TRACK THEME: MANAGEMENT OF ANIMAL RESOURCES AND SUSTAINABLE DEVELOPMENT IN AGRICULTURE

Training track "Livestock system management "

M1 at Catania University, Italy

In this slot, the student takes the obligatory courses for a total of 39 ECTS and selects, jointly with the tutor, optional courses and other activities for a total of 21 ECTS. Other activities include: seminar, congress, technical visits in Italy and abroad, participation to experimental trials and laboratory activities.

Obligatory courses	**ECTS**
1st semester	
Applied animal production	6
Animal breeding and genetics	6
Animal nutrition	6
Food of animal origin	6
TOTAL ECTS 1st semester	**24**
2nd semester	
Feed technologies	6
Farm animal morphological evaluation and welfare	6
Conservation of animal biodiversity	3
TOTAL ECTS 2nd semester	**15**
Optional courses	**ECTS**
1st semester	
Hygiene and environmental impact of animal farms	6
Forage and industrial crops	6
Water resources management in agriculture	6
Quality and safety management	6
2nd semester	
Sustainable animal production	6
Environmental agronomy	8
Acquaculture	6
Land survey and representation	3
Food processes	6
Food packaging	6
Remote sensing and GIS	6

Exact content of the obligatory courses

APPLIED ANIMAL PRODUCTION
Objectives. To deepen the knowledge about intensive, extensive and biological breeding techniques, with particular regard to the small ruminants. To give information about the traceability techniques of the breeding systems.
Contents. Dairy cows intensive breeding management. Breeding techniques in organic systems production. Technical and environmental aspects of sheep and goat grazing conditions in the Mediterranean countries: feeding behaviour, ingestion, feeding selection, stocking rate. Widening of the swine and poultry breeding systems. Traceability of the breeding system. Technical visits to animal farms and laboratory activities.

ANIMAL BREEDING AND GENETICS
Objectives. To give theoretic and practical knowledge about the animal breeding programmes. To give the traditional tools of the quantitative genetics and the innovative ones linked with the biotechnologies applied to the animal populations. To deal with genetic traceability of the animal products.
Contents. Selection criteria and advanced animal breeding programmes applied to the main domestic species. Biotechnologies applied to the genetics. Study of the genes associated to the animal production: marker assisted selection (MAS). Biotechnology techniques applied to the animal breeding: Ovum Pick up, in Vitro Fertilization, embryo and semen sexing. Laboratory practical.

ANIMAL NUTRITION
Objectives. To give knowledge about the animal diets formulation based on feedstuffs nutritional value and animal nutritional requirements.
Contents. Nutrients utilization, metabolism and enzymes; thermodynamic rudiments applied to the animal organism; material and energetic balance; metabolism energy. Feedstuff nutritive value. Anti-nutritional compounds. Technological treatments of the basic elements. Dietary supplements and additives. Diets formulation and preparation criteria. Technical visits to animal farms.

FOOD OF ANIMAL ORIGIN
Objectives. To study in deep the origin and the quality of animal products. The importance of distinguish artisanal versus industrial products.
Contents. Main animal products in the market and their production systems. The bio-diversity factors affecting animal products quality. EU regulation and legislation. Consumers' behaviours. Food safety concept in developed and developing countries. Food safety applied to traditional cheese making. Food as expression of culture value and not just nutritive value. Effect of globalization on food chain: quality of the products, diet models (Mediterranean diet, fast food, etc.) and their effects on human nutritional status. Investigate the consumers' reaction to the quality of animal products.

FEED TECHNOLOGIES
Objectives. To give information and knowledge about the concentrate formulation, the use of the additives, the processing methods of the feedstuffs, the market and the rules that regulate the feedstuff productions.
Contents. Feedstuff: nutritional and technologic characteristics. Physic and chemical systems to improve the nutritional value of the feedstuffs. Definition of a concentrate. The functional foods. Practical and computerized formulation of the concentrates: nutritional, technological and legislative criteria. Preparation of the mineral and vitamin dietary supplementations. Quality control of the feedstuffs industry: critical points evaluation and singling out.

