EQVEGAN
European Qualifications & Competences for the Vegan Food Industry
621581-EPP-1-2020-1-PT-EPPKA2-SS

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Deliverable 4.1

Delivered training of trainers for the vegan food industry

Workpackage 4	Implementation of trainings, its quality assurance, certification and recognition
Task 4.1	Implementation of trainings the trainers EQF4 – EQF7
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Foreword

The work described in this guideline was developed under the project EQVEGAN: European Qualifications & Competences for the Vegan Food Industry (621581-EPP-1-2020-1-PT-EPPKA2-SS). If you wish any other information related to this report or the EQVEGAN project please visit the project web-site (www.eqvegan.eu) or contact:

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Dissemination Level		
PU	Public	√
PP	Restricted to other programme participants (including Commission services and projects reviewers)	
CO	Confidential, only for members of the consortium (including EACEA and Commission services and projects reviewers)	

Contents

Summary

EQVEGAN project will provide updated trainings to vegan food industry professionals in order to improve their technical and soft skills in the fast-changing industry. The training materials are prepared for four European Qualifications Framework (EQF) levels, from level 4 to level 7. The occupational profiles tackled by EQVEGAN are "Food Production Operator" (EQF 4), the "Food technician" (EQF 5), the Food Technologist/Engineer (EQF 6 and 7).

Another aspect for the training materials is the train the trainer material for each level, which is the subject of this deliverable. The aim of this deliverable is to guide the trainers who will use the training materials prepared by EQVEGAN project on how they need to conduct the trainings and use the materials. It contains information about the trainings including modules, teaching topics, learning outcomes and the content of trainings.

Implementation of training of trainers in EQVEGAN

Trainings of trainers designed into four modules:

1. **PLANT-BASED PROCESSING TECHNOLOGY,**
2. **GREEN SKILLS,**
3. **DIGITALIZATION AND AUTOMATION,**
4. **SOFT SKILLS**

The training the trainers (TT) in modules are composed of 4 units. In all the training materials, the aim and description of the units are provided, the teaching topics and learning outcomes are defined the whole content is given, the training is presented in the form of video lectures and slides presentations, the reading list and additional resources for unit are suggested, followed by the unit /topic assessment.
The stakeholders of the EQVEGAN were identified and professional's profiles were defined in the first work package of the projects, which constituted the objectives to the design of training. These results are available on the Food Skills portal (food-skills.eu).
The quality of trainings will be assessed for validation and further improvement. Learning outcomes, ECVET and ECTS credits will be validated across the different countries to facilitate the design of a reliable European certification scheme. The certification scheme will be designed to include recognition of prior non-formal and informal learning and guidelines will be issued for guidance by the training organizations.

Trainings of trainers (TT)

The trainings of trainers was delivered **online**, on the ISEKI platform through **texts, presentations** and **videos**. The assessment of the quality of trainings was carried out by the trainees using a questionnaire survey.
The TT trainings provided an overview of the issues to be developed in the trainings for students/professionals from EQF 4 to 7.
The trainers had access to guidelines to implement trainings for EQF 4 to 7 in separate documents (deliverables 2.1 to 2.4).
The following sections identify the aim of the respective module in EQF 4 to 7, a short description of the module, the contents being explored, the suggested reading and link to training materials that the TT trainers can use.

1. PLANT-BASED PROCESSING TECHNOLOGY

The aim of the Plant Based Processing Module is to provide students with knowledge of the quality requirements of plant raw materials used in the production of vegan food, modern methods of producing plant protein as a substitute for animal protein in the vegan diet, technological processes and operations used in the production of plant analogues of animal products.
This module covers the following units:

1. **Vegan and vegetarian diets in Nutrition**
2. **Leguminous products**
3. **Vegetable drinks**
4. **Egg analogues**
5. **Dairy analogues**
6. **Meat analogues**

For TT, this module is restricted to Technologies and Nutrition since it is reasonably expected that the other issues are already covered in the training organizations and thus the training competences are already exist, exempting the need of training.

1.1. VEGAN AND VEGETARIAN DIETS IN NUTRITION

Aim of Unit:

This unit aims to educate participants about the dietary patterns of vegan diets.

Vegan diets, their pros and cons, and the possibilities to increase the nutritional value of plant-based diets from a nutritional point of view. Additionally, the students will learn about the bioavailability of nutrients in vegan diets and methods to reduce anti-nutrients in vegan food. The course emphasizes the basic principles of increasing the nutritional value of vegan diets. Practical aspects of vegan dishes will be presented and discussed. Health-related benefits and threats of plant diet consumption will be discussed based on scientific literature.
Unit is composed of teaching topics:

1. Plant diets – categorization and definitions.
2. Macro- and micronutrients in vegetarian diets. (Nutritional value)
3. Nutrient's bioavailability and bioaccessibility of vegan diets.
4. Protein complementation in vegan diets.
5. Health-related benefits and threats of plant diet consumption.

Description of Unit:

In unit Nutrition, students will become familiar with vegetarian diets categorization. The unit aims to deliver to students knowledge concerning nutritional value of vegan diets in relation to type/restrictivness. Students will learn how to distinguish/analyse deficiencies, identify and avoid them on vegetarian diets in human nutrition. They get acquainted with the bioavailability and bioaccessibility evaluation and modifications on plant diets. Liebig law development in relation to proteins complementation in vegan nutrition will be presented and discussed.
Methods of the diet supplementation and complementation of vegan diet will be presented (training will be performed).
Health-related benefits and threats of plant diets consumption will be analysed basing on population studies.

Learning outcomes:

SUGGESTED LEARNING OUTCOMES FOR LEVEL EQF 4

Students can recognize the differences between vegan and other vegetarian diets and the potential health benefits.

SUGGESTED LEARNING OUTCOMES FOR LEVEL EQF 5

Students understand the adventages and health risk associated with vegan and other vegetarian diets and the potential health benefits.

SUGGESTED LEARNING OUTCOMES FOR LEVEL EQF 6

Students can:
- name and define the basic types of vegetarian diets, descriptions, and rules of their application. food proportions in diets,
- name and define the nutritional value of vegan diets, with distinguishing sources of nutrients, ‘
- name and define rules of bioavailability and bioaccessibility of nutrients in plant diets,
- name and define the basic roles of protein’s complementation on vegetarian dietary patterns,
- name and distinguish risks and benefits in terms of health and non-communicable diseases.

SUGGESTED LEARNING OUTCOMES FOR LEVEL EQF 7

Students can:
- assess the health risks associated with contamination and adulteration of vegan foods and their estimation and reduction
- evaluate detailed nutritional needs of various population groups, as well as the physiological, social and cultural determinants of their diet and the impact of nutrition on public health

VIDEO LECTURE AND SLIDES PRESENTATION

Link to lecture materials:

Register as a stakeholder in the Food Skills portal (https://www.food-skills.eu/) to have access to the materials.

Suggested assessment for students:

Design balanced vegan diet and evaluate nutritional quality for selected groups of consumers (i.e. adult women, men, healthy, diabetic, overweight)

Reading List:

1. Rizzo, N. S., Jaceldo-Siegl, K., Sabate, J., & Fraser, G. E. (2013). Nutrient profiles of vegetarian and nonvegetarian dietary patterns. Journal of the Academy of Nutrition and Dietetics, 113(12), 1610–1619. https://doi.org/10.1016/j.jand.2013.06.349
2. Clarys, P., Deliens, T., Huybrechts, I., Deriemaeker, P., Vanaelst, B., De Keyzer, W., Hebbelinck, M., & Mullie, P. (2014). Comparison of nutritional quality of the vegan, vegetarian, semi-vegetarian, pesco-vegetarian and omnivorous diet. Nutrients, 6(3), 1318–1332. https://doi.org/10.3390/nu6031318
3. Kim, H., et al. (2019). Plant-based diets are associated with a lower risk of incident cardiovascular disease, cardiovascular disease mortality, and all-cause mortality in a general population of middle-aged adults.https://www.ahajournals.org/doi/10.1161/JAHA.119.012865
4. Reinhart, R. J. (2018). Snapshot: Few Americans vegetarian or vegan. https://news.gallup.com/poll/238328/snapshot-few-americans-vegetarian-vegan.aspx
5. Saturated fat. (n.d.). https://www.heart.org/en/healthy-living/healthy-eating/eat-smart/fats/saturated-fats
6. Turner-McGrievy, G. M., et al. (2015). Comparative effectiveness of plant-based diets for weight loss: A randomized controlled trial of five different diets [Abstract].https://www.sciencedirect.com/science/article/abs/pii/S0899900714004237
7. https://www.eatrightpro.org/-/media/eatrightpro-files/practice/position-and-practice-papers/position-papers/vegetarian-diet.pdf
8. Mariotti, François, and Christopher D. Gardner 2019. "Dietary Protein and Amino Acids in Vegetarian Diets—A Review" Nutrients 11, no. 11: 2661. https://doi.org/10.3390/nu11112661
9. Janet R Hunt, Bioavailability of iron, zinc, and other trace minerals from vegetarian diets, The American Journal of Clinical Nutrition, Volume 78, Issue 3, September 2003, Pages 633S–639S, https://doi.org/10.1093/ajcn/78.3.633S
10. Petroski, W., & Minich, D. M. (2020). Is There Such a Thing as "Anti-Nutrients"? A Narrative Review of Perceived Problematic Plant Compounds. Nutrients, 12(10), 2929. https://doi.org/10.3390/nu12102929
11. Dinu M, Abbate R, Gensini GF, Casini A, Sofi F. Vegetarian, vegan diets and multiple health outcomes: A systematic review with meta-analysis of observational studies. Crit Rev Food Sci Nutr. 2017 Nov 22;57(17):3640-3649. doi: 10.1080/10408398.2016.1138447. PMID: 26853923. https://www.vegansociety.com/resources/nutrition-and-health/nutrients/iron
12. Meybeck A, Gitz V. Sustainable diets within sustainable food systems. Proc Nutr Soc. 2017 Feb;76(1):1-11. doi: 10.1017/S0029665116000653. PMID: 28195528.

1.2. LEGUMINOUS PRODUCTS

Aim of Unit:

This unit aims to educate participants about legumes in terms of their applicability in the production of vegan food. Known and used raw materials and products from legumes will be presented. The technology of their production will be described. The topics will include the Bioprocessing of Legumes, Some Important Legumes in Food Products.

Description of Unit:

The training course covers the characteristics of legumes and the possibilities of their use when composing vegan products. Known technologies for treating legumes will be presented. The training will include getting to know the currently known products from legumes and the technologies of their production. Finally, the possibilities of using legumes and a description of the so far used commercial legume products are presented.

Learning outcomes:

SUGGESTED LEARNING OUTCOMES FOR LEVEL EQF 4

Students :

- know the main conservation/preservation technologies and identify the manufacturing phases of leguminous products.
- can identify the factors that influence the quality of leguminous products from receipt of raw materials to dispatch.

SUGGESTED LEARNING OUTCOMES FOR LEVEL EQF 5

Students can:

- Identify the problems inherent in the production, processing and preservation of leguminous products

- describe the technological principles of processing leguminous products
- Apply the general principles of food preservation to leguminous products

SUGGESTED LEARNING OUTCOMES FOR LEVEL EQF 6

Students can:
- create vegetable drinks
- design technology to produce vegetable drinks

SUGGESTED LEARNING OUTCOMES FOR LEVEL EQF 7

Students can:
- appraise theoretical foundations in the field of leguminous products technology and keeps track of current trends, innovations and research directions in this field
- assess the health risks associated with contamination and adulteration of leguminous products and their estimation and reduction
- argue the essence of management systems throughout the food chain to improve vegan food quality
- devise and design a leguminous food product, technological process and packaging in accordance with the technical knowledge and market requirements

VIDEO LECTURE AND SLIDES PRESENTATION

Link to lecture materials:

Register as a stakeholder in the Food Skills portal (https://www.food-skills.eu/) to have access to the materials.

Reading List:

1. Legumes: An Overview | Legumes: Nutritional Quality, Processing and Potential Health Benefits | Books Gateway | Royal Society of Chemistry (rsc.org)
2. https://www.researchgate.net/publication/224829993 Processing and Utilization of Legumes in the Tropics
3. Legumes and Legume Products - Nutrition Facts and Information (medindia.net)
4. Legume-based snacks: a great alternative to industrial products (foodnavigator-usa.com)
5. The Role of Legumes in Human Nutrition | IntechOpen
6. FAO Pulses.pdf (iseki-food.net)
7. Legume processing - an overview.pdf (iseki-food.net)

1.3 VEGETABLE DRINKS

Aim of Unit:

The unit aims to educate participants about the importance of plant-based milk alternatives in nutrition, raw materials used for production, technological processes, the nutritional value of the final products

Description of Unit:

In unit students will become familiar with the importance of plant-based milk alternatives. The Market of dairy alternatives is expected to grow globally from USD 19.79 billion to USD 47.95 billion by 2028. Compound annual growth rate is estimated to be 11,7 % in the period of 2021–2028.

Contributing factors are: health consciousness, environmental reasons, new attractive innovations, ethical reasons, allergies & intolerances

Learning outcomes:

SUGGESTED LEARNING OUTCOMES FOR LEVEL EQF 4

Students :
- know the main conservation/preservation technologies and identify the manufacturing phases of vegetable drinks
- can identify the factors that influence the quality of vegetable drinks from receipt of raw materials to dispatch.

SUGGESTED LEARNING OUTCOMES FOR LEVEL EQF 5

Students can:
- Identify the problems inherent in the production, processing, and preservation of vegetable drinks
- describe the technological principles of processing vegetable drinks

- apply the general principles of food preservation to vegetable drinks

SUGGESTED LEARNING OUTCOMES FOR LEVEL EQF 6

Students can:
- create vegetable drinks
- design technology to produce vegetable drinks

SUGGESTED LEARNING OUTCOMES FOR LEVEL EQF 7

Students can:
- appraise theoretical foundations in the field of vegetable drinks technology and keeps track of current trends, innovations, and research directions in this field
- assess the health risks associated with contamination and adulteration of vegetable drinks and their estimation and reduction
- argue the essence of management systems throughout the food chain to improve vegetable drinks
- devise and design vegetable drinks, technological process and packaging in accordance with the technical knowledge and market requirements

VIDEO LECTURE AND SLIDES PRESENTATION

Link to lecture materials:

Register as a stakeholder in the Food Skills portal (https://www.food-skills.eu/) to have access to the materials.

Suggested assessment for students:

Develop a project with an example of technology of vegetable drinks.

Reading List:

1. Aseptic solutions and UHT treatment for safe food. (n.d.). Retrieved 21 March 2022, from https://www.tetrapak.com/solutions/aseptic-solutions
2. Aydar, E. F., Tutuncu, S., & Ozcelik, B. (2020).
3. Plant-based milk substitutes: Bioactive compounds, conventional and novel processes, bioavailability studies, and health effects. Journal of Functional Foods, 70, 103975. https://doi.org/10.1016/j.jff.2020.103975
4. Carbohydrate Nutrition, Dietary Fiber, Bulking Agents, and Fat Mimetics—Knovel. (n.d.). Retrieved 21 March 2022, from https://app.knovel.com/kn/resources/kpCCFSE003/toc?issue_id=kpCCFSE003&hierarchy=undefined
5. EFSA Panel on Dietetic Products, Nutrition and Allergies (NDA). (2009). Scientific Opinion on the substantiation of health claims related to beta glucans and maintenance of normal blood cholesterol concentrations (n.d.). Retrieved 21 March 2022, from https://efsa.onlinelibrary.wiley.com/doi/epdf/10.2903/j.efsa.2009.1254
6. Kaura | Arctic Food from Finland. (n.d.). Retrieved 21 March 2022, from https://www.arcticfoodfromfinland.fi/fi/kaura
7. LLP, F. M. R. (18.11.2021).
8. Global Dairy Alternatives Market Is Expected to Reach USD 47.95 Billion by 2028: Fior Markets. GlobeNewswire News Room. https://www.globenewswire.com/news-release/2021/11/18/2337552/0/en/Global-Dairy-Alternatives-Market-Is-Expected-to-Reach-USD-47-95-Billion-by-2028-Fior-Markets.ht ml
9. Plant-based drink production. (n.d.). Retrieved 14 March 2022, from https://www.alfalaval.com/industries/food-dairy-beverage/beverage-processing/plant-based-drink-production/
10. Samona, A. (1993). SOYA MILK. In R. Macrae, R. K. Robinson, & M. J. Sadler (Ed.), Encyclopedia of Food Science,food technology and Nutrition (Second Edition) (ss. 4239–4242). Academic Press.
11. Sethi, S., Tyagi, S. K., & Anurag, R. K. (2016). Plant-based milk alternatives an emerging segment of functional beverages: A review. Journal of Food Science and Technology, 53(9), 3408–3423. https://doi.org/10.1007/s13197-016-2328-3
12. Sirén, H. (2020). Baristamaidon säilyvyys sekä baristamaidon ja kaurajuomien toimivuus kahvijuomissa. Helsingin yliopisto. https://helda.helsinki.fi/bitstream/handle/10138/315829/Siren_Heli_Pro_gradu_2020.pdf?sequence=3&isAllowed=y

13. Täydennetyt elintarvikkeet—Vegaaniliitto. (2020, March 16). https://vegaaniliitto.fi/tietoa/taydennetyt-elintarvikkeet/

1.4. EGG ANALOGUES

Aim of Unit:

Unit aims to bring to students knowledge about composition and functions of the basic components of eggs.

Description of Unit:

In unit students will become familiar with the structure, composition and functions of the basic components of eggs. Then the application and products made based on and with the participation of eggs are discussed. the next part of the training covers basic raw materials that are substitutes for the structure and function of eggs. Finally, the basic technologies and equipment necessary for producing egg analogues are discussed, along with examples of commercial products.

