PEOPLE'S DEMOCRATIC REPUBLIC OF ALGERIA

MINISTRY OF HIGHER EDUCATION AND SCIENTIFIC RESEARCH

Higher School of Saharan Agriculture

El Oued

HIGHER SCHOOL OF SAHARAN AGRICULTURE - ELOUED

المدرسة العليا للفلاحة الصحراوية - الوادي

Academic Program

2nd Cycle

Animal Production

2nd Year

3rd Semester

Semester: 03
Teaching Unit: Fundamental
Subject: Animal nutrition and metabolism
VHS: 67 h30 m (C/T/PW)
Credits: 5
Coefficient: 3
Evaluation method: Continuous assessment: 40% Exam: 60 %.

Training Objectives:

- The objectives of this program are to Understand the mechanisms of nutrition and metabolism in monogastric and polygastric animals.
- Comprehend the process of transforming feed into nutrients and final animal products.
- Express the energy and nitrogen requirements of livestock.

Course content:

I. Introduction

- Prehension, mastication, salivation, swallowing

II. Gastric Digestion

- In monogastrics (horse, rabbit)
- In polygastrics (rumen, reticulum, omasum, abomasum)

III. Intestinal Digestion

- Intestinal, pancreatic, and biliary secretions
- Intestinal motility (small and large intestine)

IV. Regulation of Organic Metabolism

- Carbohydrate, lipid, and protein metabolism

V. Feeding Behavior in Different Livestock Species

VII. Digestive and Metabolic Utilization of Feed

1. In Ruminants

- Fermentation in the rumen

- Post-ruminal digestion
- Nutrient utilization

2. In Monogastrics: Horse, rabbit

3. In Poultry: Digestion in the crop, gizzard, and intestine

4. Digestibility

- Apparent/true digestibility
- Measurement methods (in sacco, artificial rumen)

5. Metabolic Utilization

- Carbohydrates, volatile fatty acids (VFA), lipids, proteins
- Anabolism/catabolism

6. Feed Requirements and Expenditures

- Gross, metabolizable, and net energy
- Microbial protein synthesis

7. Mineral Elements

- Macro-elements and trace elements

8. Vitamins

- Fat-soluble and water-soluble: sources, roles, deficiencies

9. Feed Additives and Anabolic Substances

10. Feed and Water Intake

- Intake prediction
- Intake capacity
- Fill unit system

Practical Work

PW1: Ruminal fermentations, laboratory techniques (pH, VFA)

PW2: Protein determination, Weende/Kjeldahl methods

PW3: Feeding behavior, measurement of intake

PW4: Visit to an animal feed production plant

Tutorials

TD1: Ration formulation, use of UFL/PDI system

TD2: Comparative metabolism, energy/nitrogen balance

TD3: Methods for evaluating digestibility

TD4: Regulations

Semester: 03
Teaching Unit: Fundamental
Subject: Animal Feeding
VHS: h (C/T/PW)
Credits: 5
Coefficient: 2
Evaluation method: Continuous assessment: 40% Exam: 60 %.

Training Objectives:

- This course aims to provide students with a solid understanding of the chemical composition and nutritional value of animal feeds using standard analytical methods.
- It develops skills in feed evaluation, including determination of proteins, lipids, carbohydrates, minerals, and dry matter, as well as calculation of feeding values (UFL, UFV, PDI).
- Students will learn to identify and classify animal feed resources and by-products according to their origin, composition, and zootechnical use.
- The course also introduces principles of forage botany and feed conservation techniques.

Course Content:

I. Analysis of Feed Components

1. Main analyses of feed constituents

1.1. Total nitrogenous matter (proteins)

- (Kjeldahl method: N × 6.25)
- Urea determination
- Measurement of soluble nitrogen (for ruminants)

1.2. Determination of ether extract (fats) 1.3. Determination of structural carbohydrates

- Crude fiber, hemicellulose, lignin
- Methods: Weende, Van Soest, Scharrer

- Nitrogen-free extract: all carbohydrates except cellulose

1.4. Determination of moisture and dry matter

1.5. Determination of mineral matter (ash by incineration)

- Individual measurement of major minerals

2. Sampling for analysis

- Recommendations for sending samples to laboratories

3. Calculation of feed values (according to INRA, 1980)

- UFL, UFV (per kg of dry matter)
- PDI (g/kg of dry matter) according to Vérité and Sauvant

II. References on Feed Composition

- Forages
- Concentrates
  - Energy feeds
  - Protein feeds
  - Complete or complementary feeds

III. Study of Livestock Feeds

1. Grains 2. Grain by-products

- Milling by-products
- Brewery by-products
- Starch industry by-products

3. Oilseed meals (cake)

- Botanical origin
- Technology, composition, feed value
- Zootechnical use

4. Legume seeds (protein crops)

- Botanical origin
- Composition and feed value
- Use

5. Sugar industry by-products

- Molasses
- Sugar beet pulp

6. Animal-origin feeds

6.1. Slaughterhouse by-products

- (meat, blood, bones)
- Origin, processing, composition, hygiene

6.2. Poultry by-products

- (feathers, viscera)

6.3. Fishery by-products

6.4. Milk and dairy products

- (whole, skimmed, powder, whey, casein)
- Composition, value, processing, applications

6.5. Milk replacers

6.6. Feed legislation

7. Forages and their conservation

- Hay: technique, composition, value
- Straw: same
- Silage: same

- Roots and tubers: origin, value, use
- Pastures: permanent and temporary, grass value

IV. Forage Botany

A. General Botany

- Plant tissues
- Morphology (stems, leaves, flowers)

B. Applied Botany

1. **Key families:**

    - Legumes (Trifolium, Medicago, Vicia)
    - Grasses (Lolium, Festuca, Dactylis)
    - Others: Brassicaceae (rapeseed), Solanaceae (potato)

2. **Forage species:**

    - Comparative table (UFL, PDI, stress resistance)

Semester: 03
Teaching Unit: Fundamental
Subject: Genetic improvement
VHS: h (C/T)
Credits: 4
Coefficient: 2
Evaluation method: Continuous assessment: 40% Exam: 60 %.