FARM ANIMAL MORPHOLOGICAL EVALUATION AND WELFARE
Objectives. To give the knowledge about the methods of the morphological and functional evaluation of the farm animals, with a particular focusing on the cattle. To give the basic tools to choose the breed animals. To give knowledge on basic and applied principles of animal welfare and application of these principles to the handling and management of farm animals.

Contents. Terminology of the animal morphological evaluation; zoometric measurements and indexes; morphological, functional and constitutional typologies. Dairy cow and beef morphological evaluation. Outlines of morphological evaluation of the other farm species. Age evaluation using the teeth examination. Classroom and animal farms practices. Current regulations on animal welfare; physiological regulation of stress; heat stress in dairy cattle; diagnostic system for welfare control.

CONSERVATION OF ANIMAL BIODIVERSITY
Objectives. To give knowledge about conservation strategies of the farm animal biodiversity, the structural characteristics of the animal populations, the role of the farm animals in the protected areas, the safeguard of the animal genetics resources.
Contents. Autochthonous breeds and populations at limited diffusion, safeguard politics, associations for preserving biodiversity, improvement of animal productions, consortia for promoting the animal products. In situ and ex situ conservation techniques. The animal breeding in the parks and in the wildlife reserves. Genetics of the small populations. Genetic characterization and product quality.

Exact content of the optional courses

HYGIENE AND ENVIRONMENTAL IMPACT OF ANIMAL FARMS
Objectives. To give knowledge about the problems linked to the hygiene of the animal farms and the check strategies of animal welfare. To give information about the relationship among the animal production systems, the environment and the territory.
Contents. Immunity and vaccine. The disinfection. Main diseases of cattle and sheep. Hygiene of the milk and meat production systems. Hygiene of the slaughter procedures. Risk analysis and control critical points. Animal welfare: heat stress; animal welfare during the transportation and at the slaughterhouse. Interaction between the animal production systems and the environment. Technical strategies and regulations to contrast the natural resources deterioration. Technical visits.

FORAGE AND INDUSTRIAL CROPS
Objectives. To study the technical and the qualitative and quantitative aspects of the yearly and perennial crops used as feedstuffs; the forage system. To study the crops useful in the energy, cellulose pulp and organic compounds production in the context of cultivation systems in the Mediterranean areas.
Contents. Evaluation, utilization and improvement of the natural vegetation; the main grass and legume species used as a permanent and temporary meadows; management of the artificial meadows; forages' conservation; forage quality standards; organization and management of the fodder system. General aspects of the energy and fiber crops. Energy crops used for biomass production. Agricultural techniques using low levels of auxiliary energy.

WATER RESOURCES MANAGEMENT IN AGRICULTURE
Objectives. Analysis of water and energy exchange processes in the soil-plant-atmosphere system. Study of the evapotranspiration processes related to soil hydrology. Planning of natural water resources, which integrates the use of unconventional water (treated urban wastewater, salt water, etc…) within water scarce contexts.
Contents. Hydrological soil characterization; evapotranspiration rates and crop coefficient; surface energy balance and soil water balance; wastewater reuse in agriculture; deficit irrigation criteria; measures to prevent and control the hydrological extreme events (runoff, drought); climatic change trends.

QUALITY AND SAFETY MANAGEMENT
Objectives. To make the student aware of the basic rules of the food industries quality and safety management. At the end of the course the student must be able to plan and evaluate the performances of a quality system according to the standard UNI EN ISO 9001:2008 and also the hygienic requirements according to the EU legislation (Reg CE 852, 3, 4: 04; Reg CE 882:04).