Learning outcomes:

SUGGESTED LEARNING OUTCOMES FOR LEVEL EQF 4

Students
- know the main conservation/preservation technologies and identify the manufacturing phases of egg analogues
- can identify the factors that influence the quality of egg analogues from receipt of raw materials to dispatch.

SUGGESTED LEARNING OUTCOMES FOR LEVEL EQF 5

Students can:
- identify the problems inherent in the production, processing and preservation of egg analogues
- describe the technological principals of processing egg analogues
- apply the general principles of food preservation to egg analogues

SUGGESTED LEARNING OUTCOMES FOR LEVEL EQF 6

Students can:
- create egg analogues
- design technology to produce egg analogues

SUGGESTED LEARNING OUTCOMES FOR LEVEL EQF 7

Students can:
- appraise theoretical foundations in the field of egg analogues technology and keeps track of current trends, innovations and research directions in this field
- assess the health risks associated with contamination and adulteration of egg analogues and their estimation and reduction
- argue the essence of management systems throughout the food chain to improve egg analogues
- devise and design egg analogues, technological processes and packaging in accordance with the technical knowledge and market requirements

VIDEO LECTURE AND SLIDES PRESENTATION

Link to lecture materials:

Register as a stakeholder in the Food Skills portal (https://www.food-skills.eu/) to have access to the materials.

Suggested assessment for students:

Develop a technological project for the production of selected egg analogues

Reading list:

1. Introduction (Egg Alternatives — Egg-Truth)
2. Patents cope (WO1989010704 WHOLE EGG ANALOGUE COMPOSITION AND METHOD (wipo.int))
3. Plant-based alternatives: optimizing for functonal properties and applications (Plantbasedeggalternatives.pdf (gfi.org))

4. The science of plant-based foods: Constructing next-generation meat, fish, milk, and egg analogs (The science of plant-based foods: Constructing next-generation meat, fish, milk, and egg analogs - McClements - 2021 - Comprehensive Reviews in Food Science and Food Safety - Wiley Online Library)

1.5. DAIRY ANALOGUES

Aim of Unit:

The purpose of this unit is to familiarize students with the dairy analogues topic, including and introduction, the technology of liquid dairy analogues, fermented dairy analogues, quark analogues, cheese analogues, and spread analogues.

Description of Unit:

In unit diary analogues, students learn that an increasing number of consumers choose plant-based dairy substitutes over conventional dairy products. This is due to various reasons for instance: medical reasons: lactose intolerance, milk protein allergies, as well as other health aspects (avoiding excess cholesterol and concerns about hormone and antibiotic residues in cow's milk), lifestyle choice: sustainability (carbon footprint, greenhouse emissions) and ethical reasons (animal welfare). Statistics show increasing plant-based dairy product consumption is not just a temporary trend. Because of this potential market niche and straightforward manufacturing processes (quite similar to normal dairy manufacturing processes), conventional dairy companies have started manufacturing different plant-based products, especially vegan kinds of milk and yoghurts.

Learning outcomes:

SUGGESTED LEARNING OUTCOMES FOR LEVEL EQF 4

Students :
- know the main conservation/preservation technologies and identify the manufacturing phases of dairy analogues
- can identify the factors that influence the quality of dairy analogues from receipt of raw materials to dispatch.

SUGGESTED LEARNING OUTCOMES FOR LEVEL EQF 5

Students can:
- Identify the problems inherent in the production, processing and preservation of dairy analogues
- describe the technological principles of processing dairy analogues
- apply the general principles of food preservation to dairy analogues

SUGGESTED LEARNING OUTCOMES FOR LEVEL EQF 6

Students can:
- create egg analogues
- design technology to produce egg analogues

SUGGESTED LEARNING OUTCOMES FOR LEVEL EQF 7

Students can:
- appraise theoretical foundations in the field of dairy analogues technology
and keeps track of current trends, innovations and research directions in this field
- assess the health risks associated with contamination and adulteration of dairy analogues and their estimation and reduction
- argue the essence of management systems throughout the food chain to
improve dairy analogues
- devise and design dairy analogues, technological processes and packaging in accordance with the technical knowledge and market requirements

VIDEO LECTURE AND SLIDES PRESENTATION

Link to lecture materials:

Register as a stakeholder in the Food Skills portal (https://www.food-skills.eu/) to have access to the materials

Suggested assessment for students:

Develop a technological project - with an example of technology dairy analogue

Reading list:

1. Jeewanthi R.K.C., Paik H.D. (2018) Modifications of nutritional, structural, and sensory characteristics of non-dairy soy cheese analogs to improve their quality attributes. J Food Sci Technol 55 (11):4384-4394.
2. Tangyu M., Muller J., Bolten C.J., Wittmann C. (2019) Fermentation of plant-based milk alternatives for improved flavour and nutritional value. Appl Microbiol Biot 103:9263-9275.
3. Grossmann L., McClemens D.J. (2021) The science of plant-based foods: Approaches to create nutritious and sustainable plant-based cheese analogs. Trends Food Sci 118:207-229.
4. Laaksonen O., Kahala M., Marsol-Vall A., Blasco L., Järvenpää E., Rosenvald S., Virtanen M., Tarvainen M., Yang B. (2021) Impact of lactic acid fermentation on sensory and chemical quality of dairy analogues prepared from lupine (Lupinus angustifolius L.) seeds. Food Chem 346:128852.
5. Holland B., Welch A.A., Unwin I.D., Buss D.H., Paul A.A. and Southgate, D.A.T. (1991, McCance and Widdowson's The Composition of Foods, 5th edition, Royal Society of Chemistry, Cambridge.
6. Mital B. K., Steinkraus K. H. Fermentation of Soy Milk by Lactic Acid Bacteria. A Review. J Food Prot 1 November 1979; 42 (11): 895–899. doi: https://doi.org/10.4315/0362-028X-42.11.895
7. Mårtensson O., Öste R., Holst O. (2000) Lactic Acid Bacteria in an Oat-based Non-dairy Milk Substitute: Fermentation Characteristics and Exopolysaccharide Formation. LWT - Food Science and Technology, Volume 33, Issue 8.
8. Statista. (2021). Market value of dairy alternatives in Europe from 2014 to 2025, by category (in million U.S. dollars) [Graph]. In Statista. Retrieved June 21, 2022, from https://www.statista.com/statistics/1220817/market-for-dairy-alternatives-in-europe/
9. MRFR. (July 1, 2020). Plant-based food market value in Europe from 2019 to 2026, by country (in million U.S. dollars) [Graph]. In Statista. Retrieved June 21, 2022, from https://www.statista.com/statistics/1284367/plant-based-food-market-in-europe-by-country/
10. Chen S (1989) Preparation of fluid soymilk. In: Proceedings of the World Congress on Vegetable protein Utilization in Human Foods and Animal Feedstuffs pp. 341-351.
11. Deep N Y, Sangita B, Arvind K J, Ranjeet S. Plant Based Dairy Analogues: An Emerging Food. Agri Res & Tech: Open Access J. 2017; 10(2): 555781.

1.6. MEAT ANALOGUES

Aim of Unit:

The purpose of this unit is to familiarize students with the characteristics of the extrusion process used in the production of meat analogues.

Description of Unit:

In unit Meat analogues, students learn about trends and opportunities in the global plant-based meat industry. The term "plant-based meat" is used to refer to plant-based products designed to replace animal meat. This includes products that replicate the taste and texture of meat, as well as products made from plants (such as jackfruit, seitan, tofu, and tempeh) that serve as functional meat replacements. Although fungi and algae are not biologically classified as plants, fungi- and algae-based products are included in this definition of plant-based meat.

Global growth in the plant-based meat industry has exploded over the past few years. Hundreds of plant-based meat startups have been launched in countries as varied as Brazil, China, India, Israel, the Netherlands, and the United States. Many established food and agribusiness companies are launching plant-based product lines, and hundreds of millions of investment dollars are pouring into the plant-based meat space.

Following this trend, the market turned toward vegetable proteins, such as pulses, wheat gluten and soy protein, which are processed into meat-like products, also known as meat analogues. These products approximate certain aesthetic qualities, such as texture, flavor, and color, and nutritional characteristics of specific types of meat. The development of new, attractive food products is a challenge already, but this challenge becomes even greater, considering that these products are meant as a substitute for meat.

Extrusion Techniques for Meat Analogues

Extrusion technology, well-known in the plastics industry, has now become a widely used technology in the agri-food processing industry, where it is referred to as extrusion-cooking. It has been employed to produce so-called engineered food and special feed. Generally speaking, extrusion-cooking of vegetable raw materials deals with the extrusion of ground material at baro-thermal conditions. With the help of shear energy, exerted by the rotating

screw, and additional barrel heating, the food material is heated to its melting point or plasticating point. In this changed rheological status the food is conveyed under high pressure through a die or a series of dies and the product expands to its final shape. This results in very different physical and chemical properties of the extrudates compared to those of the raw materials used.
Extrusion is a widely accepted process for manufacturing protein-based foodstuffs that are used in a variety of textured convenience foods. Extrusion has been used for many years to produce texturized proteins, including spun soy protein isolates and extruded meat analogues, while other technologies, such as 3D printing of proteins, have only recently been introduced. Commercial feasibility has supported the development of three extrusion-based methods for the production of texturized proteins: dry extrusion, wet extrusion, and thermal extrusion.

Learning outcomes:

SUGGESTED LEARNING OUTCOMES FOR LEVEL EQF 4

Students:
- know the main conservation/preservation technologies and identify the manufacturing phases of meat analogues
- can identify the factors that influence the quality of meat analogues from receipt of raw materials to dispatch.

SUGGESTED LEARNING OUTCOMES FOR LEVEL EQF 5

Students:
identify the problems inherent in the production, processing and preservation of meat analogues
- describe the technological principles of processing meat analogues
- apply the general principles of food preservation to meat analogues

SUGGESTED LEARNING OUTCOMES FOR LEVEL EQF 6

Students:
- understand the processes of production of meat analogues
- can tell the difference between meat and plant-based meat analogue products
- are able to design different meat analogues processes utilising conventional extrusion process

SUGGESTED LEARNING OUTCOMES FOR LEVEL EQF 7

Students:
- appraise theoretical foundations in the field of meat analogues technology and keeps track of current trends, innovations and research directions in this field
- assess the health risks associated with contamination and adulteration of meat analogues and their estimation and reduction
- argue the essence of management systems throughout the food chain to improve meat analogues
- devise and design meat analogues, technological processes and packaging in accordance with the technical knowledge and market requirements

VIDEO LECTURE AND SLIDES PRESENTATION

Register as a stakeholder in the Food Skills portal (https://www.food-skills.eu/) to have access to the materials.

SUGGESTED ASSESSMENT FOR STUDENTS:

Development of a project of a meat substitute obtained by extrusion from selected plant material.

Reading List:

1. Arntfield S.D. 2009. Proteins from oil producing plants. In: Yada RY (ed.). Proteins in food processing. England Woodhead Publishing Ltd., pp. 146-175.
2. Bohrer B. M. 2017. Nutrient density and nutritional value of meat products and non-meat foods high in protein. Trends Food Sci. Technol. 65:103.
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2. GREEN SKILLS

The EQVEGAN project designed a module on GREEN SKILLS is focused on the teaching program and the strategy based on sustainability and sustainable development. Knowledge, education and a mindset for Sustainable development should be pillars for future professionals. In the Green Skills module, there should be a highlight on education, research and development, following the United Nations guidelines, the Agenda for Sustainable Development 2030/Guidelines - sustainable development goals. Future technicians, engineers, and technologists should be trained on sustainability, processes and production technologies and components of sustainability in food technology and life sciences.
In the GREEN SKILLS Unit, it is suggested to educate basic and advanced topics in:
1. Society and Visibility (complete), as are the three main pillars of sustainability. Education should always be based and planned to connect scientific research activities and projects within the future cooperation and close connection with industrial applications.
2. Economy, Marketing and Entrepreneurship (in developing basics skills, product development, marketing, entrepreneurship mindset etc).
3. Food Legislation (procedures, by-laws, normative aspects, valorisation etc.).
4. Sustainability (definitions, waste management, lean management, life cycle assessment etc); basic and advanced topics

2.1. SOCIETY AND VISIBILITY

Aim of Unit:

This unit aims to explore the links between the environment and food systems. Students should be guided to develop concerns for the protection of natural resources and ecosystem services. Food systems and also food processing should contribute to the preservation and enhancement of environmental integrity, and contribute more broadly to the Sustainable Development Goals. They also must discuss the cause-effect relationships between environmental and food systems and know which are the environmental performance indicators and tools to analyse the environmental impacts of different dietary options. It is also important to know how to communicate environmental issues to consumers. They should identify opportunities for rationalization of resources and new practices to improve environmental performance and formulate critical environmental thinking associated with processing and vegan diets.

Description of Unit:

In this unit, students will become familiar with the definition of food systems, with their contributions to the Sustainable Development Goals. The unit aims to develop your understanding of the environmental impacts associated with food systems and diets in a context of respect for sustainability principles. It aims to lead you to understand and compare the effects of environmental changes, such as climate change, biodiversity loss, depending on the various food systems and diets, including vegan. It will permit you to understand the importance of approaches to help integrate environmental concerns into food systems and diets and develop simple consumer information tools. You will be engaged with the concept of the environment footprint and associated tools and will compare the environmental performance of conventional and vegan food systems. Also will analyse and interpret data, synthesize information in order to validate conclusions and propose actions for environmental improvement in vegan processing.

Unit is composed of teaching topics:

1. **Food systems concept**
2. **Environment and food systems**
3. **Environmental footprints**

2.1.1. FOOD SYSTEMS CONCEPTS

Aim of Topic:

This topic aims to develop the concept and definition of food systems, exploring their changes over time.

Description of Unit:

In this topic, a general concept of food system is presented first, followed by the concepts of sustainable food and plant-based food systems. The contribution of food systems to the Sustainable Development Goals and the need to adapt to new environmental challenges is explored.

Learning outcomes:

SUGGESTED LEARNING OUTCOMES FOR LEVEL EQF 4 and EQF 5

Students can:

- define food systems
- distinguish between sustainable and vegan food systems
- list the interactions of the food systems with environmental goals and with sdg 2030

SUGGESTED LEARNING OUTCOMES FOR LEVEL EQF 6

Students can:

- distinguish between sustainable and vegan food systems
- explain what 'sustainability' means, in the context of food systems
- analyse the relationship between the different components in the food system with environmental goals and with sdg 2030

SUGGESTED LEARNING OUTCOMES FOR LEVEL EQF 7

Students can:

- distinguish between food systems, sustainable and vegan food systems
- discuss, from an environmental perspective, the differences between sustainable and vegan food systems
- explain the contribution of vegan food systems to sdg 2030
- explore the broad tools that can be used to make food systems sustainable
- develop strategies for communicating about vegan food systems

SLIDES PRESENTATIONS ON TH TOPICS

1. Food systems concepts
2. Sustainable food system
3. Plant-based food system

Link to lecture materials:

Register as a stakeholder in the Food Skills portal (https://www.food-skills.eu/) to have access to the materials.

Reading list:

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4. EU (2020). Towards a Sustainable Food System. Group of Chief Scientific Advisors. doi: 10.2777/282386URL
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2.1.2. ENVIRONMENT AND FOOD SYSTEMS

Aim of Topic:

This topic aims to develop the understanding of the environmental impacts associated with food systems in a context of respect for sustainability principles.

Description of Topic:

In this topic the environmental issues associated with food and related to climate change, water, land use and biodiversity are address. The way to reduce the environment impacts of food is also explored, taken in mind the achievement of the SDGs and the Paris Agreement.

Learning outcomes:

SUGGESTED LEARNING OUTCOMES FOR LEVEL EQF 4 and EQF 5

Students can:

- define food systems
- distinguish between sustainable and vegan food systems
- list the interactions of the food systems with environmental goals and with SDG 2030

SUGGESTED LEARNING OUTCOMES FOR LEVEL EQF 6

Students can:

- explain the environmental impacts of food industry and vegan food processing
- explain how vegan vegan food processing is impacted by environmental threats

SUGGESTED LEARNING OUTCOMES FOR LEVEL EQF 7

Students can:

- distinguish between food systems, sustainable and vegan food systems
- discuss, from an environmental perspective, the differences between sustainable and vegan food systems
- explain the contribution of vegan food systems to sdg 2030
- explore the broad tools that can be used to make food systems sustainable
- develop strategies for communicating about vegan food systems

SLIDES PRESENTATIONS ON THE TOPICS

1. Climate change
2. Water
3. Biodiversity

Link to lecture materials:

Register as a stakeholder in the Food Skills portal (https://www.food-skills.eu/) to have access to the materials.

Reading List:

1. Benton et al. (2021). Food system impacts on biodiversity loss. Energy, Environment and Resources Programme. The Royal Institute of International Affairs-Chatham HouseURL
2. Dawson, I.K., et al. (2019). Contributions of biodiversity to the sustainable intensification of food production – Thematic Study for The State of the World's Biodiversity for Food and Agriculture. FAO, Rome. 38 pp. Licence: CC BY-NC-SA 3.0 IGOURL
3. Dury, S., Bendjebbar, P., Hainzelin, E., Giordano, T. and Bricas, N., eds. 2019. Food Systems at risk: new trends and challenges. Rome, Montpellier, Brussels, FAO, CIRAD and European Commission. DOI: 10.19182/agritrop/00080URL
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2.1.3. ENVIRONMENTAL FOOTPRINTS

Aim of Topic:

This unit aims to develop the concept of environmental footprints and their importance to improve the sustainability of the food system.

Description of Topic:

In this topic, the relationship of environmental footprints to the food industries is analyzed. An overview of footprint indicators in food industries context is made, highlighting the carbon footprint, land footprint and water footprint. Some software tools are explore to evaluate footprints diets.