Training Objectives:

This program aims to provide students with fundamental and applied knowledge in animal genetic improvement and quantitative genetics. It enables them to understand genetic variability, heritability, and selection methods used in livestock breeding. Students will develop skills in analyzing genetic parameters and designing breeding and crossbreeding programs. The program also introduces modern techniques such as molecular genetics and immunogenetics. It prepares students to optimize animal production while preserving genetic resources and adapting breeding strategies to environmental conditions.

Course Content:

Chapter 1: Review of Fundamental Concepts

- Basics of genetic improvement

Chapter 2: Introduction to Quantitative Genetics and Genetic Improvement of Quantitative Traits

Objectives and methodology

- The genetic model: components, modes of gene action on quantitative traits, average gene effects

Chapter 3: Variability of Quantitative Traits

- Concepts of population, breed, and strain
- Parameters characterizing an animal population

- Variation and its interpretation

Chapter 4: Genetic Variability of Quantitative Traits

- Genetic parameters (additive genetics, heritability, genetic correlation, repeatability)
- Genotype/environment correlation, genotype/environment interaction

Chapter 5: Non-Genetic or Environmental Variability of Quantitative Traits

- Non-genetic factors affecting performance in different livestock species

Chapter 6: Methods for Improving Quantitative Traits

- Selection: definition, objectives, different selection methods, indexing, qualification, genetic progress
- Crossbreeding: definition, importance of crossbreeding, different types of crosses

Chapter 7: Breeding Programs by Species

- **Example 1: Cattle Genetic Improvement Scheme**
  - Selection for milk/meat production
- **Example 2: Rabbit Strain Development**
  - Line creation for specific traits

Chapter 8: Advanced Genetic Techniques

- **Immunogenetics**
  - MHC and disease resistance
- **Molecular Genetics**
  - Marker-assisted selection (MAS)
  - Genomic selection
- **Genetic Resource Conservation**
  - Cryopreservation, gene banks

Tutorials

TD 1: Analysis of genetic parameters and calculation of heritability

TD 2: Comparison of selection methods (individual, pedigree-based, progeny-based)

TD 3: Case study – Designing a crossbreeding scheme for the improvement of a quantitative trait

TD 4: Genotype–environment interaction and optimization of breeding programs

Semester: 03
Teaching Unit: Fundamental
Subject: Livestock reproduction 1
VHS: h (C/T)
Credits: 4
Coefficient: 2
Evaluation method: Continuous assessment: 40% Exam: 60 %.

Training Objectives:

This course aims to provide students with fundamental and practical knowledge of reproductive anatomy and physiology in domestic mammals. It develops skills in reproductive management, including heat detection, artificial insemination, pregnancy diagnosis, and gestation monitoring. Students will learn to analyze reproductive performance and identify major causes of infertility and reproductive disorders. The program also prepares students to apply effective reproductive management practices to improve animal health and livestock productivity.

Course Content:

CHAPTER 1: Review of Anatomy and Physiology of the Male and Female Reproductive Systems of Domestic Mammals (cattle, sheep, goats, equines)

1.1. Anatomical features

• General structure of the male reproductive system: testes, epididymis, vas deferens, accessory glands, and penis.
• General structure of the female reproductive system: ovaries, oviducts, uterus, cervix, vagina, and vulva.
• Anatomical variations among domestic species (cattle, sheep, goats, equines).

1.2. Reproductive physiology

• General functioning of the gonads.

• Role of sex hormones and the hypothalamic-pituitary system.
• Neuroendocrine regulation of reproduction.

1.3. Phases of sexual life and gametogenesis

• Puberty and sexual maturity.
• Spermatogenesis and oogenesis: processes, duration, and hormonal control.

1.4. Sexual cycles and their fundamental mechanisms

• Estrous cycle and spermatogenic cycle.
• Hormonal control of sexual cycles.
• Behavioral and physiological manifestations.

CHAPTER 2: Gestation

• Fertilization: stages and conditions for success.
• Gestation: stages, physiological and hormonal changes.
• Placenta: function and different types.
• Parturition: mechanisms, regulation, and warning signs.
• Postpartum management in the dairy cow and in the mare (foal heat).

CHAPTER 3: Practical Management of Reproduction

3.1. Heat detection and mating

• Behavioral and clinical signs of estrus.
• Detection methods (observation, technological devices).
• Management of natural mating and artificial insemination.

3.2. Pregnancy diagnosis

• Diagnostic methods: palpation, ultrasonography, hormonal assays.
• Zootechnical importance of early diagnosis.

3.3. Practical management of gestation and parturition

• Monitoring of gestation: feeding, housing, prevention of abortions.
• Preparation for and assistance during parturition.
• Postpartum care of the female and the newborn.

CHAPTER 4: Reproductive Disorders

4.1. Introduction

• Economic and zootechnical importance of reproductive disorders.

• Etiological factors: infectious, nutritional, hormonal, and environmental.

4.2. Female infertility

• Ovarian disorders: anestrus, cysts, luteal insufficiency.

• Genital infections: metritis, endometritis, vaginitis.

4.3. Male infertility

• Genetic and acquired causes: testicular abnormalities, infections, heat stress.

• Prevention and management: hygiene, nutrition, veterinary monitoring, selection.

DIRECTED WORK

TD 1: Comparative study of reproductive anatomy and physiology of domestic mammals.

TD 2: The estrous cycle and its variation among species.

TD 3: Analysis of reproductive parameters and calculation of fertility, fecundity, and prolificacy.

TD 4: Simulation of practical reproductive management: heat detection and pregnancy diagnosis.

