# Raw Materials

## Proff. Luigi Bavaresco-Licia Colli-Andrea Fiorini

# Raw Materials

## MODULE: Fruit Science

## Prof. Luigi Bavaresco

***COURSE AIMS***

The goal of the course is to give the students the scientific and technical knowledge for the comprehension and management of the fruit chain.

***INTENDED LEARNING OUTCOMES***

***Knowledge and understanding capability.***

At the end of the course the student will be able to know and understand:

1. The role of the genetic element (fruit species, cultivar, rootstock), of the environment (climate and soil) and of the cultural practices (pruning, water and fertilizer supplies, soil management, etc.) on the production and fruit quality of an orchard.
2. The morphology and physiology of a fruit tree: life cycle and annual cycle.
3. The quality evaluation of different fruit species emphasizing their nutritional values.
4. Example of a fruit chain.
5. The role of genetic, environmental, and growing factors on fruit cold starage.
6. The modern cold-storage technologies to preserve the fruit global quality while reducing the waste.
7. The most widespread fruit-based products.
8. Sustainable and organic production.

**Knowledge comprehension and utilization**

At the end of the course the student will be able to:

1. Apply the knowledge concerning the genetic, environmental, and cultural choices in order to understand the link product-field.
2. Apply the knowledge on the fruit cold-storage to get a high global quality product while reducing the wastes due to decay.
3. Apply proper field choices in order to obtain the best raw material for specific fruit processed products, avoiding using the wastes from the fresh market.

**Opinion autonomy**

At the end of the course the student will be able to:

1. Choose fruits with characteristics suitable for specific processed products (canned fruits, frozen fruits, juices, intermediate moisture fruits, fourth range fruits).
2. Advise the fruit grower as concerning the field choices in order to get specific quality parameters, keeping in mind that the quality of transformed products is firstly related to the quality of the raw material.

**Communication skills**

At the end of the teaching program the student will be able to:

1. Utilize in a proper way the scientific language related to pomology to describe and to transfer, by written documents and oral talks, the acquired knowledge.

**Learning skills**

At the end of the teaching program the student will be able to:

1. Improve the knowledge on the different fruit species by the use of textbooks, scientific and popular journals, other proper sources.

***COURSE CONTENT***

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| --- | --- |
|  | CFU |
| Global diffusion of fruit growing. Definition and role of climate and soil on fruit production and quality. Life and annual fruit tree cycle. | 1.0 |
| Cultural practices and fruit quality. Short description and role of the training system, summer and winter pruning, fertilizer supply, irrigation, soil management, plant protection on fruit quality. Fruit classification and composition; nutritional values and methods to assess the fruit ripeness. | 1.0 |
| Example of a fruit chain. Fruit cold-storage: normal and controlled atmosphere. Fruit processing: fruit requirements for specific products (canned fruits, frozen fruits, juices, intermediate moisture fruits, fourth range fruits). Sustainable and organic production | 1.0 |
| TUTORIALS. Sensory analysis of some fruit species. Visit to a fruit processing plant | 1.0 |

***READING LIST***

***Chosen book***

Westwood M.M., 1993. Temperate Zone Pomology. Timber Press.

***Suggested books***

Bavaresco L., Gardiman M., 2015. Italian Wine Grape Varieties, their Viticultural Characterization. Gianni Sartori Press, Ponte di Piave (TV).

Lespinasse J.M., Le Terme E., 2011. Growing Fruit Trees. Novel Concepts and Practices for Successful Care and Management. W.W. Norton & Company Inc.

Sansavini s. et al. 2019. Principles of Modern Fruit Science. ISHS

# *TEACHING METHOD*

1. Face-to-face lessons where the contents of the class will be taught.
2. Practical work concerning the pomological traits and the sensory evaluation of some fruit species.
3. One field trip in a fruit producing areas in order for the students to understand the production philosophy and to get familiar with the structure of the Italian fruit estates.
4. The slides utilized for the lessons will be weekly provided to the students.
5. The slides will be considered crucial for the subject learning and for the preparation of the exam.

***ASSESSMENT METHOD AND CRITERIA***

# Oral examination. The assessment will be done by asking three questions related to the diffusion of the fruit growing, the factors of fruit agrosystem, life and annual cycle, cultural practices, pomological and nutritional evaluation of the fruits, elements of a fruit chain, cold-storage, requirements for processed products, sustainable and organic production (10 maximum marks each). As concerning each question, the mark will result as the addition of single aspects, as follows:

# 5: correctness of the given answer.

# 2: capability to make connections among subjects and to have a broad vision of the topic.

# 3: capability to synthesize information and to go right away to the point, addressing the subject with a proper language and in a critical and personal way.