Learning outcomes:

SUGGESTED LEARNING OUTCOMES FOR LEVEL EQF 4

Students can:

- list the factors that may influence the environmental footprint of food systems
- explain what is the environmental footprint
- recognize the contribute of food to carbon emissions, land and water use (water use, energy use and ghgs)
- explain how the food choices affect the carbon emissions and water use
- recognize the top tips for reducing carbon footprint and water footprint

SUGGESTED LEARNING OUTCOMES FOR LEVEL EQF 5

Students can:

- list the factors that may influence the environmental footprint of food systems
- explain what is the environmental footprint
- recognize the contribute of food to carbon emissions, land and water use (water use, energy use and ghgs)
- explain how the food choices affect the carbon emissions and water use
- recognize the top tips for reducing carbon footprint and water footprint

SUGGESTED LEARNING OUTCOMES FOR LEVEL EQF 6

Students can:

- discuss the factors that may influence the environmental footprint of food systems
- identify environmental performance indicators
- identify appropriate measures of environmental performance of the vegan food processing
- propose and discuss changes on diet to reduce the carbon footprint and the water footprint
- use simple software tools
- design a vegan food consumption survey
- discuss of diet changes to reduce carbon footprint and water footprint

SUGGESTED LEARNING OUTCOMES FOR LEVEL EQF 7

Students can:

- explore the environmental performance indicators associated with sustainable and vegan diet
- discuss the how we collect data from individuals and how to translate that into a measure of impact
- use some tools to collect information about environmental impacts of food systems and diets
- use software tools to evaluate footprints diets, including vegan diet
- discuss appropriate measures of environmental performance of the vegan food processing
- calculate the environmental footprint of vegan diet (using life-cycle assessment)
- propose strategies to reduce environmental footprint
- communicate the environmental footprint of vegan diet

SLIDES PRESENTATIONS ON THE TOPICS:

1. Environmental footprints
2. Environment footprints in the food industries

3. Healthy food and the environment
4. Footprint calculator

Link to lecture materials:

Register as a stakeholder in the Food Skills portal (https://www.food-skills.eu/) to have access to the materials.

Reading list :

1. EEA, 2019. The European environment - state and outlook 2020. Knowledge for transition to a sustainable Europe. Denmark (copy)URL
2. Čuček, L., Klemeš, J., Kravanjab, Z. (2012). A Review of Footprint analysis tools for monitoring impacts on sustainability. Journal of Cleaner Production, 34, 9-20.URL
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5. Galli, A., et al. (2012). Integrating Ecological, Carbon and Water footprint into a "footprint Family" of indicators: definition and role in tracking human pressure on the planet. Ecol. Indicat. 16, 100-112.URL
6. Karwacka, M., et al. (2020). Sustainable Development in the Agri-Food Sector in Terms of the Carbon Footprint: A Review. Sustainability, 12, 6463URL
7. Matustík, J., Kocí, V. (2021). What is a footprint? A conceptual analysis of environmental footprint indicators. Journal of Cleaner Production 285,124833.URL
8. Liu, X., et al. (2021). The land footprint of the global food trade: Perspectives from a case study of soybeans. Land Use Policy, 111, 105764.URL
9. Hoekstra, A.Y., Chapagain, A.K., Aldaya, M.M. & Mekonnen, M.M. (2011) The water footprint assessment manual: Setting the global standard, Earthscan, London, UK. Water Footprint Assessment ManualURL
10. Environmental Water Footprints - Concepts and Case Studies from the Food Sector. Subramanian Senthilkannan Muthu Editor. Springer Nature Switzerland AG, 2019URL
11. Gephart, J. et al. (2016). The environmental cost of subsistence: Optimizing diets to minimize footprints. Science of The Total Environment, 553, 120-127URL
12. H. Westhoek et al. (2014). Food choices, health and environment: effects of cutting Europe's meat and dairy intake. Global Environmental Change 26, 196–205URL
13. Footprint calculator
14. Footprint calculator WWF
15. Quiz

2.2. ECONOMY, MARKETING AND ENTREPRENEURSHIP

Aim of Unit:

This unit aims to introduce the learners with the required green skills in view of today's and tomorrow's environmental challenges that society is facing.

Description of Unit:

The areas of concern covered in this unit include sustainability, vegan food processing, economy and marketing and society and visibility.

The main topics of this unit are:

1. **Circular Economy**
2. **Green Economy**
3. **Introduction to Entrepreneurship**
4. **Traceability**

VIDEO LECTURE AND PRESENTATION

Link to lecture materials:

Register as a stakeholder in the Food Skills portal (https://www.food-skills.eu/) to have access to the materials.

Reading list:

Provided on page 24

2.2.1. CIRCULAR ECONOMY

Aim of Topic:

This topic aims to familiarize learners with the concept of crcular economy.

Description of Topic:

In this topic the learners will be introduced to the concepts of circular economy based on low carbon, resource efficiency and social inclusiveness.

Learning outcomes:

SUGGESTED LEARNING OUTCOMES FOR LEVEL EQF 4

Students can:

- understand role and objectives of business organisations within the economy
- understand the difference between linear and circular economy

SUGGESTED LEARNING OUTCOMES FOR LEVEL EQF 5

Students can:

- identify how value can be created through remanufacturing
- apply theories how to integrate sharing economy in a society

SUGGESTED LEARNING OUTCOMES FOR LEVEL EQF 6

Students can:

- assess the take-make-dispose approach forming the basis of the existing economic system
- apply theories based on circular economy approach to design more sustainable products
- examine theories that enable the shift from a linear model to a circular economy

SUGGESTED LEARNING OUTCOMES FOR LEVEL EQF 7

Students can:

- construct a multidisciplinary view of the ecosystem of ideas, legislation and stakeholders at play in the circular economy

evaluate circular economy opportunities and solutions in an food related organization sector

SLIDES PRESENTATION

Link to lecture materials:

Register as a stakeholder in the Food Skills portal (https://www.food-skills.eu/) to have access to the materials.

Reading list:

Provided on page 24

2.2.2. GREEN ECONOMY

Aim of Topic:

This topic aims to introduce learners with green economy and related topics.

Description of Topic:

This topic covers green economy that is defined as low carbon, resource efficient and socially inclusive. In a green economy, growth in employment and income are driven by public and private investment into such economic activities, infrastructure and assets that allow reduced carbon emissions and pollution, enhanced energy and resource efficiency, and prevention of the loss of biodiversity and ecosystem services.

Learning outcomes:

SUGGESTED LEARNING OUTCOMES FOR LEVEL EQF 4

Students can:

understand an economy based on low carbon, resource efficiency and social inclusiveness
recognise the impact that economic environments leave on the business community

SUGGESTED LEARNING OUTCOMES FOR LEVEL EQF 5

Students can:
identify the main market factors within the green economy
understand the technologies available for green energy

SUGGESTED LEARNING OUTCOMES FOR LEVEL EQF 6

Students can:
examine interdependencies of both local and global environmental problems
evaluate economy of green energy generated from various energy sources

SUGGESTED LEARNING OUTCOMES FOR LEVEL EQF 7

Students can:
support an outlook for the green economy
examine biodiversity and ecosystem services

SLIDES PRESENTATION

Link to lecture materials:

Register as a stakeholder in the Food Skills portal (https://www.food-skills.eu/) to have access to the materials.

Reading list:

Provided on page 24

2.2.3. INTRODUCTION TO ENTREPRENEURSHIP

Aim of Topic:

This topic aims to introduce learners with entrepreneurship and related topics.

Description of Topic:

The working definition of 'entrepreneurship' employed in this unit is that stated by the European Commission: "Entrepreneurship refers to an individual's ability to turn ideas into action. It includes creativity, innovation and taking calculated risk, as well as the ability to plan and manage projects in order to achieve objectives. This supports everyone in day-to-day life at home and in society, makes employees more aware of the context of their work and better able to seize opportunities, and provides a foundation for entrepreneurs establishing a social or commercial activity" (Entrepreneurship in Vocational Education & Training, June 2009).
In line with this definition, the topic places an emphasis on fostering a mind-set that entrepreneurship is the vehicle that drives creativity and innovation. The learner will, amongst others, be encouraged to gain an insight as to how to investigate customer needs and markets to generate an innovative idea for a start-up; participate in the realistic simulation of the creation of a start-up1 ; create and pitch sections of a business plan, as well as draft sections of a business plan for an identified business idea.

Learning outcomes:

SUGGESTED LEARNING OUTCOMES FOR LEVEL EQF 4

Students can:
- examine what it takes to be an entrepreneur and the scope of entrepreneurial ventures
- explore the concept of the entrepreneurial mindset

SUGGESTED LEARNING OUTCOMES FOR LEVEL EQF 5

Students can:
- explain the importance of intrapreneurship in both public and corporate organisations
- examine the growth of entrepreneurial ventures

SUGGESTED LEARNING OUTCOMES FOR LEVEL EQF 6

Students can:

- examine what it takes to be an entrepreneur and the scope of entrepreneurial ventures
- explore the concept of the entrepreneurial mindset

SUGGESTED LEARNING OUTCOMES FOR LEVEL EQF 7

Students can:

- appraise the value of research and development as an essential tool in the development and progress of business activity.
- manage a market strategy, taking into consideration the ethical aspects that a business must take into consideration

SLIDES PRESENTATION

Link to lecture materials:

Register as a stakeholder in the Food Skills portal (https://www.food-skills.eu/) to have access to the materials.

Reading list:

Provided on pages 24

2.2.4. TRACEABILITY

Aim of Topic:

This topic aims to familiarize learners with the concept of traceability.

Description of Topic:

This topic defines traceability as the ability to track any food through all stages of production, processing and distribution (including importation and at retail). Traceability should mean that movements can be traced one step backwards and one step forward at any point in the supply chain.

Learning outcomes:

SUGGESTED LEARNING OUTCOMES FOR LEVEL EQF 4

Studens can:

- identify the traceability regulations applicable to a specific food industry
- understand the principles of food traceability

SUGGESTED LEARNING OUTCOMES FOR LEVEL EQF 5

Students can:

- understand the basic principles of internal traceability and food chain traceability
- discuss objectives and benefits of food traceability

SUGGESTED LEARNING OUTCOMES FOR LEVEL EQF 6

Students can:

- map food processes using flow charts and communication diagrams
- identify critical control points for food quality and traceability

SUGGESTED LEARNING OUTCOMES FOR LEVEL EQF 7

Students can:

- analyse a production supply chain and design a traceability system
- assess the implications involved in product recalls and food fraud

SLIDES PRESENTATION

Link to lecture materials:

Register as a stakeholder in the Food Skills portal (https://www.food-skills.eu/) to have access to the materials.

Suggessted assessment for students:

- The following are the assessment criteria that can be used for this unit:
- Discuss the importance of sustainability in the vegan food industry

- Compare conventional technologies and vegan food processing technologies with respect to energy, water and waste
- Identify the required data to perform sustainability evaluation in vegan food processing
- Discuss the no waste philosophy in the vegan food processing industry
- Map critical points for sustainable vegan food production
- Create a plan to map sustainable production of vegan food
- Differentiate between linear and circular economy
- Explain the importance of an economy based on low carbon, resource efficiency and social inclusiveness
- Plan a food traceability study for a given product
- Discuss the relationship between different components in the food system in relation to SDG2030.
- Propose changes in diet to reduce the carbon and water footprints
- Explain how the vegan food processing is impacted by environmental threats

Reading list:

1 Tim G. Benton et al, 2021. Food system impacts on biodiversity loss, Energy, Environment and Resources Programme
2 McLaren, S., et al., 2021. Integration of environment and nutrition in life cycle assessment of food items: opportunities and challenges. Rome, FAO.
3 Tay, F. (2015), Turning Good Ideas Into Small Businesses
4 Hudson, K (2007), The Idea Generator: Tools for Business Growth
5 Banis, D. (2018). Everything is ready to make 2019 the "year of the vegan". Are you? Forbes, 31 Dec, 2018.
6 Sustainability of the Food System, by Noelia Betoret, Ester Betoret (Editors); Academic Press; 2020
7 Sustainable Production in Food and Agriculture, by Jolanta B. Królczyk, Pawel Sobczak, Wioletta Żukiewicz-Sobczak (Editors), MDPI Books;· 2020
8 Environmental Footprints, by Kai Fang (Editor); Springer (2021)
9 DOWN, S. (2010) Enterprise, Entrepreneurship and Small Business. London: Sage
10 Agnoli, C., Baroni, L., Bertini, I., Ciappellano, S., Fabbri, A., Papa, M., & Sieri, S. (2017). Position paper on vegetarian diets from the working group of the Italian Society of Human Nutrition. Nutrition, Metabolism, and Cardiovascular Diseases, 27(12), 1037–1052.
11 Pojic, M., Misan, A., & Tiwari, B. (2018). Eco-innovative technologies for extraction of proteins for human consumption from renewable protein sources of plant origin. Trends in Food Science & Technology, 75, 93–104

2.3. FOOD LEGISLATION

Aim of Unit:

This unit aims to deepen the learners' knowledge about food legislation and related topics.

Description of Unit:

The Food Legislation unit is designed to provide students with a thorough grounding in all major fields of food laws and regulations related to the vegan industry. The aim of this unit is to educate students about sustainability policy. The unit also aims to explain the concept and importance of food law and legislation. Additionally, the students will get information about regulations related to the production and consumption of vegan foods, such as Food Safety, Food Labeling, Food Contaminants, Additives, GMO, etc. Another aim is to examine the background and terminology of food ethics and food fraud and to introduce key concepts related to control measures to combat the vulnerability to fraud in various cases. The course emphasizes the basic principles of voluntary food labelling and offers the opportunity to illustrate the importance of labelling vegan products in the food industry.

This Food Legislation Unit offers a unique opportunity for students to gain a general overview of food laws and regulations related to the vegan industry. This course examines the role of policies on sustainable food systems, government policies associated with sustainable food systems, Farm to Fork Strategy, and European Legislation on food waste. Students will understand the concept and significance of food law and legislation as well as be aware of Codex Alimentarius and European Union Legislation systems. This course provides an in-depth understanding of the legal framework relating to Food Safety, Food Contact Materials, Food Labeling, Food Contaminants, Pesticides,

Additives, GMO regulations. Through the unit, students will understand the background and terminology for food ethics and food fraud and key concepts related to control measures to combat the vulnerability to fraud in various cases. This unit examines what voluntary food labelling is and why it is important for the vegan industry. Food regulations and standards will be discussed in the context of sustainability, ethics, and science-based principles.
The unit is composed of teaching topics:

1. Food Policy
2. Food law and legislation
3. Food ethics
4. Voluntary labelling

2.3.1. FOOD POLICY

Aim of Topic:

This topic aims to educate learers about food policy and related topics.

Description of Topic:

Food sustainability is about generating food at a productivity level that is enough to maintain the human population. Sustainable food production is related to sustainable farming practices, upholding animal welfare, low environmental impact, protection of public health and good employment practises. Policy plays a significant role in defining the food system of any country, and a sustainable food system is necessary for food security.

Learning outcomes:

SUGGESTED LEARNING OUTCOMES FOR LEVEL EQF 4

Students can state the role of policy in promoting sustainable food practices

SUGGESTED LEARNING OUTCOMES FOR LEVEL EQF 5

Students can:

- recognize the role of policy in promoting sustainable food practices
- describe the government policies associated with sustainable food systems

SUGGESTED LEARNING OUTCOMES FOR LEVEL EQF 6

Students can:

- identify the role of policy in promoting sustainable food practices
- analyse government policies associated with sustainable food systems
- explain European Legislation on Food Waste

SUGGESTED LEARNING OUTCOMES FOR LEVEL EQF 7

Students can:

- identify the role of policy in promoting sustainable food practices
- analyse government policies associated with sustainable food systems
- analyse european legislation on food waste

SLIDES PRESENTATION

Link to lecture materials:

Register as a stakeholder in the Food Skills portal (https://www.food-skills.eu/) to have access to the materials.

Reading list:

- Provided on pages 28-30

2.3.2. FOOD LAW AND LEGISLATION

Aim of Topic:

This units aims to provide in-depth understanding of the legal framework relating to Food Safety, Food Contact Materials, Food Labeling, Food Contaminants, Pesticides, Additives, GMO regulations.

Description of Topic:

In this tipic students will learn about food law and regulations issues. Significant federal regulatory initiatives have been successfully implemented to enhance all aspects of our complex food safety system, including food production and distribution, animal and plant husbandry, processing, transportation, and preparation. Food regulations have a role in helping to perform inspections of food facilities, conduct laboratory analyses of foods, and take enforcement action where infractions result in an unacceptable risk to the public.

Learning outcomes:

SUGGESTED LEARNING OUTCOMES FOR LEVEL EQF 4

Students can:

- recognize the concept of food law and legislation
- state the legal regulations related to the production and consumption process of vegan foods

SUGGESTED LEARNING OUTCOMES FOR LEVEL EQF 5

Students can:

- describe the concept of food law and legislation
- explain the legal regulations related to the production and consumption process of vegan foods
- describe the difference between horizontal and vertical regulations
- prepare a basic report of food legislation used in vegan food processing

SUGGESTED LEARNING OUTCOMES FOR LEVEL EQF 6

Students can:

- understand the concept and significance of food law and legislation as well as be aware of Codex Alimentarius and European Union Legislation systems.
- understand the legal framework relating to Food Safety, Food Contact Materials, Food Labeling, Food Contaminants, Pesticides, Additives, GMO regulations

SUGGESTED LEARNING OUTCOMES FOR LEVEL EQF 7

Students can:

- assess the concept of food law and legislation
- analyse more legal regulations related to the production and consumption process of vegan foods
- explain novel food regulation
- give a seminar about the role of food legislation in vegan food processing

VIDEO LECTURE AND SLIDES PRESENTATION

Link to lecture materials:

Register as a stakeholder in the Food Skills portal (https://www.food-skills.eu/) to have access to the materials.