Semester: 03
Teaching Unit: Methodology
Subject: Cattle production systems
VHS: h (C/PW)
Credits: 3
Coefficient: 1
Evaluation method: Continuous assessment: 40% Exam: 60 %.

Course Content:

Course Title 1: Bovine Production Management

Chapter 1: Cattle Herd Characteristics

- **Breeds of Cattle**
  - Dairy breeds (Holstein, Montbéliarde, etc.)
  - Beef breeds (Charolais, Limousin, etc.)
- **Exterior Conformation & Biometrics**
  - Body measurements (wither height, chest girth)
  - Phenotypic selection criteria

Chapter 2: Types of Cattle Production Systems

- **Dairy Cows** (Milk production)
- **Suckler Cows** (Beef calf rearing)
- **Veal Production** (Butcher calves)
- **Growing & Fattening Cattle** (Feedlot systems)

Chapter 3: Beef Production

Growth & Performance Factors

- Genetic potential
- Nutrition (forage vs. concentrate-based)
- Health & housing management

Meat Quality Evaluation

- Slaughter processes
- Carcass classification (EUROP grading)

- Cut yield & meat quality traits

Production Methods

- Breeding strategies (AI, natural service)
- Performance recording (ADG, FCR)
- Hygiene & housing standards

Economic Aspects

- Market trends (supply-demand balance)
- Beef cattle marketing (liveweight vs. carcass)

Chapter 4: Milk Production

Management Practices

- Genetic selection (PTA for milk yield/components)
- Specific feeding strategies (TMR, phase feeding)

Zootechnical Performance

- Lactation curves
- Milk recording (fat%, protein%, SCC)

Chapter 5: Dairy Economics & Algerian Context

- Cost analysis (feed, labor, infrastructure)
- National production challenges
- Market integration

Field Activity

- **Farm Visit**: Dairy cattle operation (hands-on assessment of management practices)

Semester: 03
Teaching Unit: Methodology
Subject: Sheep and goat production systems
VHS: h (C)
Credits: 3
Coefficient: 2
Evaluation method: Continuous assessment: 40% Exam: 60 %.

I. SHEEP PRODUCTION

Chapter 1: Sheep Breeds & Characteristics

- Major Sheep Breeds (Local & international)
- Exterior Conformation (Body measurements, wool traits)

Chapter 2: Reproductive Specificities

- Seasonal Anoestrus (Photoperiod effects)
- Lactational Anoestrus
- Management Solutions (Hormonal, lighting, nutrition)

Chapter 3: Ewe Nutrition

- Breeding Preparation & Estrus (Flushing techniques)
- Gestation (Energy/protein requirements)
- Lactation (Milk yield optimization)

Chapter 4: Lamb Growth Nutrition

- Pre-weaning (milk replacers, creep feeding)
- Post-weaning (forage/concentrate balance)

Chapter 5: Meat Production Systems

- Carcass Quality (EUROP grading, fat scoring)
- Growth Factors (Genetics, feed efficiency)

Chapter 6: Milk Production

- Herd Management (Milking frequency, udder health)
- Lactation Performance (Yield, fat%, SCC)

Chapter 7: Wool Production

- Fleece Structure (Fiber histology)
- Wool Quality (Staple length, micron count)

Chapter 8: Sheep Farming in Algeria

- Breeds, challenges, market trends

II. GOAT PRODUCTION

Chapter 1: Goat Breeds & Characteristics

- Dairy (Saanen, Alpine) vs. meat (Boer) breeds

Chapter 2: Milk Production

- Milking Management (Machine vs. hand milking)
- Milk Composition (Fat, protein, lactose)

Chapter 3: Herd Management

- Housing, health protocols, record-keeping

Chapter 4: Feeding Systems

- Nutritional Requirements (NRC guidelines)
- Pasture vs. Stall-Feeding

Chapter 5: Reproduction & Breeding

- Buck Selection (Semen evaluation)
- Kidding Management

Chapter 6: Lactation Performance

- Peak yield, persistence, kid-weaning strategies

Chapter 7: Buck & Kid Rearing

- Growth benchmarks, disease prevention

Chapter 8: Meat Production

- Chevon Quality (Tenderness, dressing percentage)

Chapter 9: Goat Farming in Algeria

- Production systems, economic viability

ASSIGNMENTS

1. Algerian Sheep & Goat Breed Identification
2. Nutrition Strategies by Physiological Stage
3. Economic Analysis of Sheep/Goat Products

Semester: 03
Teaching Unit: Methodology
Subject: Poultry and Rabbit Production
VHS: h (C)
Credits: 3
Coefficient: 2
Evaluation method: Continuous assessment: 40% Exam: 60 %.

Training Objectives:

The objective of the Poultry and Rabbit Production course is to provide students with the theoretical knowledge and practical skills necessary for the efficient management and production of poultry and rabbits. The course covers:

- Understanding the characteristics of poultry and rabbit breeds, strains, and lines.
- Mastering reproductive management, incubation techniques, and embryonic development.
- Managing the feeding, housing, and health of poultry and rabbits.
- Efficiently producing high-quality eggs, meat, and, where applicable, fur.
- Understanding the technical and economic aspects of poultry and rabbit production, including an analysis of production chains in Algeria.

