knowledge, skills and attitudes necessary to carry out a research project in a particular topic in the speciality of animal nutrition.

##### ***Learning outcomes:***

- To improve skills in the search for information, as well as in its selective and systematic treatment.
- To develop criteria for defining the objectives of a particular research study.
- To know how to plan the research work in order to best achieve the objectives set and to optimise time.
- To develop skills in the use of techniques and methodologies relevant to the execution of a research project and to discern the advantages and disadvantages of each one for each particular project.
- To know how to integrate knowledge and to learn how to analyse and contrast results.
- To value the guidance received to plan and develop a research work, fostering dialogue, criticism and capacity to work as a member of a team.
- To develop skills for self-directed learning and autonomous work.
- To improve the capacity of response to unforeseen situations and the ability to reorient a research if need be.

#### **MASTER THESIS (30 ECTS)**

The aim of this unit is to apply previous education received throughout the Master programme to carry out original research in the topic chosen in the previous unit, that concludes with the elaboration of a written thesis.

##### ***Learning outcomes:***

- To be able to apply previously acquainted knowledge, methods and techniques in a discerning manner.
- To develop skills in the analysis of problems and in the definition of objectives.
- To know how to design the diverse experiments included in the research project correctly.
- To be competent in data collection and analysis according to a pre-established research protocol.
- To gain experience in the analysis of results and the elaboration of conclusions that may contribute to clarify and find possible solutions to problems.
- To develop skills in the synthesis and presentation of contents and in the preparation of scientific texts.
- To gain practice in the preparation and presentation of oral communications and in their public defence.
- To acquire attitudes to favour exchange and collaboration with other researchers and professionals.

Research work is carried out in well-recognized institutions (universities, research centres or firms), generally throughout Spain or in the participant's country of origin, under the scientific supervision of a thesis director that must be a doctor of renowned prestige. Participants choose the topic according to their interest of training, which is approved by a Committee. If the participant so requires, the organizing institutions advise on the choice of the most appropriate thesis director and institution to carry out the desired project, and likewise propose topics related to their research activities or other topics of interest previously accorded with other institutions.

The assessment of acquired competences for both units is made by an examining board composed of representatives of the organizing institutions and external members selected

in each case for their expertise and prestige in the field of the research work. For the first unit, this assessment is based on: (i) an oral examination by the examining board; (ii) the evaluation done by the thesis director on the performance of the candidate; and (iii) the evaluation based on the reports presented periodically by the participant, with the support of the thesis director, on the development and progress of the research work. For the second unit, assessment is based on quality of the thesis and on its public presentation and defence.

#### **Research activities: most common topics for Master of Science theses**

- Effects of diet composition and additives on nutrient absorption, production performance and reproductive parameters
- Feed value of different products and by-products
- Effect of nutrition on animal product quality
- Influence of nutrition on the environment
- Consequences of nutrition in animal health and welfare
- Modelling in animal nutrition

#### **INDICATIVE MASTER THESES REALIZED WITHIN THE AREA**

1. **Title:** *In vitro* study of the level and type of carbohydrate supplementation best suited to optimize the concentration of isomers of CLA in dairy cows on pasture (2009)  
**Author:** Hakim Bergoug, Agronomist, Algerian  
**Place of realization:** Departamento de Producción Animal y Ciencia de los Alimentos, Facultad de Veterinaria, Universidad de Zaragoza, Spain  
**Thesis directors:** Manuel Fondevila and Leticia Abecia
2. **Title:** Effects of dietary cation-anion difference in lactational performances of dairy ewes (2009)  
**Author:** Andres Schlageter, Veterinarian, Chilean  
**Place of realization:** Departamento de Ciencia Animal y de los Alimentos, Facultad de Veterinaria, Universidad Autonoma de Barcelona, Spain  
**Thesis director:** Gerardo Caja
3. **Title:** Forage digestion: contrast of *in situ* and *in vivo* methods (2009)  
**Author:** Xhilda Pepa, Veterinarian, Albanian  
**Place of realization:** Departamento de Producción Animal, Escuela Técnica Superior de Ingenieros Agrónomos, Universidad Politécnica de Madrid, Spain  
**Thesis director:** Javier González Cano
4. **Title:** Quality of carcasses, meat and fat of commercial bred pigs fattened in extensive conditions and slaughtered at a high weight (2009)  
**Author:** José Antonio Rodríguez Sánchez, Agronomist, Spanish  
**Place of realization:** Unidad de Tecnología en Producción Animal, Centro de Investigación y Tecnología Agroalimentaria, Gobierno de Aragón, Zaragoza, Spain  
**Thesis director:** M<sup>a</sup> Ángeles Latorre
5. **Title:** Economic analysis and efficiency of Assaf and Awassi daily sheep farms in Castilla León (2009)  
**Author:** Fadhila Akli née Freni, Agronomist, Algerian  
**Place of realization:** Departamento de Ciencia Animal y de los Alimentos, Facultad de Veterinaria, Universidad Autonoma de Barcelona, Spain  
**Thesis director:** María José Milán

**Detailed additional information, in particular an analytical syllabus, is available in “ECTS information package” at IAMZ web site ([www.iamz.ciheam.org/en/pages/paginas/pag\\_formacion8.htm](http://www.iamz.ciheam.org/en/pages/paginas/pag_formacion8.htm))**