Reading list:

- Provided on pages 28-30

2.3.3. FOOD ETHICS

Aim of Topic:

The aim of this topic is to examine the background and terminology for food ethics and food fraud.

Description of Topic:

Ethics can be described as the application of morals to human activity. Food ethics is important for the demonstration of moral cognition and the making of ethical choices.

Learning outcomes:

SUGGESTED LEARNING OUTCOMES FOR LEVEL EQF 4

Students can:

- understand the importance of food ethics
- explain food fraud and food authenticity

SUGGESTED LEARNING OUTCOMES FOR LEVEL EQF 5

Students can:

- describe the key characteristics of food ethics and food fraud

- demonstrate relevant control measures to combat the vulnerability to fraud in various cases.
- describe the legislation on food fraud in the EU.
- explain consumer perceptions of food ethics and food fraud

SUGGESTED LEARNING OUTCOMES FOR LEVEL EQF 6

Students can:

- examine the background and terminology for food ethics and food fraud.
- inspect relevant control measures to combat the vulnerability to fraud for various cases
- evaluate legislation on food fraud in the EU
- appraise consumer perceptions of food ethics and food fraud.

SUGGESTED LEARNING OUTCOMES FOR LEVEL EQF 7

Students can:

- assess the background and terminology for food fraud, authenticity.
- select relevant control measures to combat the vulnerability to fraud in various cases.
- appraise legislation on food fraud in the EU.
- interpret the vulnerability assessment tools such as the rapid alert system for food and feed (rasff), emalert etc.

- evaluate consumer perceptions of food ethics and food fraud

Suggested activity (Visit to laboratory) Assignment

SLIDES PRESENTATION

Link to lecture materials:

Register as a stakeholder in the Food Skills portal (https://www.food-skills.eu/) to have access to the materials.

Reading list:

- Provided on pages 28-30

2.3.4. VOLUNTARY LABELLING

Aim of Topic:

The aim of this unit is to evaluate voluntary food labelling system.

Description of Topic:

This unit discusses mandatory information vs. voluntary food labelling. Mandatory information means that information must be included by law while voluntary information can be added to the food package as manufacturers think that it could be useful for the consumer. For instance, ”suitable for vegetarians”. Although some information is not required by law, they are often found on food labels. They are added by the producer or seller voluntarily.

Learning outcomes:

SUGGESTED LEARNING OUTCOMES FOR LEVEL EQF 4

Students can explain what is voluntary food labelling

SUGGESTED LEARNING OUTCOMES FOR LEVEL EQF 5

Students can:

- explain what is voluntary food labelling
- underline the importance of labelling for the vegan industry

SUGGESTED LEARNING OUTCOMES FOR LEVEL EQF 6

Students can:

- evaluate what is voluntary food labelling
- illustrate the importance of labelling for the vegan industry
- analyse the legal regulations related to labelling

SUGGESTED LEARNING OUTCOMES FOR LEVEL EQF 7

students can:

- evaluate what is voluntary food labelling
- interpret the importance of labelling for the vegan industry
- analyse the legal regulations related to labelling
- analyse food standards related to vegan labelling

VIDEO LECTURE AND SLIDES PRESENTATION

Link to lecture materials:

Register as a stakeholder in the Food Skills portal (https://www.food-skills.eu/) to have access to the materials.

Suggested Activity (Visit to processing plant)Assignment

SUGGESTED ASSESSMENT FOR STUDENTS

Describe a basic report of food legislation used in vegan food processing

Give a seminar about the role of food legislation in vegan food processing

Reading list:

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13. Commission Regulation (EU) No 10/2011 of 14 January 2011on Plastic Materials and Articles Intended to Come into Contact with Food (https://eur-lex.europa.eu/legal content/EN/TXT/PDF/?uri=CELEX:32011R0010&from=EN)
14. Commission Regulation (EC) No 450/2009 of 29 May 2009 on Active and Intelligent Materials and Articles Intended to Come into Contact with Food (https://eur-lex.europa.eu/legal-content/EN/TXT/PDF/?uri=CELEX:32009R0450&from=EN)
15. Commission Regulation (EC) No 1881/2006 of 19 December 2006 Setting Maximum Levels for Certain Contaminants in Foodstuffs (https://eur-lex.europa.eu/legal-content/EN/TXT/PDF/?uri=CELEX:32006R1881&from=EN)
16. Commission Regulation (EC) No 1441/2007 of 5 December 2007 amending Regulation (Ec) No 2073/2005 on Microbiological Criteria for Foodstuffs (https://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=OJ:L:2007:322:0012:0029:EN:PDF)

17. Commission Regulation (EC) No 2023/2006 of 22 December 2006 on Good Manufacturing Practice for Materials and Articles Intended to Come into Contact with Food (https://eur-lex.europa.eu/legal-content/EN/TXT/PDF/?uri=CELEX:32006R2023&from=EN)
18. Council Directive of 15 October 1984 on the Approximation of the Laws of The Member States relating to Ceramic Articles Intended to Come into Contact with Foodstuffs (https://eur- lex.europa.eu/legal-content/EN/TXT/PDF/?uri=CELEX:31984L0500&from=EN)
19. Council Regulation (EEC) No 315/93 Of 8 February 1993 Laying Down Community Procedures for Contaminants in Food (https://eur-lex.europa.eu/legal-content/EN/TXT/PDF/?uri=CELEX:31993R0315&from=EN)
20. Codex alimentarius, Understanding Codex. http://www.fao.org/3/ca1176en/CA1176EN.pdf
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24. Commission Regulation (EC) No 1881/2006 of 19 December 2006 Setting Maximum Levels for Certain Contaminants in Foodstuffs (https://eur-lex.europa.eu/legal-content/EN/TXT/PDF/?uri=CELEX:32006R1881&from=EN)
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26. Commission Regulation (EC) No 2023/2006 of 22 December 2006 on Good Manufacturing Practice for Materials and Articles Intended to Come into Contact with Food (https://eur-lex.europa.eu/legal-content/EN/TXT/PDF/?uri=CELEX:32006R2023&from=EN)
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29. Codex alimentarius, Understanding Codex. http://www.fao.org/3/ca1176en/CA1176EN.pdf
30. Commission Directive 2007/42/EC of 29 June 2007 Relating to Materials and Articles Made of Regenerated Cellulose Film Intended to Come into Contact with Foodstuffs (https://eur-lex.europa.eu/legal-content/EN/TXT/PDF/?uri=CELEX:32007L0042&from=EN)
31. Commission Regulation (EU) No 10/2011 of 14 January 2011on Plastic Materials and Articles Intended to Come into Contact with Food (https://eur-lex.europa.eu/legal-content/EN/TXT/PDF/?uri=CELEX:32011R0010&from=EN)
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52. Spink and D.C. Moyer. 2011. Defining the Public Health Threat of Food Fraud. Journal of Food Science, 76, R157, R.158.
53. van Ruth, S. M., Huisman, W., & Luning, P. A. (2017). Food fraud vulnerability and its key factors. Trends in Food Science and Technology, 67, 70-75. https://doi.org/10.1016/j.tifs.2017.06.017

2.4. SUSTAINABILITY

Aim of Unit:

The unit aims to deliver to students what are sustainable vegan processing and plant-based processing.

Description of Unit:

In the unit students should become familiar with general definitions and parameters that stand in terms of sustainable development. Students will compare conventional and vegan food processing technologies. Also, students will be trained to prepare plans for food waste reduction in vegan food processing. There will be education regarding food waste, how to educate consumers on how to treat plant-based products, and how to reduce, reuse and recycle plant-based products.

The unit is composed of the topics:

- Introduction to sustainability
- Energy, water, waste critical points
- Food waste – targeting consumers
- Food by-products
- Waste management

2.4.1. INTRODUCTION TO SUSTAINABILITY

Aim of Topic:

The topic aims to the introduce students to the concept of sustainability.

Description of Topic:

In this topic students will be able to understand the general definitions and parameters that stand in terms of sustainable development. Several points mandatory like Agenda 2030, sustainable development goals (SDG), links to different documents for sustainable development, etc., are here presented

Learning outcomes:

SEGGESTED LEARNING OUTCOMES FOR LEVEL EQF 4

Students can list sustainable parameters

SEGGESTED LEARNING OUTCOMES FOR LEVEL EQF 5

Students can r ecognize sustainable parameters

SEGGESTED LEARNING OUTCOMES FOR LEVEL EQF 6

Students can:

- identify sustainable parameters
- explain vegan food processing in terms of sustainability

SEGGESTED LEARNING OUTCOMES FOR LEVEL EQF 7

Students can:

- identify primary and secondary sustainable parameters
- explain vegan food processing in terms of sustainability
- compare vegan food processing in terms of sustainability with conventional meat processing

VIDEO LECTURE AND SLIDES PRESENTATION

Link to lecture materials:

Register as a stakeholder in the Food Skills portal (https://www.food-skills.eu/) to have access to the materials.

Reading list:

Provided on page 34

2.4.2. ENERGY, WATER, WASTE CRITICAL POINTS

Aim of Topic:

The topic aims to explain energy/water/waste critical points in processing and how food waste in processing can be reduced.

Description of Topic:

Through the Topic, there will be a focus on food by-products and effective usage of by-products in extraction processing and further incorporation of output products. In waste management, it is necessary to establish critical thinking and skills toward future lead in vegan food processing technology. Software will be used to understand, collect and analyse data from vegan food processing plants and analyse data in terms of sustainable parameters.

Learning outcomes:

SEGGESTED LEARNING OUTCOMES FOR LEVEL EQF 4

Students can:

- name conventional technologies and vfp (vegan food processing) and energy/water/ waste critical points in vfp
- relate food waste reduction in vfp with consumers

SEGGESTED LEARNING OUTCOMES FOR LEVEL EQF 5

Students can:

- identify conventional technologies and vfp
- describe energy/water/ waste critical points in vfp

SEGGESTED LEARNING OUTCOMES FOR LEVEL EQF 6

Students can:

- compare conventional technologies with vfp

– distinguish energy/water/ waste critical points in vfp

SEGGESTED LEARNING OUTCOMES FOR LEVEL EQF 7

Students can:

– plan management of mapping energy/water/waste critical points in conventional technologies with vfp
– measure efficiency in energy/water/waste requirements in vfp (usage of life cycle assessment software)

VIDEO LECTURE AND SLIDES PRESENTATION

Link to lecture materials:

Register as a stakeholder in the Food Skills portal (https://www.food-skills.eu/) to have access to the materials.

Reading list:

Provided on page 34

2.4.3. FOOD WASTE – TARGETING CONSUMERS

Aim of Topic:

This topic aims to educate learners on preparing plans for food waste reduction in vegan food processing.

Description of Topic:

In this topic students will be taught about preparing plans for food waste reduction in vegan food processing. There is a suggestion, on how to educate consumers regarding food waste, how to educate consumers how to treat plant-based products, and how to reduce, reuse and recycle plant-based products.

Learning outcomes:

SUGGESTED LEARNING OUTCOMES FOR LEVEL EQF 4

Students can relate food waste reduction in VFP with consumers

SUGGESTED LEARNING OUTCOMES FOR LEVEL EQF 5

Students can discuss food waste reduction in VFP from consumers perspective

SUGGESTED LEARNING OUTCOMES FOR LEVEL EQF 6

Students can:

- create a plan for food waste reduction in VFP
- manage education for consumers regarding sustainability in VFP

SUGGESTED LEARNING OUTCOMES FOR LEVEL EQF 7

Students can:

- create a plan for food waste reduction in vfp
- evaluate most effective plan for waste reduction in vfp
- manage education for consumers regarding sustainability in vfp
- score the consumers knowledge in sustainable indicators and societal impact (usage of life cycle assessment software)

VIDEO LECTURE AND SLIDES PRESENTATION

Link to lecture materials:

Register as a stakeholder in the Food Skills portal (https://www.food-skills.eu/) to have access to the materials.

Reading list:

Provided on page 34

2.4.4. FOOD BY-PRODUCTS

Aim of Topic:

This topic aims to educate learners about food by-products.

Description of Topic:

In this topic larners will be taught about food by-products and effective usage of by-products in extraction processing and further incorporation of output products.

Learning outcomes:

SEGGESTED LEARNING OUTCOMES FOR LEVEL EQF 4

Students can underline possible by-products in VFP

SEGGESTED LEARNING OUTCOMES FOR LEVEL EQF 5

Students can sketch possible by-products in VFP

SEGGESTED LEARNING OUTCOMES FOR LEVEL EQF 6

Students can:
- estimate by-products in VFP
- evaluate food byproducts worth for further processing

SEGGESTED LEARNING OUTCOMES FOR LEVEL EQF 7

Students can:
- estimate by-products in VFP
- rate most valuable by-product from VFP (in terms of nutraceuticals/energy/proteins)(usage of life cycle assessment software)

VIDEO LECTURE AND SLIDES PRESENTATION

Link to lecture materials:

Register as a stakeholder in the Food Skills portal (https://www.food-skills.eu/) to have access to the materials.

Reading list:

Provided on page 34

2.4.5. WASTE MANAGEMENT

Aim of Topic:

This topic aims to educate learners about waste management..

Description of Topic:

In this topic there is information about waste management. There is tutorial and necessity leading on how to establish critical thinking and skills toward future lead in vegan food processing technology. There is also, usage of software and application on how to understand, collect and analyse data from vegan food processing plants and analyse data in terms of sustainable parameters.

Learning outcomes:

SEGGESTED LEARNING OUTCOMES FOR LEVEL EQF 4

Students can discuss data that should be obtained to perform sustainability evaluation in VFP

SEGGESTED LEARNING OUTCOMES FOR LEVEL EQF 5

Students can
- identify data that should be obtained to perform sustainability evaluation in VFP
- demonstrate existing tools for sustainability evaluation in VFP

SEGGESTED LEARNING OUTCOMES FOR LEVEL EQF 6

Students can:
- analyse data obtained from sustainability evaluation in VFP
- apply tools for sustainability evaluation in VFP in complete value chain

SEGGESTED LEARNING OUTCOMES FOR LEVEL EQF 7

Students can:
- analyze data obtained from sustainability evaluation in VFP. On-site case study (visiting to processing plant) and collected data
- justify sustainability evaluation in VFP in complete value chain (case study) – impact to ecology, environment and society. On-site case study (visiting to processing plant) and collected data

VIDEO LECTURE AND SLIDES PRESENTATION

Link to lecture materials:

Register as a stakeholder in the Food Skills portal (https://www.food-skills.eu/) to have access to the materials.

SUGGESTED ASSESSMENTS FOR STUDENTS

SUGGESTED ASSESSMENT FOR EQF 4

State possible ways of reporting sustainability evaluation that should be present in VFP

SUGGESTED ASSESSMENT FOR EQF 5

Describe basic report of sustainability evaluation that should demonstrated in VFP

SUGGESTED ASSESSMENT FOR EQF6

- Quantified sustainability values using software tools for calculations in VFP chain
- Develop plan for food waste consumer education

SUGGESTED ASSESSMENT FOR EQF 7

- Quantified sustainability values using software tools for calculations in VFP chain (usage of life cycle assessment software) (collected reports),
- Developed plan for food waste consumer education Interpret survey analysis results of consumers knowledge of indicators and societal impact

Reading list:

1. Sustainable Food Processing 1st Edition; by Brijesh K. Tiwari (Editor), Tomas Norton (Editor); Nicholas M. Holden (Editor); Elsevier (2013)
2. Sustainable Food Processing and Engineering Challenges; by Charis Michel Galanakis (Editor); Academic Press; 2021
3. Sustainable Food Systems from Agriculture to Industry, by Charis M. Galanakis (Editor); Academic Press; 2018
4. Sustainable Food Waste Management: Concepts and Innovations, by Monika Thakur, V. K. Modi, Renu Khedkar (Editors); Springer; 2021
5. Valorization of Food Processing By-Products; by M. Chandrasekaran (Editor), CRC, 2012
6. Sustainability of the Food System, by Noelia Betoret, Ester Betoret (Editors); Academic Press; 2020
7. Sustainable Production in Food and Agriculture, by Jolanta B. Królczyk, Pawel Sobczak, Wioletta Żukiewicz-Sobczak (Editors), MDPI Books;· 2020

3. DIGITALIZATION AND AUTOMATION

The digitalization and automation module provides an overview of general ICT skills, and various aspects of automation and robotics, as well as some optional courses for professionals in the vegan food industry. The module is divided into four teaching units: automation, ICT, robotics and electives.

In the automation unit, the students familiarize themselves with automated systems. The unit consists of the following topics: introduction to automation, effective cooperation with automation specialists, manual controlling of machines and processes, programmable logic controllers (PLC) – Hardware and Software, vegan food process sensoring and thermal processing control. The students will be able to differentiate between various automation systems and identify the components used in them. They will understand how automation systems work. An understanding about the structure, function and connections of relays and PLC drivers and the more common types of sensors and actuators will occur. The students will learn the idea behind the logic needed in automation technology.

In the ICT unit, the students become familiar with information technology systems. Teaching covers several topics: industry 4.0, ICT and production function (data analysis using BI and Excel). The unit provides information on the digital transformation facing the vegan food industry. The students can use the current softwares, different online services and online learning environment. The students are also able to apply basic information technology skills in new hardware and software environments.

The Robotics unit provides fundamental knowledge of robotics, which allows the students to become familiar with robotic systems. The teaching unit covers several topics: introduction to robotic systems, industrial manipulator robots, related programming languages and techniques and collaborative robotics systems. The students will learn about various types of robots and how to use them in factory automation and other areas where robots are needed. They will know the structure, features and coordinate systems of robots as well as the periphery devices used in robotics. The students will be competent in handling and programming industrial robots on- and offline. The aim is also to provide the students an ability to design and select equipment for the automatic handling of products.