Course content:

GENERAL INTRODUCTION

I. POULTRY FARMING (AVICULTURE)

Chapter 1: Poultry stock: breeds, strains, lines
Chapter 2: Specialization in poultry farming: breeder, multiplier, farmer

Chapter 3: Breeding of parent stock

- Reproduction in the female and egg formation
- Laying cycle
- Brooding (incubation by the hen)
- Natural and induced molting

- Light and egg production
- Reproduction in the male
- Sperm production
- Rearing of roosters
- Natural mating and artificial insemination

Chapter 4: Embryonic development and incubation

Chapter 5: Rearing of pullets

Chapter 6: Table egg production and laying hen management

- Egg structure, egg quality

Chapter 7: Meat production and broiler farming

- Slaughtering, carcass characteristics
- Feeding recommendations

Chapter 8: Technical and economic aspects of poultry farming

Chapter 9: Status of poultry farming in Algeria

II. RABBIT FARMING (CUNICULTURE)

Chapter 1: Rabbit stock: breeds, strains, lines

Chapter 2: Physiological specificities: digestion and reproduction

- Practical implications of these specificities on feeding and reproductive management

Chapter 3: Breeding of parent stock

- Selection of breeders
- Reproductive management, reproduction rhythms
- Farming management: kindling (parturition), weaning, fattening
- Renewal of breeders: self-replacement, purebred, hybrids
- Feeding recommendations

Chapter 4: Meat production

- Growth and development of rabbits

- Feeding recommendations
- Slaughter and carcass quality

Chapter 5: Farming for hair and fur production: main constraints

Chapter 6: Technical and economic aspects of rabbit farming

Chapter 7: Development prospects in Algeria

Personal Work:

1. Identification of breeds and strains in poultry and rabbit farming
2. Reproduction techniques and management of breeders in poultry and rabbits
3. Feeding strategies according to production objectives: eggs, meat, hair
4. Technical and economic analysis of poultry and rabbit sectors in Algeria

Field Trip:

Visit to a poultry or rabbit farming complex: observation of reproduction, incubation, feeding practices, and product valorization in Algeria.

Semester: 03
Teaching Unit: Discovery
Subject: Ethics and professional conduct
VHS: h (C)
Credits: 1
Coefficient: 1
Evaluation method: Continuous assessment: 100%

Training Objectives:

• Introduce students to ethical reflection applied to agricultural and livestock practices.
• Familiarize students with the principles of professional conduct governing agri-food sector professions, while fostering a responsible professional attitude that respects living beings and societal norms.

Course Content:

1 – Foundations of Professional Ethics

1. **Introduction to Applied Ethics**
    - Definitions: Morality, Ethics, Professional Conduct
    - History of Ethical Thought in the Sciences
    - Specifics of Ethics in Agronomy and Animal Production
2. **Core Values**
    - Responsibility, Respect for Living Beings, Integrity, Transparency
    - Environmental Ethics and Agroecology

2 – Professional Conduct in Agronomy

1. **Academic and Professional Ethics**
    - University Code of Ethics
    - The Role of the Future Agronomist in Society
2. **Professional Standards**
    - Confidentiality, Rigor, Loyalty

- Compliance with Technical, Health, and Social Standards

3 – Ethics in Animal Production

1. **Animal Welfare and Moral Responsibility**
    - Ethical Farming: Housing, Transport, Slaughter
    - Controversies Around Intensive Farming, Cloning, and Biotechnology
2. **Societal Challenges**
    - Food Security, Sovereignty, Social Justice
    - Ethics and Sustainability of Livestock Systems

4 – Ethics in Research and Education

1. **Scientific Research**
    - Responsible Methodology, Plagiarism, Copyright
    - Scientific Integrity, Report and Thesis Writing
2. **Conduct in Teaching and Internships**
    - Ethical Behavior in Academic and Professional Settings
    - Respect for Partners, Animals, and Local Cultures
3. **Case Studies and Simulations**
    - Analysis of Real-Life Ethical Dilemmas: Livestock Farming Conflicts, Genetic Engineering, Animal Testing
    - Debates and Role-Playing Exercises

Drafting a Personal Code of Ethics

Semester: 03
Teaching Unit: Discovery
Subject: Hygiene and Prophylaxis
VHS: h (C)
Credits: 1
Coefficient: 1
Evaluation method: 100% Exam

Training Objectives:

- Identifier les major maladies of animal d'élevage (ruminants, volailles, lapins, etc.) and include leurs causes, leurs clinical signs and leurs conséquences.
- Configure the principles of sanitary treatment at the elevation.
- Sensitivity to the importance of bathroom hygiene and material for the animal skin

Matter content:

Chapter 1 – Introduction to Pathology of Farm Animals

1. **Nutritional Diseases**
   - Deficiencies, excesses, and metabolic disorders related to feeding
2. **Infectious Diseases**
   - Bacterial origin (brucellosis, pasteurellosis, tuberculosis, etc.)
3. **Viral Diseases**
   - Foot-and-mouth disease, Newcastle disease, Gumboro disease, etc.
4. **Parasitic Diseases**
   - Endoparasites (intestinal worms), ectoparasites (ticks, lice)
5. **Mycoses (Fungal Diseases)**
   - Fungal infections: ringworm, candidiasis, etc.
6. **Basics of Pathological Anatomy**
   - Visible lesions, affected organs
7. **Basics of Pathophysiology**
   - Stress responses, heat shock, immunosuppression

8. **Introduction to Veterinary Legislation**
    - Health regulations, mandatory reporting, prophylaxis

Chapter 2 – Hygiene in Livestock Farming

1. **Design of Livestock Buildings**
    - Overview of structure and ventilation:
        - Cattle barn, sheepfold, milking parlor
        - Poultry house (aviculture)
        - Rabbit hutch (cuniculture)
2. **Hygiene of Livestock Facilities**
    - Cleaning, disinfection, waste and effluent management
3. **Hygiene of Farming Equipment**
    - Drinkers, feeders, milking equipment

Semester: 03
Teaching Unit: Transversal
Subject: Communication
VHS: h (C)
Credits: 1
Coefficient: 1
Evaluation method: 100% Exam

Training Objectives:

By the end of this course, students should be able to:

• Learn simple and effective methods to carry out key communication activities

• Communicate clearly in speaking and writing

• Make a good oral presentation in public

• Listen actively and respond appropriately

• Understand and use professional communication documents

• Write clear and simple professional messages (e.g. emails, memos, reports)

• Understand the goals of internal and external communication in professional settings

Course Content:

Chapter 1: Improving Language Skills

- Vocabulary and expressions for communication
- Grammar for clear messages

Chapter 2: Introduction to Communication Methods

- Basics of professional communication
- Understanding the communication process
- Recognize common barriers to effective communication.

