# Raw Materials

## Proff. Luigi Bavaresco-Riccardo Negrini-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 to use the wastes from the fresh market.

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**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 an orchard. | 1.0 |

***BREADING LIST***

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

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

# *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.

## MODULE Animal Sources

## Prof. Riccardo Negrini

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

The world population will significantly increase by 2050, from the current seven million to more than nine million inhabitants, and the highest rate of increase is expected in developing countries. The demand for animal products will follow the population growth and increase between 50 and 70%, although with differences between all regions. According to nutritional recommendations, at least one-third of the daily protein requirement should be derived from animal proteins. Also, meat, fish, milk, and eggs, are a valuable source of essential amino acids, micronutrients, and vitamins.

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

This course will explore the concepts driving current livestock food production (population growth, urbanization, emerging affluence, resource constraints, and underlying biological limits) focusing on dairy, meat, eggs, honey, aquaculture. Each major food animal species (dairy, swine, beef, and poultry) will be investigated in terms of quality of their production, life cycles and physiology, constraints to production, production model, and emerging societal issues.

***Knowledge and understanding capability***

Through interactive front lessons and discussions, the student will develop a detailed understanding of environmental, social, and economic factors across a range of livestock sectors and products and to identify specific issues relating to milk, meat, eggs, and aquaculture.

The knowledge acquired will be of particular use to professionals and relevant to anyone across the food industry interested to animal production and production systems.

**Knowledge comprehension and utilization**

By the end of the course, participants will be able to:

- Describe the historical and geographic origin and distribution of livestock species and breeds

- Critically evaluate the challenges and opportunities facing different livestock production sectors

- Critically 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.

- Use appropriate tools to identify reliable information and literature on this topic

**Critical thinking**

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 sources of information.

- Establish which information is most relevant to the problem at hand.

- Improve decision-making skills

**Communication skills**

The course, fostering active interactions and team-working, will empower the ability to:

- Connect and interact with others

- Get the most favorable outcomes from discussions

- Know how to deal with problems, give constructive criticism and handle complaints.

***COURSE CONTENT***

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| --- | --- |
|  | CFU |
| Livestock production systems and models | 0.5 |
| Overview of Milk, Beef, Egg supply chain by species and breeds | 1 |
| Livestock environmental sustainability and adaptation to climatic changes | 0.5 |
| Essentials on livestock breeding and selection | 0.3 |
| Livestock raw materials traceability and authentication | 0.3 |
| Meat and milk quality and valorization | 0.4 |
| Tutorials: Essential on livestock physiology, aquaculture, alternative products and productions | 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*

The slide in power point and the teaching materials used during lessons will be made available through black board.

***TEACHING METHOD***

The course will consist of lectures given by the instructor supported by PowerPoint slides and other materials. The lesson will cover the whole syllabus and will follow logic and sequential *iter*. Seminars on specific topics provided by invited key speakers will complement the lectures

A series of practical exercises and an educational visit to the University experimental farm will complete the course and provide the opportunity to put into practice some of the theoretical notions acquired.

***ASSESSMENT METHOD AND CRITERIA***

The final exam consists of an interview in which the candidate is asked to answer three main questions spanning the whole course syllabus on average. The candidate is also asked to prepare and discuss a PowerPoint presentation (10 sliedes max) on topics of his choice related to the course main arguments.

Each main question counts for 1/3 of the final vote expressed in thirtieths.

Adequate understanding of the topics, acquire of the appropriate technical language, and critical capacity to address questions and propose original solutions compose the assessment methods.

***NOTES AND PREREQUISITES***

Background knowledge of animal physiology and morphology, essential on livestock husbandry, and fundamentals of general and organic chemistry may help during the course

If health restriction measures prevent face-to-face lessons, synchronous or asynchronous lecturing mode will be activated and promptly notified to students.

***OFFICE HOURS FOR STUDENTS***

Il Prof. Riccardo Negrini is available to meet students after the lectures by appointment.

## 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 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: cereals, processing tomato, canned beans and 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***

|  |  |
| --- | --- |
|  | CFU |
| Sustainable agro-ecosystems for producing sustainable raw materials: how to enhance soil fertility and ensure high quality products; the role of conservation soil-crop management practices. | 1.0 |
| The cropping cycle and product chain of the most widespread grains and vegetables raw materials: cereals, dry legumes, processing tomato, fresh canned products (i.e. beans and peas). Imported raw materials. | 1.0 |
| Quality standards and product requirements. | 0.5 |
| Processes and technologies to transform and preserve grain and vegetable raw materials. | 0.5 |
| Tutorials: quality standards evaluation; visit to vegetable cultivations 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.

In case the current Covid-19 health emergency does not allow frontal teaching, remote teaching will be carried out through synchronous or asynchronous procedures that will be promptly notified to students.

***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.

## 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 the 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.
* How to manage quality traits of grains and vegetables along the food chain.
* 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***

|  |  |
| --- | --- |
|  | CFU |
| Sustainable agro-ecosystems for producing sustainable raw materials: how to enhance soil fertility and ensure high quality products; the role of conservation soil-crop management practices. | 1.0 |
| Assessing and managing yield potential and quality traits of grain and vegetable raw materials throughout the stages of the food chain, including breeding, growing, receival, and storage. Quality standards and product requirements. | 1.0 |
| Cropping cycle and product chain of the most widespread grain, including common and durum wheat, maize, and barley. | 0.5 |
| Cropping cycle and product chain of the most widespread vegetables, including processing tomato. | 0.5 |
| Tutorials: visits to (i) CERZOO Research Station, (ii) Consorzio Casalasco del Pomodoro, and (iii) Martino Rossi SPA. | 1.0 |

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

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

C. Wrigley-I. Batey-D. Miskelly, *Cereal Grains - Assessing and managing quality at all stages of the grain chain*. Woodhead Publishing, 2017.

***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***

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