3.1. AUTOMATION

Aim of Unit:

Students will be able to differentiate between various automation systems and identify the components used in them. They will understand how automation systems work. Students will be knowledgeable of the structure, function and connections of relays and PLC drivers and the more common types of sensors and actuators. They will learn the idea behind the logic needed in automation technology.

Description of Unit:

In the Automation course, students will become familiar with automated systems. The unit is composed of teaching topics:

1. Introduction to Automation
2. Effective cooperation with automation specialists
3. Manual controlling of machines and processes
4. Programmable Logic Controllers (PLC)
5. PLC - Hardware
6. PLC - Software
7. Vegan Food Process Sensoring
8. Thermal Processing Control

Learning outcomes:

SUGGESTED LEARNING OUTCOMES FOR LEVEL EQF 4

Students can:

- operate effective cooperation with automation specialists
- recognize manual controlling of machines and processes explain basic understanding of automated systems
- Identify common sensors in the automation of components and use cases for sensors
- Organize PLC and how it can be used in systems control units
- Identify instruments and systems used in process automation, such as control rooms, control instruments and field buses in the process industry

SUGGESTED LEARNING OUTCOMES FOR LEVEL EQF 5

Students can:

- operate effective cooperation with automation specialists
- recognize manual controlling of machines and processes
- explain basic understanding of automated systems
- identify common sensors in the automation of components and use cases for sensors
- organize plc and how it can be used in systems control units
- operate fault diagnostic of automation systems
- analyse solving the fault of automation systems and the whole process

SUGGESTED LEARNING OUTCOMES FOR LEVEL EQF 6

Students can:

- Operate effective cooperation with automation specialists

- recognize manual controlling of machines and processes
- explain basic understanding of automated systems
- identify common sensors in the automation of components and use cases for sensors
- organize plc and how it can be used in systems control units
- design sensoring for specific vegan food processes
- identify online and offline need of sensoring
- identify instruments and systems used in process automation, such as control rooms, control instruments and field buses in the process industry

SUGGESTED LEARNING OUTCOMES FOR LEVEL EQF 7

Students can:

- operate effective cooperation with automation specialist
- recognize manual controlling of machines and processes
- explain basic understanding of automated system
- identify common sensors in the automation of components and use cases for sensors
- organize plc and how it can be used in systems control units
- design sensoring for specific vegan food processes
- identify online/offline need of sensoring
- identify instruments and systems used in process automation, such as control rooms, control instruments and field buses in the process industry

VIDEO LECTURE AND SLIDES PRESENTATIONS

There are documents presenting the following topics

1. Introduction to automation
2. Effective cooperation with automation specialists
3. Manual controlling of machines and processes
4. Programmable Logic Controllers (PLC)
5. PLC – Hardware
6. PLC – Software
7. Vegan food process sensoring
8. Thermal Processing Control
9. Fault diagnostic of automation systems (EQF5)

Link to lecture materials:

Register as a stakeholder in the Food Skills portal (https://www.food-skills.eu/) to have access to the materials.

Reading list:

1. EN 1672-2:2020 Food processing machinery – Basic concepts – Part 2: Hygiene and cleanability requirements.

2. Edgar, T. F., Smith, C. L., Shinskey, F. G., Gassman, G. W., Waite A. W. R., McAvoy, T. J. & Seborg, D. E. (2007). Process control, in Perry's Chemical Engineers' Handbook 8th ed. R. H. Perry, and D. W. Green, eds. McGraw-Hill, New York, NY, US.

3. Fellows, P. J. (2017). Food Processing Technology: Principles and Practice. 4th edition. London: Woodhead Publishing Group.

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Thermal Processing Control:

1. J. Castleman, in Coal Combustion Products (CCP's), 2017
   Gregory W. O'Neil, ... Christopher M. Reddy, in Biofuels from Algae (Second Edition), 2019

2. Z. Boz, ... F. Erdoğdu, in Encyclopedia of Food Microbiology (Second Edition), 2014
   Petr Stehlík, in Handbook of Process Integration (PI), 2013
   P.E.D. Augusto, ... M. Cristianini, in Encyclopedia of Food Microbiology (Second Edition), 2014

SUGGESTED ASSESSMENT FOR STUDENTS:

Project and exam (3h)

RESOURCES

A fully equipped classroom; hardware and software for online teaching;

Suggestions on software:

https://factoryio.com/ 30 day free trial available
https://www.plcfiddle.com/ ladder logic simulator - free.
Siemens Tia Portal - Siemens software
others

3.2. INFORMATION AND COMMUNICATIONS TECHNOLOGY (ICT)

Aim of Unit:

The aims of unit is to familiarize studnets with the digital transformation that faces the vegan food industry.

Description of Unit:

In ICT courses, students will become familiar with information technology systems. They will be able to use the current software, different online services and online learning environment. The student will be able to apply basic information technology skills in new hardware and software environments.
The unit is composed of teaching topics:

1. Industry 4.0
2. ICT
3. Production function, data analysis using BI and Excel

Learning outcomes:

SUGGESTED LEARNING OUTCOMES FOR LEVEL EQF 4

Students can operate with basic ICT (working with human-machine interface; use different software, like traceability, IoT)

SUGGESTED LEARNING OUTCOMES FOR LEVEL EQF 5

Students can:

- operate with basic ICT (working with human-machine interface; use different software, like traceability, IoT)

- arrange version control for natural origin raw material changes and properties
- apply Manufacturing Enterprise System software for documentation

SUGGESTED LEARNING OUTCOMES FOR LEVEL EQF 6

Students can:

- operate with basic ICT (working with human-machine interface; use different software, like traceability, IoT)
- arrange version control for natural origin raw material changes and properties
- apply Manufacturing Enterprise System software for documentation

SUGGESTED LEARNING OUTCOMES FOR LEVEL EQF 7

Students can:

- operate with basic ICT (working with the human-machine interface; use different software, like traceability, IoT)
- arrange version control for natural origin raw material changes and properties
- apply Manufacturing Enterprise System software for documentation

VIDEO LECTURE AND SLIDES PRESENTATIONS

Link to lecture materials:

Register as a stakeholder in the Food Skills portal (https://www.food-skills.eu/) to have access to the materials.

Reading list:

1. Bai, C., P. Dallasega, G. Orzes, and J. Sarkis. 2020. Industry 4.0 technologies assessment: A sustainability perspective. International Journal of Production Economics 229:107776.
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2. Barbut, S. 2020. Meat industry 4.0: A distant future? Animal Frontiers: The Review Magazine of Animal Agriculture 10 (4):38–47.
doi: 10.1093/af/vfaa038.

3. Bottani, E., Vignali, G., & Carlo Tancredi, G. P. (2020). A digital twin model of a pasteurization system for food beverages: Tools and architecture. 2020 IEEE International Conference on Engineering, Technology and Innovation (ICE/ITMC), 1–8.
https://doi.org/10.1109/ICE/ITMC49519.2020.9198625

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doi: 10.1080/00207543.2018.1444806

5. Dalzochio, J., R. Kunst, E. Pignaton, A. Binotto, S. Sanyal, J. Favilla, and J. Barbosa. 2020. Machine learning and reasoning for predictive maintenance in Industry 4.0: Current status and challenges. Computers in Industry 123:103298.
doi: 10.1016/j.compind.2020.103298.

6. Garg, D., Luthra, S., & Mangla, S. K. (ei pvm.). 9.3 Functional Roles of it in SCM. Teoksessa Supply Chain and Logistics Management. New Academic Science. https://app.knovel.com/hotlink/pdf/id:kt012NVIU1/supply-chain-logistics/functional-roles-it-in

7. Hassoun, A., Aït-Kaddour, A., Abu-Mahfouz, A. M., Rathod, N. B., Bader, F., Barba, F. J., Biancolillo, A., Cropotova, J., Galanakis, C. M., Jambrak, A. R., Lorenzo, J. M., Måge, I., Ozogul, F., & Regenstein, J. (2022). The fourth industrial revolution in the food industry—Part I: Industry 4.0 technologies. Critical Reviews in Food Science and Nutrition, 0(0), 1–17. https://doi.org/10.1080/10408398.2022.2034735

8. Hugos, M. (ei pvm.). 4.2.5 Enterprise Resource Planning (ERP). Teoksessa Essentials of Supply Chain Management (4th Edition). John Wiley & Sons. https://app.knovel.com/hotlink/pdf/id:kt0127YA81/essentials-supply-chain/enterprise-resource-planning

9. Jambrak, A. R., M. Nutrizio, I. Djekić, S. Pleslić, and F. Chemat. 2021. Internet of nonthermal food processing technologies (Iontp): Food industry 4.0 and sustainability. Applied Sciences 11:Kayikci, Y., N. Subramanian, M. Dora, and M. S. Bhatia. 2020. Food supply chain in the era of Industry 4.0: Blockchain technology implementation opportunities and impediments from the perspective of people, process, performance, and technology. Prod Plan Control 33:301–321.
doi: 10.1080/09537287.2020.1810757.

10. Khan, P. W., Y. C. Byun, and N. Park. 2020. IoT-blockchain enabled optimized provenance system for Food Industry 4.0 using advanced deep learning. Sensors 20 (10):2990. doi: 10.3390/s20102990.

11. Lee, J., B. Bagheri, and H. A. Kao. 2015. A cyber-physical systems architecture for Industry 4.0-based manufacturing systems. Manufacturing Letters 3:18–23.
doi: 10.1016/j.mfglet.2014.12.001.

12. Lennon Olsen, T., and B. Tomlin. 2020. Industry 4.0: Opportunities and challenges for operations management. Manufacturing & Service Operations Management 22 (1):113–122.
doi: 10.1287/ msom.2019.0796.

13. Scholten, B. (ei pvm.). MES Guide for Executives—Why and How to Select, Implement, and Maintain a Manufacturing Execution System. https://app.knovel.com/hotlink/toc/id:kpMESGEWH2/mes-guide-executives/mes-guide-executives

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SUGGESTED ASSESSMENT FOR STUDENTS:

Project and exam

RESOURCES

A fully equipped classroom; hardware and software for online teaching;

3.3. ROBOTICS

Aim of Unit:

The aims of unit is to teach students about various types of robots, examine robots and learn how to use them in factory automation and other areas where robots are needed.

Description of Unit:

In the Robotics course, students will become familiar with robotic systems. They will know the structure, features and coordinate systems of robots as well as the periphery devices used in robotics. Students will be competent in handling and programming industrial robots on- and offline. The course provides fundamental knowledge of robotics and an ability to design and select equipment for the automatic handling of products.

The unit is composed of teaching topics:

1. Introduction to Robotic Systems
2. Industrial Manipulator Robots
3. Robot Programming Languages and Techniques
4. Collaborative Robotic Systems

Learning outcomes:

SUGGESTED LEARNING OUTCOMES FOR LEVEL EQF 4

Students can:

- identify various types of robots
- identify how to use robots in factory automation and other areas where robotics are used
- recognise the structure, properties, co-ordinations of robots, as well as the additional devices used in robots

SUGGESTED LEARNING OUTCOMES FOR LEVEL EQF 5

Students can:

- identify various types of robots
- identify how to use robots in factory automation and other areas where robotics are used
- recognise the structure, properties, co-ordinations of robots, as well as the additional devices used in robots

SUGGESTED LEARNING OUTCOMES FOR LEVEL EQF 6

Students can:

- identify various types of robots
  operate fault diagnostic of robots
  identify how to use robots in factory automation and other areas where robotics are used
- recognise the structure, properties, co-ordinations of robots, as well as the additional devices used in robots
- operate in handling and programming industrial robots using online and offline methods of programming
- select devices for the automatic handling of products
- integrate devices for the automatic handling of products

SUGGESTED LEARNING OUTCOMES FOR LEVEL EQF 7

Students can:

identify various types of robots

- operate fault diagnostic of robots
- identify how to use robots in factory automation and other areas where robotics are used
- recognise the structure, properties, co-ordinations of robots, as well as the additional devices
- used in robots
- operate in handling and programming industrial robots using online and offline methods of programming
- select devices for the automatic handling of products
- integrate devices for the automatic handling of products

VIDEO LECTURE AND SLIDES PREESENTATION

Link to lecture materials:

Register as a stakeholder in the Food Skills portal (https://www.food-skills.eu/) to have access to the materials.

Reading list:

1. Gupta, A.K. Arora, S.K. Westcott, Jean Riescher. (2017). Industrial Automation and Robotics. Mercury Learning and Information. Retrieved from
https://app.knovel.com/hotlink/toc/id:kpIAR00001/industrial-automation/industrial-automation

2. Habib, Maki K. (2020). Advanced Robotics and Intelligent Automation in Manufacturing. IGI Global. Retrieved from
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3. Jaulin, Luc. (2019). Mobile Robotics (2nd Edition). John Wiley & Sons. Retrieved from
https://app.knovel.com/hotlink/toc/id:kpMRE00014/mobile-robotics-2nd-edition/mobile-robotics-2nd-edition

4. Mullakara, Nandan Asokan, Arun Kumar. (2020). Robotic Process Automation Projects. Packt Publishing. Retrieved from
https://app.knovel.com/hotlink/toc/id:kpRPAP0001/robotic-process-automation/robotic-process-automation

SUGGESTED ASSESSMENT FOR STUDENTS:

Project and exam (4h)

RESOURCES:

A fully equipped classroom; hardware and software for online teaching;RokoDK, KUKA, Yaskawa…

https://robodk.com/ 30 day free trial

4. SOFT SKILLS

Aim of the Unit:

In this unit, the trainer will find materials and methods to develop soft skills in trainees for courses at European Qualifications Framework levels 4 to 7.

This Unit has a different structure and content from the previous Units, due to it specific scope and character of activities.

Description of Unit:

The EQVEGAN project identified the need to train soft skills in food operators (EQF 4), food technicians (EQF 5), and food technologists (EQF 6 and 7). These skills are not the exhaustive list of soft skills for the food industry professionals but are the most relevant ones.

These skills are divided into four groups (Critical and Innovative Thinking, Interpersonal, Intrapersonal and Other) along the several occupations. Check them in the table below.

Domains	**FOOD PRODUCTION OPERATOR**	**FOOD TECHNICIAN**	**FOOD TECHNOLOGIST**
Critical and innovative thinking	Problem solving	Problem solving	Problem solving Critical thinking
Interpersonal skills	Active listening	Active listening	Active listening
	Team working	Team working	Team working Team building management Leadership
Intrapersonal skills			Self-management (time, stress, organization)
			Self-awareness
Other	Ethical understanding	Ethical understanding	Ethical understanding

Although self-awareness and self-management were indicated as relevant skills, the Intrapersonal skills are treated in training where several intrapersonal and interpersonal skills can be dealt with (training with the title Intrapersonal and Interpersonal Skills).

Interpersonal skills such as active listening, teamwork, team building, and leadership have dedicated training sessions.

Problem solving and critical thinking training are included in a training title Problem Solving since the training on one of these skills also develops the other, together with the decision making skill that was not indicated has relevant for the training.

The training here suggested will give you, the trainer, the guidance to implement training of these skills. For each activity, suggestions for the duration, summary, goals, materials, preparation, instructions, debriefing, and evaluation are provided.

THIS TRAINING is recommended to be part of training in technical topics (such as waste management, food technology, etc.).

VIDEO LECTURE

Link to lecture materials:

Register as a stakeholder in the Food Skills portal (https://www.food-skills.eu/) to have access to the materials.

4.1. INTRODUCTION TO INTRAPERSONAL AND INTERPERSONAL SKILLS

Aim of Unit:

The aims of unit is introduce students with the difference between Intrapersonal and Interpersonal Skills.

Description of Unit:

This course starts with the difference between Intrapersonal and Interpersonal Skills. Students eventually discuss the importance of such skills in their personal and working lives. Giving equal importance to both Intrapersonal and Interpersonal Skills, together with suggestions on how these skills can be improved over time, is discussed. The sessions in this course are practical oriented, and students will be encouraged to reflect, share and listen.

VIDEO LECTURE AND PRESENTATION

Link to lecture materials:

Register as a stakeholder in the Food Skills portal (https://www.food-skills.eu/) to have access to the materials.

4.2. ACTIVE LISTENING

Aim of Unit:

This six-hour course aims to make learners familiar with the active listening skill and its importance in both their personal and professional lives.

Description of Unit:

In this unit students will work through watching videos and talks on the subject, and learn and practice some techniques. In this course, the facilitator will find audiovisual and written materials to approach Active Listening. THE EQVEGAN project identified the need to train this skill in food operators (EQF 4), food technicians (EQF 5), and food technologists (EQF 6 and 7).

The training here suggested will give you, the facilitator, the guidance to implement training of this skill.

Learning outcomes	After successful training, students will: -understand that the better they listen the more information they receive and that there are strategies and techniques they can learn to succeed. -be able to define "Active Listening" and recognise its importance for their personal and professional lives. -learn about different techniques to improve Active Listening. -learn how to show they are listening by providing feedback through body language and by showing responsiveness. -understand that Active Listening entails serious issues such as change constructively people's attitudes and promote individual growth.
Learning activities	Readings, pair work, video watching, listening & comprehension exercises, individual work.
Checking for learning	Written and oral summaries of a talk or video; written summary of strategies involved in being a better listener; pair assessment.