Chapter 3: Internal and External Communication

- Differences and examples (e.g. communication within a company vs. with clients or partners)

Chapter 4: Meeting Techniques

- How to prepare and participate in a meeting
- Taking notes, speaking clearly, respecting time

Chapter 5: Oral and Written Communication

- How to write emails, letters, short reports
- How to speak with confidence and clarity

Personal Work

Oral presentation: each student prepares and presents a short topic, group of students play roles about different topics to show different types of communications and analyse the process.

4th Semester

Semester: 04
Teaching Unit: Fundamental
Subject: Domestic Animals and Livestock Production Systems
VHS: 67 h30 m (C/T/PW)
Credits: 5
Coefficient: 3
Evaluation method: Continuous assessment: 40% Exam: 60 %.

Training Objectives:

- Understand the main **domestic animal species** and their characteristics.
- Learn the basic concepts of **animal husbandry (zootechnics)** and ethnology.
- Distinguish between **species and breeds** and understand their evolution.
- Analyze the **external morphology (phenotype)** of animals.
- Acquire skills to **determine the age** of different animal species.
- Understand **limb conformation (aplombs)** and its importance in animal production.
- Learn different **animal identification systems** (national and international).
- Perform **body measurements** and estimate animal weight

Course Content:

I. Introduction

1. Definition: Animal Science (Zootechnics)
2. Ethnology
3. Concepts: Species – Breed
4. Domestication
5. Evolution of breeds

II. Ethnology

1. Cattle; Sheep; Goats; Horses; Camels; Dogs; Cats; Poultry; Rabbits
2. For all species:
3. External morphology of the animal
4. Ethnic (breed) variations
5. Study of breeds:
6. In the world
7. In Algeria

III. Age determination

1. Cattle, sheep, goats, horses, camels, dogs, cats

IV. Study of limbs (conformation / stance)

1. Cattle, horses

V. Identification of domestic animals

1. Definition
2. Importance
3. Identification systems:
4. International
5. National
6. Cattle; Sheep; Goats; Horses; Dogs; Cats
7. Horse identification / description (marking and signalment)

VI. Measurements
Cattle; Sheep; Horses; Dogs

VII. Livestock housing facilities

1. General data
2. Specific data

Tutorials

TD 1: Zootechnical sheet by animal species (identify the main characteristics of a domestic species).

TD 2: Comparative analysis of livestock production systems in Algeria (understand differences between extensive, semi-intensive, and intensive systems).

TD 3: Design of a simplified livestock building plan (apply design rules adapted to a species).

TD 4: Simulation of livestock management (reflect on management practices over a short period, e.g., poultry farming, rabbit farming, or lamb fattening).

Practical Work

1. Farm visits

2. Study of external morphology and breeds (phenotype)
3. Limb conformation and animal age determination
4. Measurements and weight calculation

Semester: 04
Teaching Unit: Fundamental
Subject: Feed production and processing technology
VHS: 45 h (C /PW)
Credits: 5
Coefficient: 2
Evaluation method: Continuous assessment: 40% Exam: 60 %.

Course Content:

Chapter I: Raw Materials and By-products

• Feed ingredients: Various feedstuffs
• Agro-industrial by-products
• Utilization in animal nutrition

Chapter II: Compound Feeds and Manufacturing Technology

• Technological treatments applied to grains
• Mechanical processing
• Thermal and hydrothermal treatments
• Variability factors

Chapter III: Processing Technologies and Nutritional Value

• Basic principles
• Manufacturing process - Nutritional value relationship
• Species-specific feed formulation

Chapter IV: Forage Harvesting and Preservation

• Forage selection criteria
• Nutritional value of forages and influencing factors
• Harvesting and preservation techniques

• Optimal harvest stage
• Other factors (climate, soil conditions)
• Forage intake and digestibility
• Forage preservation methods:

- Dry conservation (hay)
- Wet conservation (silage)
- Packaging techniques
  • Nutritional value assessment methods (in vivo, in vitro)

Chapter V: Anti-nutritional Factors and Physico-chemical Treatments

• Benefits of processing
• Low-quality forages
• Physical treatments (mechanical/non-mechanical)
• Chemical treatments (alkalis, acids)
• Impact of alkali treatments on feed value
• Improving poor-quality hay (physical/chemical treatments)

Chapter VI: Feed Quality Control and Standardization

Practical work

1. **Visit to an Animal Feed Mill**
   - Observing production stages: raw material reception, grinding, mixing, pelleting, bagging
   - Discussion on quality standards and quality control measures
2. **Field Trip to Forage Production Farm/Cooperative**
   - Studying harvesting techniques, drying, silage/baleage production
   - Analyzing climatic and logistical challenges
3. **Animal Feed Quality Control Lab Visit**
   - Demonstration of basic physico-chemical analyses (DM, CP, fiber, etc.)
   - Overview of regulatory standards and compliance

Learning Outcomes:

- Identify and evaluate feed ingredients and by-products
- Understand feed manufacturing processes and technologies
- Apply forage quality assessment methods
- Implement appropriate feed preservation techniques
- Recognize and mitigate anti-nutritional factors
- Comprehend feed quality control protocols

Semester: 04
Teaching Unit: Fundamental
Subject: Animal-Origin Products
VHS: 45 h (C /T)
Credits: 4
Coefficient: 2
Evaluation method: Continuous assessment: 40% Exam: 60 %.