***NOTES AND PREREQUISITES***

Tutorial is recommended as it will be included in the final exam. The pre-qualifications are represented by basic knowledge of biology.

*OFFICE HOURS FOR STUDENTS*

Prof. Luigi Bavaresco is available to meet with students after the lectures and at the DI.PRO.VE.S, Pomology and Viticulture Section, Piacenza (room 316).

## MODULE: Animal Sources

## Prof. Licia Colli

***COURSE AIMS AND INTENDED LEARNING OUTCOMES***

The world human population will significantly increase by 2050 to nine billion inhabitants, with the highest growth rate in developing countries. Accordingly, the demand for animal products is expected to increase between 50 and 70%, although with large differences between regions. According to the nutritional recommendations, at least one-third of the daily protein requirement should derive from animal sources, since meat, fish, milk, and eggs are a valuable source of essential amino acids, micronutrients, and vitamins.

However, the rising concern about environmental impacts, global warming, disease spread, animal welfare, food security and safety requires a shift of the production paradigm towards the so-called “sustainable intensification”.

This course will focus on current livestock-based food productions (population growth, urbanization, emerging affluence, resource constraints, and underlying biological limits), focusing on dairy, meat, eggs, and will introduce cuniculture, aquaculture, heliciculture and honey production. Each major food animal species (dairy, beef, swine and poultry) will be investigated in terms of quality of their production, life cycles, and physiology, constraints to production, production systems, and emerging societal issues.

***Knowledge and understanding***

Thanks to interactive front lessons and discussions, on completion of this course the student will have developed a detailed understanding of environmental, social, and economic factors affecting the livestock sectors and products and will be able to identify specific issues related to milk, meat, eggs, and other types of productions (e.g. rabbit farming, aquaculture etc.). The knowledge acquired will be of particular use to professionals and relevant to anyone across the food industry interested in animal productions and production systems.

***Ability to apply knowledge and understanding***

By the end of the teachings, participants will become able to successfully deliver a correct and precise description of the fundamental topics of the subject using proper scientific terms, and to integrate the information gained during the course with knowledge from previous studies and from the literature. The students will be able to:

- describe the historical and geographic origin and distribution of livestock species and breeds;

- identify and evaluate the challenges and opportunities facing different livestock production sectors;

- identify and evaluate measures to improve the quality, sustainability, welfare of a livestock production system;

- describe a set of animal products in terms of quality and physio-chemical features.

***Autonomy of judgement, Communication skills and Learning ability***

At the end of the course the students are expected to hold learning and communication capacities suitable to autonomously elaborate on specific topics related to animal productions, to disseminate them to both professionals and non-professionals, and to evaluate the concepts in a critical way. The lessons are designed to improve the student’s ability to:

- form independent opinions, develop personal ethics and confidence;

- evaluate the credibility and reliability of information sources;

- establish which information is most relevant to the problem at hand;

- improve decision-making skills.

***COURSE CONTENT***

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| --- | --- |
|  | CFU |
| Livestock production systems and models | 0.5 |
| Overview of Milk, Beef, Eggs supply chains by species and breeds | 1.0 |
| Overview of aquaculture and rabbit farming | 0.6 |
| Quality of animal products | 0.25 |
| Livestock environmental sustainability and adaptation to climatic changes | 0.4 |
| Livestock raw materials traceability and authentication | 0.25 |
| Tutorials: Essential on livestock physiology, alternative products and productions (e.g. snail farming, honey production) | 1.0 |

***READINGS LIST:***

J.R. Campbell-M. Douglas Kenealy- K.L Campbell: *Animal sciences. The biology, care, and production of domestic animals.* 2010 *4th edition WAvELAND Press*

R. Nandan: *Livestock and Poultry Production Management and Planning.* 2015. VetBooks Press.

The slides and the teaching materials used during the lessons will be made available through the BlackBoard platform.

***TEACHING METHOD***

The course teaching method will comprise different types of activities:

i) classroom lectures (24 hours) which will cover both the theoretical topics of the course and a set of relevant real-life examples. The lesson will cover the whole syllabus and follow a sequential *iter*. The teacher will often intract with the student during the lectures, to stimulate individual involvement and discussion. Seminars on specific topics provided by invited key speakers may complement the lectures.

ii) indoor seminars and tutorials (8 hours) focused on practical computer-based activities.

An outdoor technical visit to the University’s experimental livestock farm (4 hours) will complete the course and provide the opportunity to understand how some of the theoretical notions acquired can be put into practice.

***ASSESSMENT METHOD AND CRITERIA***

The final exam consists of an oral interview during which the candidate should answer three main questions spanning the whole course syllabus, including the topics proposed during the seminars and the field trip. The final mark will be based on: a) the actual knowledge of the subject and the overall handling of the matter; b) use of proper terms and clearness of exposition during the interview; c) ability to to propose original solutions and make connections between different topics and subjects.