ACTIVITY 1: THE MEANING OF ACTIVE LISTENING (60 minutes)

Duration:	60 minutes
Summary:	Students will work to a definition of active listening.
Goals:	Learners will be made aware that active listening is very important in many situations – classroom, workplace, interaction with professors, colleagues, clients, team leaders, etc. It is the most critical of interpersonal communication skills because it reinforces open communication, being an effective way for learners to gain self-understanding, feel

	understood, make the learning-teaching process easier. Moreover, it is a soft skill highly regarded by employers. Learners will be made aware of what it takes to be a good listener.
Materials:	This session is based on discussion after a brainstorming technique to generate ideas. Through the brainstorming technique, learners are invited to come up with their ideas and thoughts about what active listening entails. A video will be watched and a challenge to practise active listening will be provided.
Preparation/Instructions:	Inform students about the topic of the session. Topics that may arise during brainstorm: - A tentative definition of Active Listening – a process by which a person gets information from another person or group. - Its importance for the individual, personally – as is the case with gaining a better control of one's own learning process and in personal relationships; and professionally – helping in job interviews and career development. - It involves paying attention to the speaker, not interrupting, and taking the time to understand what the speaker is discussing. - Understand what the "active" element involves. After a discussion around the ideas put forward and a summary made by the facilitator, learners watch the following video: Please see "Improve Your Listening Skills with Active Listening" activity below! Learners are given a challenge to practise active listening: Please see "Challenge to practise active listening" activity below!
Tips for the facilitators:	Ask questions to understand if advice was successfully apprehended. Make sure all students participate. Ask students to find other websites and materials about active listening.

VIDEO LECTURE AND SLIDES PRESENTATION

Link to lecture materials:

Register as a stakeholder in the Food Skills portal (https://www.food-skills.eu/) to have access to the materials.

ACTIVITY 2: ACTIVE LISTENING TECHNIQUES (60 minutes)

Duration:	60 minutes
Summary:	Learners will understand that there are techniques that can be learned to improve active listening.
Goals:	This session is based on discussion about the different techniques: - Paying attention – be fully focused and concentrated. A high level of sincerity and authenticity is required as the speaker will notice lack of honesty in that respect and it can affect negatively the speaker's performance. - Keeping eye contact – helps in building trust and establish rapport. - Ignoring external distracting factors – such as the mobile phone. - Avoiding interrupting – not to interfere with the speaker's line of thought. - Avoiding judgement and interpreting – it is important to learn open-mindedness – the willingness to listen to and consider other people's ideas and suggestions. - Providing feedback – allows the speaker to get information about how her/his message is being received by the listeners.
Materials:	A TED Talk – "Five Ways to Listen Better" – by Julian Treasure
Preparation/Instructions:	After a discussion on the mentioned techniques, learners are required to watch a TED talk: Please see "TED talk: 5 ways to listen better" activity below!
Tips for the facilitators:	Ask learners to make an oral comment on their usual behaviors regarding the technique they value the most. This allows for self-awareness and reflection.

Video lecture - TED talk: 5 ways to listen better

Julian Treasure: 5 ways to listen better | TED Talk

Link to lecture materials:

Register as a stakeholder in the Food Skills portal (https://www.food-skills.eu/) to have access to the materials.

ACTIVITY 3 – WAYS OF SHOWING ACTIVE LISTENING (120 minutes)

Duration:	120 minutes
Summary:	Learners will be made aware of ways of showing they are listening.
Goals:	Learners will be made aware of ways of showing they are listening by providing feedback through body language and by showing responsiveness. They will be directed to the importance of the use of body language (non-verbal communication through gestures, tone of voice, etc.) and of providing feedback by questioning or asking for clarification.
Materials:	A short article on nonverbal communication. A talk by the facilitator on a topic related to the students' field of studies.
Preparation/Instructions:	The facilitator will choose a topic related to the learners' field of studies as prior knowledge of the study area will help them focusing. Learners are asked: - To listen actively, resorting to body language - nod sometimes, smile and use facial expressions. - To show an attitude of openness and interest (to encourage the speaker to continue). - To provide feedback (with an open mind, leaving on hold personal beliefs and assumptions). - To reflect on what has been said. The facilitator will also provide learners with a few ideas on how to write an effective summary and paraphrase. Learners are asked to read a short article on Nonverbal Communication: Heathfield, S. (2019). Nonverbal Communication in the Workplace. [Online]. Please see "Nonverbal Communication in the Workplace" activity below! A discussion will follow about the examples of body language and other types of nonverbal language.
Tips for the facilitators:	Ask students to write a summary of the main ideas he/she conveyed and moderate a discussion.

PRESENTATION

Link to lecture materials:

Nonverbal Communication in the Workplace (thebalancemoney.com)

ACTIVITY 4: RESPOND APPROPRIATELY (120 minutes)

Duration:	120 minutes
Summary:	This will be a practical session involving pair work.
Goals:	Learners will practise how to: - Respond appropriately. - Learn assertiveness with respect. - Hold judgement. - Paraphrase.
Materials:	- Two one-page texts chosen by the facilitator. - An article by Rogers, C. & Farson, R. (1987). Active Listening
Preparation/Instructions:	A learner will be given a text to read to a classmate and alternate with a different text. Learners are asked: - To listen actively, letting their partners know that they are understanding. - To show an attitude of openness and interest but not interrupting the speaker until he/she finishes. - To allow the speaker to continue and finish each point before asking questions.

	- Both learners are encouraged to obtain information and be honest and open in their responses. - To paraphrase to show understanding. Learners will be given a list of the main important points of the texts they had listened to and will verify whether the main ideas the speaker conveyed were understood Finally, learners are asked to read a brief article on Active Listening: Rogers, C. & Farson, R. (1987). Active Listening. In R. G. Newman; M. A. Danzinger & M. Cohen (Eds). *Communicating in Business Today*. D. C. Heath & Company. Please see "Article on Active Listening" activity below! This reading will prompt a final reflection with learners that might point to some other benefits of active listening such as: - Creating emotional connection. - Facilitating open communication. - Helping to accept criticism well. - Enhancing trust, empathy, diversity, respect…
Tips for the facilitators:	The facilitator may take the opportunity to articulate this session with the first one as it complements the information gathered in the first session. The contents of the article point to difficult issues within a larger scope understanding of serious Active Listening as a driver of changing constructively people's attitudes and promoting individual growth.

Article on Active Listening

ACTIVE LISTENING. by Carl R. Rogers and Richard E. Farson - PDF Free Download (docplayer.net)

4.3. LEADERSHIP, TEAM BUILDING, TEAM WORKING

Aim of Unit:

The aim of this unit is provide materials and methods to develop Leadership, Team Building, Team Working skills in trainees for courses at EQF levels 4 to 7.

Description of Unit:

THE EQVEGAN project identified the need to train teamwork skills in food operators (EQF 4), food technicians (EQF 5) and food technologists (EQF 6 and 7). Additionally, the project team identified the need to develop leadership and team building skills in food technologists.

In this course, the trainer will find materials and methods to develop leadership, team building, team working skills in trainees for courses at EQF levels 4 to 7.

THE EQVEGAN project identified the need to train teamwork skills in food operators (EQF 4), food technicians (EQF 5) and food technologists (EQF 6 and 7).

Additionally, the project team identified the need to develop leadership and team building skills in food technologists.

In this course, you will find the guidance to implement training of these skills.

Leadership (EQF 6 and 7)

Learning template

Learning outcomes	These are the outcomes suggested for this training. After this unit, students are able to… Define leadership. Understand and explain how leadership operates in organizations. Identify his own strengths and development needs as a leader. Assess their own styles of influencing others and of exercising leadership and power Integrate knowledge about the different styles of leadership and influence and understand their impact on behaviour in the workplace Describe qualities and behaviours of effective leaders. Work effectively with other people, by applying leadership techniques related to specific situations.

Learning activities	There are many strategies to approach leadership. Here we will be using the following: Storytelling, Case Study, Role-Playing, (Giving/Taking) Feedback, Discussion, Project-based Learning, and peer and Self-Assessment
Checking for learning	Self and peer assessment; group Project based learning (presentation of group results) (2 hours minimum)
Tips for the facilitators:	There are many resources (on books and websites) about this topic. Dedicate some time to find the ones that better fit your course and students. This is a good example: Haselberger, D., Oberhuemer, P., Perez, E., Cinque, M., & Capasso, F. (2012). Mediating Soft Skills at Higher Education Institutions: Guidelines for the design of learning situations supporting soft skills achievement. Education and Culture DG Lifelong Learning Programme, European Union, 1-133.
Self-Study (Non-Guided Learning)	4 hours (Reading literature)

In the following sections, the trainer will find suggested activities duration, summary, goals, materials, preparation, instructions, debriefing and evaluation.

ACTIVITY 1: DEFINING LEADERSHIPLESSON

Duration:	1 h
Summary:	Students learn basic concepts of leadership
Goals:	Students will be able to define and characterize leadership.
Materials:	Annex 1 (Kruse, K. (2013). What Is Leadership?
Preparation/ instructions:	Ask students to define leadership; in groups make them find one single definition. Then, ask them to read the article by Kruze (2013) and redefine their definitions. Give students the following definition: Leadership is a process of social influence, which maximizes the efforts of others, towards the achievement of a goal. Explain that it is one social and organizational (soft) skill skills of utmost importance in the work place. Ask them if they agree and why? Clarify the definition of leadership as soft skill: If we envisage leadership as a soft skill we may say that it is the ability to motivate and guide others (process of social influence) to get them to contribute effectively and adequately (maximizing the efforts of others) to the attainment of the objectives (towards the achievement of a goal). Ask students if they know any example of a good leader. Ask them to share examples and argue how their examples fit the concept of leadership.

ACTIVITY 2: STORYTELLING AND CASE STUDIES (GROUP WORK): THE ELEMENTS OF GOOD LEADERSHIP LESSON

Duration:	3 hours
Summary:	Students will learn from a number of case studies diverse leadership styles, the importance of context, and the characteristics that make a good leader.
Goals:	To understand what are the characteristics that make a good leader; to understand that leadership is dependent on the context, goals and social environment.
Materials:	Case studies – these may be presented verbally, in work sheets, slides or video; “checklist Principles of leaders”
Preparation:	Gather a few case studies and distribute sheets with the life stories of your chosen models. (Some examples: Martin Luther King, Mother Teresa of Calcutta, Mahatma Ghandi, Nelson Mandela, Steve Jobs, Bill Gates…). Or You may prefer to ask students, in advance, to find out those stories and prepare themselves to present it to their peers. Invite students to read biographies or autobiographies of great leaders

<table>
<tr><td></td><td>(give them examples) and to extract form these life stories the leadership style, mission, values and focus.
Or
You may prefer to use the examples in Annex 2 “7 INSPIRING LEADERSHIP STORIES”.</td></tr>
<tr><td>Instructions:</td><td>Distribute sheets with the life stories of your chosen models.
Inspire the students with this idea: In his autobiography (Long Walk to Freedom), Nelson Mandela compares leadership to shepherding: like the shepherd, the leader "stays behind the flock, letting the most nimble go out ahead, whereupon the others follow, not realizing that all along they are being directed from behind."
In groups, students learn about one of the chosen examples (each group one different case) and prepare a presentation where they summarize the relevant elements and characteristics of the leadership style under their scrutiny.
In plenary students present their cases and extract the qualities of the leader.
Compare the student’s lists and make clear the main qualities they found to be notorious in great leaders.
Distribute the “checklist Principles of leaders” (Annex 3) – make students compare the principles with their findings.
Ask students if such qualities are also present in leaders in the workspace.
Ask them to share stories of good leaders they might know of.
Ask what they think about their own leadership qualities. Ask them to fill in the checklist, now thinking of themselves.
Show them the figure bellow and have them compare and take their own conclusions.

<table><tr><td colspan="2">The Good Leader</td></tr><tr><td>Responsibilities / Roles</td><td>Characteristics</td></tr><tr><td>Manage the operation and administration with clear goals and objectives
Lead and motivate the team and provide them with direction
Manage performance
Solve problems
Care for health, safety and welfare of your people
Support team members in order for them to succeed.</td><td>Clear vision/ Clear focus/ Decisiveness
Integrity /Honesty/ Transparency
Strategic planner/ Creativity
Learn from Failure/ Humility/ Courageous
Trust/ Confidence/ believes in teamwork</td></tr></table></td></tr>
<tr><td>Debriefing and evaluation:</td><td>Conclude with the idea that leadership can be developed (is not innate), is contextual and depends on the mission of the organizations, the goals of the group and aspects such as mentality, culture, resources, etc.</td></tr>
</table>

ACTIVITY 3: ROLE PLAY – DIFFERENT LEADERSHIP STYLESLESSON

Duration:	1 to 3 hours (better to shorten the role play)
Goals:	This exercise helps a group to see how the behaviour of the leader affects the group he or she is working with. It is a good exercise to use at the beginning of a workshop on leadership.
Materials:	chairs, newsprint, prepared papers, markers

	Phase One:
	1. About six volunteers for each of the two role-plays. Each should be asked to act out a meeting of some group with which they are familiar. They are given a task to make a decision on some matter of general interest to the whole group or their experiences at home.
	2. The first leader is told to act the part of a very dictatorial chairperson: to call for ideas, but not listen to people, to squash their suggestions, to impose her/his own point of view on the group, to tell them that it is all their fault etc.
	3. Other members of the group are each given specific roles:
	A is asked to support whatever the chairperson suggests, B suggests several different possibilities, C supports speaker B, D always interrupts and opposes the chairperson, etc.
	These instructions can either be given orally to individuals before doing the play, or be written on slips of papers for each volunteer.
	4. The chairs should be arranged in an open circle in front of the group, so that everyone can see and hear well. The actors should be reminded to speak clearly and make all their gestures clearly visible.
	5. The chairperson starts the play and each person participates in the roles (s)he has been given.
	6. Meanwhile the audience is asked to make notes on the following questions the animator has written down before the play: * What does the leader do in the group? * How does the group react?
	7. When the situation has become clear to the audience, the animator stops the action and asks the second group of six to come to the chairs.
Instructions:	Phase Two:
	8. This is a different committee in a different place, but their task is similar. Most of the members have been given similar instructions about their roles, but this time the chairperson has been asked to be very passive. This style of leadership is called Laissez-faire (= french: “let them do as they like”).
	This leader shows little interest, makes no suggestions, does not respond to suggestions of the group, does not help to reach decisions or solve conflicts.
	9. The audience is asked to take notes.
	10. Again the animator stops the play when the situation has become clear.
	11. If the group is fairly big it is best to let the participants buzz about these questions in three’s for a few minutes before gathering up all the answers in the whole group.
	Phase Three:
	12. After the mistakes and reactions have been thoroughly discussed the animator asks another question: * What does a good facilitator do in a group? (Try to get specific answers-not just general statements!) The answers are recorded on newsprint. Phase Four:
	13. Finally the role-play(s) can be re-acted with someone who volunteers to play the part of a democratic chairperson as effectively as possible; The animator may wish to summarise all the points made by the group and also add points on the role of an animator and a facilitator.

Characteristics of the dictatorial style of leadership:	Characteristics of the laissez-faire style of leadership:	Characteristics of the democratic style of leadership:

	- order, directions and obedience - the leader controls, sets the objectives and watches the realization - the members have to follow and obey - cooperation and creativity of the members are hindered - there is no possibility for the members and for the group to develop	- minimized leadership - the group can act just as it wants - information or help is rarely given - there is no development of the group or of its members	- the leader gives the group and its members sufficient help and information to solve their conflicts or activities on their own - the group learns to accept each other's different abilities and to find them helpful - after a while the group's will to cooperate is not dependent on the leader's presence - the leader will act "as actively as necessary and as passively as possible".
	Think and Discuss:		
	* What kind of structures are necessary to make our leadership a democratic and enabling one?		
Debriefing and evaluation:	* Is one single "chairperson" really able to act democratically or does this structure not promote the dictatorial style of leadership somewhat?		
	- Can we think of other structures in our group or ways of adjusting the existing ones to make them more democratic?		

ACTIVITY 4: PROJECT BASED LEARNING

Duration: 10 hour minimum
Summary and goals:Any project to be developed by the students in teamwork. This should be content specific (to the course EQVEGAN). The project can be developed in another module as long as it implies that students cooperate and for different tasks, different students take the lead. The results should be presented to the class by the team of students and they should elaborate on how each one's leadership abilities influenced the group in terms of achievement, motivation and group cohesion

Teambuilding and teamwork (EQF 6 and 7)

Learning template

Learning outcomes	After this unit, students are able to… Define and differentiate teambuilding and teamwork Understand the functions and objectives of teambuilding and teamwork Experience a few examples of teambuilding and team cooperation activities understand and apply tactics to increase a feeling of connection, cooperation and team engagement Work effectively with other people, by applying leadership and teambuilding techniques related to specific situations.
Learning activities	Reading, brainstorming, group dynamic activities and cooperative games
Checking for learning	Not needed – this topic is part of the Leadership theme
Tips for the facilitators:	There are many online resources about this topic.
Self-Study (Non-Guided Learning)	1 hour (Reading literature, finding activities online)

ACTIVITY 1: DIFFERENTIATING THE CONCEPTS OF TEAM BUILDING AND TEAMWORK: DEFINITIONS, FUNCTIONS AND OBJECTIVES

Duration:	20 minutes
Goals:	to differentiate the concepts of Team Building and Teamwork: definitions, functions and objectives
Materials:	Article – The Difference Between Teamwork and Team Building (https://blog.vantagecircle.com/teamwork-and-team-building/)
	Article – 7 Progressive Tips to Improve Teamwork In The Workplace (https://blog.vantagecircle.com/improve-teamwork/)

ACTIVITY 2: TEAM BUILDING AND TEAMWORK ACTIVITIES

Duration:	Depending on the activities selected among the ones presented below. For a session of 3 hours, include at least 1 or 2 short icebreaker activities and 2-3 other activities so that the participants have the chance to experience intensive immersive teamwork and team building activities.
Goals:	To experience group activities aiming at team building and team cooperation; to lead the group of participants to collaborate as a team and provide group identity.
Activities:	Please see below 'A selection of Workplace team-building activities and games' and chose the most suitable for your context and group. It is suggested that you organize the activities for a duration of about 2-3 hours.