Training Objectives:

- Identify the main products of animal origin (meat, milk, eggs, fish, honey, etc.) and their sources.
- Understand the nutritional composition and health benefits of animal products.
- Explain the physiological and biochemical processes involved in the production of meat, milk, and eggs.
- Apply knowledge of proper handling, processing, preservation, and storage of animal-origin products.
- Evaluate the quality, safety, and hygiene standards of animal products.

Course content:

I. Biosynthesis of Main Animal Products:

- Meat (growth and development of different tissues),
- Milk (metabolism of the mammary gland),
- Egg (egg formation).

II. TECHNOLOGY OF FOOD PRESERVATION AND STABILIZATION

1. **Cold Treatments**
   - Refrigeration
   - Freezing
2. **Heat Treatments**
   - Pasteurized products – semi-preserved foods
   - Sterilized products – canned foods
3. **Drying and Freeze-Drying Treatments**
4. **Irradiation**

5. **Additives: preservatives and antioxidants**
6. **Acidification and acid fermentation**
7. **Salting and curing**

I. Milk and Dairy Products

II. Eggs and Egg Products

III. Fish and Fishery Products

IV. Honey: Quality and Control

V. Additives

VI. Wastewater: Wastewater Treatment

Tutorials (Directed Work):

- Physicochemical techniques applied to milk: acidity, fat content.
- Fish: assessment of freshness.
- Visits: ENAFROID, dairies, canneries, processing plants, etc.

Semester: 04
Teaching Unit: Fundamental
Subject: Livestock reproduction 2
VHS: 45 h (C /T)
Credits: 4
Coefficient: 2
Evaluation method: Continuous assessment: 40% Exam: 60 %.

Training Objectives:

To deepen understanding of applied reproduction aspects, master reproductive management and evaluation tools, and explore oviparous species reproduction.

Course Content:

CHAPTER 1: Reproductive Parameters and Control

4.1. Reproductive parameters and record keeping

• Definitions: fertility, fecundity, prolificacy, parturition rate.
• Methods for monitoring and recording reproductive data.

4.2. Improvement of fecundity and reproductive efficiency

• Factors influencing fertility (nutrition, health, management).
• Improvement techniques: synchronization, genetic selection, health management.

4.3. Seasonality and photoperiod

• Influence of light and season on sexual cycles.
• Zootechnical adaptations for controlling seasonal reproduction.

4.4. Nutrition and reproduction

• Impact of nutritional deficiencies or excesses on reproductive function.
• Feeding management of breeding females and males during the reproductive period.

CHAPTER 2: Milk Secretion

1. Anatomy of the mammary gland

• General organization of mammary tissue.

• Vascularization, innervation, and anatomical particularities according to species.

2. Physiology of milk secretion

• Mammary development (mammogenesis).

• Initiation and maintenance of lactation: role of prolactin, oxytocin, and steroid hormones.

• Mechanisms of milk ejection.

3. Zootechnical characteristics of lactation

• Lactation curve and its phases (rise, plateau, decline).

• Factors influencing milk production (nutrition, genetics, environment).

• Weaning and drying-off.

CHAPTER 3: Reproduction in Oviparous Species (birds, fish) — Specific Features

6.1. Anatomical organization and general physiology

• Male and female reproductive systems in birds and fish.

• Internal or external fertilization processes depending on the species.

6.2. Hormonal regulation

• Role of photoperiod and gonadotropic hormones.

• Comparison of endocrine regulation with that of mammals.

6.3. Reproductive strategies and incubation

• Types of fertilization and egg-laying.

• Incubation behaviors and parental care.

Tutorials

TD1: Simulation of heat detection and pregnancy diagnosis.

TD2: Calculation of reproductive parameters (case studies).

TD3: Case study: improvement of reproduction in dairy farming.

TD4: Analysis of reproduction in oviparous species (comparative sheet).

Semester: 04
Teaching Unit: Methodology
Subject: Livestock Buildings and Equipment
VHS: 60 h (C /T/PW)
Credits: 4
Coefficient: 2
Evaluation method: Continuous assessment: 40% Exam: 60 %.

Training Objectives:

- Understand the interactions between housing conditions and animal welfare/productivity.
- Know the characteristics of livestock buildings according to species.
- Learn how to assess and improve indoor environmental conditions (temperature, ventilation, humidity, etc.).
- Master the technical equipment necessary for the proper functioning of modern livestock farms.
- Understand the main legal and regulatory requirements for creating and managing livestock buildings.

Course Content:

I. Indoor Environment in Livestock Buildings

1.1 Definition and Components of Indoor Environment

- Temperature, relative humidity, air speed.
- Gas concentration (ammonia, CO_2).
- Light intensity and noise.

1.2 Requirements of Main Livestock Species

- Thermal comfort thresholds according to species (cattle, sheep, goats, poultry, rabbits).

II. Thermal Balance Between Animal and Environment

2.1 Thermoregulation in Domestic Animals

- Thermal zones (neutrality, comfort, critical).
- Heat gain/loss mechanisms.

2.2 Impact of Environment on Productivity

- Effect of temperature on milk production, growth, reproduction.
- Risks related to thermal stress: hypothermia, hyperthermia.

III. Basic Calculations for Indoor Climate and Ventilation

3.1 Fundamental Concepts of Ventilation

- Natural ventilation vs mechanical ventilation.
- Required airflow rate by species.

3.2 Simplified Thermal Balance of a Building

- Heat gains and losses.
- Introduction to ventilation sizing.

IV. Main Livestock Buildings

4.1 Cattle Barns (Dairy and Beef)

- Types: free-stall, tie-stall.
- Functional areas: feeding, resting, circulation.

4.2 Sheepfolds and Goat Houses

- Specific interior arrangements.
- Bedding and ventilation management.

4.3 Poultry Houses (Layers and Broilers)

- Organization: floor systems, cages.
- Climate management and biosecurity.

4.4 Rabbit Houses

- Materials and internal organization.
- Hygiene and aeration.