Contents. Definition of a system, standards UNI EN ISO 9001, 9004, 9000. Documents development, process analysis and critical points singling out. Process statistic control, control charts, process capability and specifications. Food safety: industrial sector concepts and law, HACCP system development, traceability.

SUSTAINABLE ANIMAL PRODUCTION
Objectives. To understand the relationships among the animal production systems and the environment.
Contents. Animal production systems according FAO. The systems of animal production in the Mediterranean area. Interaction between the animal breeding and the environment. Grazing management. Farm gate balance. Organic animal production systems. Breeding systems, territory and animal products.

ENVIRONMENTAL AGRONOMY
Objectives. To give knowledge about the relationships between the agriculture production systems and the environment, the agronomic planning of use of the soil, the preservation of the agro-ecosystem.
Contents. The relationship between the agriculture and the environment. The agricultural soil. Environmental impact of the crop manuring. The role of the organic matter in the soil. Agronomic classifications of the territory. Maps of the agricultural use of the soil. Rotation of crops and control of the weeds. Plants for phyto-depuration and phyto-extraction.

ACQUACULTURE
Objectives. To give the technical and scientific basis in order to get a correct and a profitable management of the aquaculture. In particular, the student should be able to solve the problems linked to the environmental and animal characteristics to point out their limits and to trace the potential line operation.
Contents. Physical, chemical and biological characteristics of the seas, the lakes and the rivers; first principles of ichthyology, with reference to the anatomic and physiological parameters of the Actinopterygii (ray-finned fishes); general characteristics of the aquaculture; focusing onn the biologic, technical and commercial aspects of the trout and carp breeding.

LAND SURVEY AND REPRESENTATION
Objectives. Provide skills for carrying out topographic survey, graphic representation and mapping of the landform, analysis and interpretation of spatial data. Professional skills to carry out cadastral works in both rural and urban areas.
Contents. Instruments and methods for the survey and graphic representation of landform. The GPS system. Methods for the topographic survey. General and thematic cartography. Principles of numeric cartography. The maps of Italy. The Italian cadastre. Principles of photogrammetry, GIS and their application in agriculture.

FOOD PROCESSES
Objectives. To convey the knowledge linked to the industrial transformation of the animal (meat, fish products, eggs) and vegetable (fruit, vegetables, coffee, cacao) food. The technological processes of the oven products (pasta, bread, (yeast) leavened and not (yeast) leavened cakes) will be focused.
Contents. Rudiments about the meat and fish supply chain process. Salami process industry. Fish preserves, semi-preserves and by-products. Qualitative characteristics of the eggs and their by-products. General information about the vegetable products: fruit and vegetable preserves and semi-preserves. Cacao and chocolate industry: feedstock and processes. Rudiments about the oven products. Technologies of pasta-making, bread-making and (yeast) leavened and not (yeast) leavened oven products.

FOOD PACKAGING
Objectives. To give the necessary knowledge to link up the elements obtained in the other branches of learning with the particular problems of the conditioning and the distribution of the food products and, moreover, to make the student aware to carry out and address, in the right way, the food packaging processes.

Contents. Definitions, statistics and evolving trend. Outlines of the materials' science. Diffusional properties. Packaging materials: chemical structure, techniques of production, characteristics, utilization and problems linked with glass disposal, stainless and protected steels, aluminium, cellulosic materials and plastic polymers. Rigid and flexible packing. Packaging technologies. Shelf life. Logistic and business distribution.

REMOTE SENSING AND GIS

Objectives. Knowledge of cartography, Remote Sensing and GIS to perform land representation, manage spatial information and produce thematic maps. Students will acquire knowledge of GIS tools in applied activities.

Contents. Basic principles of digital cartography. Introduction to Remote Sensing: definitions and physical laws. Remote sensing instruments. Introduction to GIS. Data model and type, data attributes, operators and functionalities. Image georeferencing. Image processing. Image classification. Applications of remote sensing and GIS to the management of agricultural and environmental resources. Applied activities.