A selection of workplace team-building activities and games

(taken form: https://www.wrike.com/blog/ultimate-guide-team-building-activities/)

Office Trivia	Instructions: Come up with a series of 20-25 trivia questions about your workplace and test your team's knowledge. "What color are the kitchen tiles?" "How many people are in the IT department?" "How many windows are there in the entire office?" "What brand are the computer monitors?" "What month of the year is most common for birthdays among our employees?"
Scavenger Hunt Collaboration Skills & Team Bonding	What you'll need: Pen and paper Instructions: A classic team bonding game. Split everyone into groups and make a list of fun things to find or do outside your office. Make it each team's mission to find and photograph everything on that list within a certain time limit. The first team to complete each item on the list wins!
Salt and Pepper Communication Skills	What you'll need: Tape, a pen, a small piece of paper for each employee, and a list of well-known pairs (think peanut butter and jelly, Mario and Luigi, or salt and pepper). Instructions: Write one half of each pair on the sheets of paper (Mario on one piece, Luigi on another, and so on). Tape one paper to each person's back, then have everyone mingle and try to figure out the word on their back. The rule: they can only ask each other yes or no questions. Once they figure out their word, they need to find the other half of their pair. When they find each other, have them sit down and find three things they have in common while the rest of the team continues.
Masterpiece Murals Team Bonding & Icebreakers	What you'll need: Pre-drawn canvases, paints and brushes, a drop cloth or tarp Instructions: Give each member of your team a canvas and brush, and let everyone create a colorful masterpiece on their canvas. Once they're dry, they can be put together and displayed in your office as a mural, or placed throughout your workspace.
Campfire/Memory Wall Team Bonding & Icebreakers	What you'll need: Post-It notes or a whiteboard Instructions: Write a few general work-related topics on the whiteboard or on sticky notes posted to the wall: "My first day," "Teamwork," "Work travel," etc. Gather your team together and have everyone choose one of the topics and share a story from their time with your company to laugh and bond over shared experiences. You can also pass out sticky notes and have everyone write down positive memories of working together or special team accomplishments. They can use words or pictures to record these memories. Then

	have everyone share their memory and post it on the wall, forming a positive memory cloud.
Company Coat of Arms Team Bonding	What you'll need: Paper, pens, markers Instructions: Have teams create your company coat of arms. In the first space, draw something that represents a recent achievement. In the second space, draw something that reflects your company values. In the third space, draw something that represents where you see the company going in the future. Post the finished coat of arms in your office.
Egg Drop Creative Problem Solving & Collaboration Exercise	What you'll need: A carton of eggs; basic construction materials like newspapers, straws, tape, plastic wrap, balloons, rubber bands, popsicle sticks, etc.; tarp or drop cloth, parking lot, or some other place you don't mind getting messy! Instructions: Divide the group into teams and give each one 20-30 minutes to construct a carrier that will keep an egg safe from a two-story drop (or however high you choose). If you end up with a tie, gradually increase the height of the drop until you're left with a winner.
Paper Plane Contest Collaboration Exercise	What you'll need: A long hallway, tape to mark the launch line, measuring stick, card stock Instructions: This game can be played either indoors or outdoors. Each team gets a piece of card stock to construct a paper plane. Show them a variety of airplane designs and let them work together to construct one they think will fly the farthest. Add to the fun by decorating the planes before launch. The team whose plane flies farthest wins all the glory!
Plane Crash Creative Problem Solving & Collaboration Skills	What you'll need: 20-30 minutes Instructions: Imagine this: the plane carrying your team has crashed on a desert island. Have your group work with 12 items from around the office that they think would be most useful in their survival, ranking each item in order of importance. Alternatively, have individuals make their selections first and then have the group discuss and come to a consensus. This game focuses on communication and negotiation skill-building.
Minefield Creative Problem Solving & Collaboration Exercise	What you'll need: An empty room or hallway, and a collection of common office items Instructions: Use boxes, office chairs, water bottles, etc. to create an obstacle course of "mines" within your empty space. Divide the group into pairs, where one partner is blindfolded. The other must guide that person from one end of the course to another without setting off any mines. The person guiding their partner cannot enter the course and must only use verbal instructions to get their partner through. Depending on the number of people you have and how difficult you want this activity to be, you can vary the number of pairs trying to complete the course at the same time so that pairs have to work harder to listen to each other and communicate clearly.
"Would You Rather" Team Bonding & Icebreakers	(these questions have been taken from https://blog.vantagecircle.com/would-you-rather-questions-for-work/) – In this list of short "Would you rather" questions, you'll find that some are funny, some are unique, and some are quite deep. 1. Would you rather live in a tiny apartment in the city or a house in the middle of nowhere? 2. Would you rather live a regular boring life or that something unexplainable happens to you every day? 3. Which would you choose: being the best at a terrible job or being the worst at your dream job? 4. Which one would you choose: the superhuman ability to read minds or having all of your lies believed? 5. Would you rather eat only fried food or eat only boiled food for the rest of your life? 6. Which would you rather be— a great boss but a terrible human being or a bad boss but a great human being? 7. Would you rather have a magic van that can transport you anywhere and time-travel you back in time or a magic ring that absorbs all of the knowledge inside a book? 8. Would you rather be able to turn sand into water or air into sand? 9. Would you rather be able to eat whatever you want and be perfectly healthy, or have to sleep only one hour every day and be completely rested?

	10. Would you rather own an elephant the size of a hamster or a hamster the size of an elephant? 11. What would you pick if you could either spend the rest of your life in space or live during prehistoric times? 12. Would you rather battle King Kong or Gorilla? 13. Which one is the right choice: cereal first or milk first? 14. Would you rather have the power of stopping time whenever you wanted or the ability to turn invisible? 15. Would you rather have hiccups for the rest of your life or feel the need to sneeze but be unable to do so for the rest of your life? 16. You can either have a great job or a great boss. Which would you choose? 17. Do you prefer to get the good news first or the bad news first? 18. Would you rather travel 00 years in the future or 00 years in the past? 19. You can only eat sweet or spicy foods for the rest of your life. Which would you pick? 20. Would you rather work a short shift of intense work or a long shift of relatively relaxed work for the same pay? 21. Would you rather tell your past self something or ask your future self a question? 22. Would you rather have the ability to forget anything you want or remember everything you've ever done? 23. Cooking or takeout. What would you pick? 24. Which one is superior— pie or cake? 25. Would you rather land your dream job with bad pay or get a bad job with a dream pay? 26. Christmas or new year. What's your pick out of these two holidays? 27. Would you rather play the main character in a bad movie or a supporting role in a good movie? 28. Pineapple over pizzas. Is that a "yes" or "no" from your side? 29. Would you rather never listen to old music again or never listen to new music again? 30. You can strike off either Monday or Friday from your workweek. What would you choose?

READING MATERIALS: The Difference Between Teamwork and Team Building
https://blog.vantagecircle.com/teamwork-and-team-building/

READING MATERIALS: 7 Progressive Tips to Improve Teamwork In The Workplace
https://blog.vantagecircle.com/improve-teamwork/

Teamwork (EQF 4 and 5)

Learning outcomes	After this unit, students are able to… Understand the functions and objectives of teamwork Experience a few examples of team cooperation activities Increase a feeling of connection, cooperation, and team engagement Work effectively with other people by applying teamwork techniques.
Learning activities	Reading, brainstorming, group dynamic activities and cooperative games
Checking for learning	Not needed specific assessment – the assessment of teamwork skills should be part of the assessment in other specific modules.
Self-Study (Non-Guided Learning)	30 minutes (Reading literature)

Learning template

ACTIVITY 1: UNDERSTANDING THE CONCEPTS OF TEAMWORKLESSON

Duration:	3 hours
Goals:	To understand the meaning and importance of teamwork as crucial skill in the workplace

Materials:	Article – 7 Progressive Tips to Improve Teamwork In The Workplace (https://blog.vantagecircle.com/improve-teamwork/)

ACTIVITY 2: TEAMWORK ACTIVITIES

Duration:	Depending on the activities selected among the ones presented below. For a session of 3 hours, include at least 1 or 2 short icebreaker activities and 2-3 other activities so that the participants have the chance to experience intensive immersive teamwork and team building activities.
Goals:	To experience group activities aiming at team cooperation; to lead the group of participants to collaborate as a team and provide group identity.
Activities:	Please see below 'A selection of Workplace team-building activities and games' and chose the most suitable for your context and group.

The meaning of teamwork

WHAT IS TEAMWORK?
Working in a team urges people to come together and collaborate, keeping aside their personal conflicts.
Teamwork is the product of people effectively working together. It is essential for team members to understand the importance of good communication skills, mutual respect, good leadership, and excellent decision-making skills to achieve team goals. Coordination and collaboration of ideas and people who work towards a common objective are called teamwork.
For teams to succeed, they need teamwork and the readiness to accept each other. For members to work as a team, they need to function through teamwork's necessary vital organs. These important aspects are

Defined roles and responsibilities
Strong internal communication
Mutual respect
Accepting people with diverse opinions
Holding discussions before arriving at a consensus
Involving everyone in decision-making processes
Giving everyone the freedom and autonomy to fulfill their functions
Strong leadership skills
Having the required skills and ability to come up with innovative ideas
Being accountable and responsible for their actions

OBJECTIVES OF TEAMWORK

Problem Solving
Diverse opinions and ideas, if harnessed properly, can solve even the most complex set of problems.
There are several teamwork strategies you can utilize to practice problem solving with the members of your team. Teamwork aims to achieve thorough problem solving because it believes that diverse ideas when combined together can lead to effective problem solving. Working in a team exposes people to new ideas, perspectives and learn new problem-solving methods. This also encourages people to share their opinions on matters, improve communication and can actually regulate more collaboration.

Encourage Cooperation
Working in a team requires people to work towards a common goal. This can only be achieved when they give each other a chance to portray their individual expertise. Teamwork's objective is to help employees learn skills like patience, trusting each other, listening and trying to find common ground. These skills will only help team members to open up to each other and participate in the completion of their function.

Improve Team Productivity
When you make a group of skilled people strive towards achieving the same thing, you can get more done in less time. There can be many tasks which are too complex or time-consuming to be undertaken by a single employee.

But when you assign these tasks to a group, they can divide it among themselves and strategize the best possible way to complete it. This saves time, enhances individual performance and increases the team's overall productivity.

A selection of workplace team-building activities and games

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	Would you rather have the ability to forget anything you want or remember everything you've ever done? Cooking or takeout. What would you pick? Which one is superior— pie or cake? Would you rather land your dream job with bad pay or get a bad job with a dream pay? Christmas or new year. What's your pick out of these two holidays? Would you rather play the main character in a bad movie or a supporting role in a good movie? Pineapple over pizzas. Is that a "yes" or "no" from your side? Would you rather never listen to old music again or never listen to new music again? You can strike off either Monday or Friday from your workweek. What would you choose?

4.4. PROBLEM SOLVING

Aim of the Unit:

In this course, the trainer will find materials and methods to develop problem solving skills in trainees for courses at EQF levels 4 to 7.

Description of the Unit:

The training here suggested will give the trainer the guidance to implement training of this skill.

Learning outcomes	After this unit, students will recognize that problem solving and critical thinking are competences that can and should be trained and developed; they will have gathered a few strategies to develop their mental plasticity and ability to decide and solve problems in various personal and professional domains.
Learning activities	Group dynamics; case studies; readings; metacognition; video watching
Checking for learning	Written essay; group problem solving.

In the following sections, the trainer will find suggested activities duration, summary, goals, materials, preparation, instructions, debriefing and evaluation.

ACTIVITY 1: STRATEGIES USED FOR WISE EFFECTIVE PROBLEM SOLVING

Duration:	Students' autonomous reading at own pace
Summary:	Various strategies that can be used by the instructor in various teaching and learning sessions, in order to stimulate creative thinking, creativity, ideation and gathering information and ideas necessary for a reasoned decision and effective problem solving. These activities are generic and can be used in multiple contexts and with problems of different types.
Goals:	Students will learn about strategies and techniques for reasonable problem solving.
Materials:	Links: **See activity "Website: 60+ types of problem solving" below!**
Preparation/ instructions:	Ask students to visit and explore the websites above mentioned and read the suggested articles. In class, use several of the above-mentioned strategies (namely brainstorming), as way to model its efficacious use and relevance. Find here some more ideas: **See activity "Website: The road to a solution - Generating ideas" below!**
Tips for the facilitators:	There are many books and websites about these topics. Dedicate some time to find the ones that better fit your course and students.

Website: 60+ types of problem solving

72 Examples of Problem Solving - Simplicable

Website: The road to a solution - Generating ideas

ITS Education Asia Article - THE ROAD TO A SOLUTION - GENERATING IDEAS

ACTIVITY 2: LEARNING FROM FAILURE, THINKING OUT OF THE BOX

Instructions for Activity 2 Ask students "How do you solve problems? What are your usual strategies for finding the best solution?" Let students discuss the question, present ideas and tell stories on the topic based on their own cases (either in plenary or in small groups). Ask students to recall cases of failure (an unresolved problem, a failed decision) or present them with a few cases of failure for analysis. Then, ask them to review these cases in small groups and list possible reasons for failure and draw out important lessons. Rethink the case studies. In small groups students find creative and more accurate ideas for solving the cases/ problems studies.

ACTIVITY 3: INNOVATIVE SOLUTIONS, THINKING OUT OF THE BOX

Duration:	60 minutes (minimum)
Summary:	Students analyse content related case studies and imagine/ produce innovative solutions for it; the session ends with results presented in a poster session.
Goals:	Case studies – these may be presented verbally, in worksheets, slides or video.
Materials:	Solving real problems and presenting results in a poster session
Preparation:	Gather a few case studies (these should be relevant for the topic of the session and the professional contents being discussed in the course.
Instructions:	See "Instructions for Activity 3" below!
Debriefing and evaluation:	Recognize students' efforts, praise them and guide them through the process and results.
Tips for the facilitators:	Provide students with ideas on how to better find the way to solve the problems: https://www.itseducation.asia/article/finding-possible-solutions

Instructions for Activity 3

ACTIVITY 4: COOPERATIVE PROBLEM SOLVING (THE MARSHMALLOW CHALLENGE)

Duration:	120 minutes
Summary:	The CHALLENGE: Teams of four have to build the tallest free-standing structure in just 18 minutes out of 20 sticks of spaghetti, one yard of tape, one yard of string and a marshmallow. The marshmallow must be on top and cannot be deformed to hold it in place. Detailed instructions (see below) taken from https://www.marshmallowchallenge.com/ Note. Before planning the activity with the students Watch the ted talk by Tom Wujec 'Build a tower, build a team'
Goals:	The Marshmallow Challenge is a cooperative activity where teams build a tower using 20 sticks of spaghetti, 1 yard (91.5 cm) of stream, 1 yard of masking tape and 1 marshmallow. It is also a comparative/ competitive task as the goal is also to build the tallest tower. The activity teaches us that prototyping and rehearsing can

	help achieve success. It also shows that for many activities successful problem solving depends upon teamwork and close collaboration.
Materials:	Items for Each Team 1 marshmallow Any marshmallow brand should be fine as long as they are standard size, measuring around an inch and a half across. Jumbo or mini marshmallows don't work very well, so avoid those. Also, use fresh marshmallows as stale ones are likely not to have the same fluffiness. 20 sticks of spaghetti Obviously, the spaghetti should be uncooked. Use regular spaghetti instead of thicker or thinner types. As a hint, there are about 380 sticks of spaghetti in a one-pound box (or 420 sticks in a 500g box). 1 yard of string The participants will use the string to connect the spaghetti sticks. The string should be reasonably flexible and easy to break with your hand. For more rigid strings, you can include a pair of scissors. 1 yard of masking tape Typically, people tape the spaghetti sticks to the table to stabilise the structure. Some use it to bind sticks together. Any standard masking tape should do the job. Similarly to the string, it should be easy to break the tape with hand, but feel free to include scissors. Paper bag (optional) A letter-size manila envelope or regular size lunch bags should do the trick. You should be able to place all the other items in the bag. Items for the Organiser It would help if you also had the following tools nearby as they are helpful to instruct, drive and judge the exercise. Stopwatch or countdown timer 18 minutes is the recommended time for the marshmallow challenge. It just seems to be the right length, not too short and not too long. You should use a stopwatch or, better still, project an online countdown timer on a screen so every team can see how much time they've got left. Measuring tape You would need a measuring tape, preferably a retractable measuring tape, to measure the height of each team's structure at the end of the challenge. Projector and sound system (optional) You can deliver the marshmallow challenge presentation using a video projector and get a sound system for music during the challenge. Aim to create a playlist that is exactly 18 minutes long so that the end of the last song coincides with the challenge's conclusion.
Preparation:	<u>Step One: Schedule The Event</u> Find a 45-60 minute window where your team can fully concentrate on the challenge. Organise it when the participants are not frustrated or stressed and don't need to run back to work quickly. Marshmallow challenge has been organised for as few as four people to groups with nearly a thousand people. If it's the first time you're managing the exercise, start with fewer people first. Have some idea how you will form the teams; it can help have a smoother start. If people need to self organise at the beginning of the exercise, they might experience frustration, especially if they don't know each other. I found it helpful to ask the participants to organise themselves in groups before the meeting. Alternatively, you can ask the participants to pull numbers from a hat and assign them to teams based on the number. You can also use the existing team structure

	or just define the teams yourself. Choose the way that works best for the participants. If possible, have the same number of people on each team. There's no hard rule for team size; if you want to improve the current team culture, you can use similar to your existing team sizes. However, make sure the teams are not too big. Groups of 4 to 6 members usually function efficiently. Organise the meeting in a room where you can provide each team with a stable table and sufficient space around each table. Don't mention in your invitation that the exercise is about the marshmallow challenge. It would spoil the surprise. - <u>Step Two: Prepare the Necessary Items for Each Team</u> Before the challenge starts, prepare the items for each team. For convenience, place them in a simple paper bag; this will help you distribute everything and add a surprise factor to the exercise.
Instructions:	<u>Step Three: Explain The Rules</u> Each team must understand the goal and the rules of the marshmallow challenge. Rules Should Always Be Visible to Everybody The participants tend to ignore the ones they don't like. So it's crucial to display the rules during the whole exercise and make sure everybody can see them. Use a projector or a whiteboard. It would be best if you repeat the rules a few times. People get too excited or just chatting with their team members, so they don't pay too much attention for the first time. Before progressing to the challenge, ask the teams if they clearly understand the rules. You can even ask them to repeat it with you. Make sure you're using a communication style that's suitable for the actual working culture of the participants. The Goal Build the tallest free-standing structure. The team that builds the tallest structure measured from the table's surface to the top of the marshmallow wins the challenge. The Rules The Structure Must Stand on Its Own The structure shouldn't hang or lean on any other objects. Of course, the participants can do whatever they want during the construction, but they must not hold the structure at the end. The Whole Marshmallow Must Be on Top Teams need to place whole marshmallows at the top of their structure. They must not break it into smaller pieces. Any team that intentionally destroys, hides or eats its marshmallow is disqualified. It happens sometimes. Or prepare a few extra marshmallows. No Need to Use All The Ingredients There's no restriction on how much materials the teams use. They don't need to use all types of ingredients either. The group can use all or no spaghetti sticks at all. The same goes for the string and the tape. However, teams can't use the paper bags for construction. Break The Spaghetti, Cut The Tape And The String Without limitations, teams can break their spaghetti and cut their string or tape into bits to make new structures. The Duration of The Challenge The challenge is 18 minutes long. All teams must stop working on their structure at the 18-minute mark. Any team that attempts to support or hold their structure at the end of the challenge is disqualified.