4.5 Horse Stables

- Boxes, paddocks, outdoor access.

V. Livestock Equipment

5.1 Feeding and Watering

- Automatic feeders, troughs, drinkers.
- Feed rationing systems.

5.2 Cleaning and Waste Removal

- Automatic scraping, slurry systems, composting.

5.3 Milking Equipment

- Manual vs automated milking.
- Milking parlor, hygiene, maintenance.

5.4 Specific Equipment: cages, batteries, pens

- Advantages/disadvantages according to production type.

VI. Legislation and Regulations

6.1 Technical and Sanitary Standards

- Distances, ventilation, lighting, surfaces.

6.2 Administrative Procedures for Farm Creation

- Declarations, permits, environmental authorizations.

Tutorials (TD)

TD1: Case Study on Building Environment

- Analysis of climatic data (temperature, humidity).
- Risk identification and adjustment proposals.

TD2: Comparison of Livestock Buildings by Species

- Comparative tables (species, area, ventilation, layout).

TD3: Calculation of Required Ventilation Rate

- Application of simple design formulas.
- Case study to complete and comment on.

TD4: Simplified Building Project

- In pairs: draft plan + equipment choice + area estimation according to species.

Practical Work (TP)

TP1: Guided Visit or Video Observation of a Livestock Building

- Analysis of strengths and weaknesses in environment, equipment, hygiene.
- Field checklist or video worksheet.

TP2: Handling and Demonstration of Equipment

- Use/demonstration of drinkers, feeders, milking equipment.
- Demonstration of cleaning or ventilation principles (models/videos).

Semester: 04
Teaching Unit: Methodology
Subject: Technical Management of Farms
VHS: 45 h (C /T)
Credits: 4
Coefficient: 2
Evaluation method: Continuous assessment: 40% Exam: 60 %.

Training Objectives:

- Understand the organization of rational livestock farming according to species and production purpose.
- Learn how to record and interpret technical and economic performance indicators.
- Acquire the fundamentals of economic management applied to livestock farming.
- Be able to analyze an investment project in a livestock production system.

Course Content:

1. Herd Organization

- Designing herd composition according to production objectives: meat, milk, or reproduction.
- Animal categories and flow management: breeding stock, young animals, fattening animals, culling.
- Livestock calendar and planning of reproductive and production cycles.
- Reproductive management: synchronization and planning of calving/lambing periods.

2. Technical Management

2.1. Recording Zootechnical Data

- Types of data: reproduction, growth, milk or meat production, diseases.
- Recording tools: herd notebooks, monitoring software, mobile applications.

2.2. Performance Monitoring

- Key zootechnical indicators: fertility rate, average daily gain (ADG), milk yield, mortality rate.
- Interpretation of results and implementation of corrective measures.

3. Economic Management

- Basic concepts in livestock economics: fixed and variable costs.
- Calculation of production cost per animal, per liter of milk, or per kilogram of meat.
- Profitability and gross margin of a livestock production unit.
- Economic decision-making: reducing losses, optimizing costs, increasing productivity.

4. Investments in Livestock Farming

- Types of investments: buildings, equipment, genetics, feeding.
- Evaluation of investment profitability: initial cost, depreciation period, return on investment.
- Possible financial support and subsidies.
- Case studies of economically oriented livestock projects.

Tutorials

TD1 – Typical Herd Organization in Cattle or Sheep Production

- Development of a functional diagram: categories, animal flow, reproductive calendar.
- Practical case study based on a fictional farm.

TD2 – Analysis of Zootechnical Performances Using Record Sheets

- Reading and interpretation of real or simulated data.
- Calculation of fertility rate, ADG, average production, etc.

TD3 – Calculation of Production Costs and Profitability

- Application of simple formulas to provided data.
- Evaluation of gross margin and profitability analysis.

TD4 – Study of a Livestock Investment Project

- Selection of equipment (milking parlor, fences, building), cost evaluation, financing plan, and depreciation.
- Group presentation of the project summary.

Semester: 04
Teaching Unit: Discovery
Subject: Marketing
VHS: 22 h30 (C)
Credits: 1
Coefficient: 1
Evaluation method: 100% Exam.

Training Objectives:

- Understand the fundamentals of marketing applied to animal production sectors.
- Identify the characteristics of the market for livestock products, inputs, and equipment.
- Develop commercial strategies adapted to the specificities of the animal production sector.
- Master marketing channels, pricing mechanisms, and regulations.

Course Content:

1. Introduction to the Concept of Marketing

- Definitions and basic principles
- Objectives of marketing in animal production sectors
- Evolution of agri-food marketing and its role in the value chain

2. Areas of Application of Marketing in Animal Production

- Marketing of livestock feed (compound feed, concentrates, additives)
- Marketing of live animals (breeding stock, young animals, fattened animals)
- Marketing of animal products: milk, meat, eggs, honey, leather
- Marketing of livestock equipment: machines, materials, buildings

3. Consumer Behavior

- Factors influencing consumer choices (quality, price, origin, labels)
- Evolution of consumption habits for animal products

- Perception of animal welfare and sanitary quality

4. Market Strategies

- SWOT analysis applied to livestock enterprises
- Market positioning and segmentation
- Differentiation strategies: quality labels, PDOs, organic products, short supply chains
- Communication and advertising in the animal production sector

5. International Marketing of Animal Products

- Export markets: opportunities and constraints
- International standards and sanitary barriers
- Case studies of exports (milk, meat, egg products)

6. Marketing Channels

- Direct sales, cooperatives, wholesale markets, purchasing centers
- Role of intermediaries and logistics
- Integrated approach: from farm to consumer

7. Prices and Their Regulation

- Formation of agricultural prices: supply, demand, seasonality
- National and international regulation mechanisms
- Interventions by the State and interprofessional organizations