***NOTES AND PREREQUISITES***

Background knowledge of animal physiology and morphology, essentials on livestock farming, and fundamentals of general and organic chemistry may help during the course.

***OFFICE HOURS FOR STUDENTS***

Prof. Licia Colli is available to meet students by appointment either after the lectures, or via Teams meeting or at her office in Piacenza at the Department of Animal Science, Food and Nutrition (DIANA).

## MODULE: Grains and Vegetables

## Prof. Andrea Fiorini

***COURSE AIMS AND INTENDED LEARNING OUTCOMES***

The goal of this course is to supply the basis of scientific and technical knowledge for understanding and evaluating main elements of cultivation and other production processes of grain and vegetable raw materials.

***Knowledge and understanding capability***

At the end of the course the student will be able to know and understand:

* The role of soil- and crop-related variables (i.e. soil properties, crop species) and soil-crop management (i.e. tillage, irrigation, fertilization) to steer the yield performance and quality standards of grains and vegetables in sustainable agro-ecosystems.
* Elements of the cropping cycle of the most widespread cultivated grains and vegetables.
* Examples of grain and vegetable chains: common and durum wheat, maize, barley, processing tomato, and canned peas.
* Elements of processes and technologies to preserve grain and vegetable raw materials.
* Evaluation criteria of grain and vegetable raw materials.

**Knowledge comprehension and utilization**

At the end of the course the student will be able to:

* Apply the knowledge about soil-crop management in order to understand the whole production process and the relationships between cultivation methods and raw material quality.
* Apply the knowledge on processes and technologies to preserve grains and vegetables.
* Make suggestions (also at the field level) in order to sustainably enhance as much as possible the production process of grains and vegetables.

**Opinion autonomy**

At the end of the course the student will be able to:

* Judge the cropping management at the field level and identify corrective actions.
* Carry out objective, and site-specific analysis of the production process of grains and vegetables.

**Communication skills**

At the end of the teaching program the student will be able to:

* Confidently utilize the scientific and technical language related to grain and vegetable production process,
* Properly describe and transfer, by written documents and oral talks, the acquired knowledge.

**Learning skills**

At the end of the teaching program the student will be able to:

* Improve scientific and technical knowledge on how to produce grain and vegetable raw materials.
* Improve scientific and technical knowledge on how to evaluate grain and vegetable raw materials.

***COURSE CONTENT***

|  |  |
| --- | --- |
| Topics | CFU |
| Sustainable agro-ecosystems for producing sustainable raw materials: how to enhance soil fertility and ensure high quality products; conservation soil-crop management practices and precision tools. | 1.0 |
| Steps in the agro-food chain, from cultivation to raw materials. How to assess and manage quality. | 1.0 |
| Cereal grains: Diversity of uses; Morphology and main characteristics; Production process; Assessing and managing quality. | 0.5 |
| Vegetables: Diversity of uses; Morphology and main characteristics; Production process; Assessing and managing quality. | 0.5 |
| Tutorials and visits to raw materials cultivation and/or processing plants | 1.0 |

***READING LIST***

J.A.R. Lockhart-A.J.L. Wiseman, *Lockhart & Wiseman's Crop Husbandry Including Grassland*, Elsevier, 2014.

A.A. Perdon-S.L. Schonauer-K. Poutanen (Eds.)., *Breakfast Cereals and How They Are Made: Raw Materials, Processing, and Production,* Elsevier, 2020.

W.A. Gould, *Tomato production, processing and technology,* Elsevier, 2013.

M. Siddiq-M.A. Uebersax (Eds.), *Dry beans and pulses: Production, processing and nutrition*, John Wiley & Sons, 2012.

***TEACHING METHOD***

* Classroom-taught lessons.
* Interactive lectures with question-and-answer sessions to share point of view on the case studies.
* Tutorials, including visits to vegetable cultivations and/or processing plants.

***ASSESSMENT METHOD AND CRITERIA***

# Oral examination on the above-trated topics and related sources: three questions to each student. Each question is assigned a maximum score of 10/30 as a sum of the following aspects:

# Correctness of the given answer (6 max).

# Capability to answer with technical language, in a critical and personal way (2 max).

# Capability to make connections among subjects and to have a broad vision of the topic (2 max).

***NOTES AND PREREQUISITES***

Attending to lectures is recommended.

***OFFICE HOURS FOR STUDENTS***

Prof. Andrea Fiorini ([andrea.fiorini@unicatt.it](mailto:andrea.fiorini@unicatt.it)) is available to meet students after the lectures by appointment.