8. Legal and Regulatory Framework

- National regulations on production, processing, and marketing
- International regulations (WTO, Codex Alimentarius, EU, etc.)
- Traceability, sanitary standards, labeling, animal welfare

9. Financing and Support for Commercialization

- Sources of financing: agricultural loans, subsidies, microcredit
- Support mechanisms for producers and agricultural SMEs
- Development programs for animal production sectors

10. Consumption–Production Balance

- Analysis of imbalances between local production and national demand
- Management of surpluses or shortages
- Agricultural and food policies related to food security

11. Farm-to-Fork Regulations

- Legal framework from production to consumption
- Hygiene, food safety, and environmental standards
- Producer responsibility and traceability

Semester: 04
Teaching Unit: Discovery
Subject: Animal husbandry in challenging Areas
VHS: 22 h30 (C)
Credits: 1
Coefficient: 1
Evaluation method: 100% Exam

Training Objectives:

- Understand the ecological and climatic specificities of harsh environments.
- Identify the plant and animal resources available in these environments.
- Master livestock adaptation strategies to environmental constraints.
- Integrate the principles of sustainable development into pastoral and agropastoral systems.

Course Content:

1. Climatic Constraints and Animal Adaptation

1.1. Influence of Extreme Temperatures

- Impacts of cold and heat on animal performance
- Thermoregulation mechanisms in livestock species

1.2. Thermal Regulation in Ruminants and Monogastrics

- Physiological adaptations
- Adaptive behaviors (shelter, activity, feeding)

2. Plant Resources Available in Harsh Environments

2.1. Steppe, Mountain, and Saharan Rangelands

- Floristic diversity: grasses, legumes, halophytes
- Grazing periods and forage yield

2.2. Fodder Trees and Shrubs

- Main species used (acacia, atriplex, etc.)
- Nutritional value and methods of use
- Techniques for integration into forage systems

3. Bioclimatology and Ecology of Livestock Species

3.1. Definition of Bioclimatic Zones

- Characteristics of steppe, mountainous, and Saharan areas

3.2. Ecological Requirements of Livestock Species

- Sheep, goats, camelids, hardy cattle
- Environmental behaviors and adaptations

4. Technical Management and Integration into Production Systems

4.1. Grazing Systems and Extensive Livestock Farming

- Transhumance, nomadism, sedentary pastoralism
- Sustainable rangeland management

4.2. Criteria for Selecting Farming Systems

- Available resources, technical level, production objectives
- Optimization practices (storage, feed supplementation)

4.3. Integration of Woody Resources into Livestock Systems

- Agroecological role of shrubs
- Planting and maintenance techniques

5. Animal Resources and Types of Production

5.1. Livestock Species According to the Areas

- Steppe: sheep, goats
- Mountain areas: hardy cattle, sheep
- Sahara: dromedaries, Saharan goats

5.2. Products Derived from These Farming Systems

- Milk, meat, wool, hides, draught power, transport

6. Livestock Farming and Sustainable Development

6.1. Agroecological Approach to Livestock Farming in Harsh Environments

- Soil preservation, water management, and biodiversity

6.2. Food Security and System Resilience

- Role of pastoral systems in socio-economic stability

6.3. Social and Economic Issues

- Role of livestock farming in rural economies
- Integration into national agricultural policies

Semester: 04
Teaching Unit: Transversal
Subject: Legislation
VHS: 22 h30 (C)
Credits: 1
Coefficient: 1
Evaluation method: 100% Exam

Training Objectives:

- Introduce students to the fundamental concepts of law.
- Familiarize students with Algerian and international legal texts.
- Develop the ability to apply and comply with regulations related to livestock production and agro-food activities.

Course Content:

1. General Introduction to Law

1.1. Definitions and Fundamental Concepts

- Public law and private law
- Criminal law and civil law

1.2. Origins and Hierarchy of Legal Texts

- Constitution, laws, decrees, and regulations
- Courts and levels of application

2. Criminal Law and Responsibility in the Animal Sector

2.1. Offenses, Violations, and Sanctions

- Professional responsibilities in livestock farming
- Criminal consequences of non-compliance with legislation

2.2. Consumer Protection and Food Safety

3. Presentation of the Algerian Legal System

3.1. Reference Texts and Official Sources

- Use of the website: JORADP
- How to search for a law or decree

3.2. Examples of Regulatory Texts Related to the Agro-Food Sector

4. General Regulations Related to Animal Production and Agro-Food Products

4.1. Cross-Cutting Laws

- Consumer protection law
- Food hygiene and safety regulations
- Labeling and consumer information regulations

4.2. Regulations on Additives, Preservatives, and Packaging

- Authorized lists, mandatory labeling, compliance control

4.3. Regulations on Trademarks and Traceability

5. Specific Regulations Applied to Livestock Production and Animal Products

5.1. Hygiene in Farms and Slaughterhouses

- Laws concerning animal facilities
- Health standards and veterinary inspections

5.2. Regulatory Requirements for Dairy, Meat, Eggs, and Other Products

- Registration, declaration, and storage conditions

6. Regulatory and Enforcement Bodies

6.1. Algerian Monitoring and Control Structures

- DCP (Wilaya Directorate of Commerce)
- CACQUE (Center for Analysis and Quality Control)
- ONML (National Office of Legal Metrology)
- Municipal hygiene offices

6.2. Coordination Between Services and Field Missions

7. Standardization and Accreditation

7.1. National Organizations

- IANOR: Algerian Institute of Standardization
- ALGERAC: National Accreditation Body

7.2. International Standards

- ISO standards
- Codex Alimentarius
- Algerian Standards (NA) and AFNOR standards

8. Practical and Personal Work

8.1. Study of Legal Texts

- Reading, analysis, and synthesis of a regulatory text

8.2. Quality Control Simulation

- Stages of inspection in a farm or agro-food enterprise

8.3. Oral Presentations

- Free topic selection: standard, law, or regulatory body.