	<u>Step Four: Begin the Challenge</u> Reiterate that teams only have 18 minutes and then start the countdown timer and music to flag off the challenge. ● Observe and walk the room: Notice how teams get along and peep how they build and innovate their structure. ● Draw the teams' attention to time: Audibly countdown the time at specific intervals. You can call when it's halfway through (9 minutes), 5 minutes, 3 minutes, a minute, and a final 15 seconds countdown. ● Comment on the progress of each team: Raise the bar by encouraging and subtly praising teams that make notable progress. Build healthy competition by inviting teams to take a peek at each other's work. ● Emphasise that holders will be disqualified: Some teams will be tempted to hold or support their structure at the end of the challenge. This is often done in a desperate bid to keep the last marshmallow they placed on their structure before time ran out. The building that wins needs to be free-standing and stable. - <u>Step Five: Conclude the Challenge</u> Once the timer goes off, tell everyone in the room to take a seat away from their structure so everyone can see what each team has done. Usually, about half the teams will have successfully built a free-standing construction. ● Measure each structure: Ideally, from the shortest to the tallest, and call out the heights as you measure. You should have someone record each score for all teams to see. ● Find the winner: Decide the winning team and ensure that they get treated to rousing applause and a prize (if plans were made for one).
Debriefing and evaluation:	<u>Step Five: Conclude the Challenge (Continued)</u> – Conclude with lessons and objectives of the Marshmallow Challenge: You can deliver a presentation if you had one prepared or just round things off with some vital observable lessons. – Kids excel at this challenge more than business students: On almost every form of innovation, children have always found a way to create taller and more intriguing structures. – Prototyping is crucial: Kids and kindergarten tend to outsmart business school students because they spend more time prototyping and playing. Kids will often start by sticking the marshmallows in the sticks and build up from there. Conversely, business school students spend most of the time coming up with a plan. Eventually, they realise that they don't have enough time to finetune the design when the marshmallows go on top. – The Marshmallow challenge exposes the hidden assumptions of a project: The common thought at the beginning of the challenge is that marshmallows are light enough to be supported by spaghetti sticks. However, once you start building the structure, you notice that marshmallows aren't as light as you initially thought. The marshmallow challenge highlights the need to be aware of the assumptions in our projects – the cost of the product, customer preferences, duration of the project – and test them out as soon and as frequently as possible. This is the mechanism that drives innovation.
Reflexion and evaluation	– After the challenge and debrief, let the student talk to each other about the activity and what they learned (10 minutes) – Propose them to watch the ted talk by Tom Wujec 'Build a tower, build a team' – Then, ask the students to write an essay on "Lessons learned from a marshmallow' (20 minutes)

	Note - In the case that this essay is taken as material for assessment students should be informed about that in advance and criteria for evaluation presented to them.
Tips for the facilitators:	– Introduction - Start with a short presentation introducing the challenge. – Goals - Make sure you're very clear about the goal of the exercise, as well as clearly communicating the rules. – You probably want to repeat the rules a few times; people might be playing with the ingredients and not pay enough attention. – Cheating - There are always a few teams who try to bend the rules or even cheat. Make sure they're not getting any unfair advantage. Be encouraging about creative ideas, even if they're slightly bending the rules; announce these attempts loudly. It might help other teams to think outside the box. – Prizes - To encourage healthy competition, offer some prizes for the winning team depending on the team's culture. It can be anything from standing ovation from the other groups, or sweets, books. A huge prize can have a pretty **negative effect* on the performance. – Music - Optionally, to make the exercise less formal, play some music. Select the music based on the environment you're organising the event. Rock, pop music is usually a good choice. However, some groups might prefer classical music. – The volume should be enjoyable and not distracting. If the music is too loud, everybody will start to shout at each other. And the exercise turns into chaos. The recommended length of the challenge is 18 minutes. You can emphasise that with exactly that long playlist; when the music stops, the challenge is over.

4.5. ETHICAL UNDERSTANDING

Aim of Unit:

This unit aims to provide materials and methods to develop the skill ethical understanding in trainees for courses at EQF levels 4 to 7.

Description of Unit:

The EQVEGAN project identified the need to train this skill in food operators (EQF 4), food technicians (EQF 5), and food technologists (EQF 6 and 7).
The training here suggested will give you, the trainer, the guidance to implement training of this skill.

The suggested learning outcomes for this unit to be implemented by you are:

- students will be recognizing the breadth of ethical judgements and factors that affect them;
- they will be able to reflect on an ethical issue and produce sound decisions considering the judgements of different stakeholders.

In the following sections, the trainer will find three suggested activities. First, motivate students by discussing and providing an overview of **ethical issues in the food system**. Second, lead students to **appreciate the diversity of ethics principles** by having them play different stakeholder roles. Third, guide them through the use of an **ethical decision-making** tool to equip them with decision capability on ethical dilemmas.
For each activity, suggestions for the duration, summary, goals, materials, preparation, instructions, debriefing, and evaluation are provided.
Preferably, the training on this skill (and any other soft skill) should be included in another technical-related module (like plant-based processing, food technology, food safety, etc.).

ACTIVITY 1: ETHICS ISSUES IN THE FOOD SYSTEM

Duration:	2h lecture
Summary:	Overview of ethics issues (food fraud, etc.) and what affects moral judgements (ethics principles, stages of moral development, factors that affect moral judgements).

Goals:	Inform students about the different food ethics issues and made them aware that there is not an obvious or correct single ethical judgement.
Materials:	slides
Preparation/ instructions:	Give an overview of food ethics issues, particularly food fraud. Give an overview of what affects moral judgements (ethics principles, stages of moral development, factors that affect moral judgements). Interact with students on each topic: at the start, ask them for examples; make questions all the time.
Tips for the facilitators:	There are many books and websites about these topics. Dedicate some time to finding the ones that better fit your course and students. Costa, R., Pittia, P. eds: Food ethics education. Springer International Publishing (2017) Behave: The biology of humans at our best and worst, Sapolsky, Robert M. Penguin Press: New York, NY. 2017 FAO. 2021. Food fraud – Intention, detection and management. Food safety technical toolkit for Asia and the Pacific No. 5. Bangkok, https://www.fao.org/3/cb2863en/cb2863en.pdf

VIDEO LECTURE

Register as a stakeholder in the Food Skills portal (https://www.food-skills.eu/) to have access to the materials.

ACTIVITY 2: APPRECIATING THE DIVERSITY OF ETHICS PRINCIPLES

Duration:	Introduction 1.5 hours + role playing 1.5 hours + preparation 7 hours = 10 hours
Summary:	Students will put themselves in different roles and reflect on ethical issues.
Goals:	To appreciate possible ethical judgements about the same issue.
Materials:	Case studies – web search on given issues.
Preparation:	Students to search texts, read and reflect on a given case study.
Instructions:	**See "Instructions for Activity 2" below!**
Debriefing and evaluation:	Evaluate the degree to which the student took on the role and if all the arguments of the role were brought into the discussion (note that students have difficulty thinking as policymakers). Ask students for the lessons learned.

Instructions for Activity 2

Divide students into groups, assign to each group an issue (see activity 1), and to each student a role according to the stakeholders (representatives of the food industry, consumers association, policymakers, animal protection association, etc.).

Debate in groups each topic with the teacher moderating the debate.

ACTIVITY 3: ETHICAL DECISION MAKING

Duration:

Introduction 0.5 hours + preparation by students 7 hours + prepare and deliver presentation 3 hours =10.5 hours

Summary:

Students will analyse the ethical judgments in each study case according to the ethical matrix tool.

Goals:

To learn how to use a conceptual tool designed to help decision-makers to reach sound judgements or decisions about the ethical acceptability and/or optimal regulatory controls.

Materials:

Case studies – web search on given issues.

Ethical matrix: https://www.researchgate.net/publication/254833030_Ethical_Matrix_Manual Preparation: Students to search texts, read and reflect on a given case study. Instructions: Explain the ethical matrix of Ben Mepham. Divide students into groups and assign an issue to each group. Students will identify the stakeholders of the issue and fill the ethical matrix. Students present the filled ethical matrix, starting by introducing the issue and justifying how for each stakeholder are respected the ethical principles of wellbeing, autonomy, and fairness. Debriefing and evaluation: Evaluate the degree to which the students reflected and how well they were able to justify their choices. Ask students for the lessons learned.

VIDEO LECTURE

Register as a stakeholder in the Food Skills portal (https://www.food-skills.eu/) to have access to the materials.

5. COURSE QUALITY ASSESSMENT - RESULTS

5.1. EVALUATION BY TRAINEES

In the end of the entire trainings, the trainees were requested to evaluate the courses using the online questionnaire. The results of the survey were collected and elaborated for the purpose of the quality assessment and further improvements, if necessary.

The questions used for the course quality assessment by the trainees relevant to all the Modules are presented below:

Course Evaluation Questionnaire (Training the trainers WP4.1)

Question #	Question
Q1 **Structure rating**	How would you rate the course in terms of structure (logical, easy to follow, confusing)? very good good neutral weak very weak
Q2 **Visual quality**	How would you rate the quality of visuals (images, presentations, videos)? very good good neutral weak very weak
Q3 **Concept clarity**	How easy or difficult was it to understand the concepts ?
Q4 **In-depth topics**	Which topics do you wish were presented more in-depth ? If Yes, What /Why ?
Q5 **Skipping content**	Would you skip any part of the course/training as unnecessary ? If Yes, What /Why ?
Q6 **Course modification**	Would you change any part of the course? if Yes, What / Why ?
Q7	What was the most useful thing that you have learned in this course/training?

Most useful learning	
Q8 **Change in perspective**	Did the course/training make you think differently about a certain topic ? Why ?
Q9 **New unfamiliar topic**	Name one topic that you didn't know anything about.
Q10 **Confidence in application**	How confident are you in applying what you have learned in this course /traning ? confident slightly confident neutral not confident
Q11 **Additional comments**	Do you have any additional comments, questions, or concerns you would like to share?

The detailed evaluation of all the courses is presented in Appendix # 1, attached to this report.

The summary of the evaluation by the Trainees

As the responses to all the Questions are Module and course specific, the comprehensive summary evaluation by the trainees was presented for the 4 Modules (Plant-Based Processing, Green Skills, Digitalization and Automation and Soft Skills), split into relevant courses and selected questions.

Plant-Based Processing Module:

- Positive evaluations of structure, quality, and difficulty.
- In-depth topics suggested: plant-based diets, food processing technologies, sustainability, nutrition, and consumer trends.
- No specific parts recommended to skip.
- Suggestions for changes: more visuals, practical examples, and videos.
- Most useful topics: plant-based food processing technologies, nutritional aspects of plant-based diets, sustainable practices, and consumer trends.
- Changed thinking in plant-based food production, processing methods, sustainability, and nutrition.
- New topics introduced: plant-based food processing, nutritional implications, and sustainable practices.
- Confidence in applying concepts was moderately high, average scores ranging from 3.3 to 3.7 out of 4.

Green Skills Module:

- Positive evaluations of structure, quality, and difficulty.
- In-depth topics suggested: society and visibility, economy, marketing, entrepreneurship, food legislation, and sustainability.
- No specific parts recommended to skip.
- Suggestions for changes: more visuals, interactivity, and video presentations.
- Most useful topics: environmental footprints, climate change, sustainable food systems, circular economy, and green economy.
- Changed thinking in environmental impact, sustainability practices, and climate change.
- New topics introduced: water footprints, sustainability concepts, and European Green Deal practices.
- Confidence in applying concepts moderately high, average scores ranging from 3.7 to 4.7 out of 5.

Digitalization and Automation Module:

- Positive evaluations of structure, quality, and difficulty.
- In-depth topics suggested: automation, ICT, and robotics.
- No specific parts recommended to skip.
- Suggestions for changes: more visuals, video materials, and practical examples.
- Most useful topics: PLCs, sensors, automation, digitalization, IoT, and Industry 4.0/5.0 concepts.
- Changed thinking in automation, digitalization, sensors, and control engineering.
- New topics introduced: PLCs, vegan food processing sensors, and IoT concepts.
- Confidence in applying concepts varies, average scores ranging from 2.9 to 3.6 out of 4.

Soft Skills Module:

- Positive evaluations of structure, quality, and difficulty.
- In-depth topics suggested: intra and interpersonal skills, active listening, leadership, team building, teamwork, problem solving, and ethical understanding.
- No specific parts recommended to skip.
- Suggestions for changes: more interactivity, visuals, and video presentations.
- Most useful topics: intrapersonal and interpersonal skills, active listening, differences between teamwork and team building, problem-solving techniques, and ethical understanding.
- Changed thinking in personal growth, communication, and problem-solving.
- New topics introduced: active listening challenges, leadership roles, and ethical matrix concepts.
- Confidence in applying concepts varies, average scores ranging from 3.1 to 3.6 out of 4.

Summary of Differences:

- Content focus: Each module has a distinct content focus, ranging from sustainability and green skills to digitalization and automation, soft skills, and plant-based processing.
- Areas for improvement: The modules share the need for more visuals, practical examples, interactivity, and video presentations to enhance the learning experience.
- Most useful topics: Topics vary significantly across the modules, reflecting their unique themes. The most useful topics include plant-based food processing, sustainability practices environmental footprints, automation technologies, and active listening.
- Confidence in application: Confidence levels in applying concepts differ among the modules, with Plant-Based Processing exhibiting moderate to high confidence, Green Skills showing high confidence, Digitalization and Automation showing varying levels, and Soft Skills demonstrating higher confidence.

5.2 EVALUATION BY TRAINERS

In the end of the entire trainings, the trainers were requested to evaluate the courses using the online questionnaire. The results of the survey were collected and elaborated for the purpose of the quality assessment and further improvements, if necessary.

The questions used for the course quality assessment by the trainers are presented below:

Question #	Question
Q1 **Qualifications**	What professional qualifications do You have? (diploma, academic degree, position, other)
Q2 **Experience**	What experience You have got in professional teaching ? number of years in teaching

	number of years in preparing online training
Q3 **Employment**	What is your current employment ? institution, place, country
Q4 **Difficulties**	Did you encounter any difficulties during the preparation of the on-line training ? If yes, please explain
Q5 **Improvement**	If a second round of trainings would take place, would you change or improve anything in the content of your trainings? If Yes, please explain
Q6 **Overall satisfaction**	How do you evaluate your overall satisfaction from performing the on-line trainings ? very satisfied satisfied moderately satisfied unsatisfied

The detailed evaluation is presented in Appendix # 2, attached to this report.
The summary of the evaluation by the Trainers

Professional qualifications:

- Most of teachers involved in the training of trainers responded to evaluation questionnaire (16 out of 18).
- All respondents had academic degree, most of them were academics but did not indicate their position, 2 indicated professor position, 1 adjunct and 1 R&D menager.

Experience:

- The majority of respondents declared a long track record in teaching (10-20 years and over 20 years), with the average of 18 years.
- Average experience in online training amounted to almost 3,7 years.

Employment:

- Majority of trainers were academic professionals represented various universities across Europe, some trainers were affiliated in the government institution in Türkiye.

Difficulties:

- Almost all teachers declared that they experienced no difficulties.
- One person was not sure if all the infromation introduced and the activities were the best for an online training.

Improvement:

- The majority of participants declared that they wouldn't introduce changes to the content of the training.
- The remaining persons suggested some particular points for improvement.

Overall satisfaction:

- The respondents were very satisfied and satisfied, no one reported dissatisfaction.

Appendix 1 - COURSE QUALITY ASSESSMENT BY TRAINEES - DETAILED RESULTS

Course Evaluation Questionnaire (Training the trainers WP4.1)

Question #	Question
Q1 **Structure rating**	How would you rate the course in terms of structure (logical, easy to follow, confusing)? very good good neutral weak very weak
Q2 **Visual quality**	How would you rate the quality of visuals (images, presentations, videos)? very good good neutral weak very weak
Q3 **Concept clarity**	How easy or difficult was it to understand the concepts ?
Q4 **In-depth topics**	Which topics do you wish were presented more in-depth ? If Yes, What /Why ?
Q5 **Skipping content**	Would you skip any part of the course/training as unnecessary ? If Yes, What /Why ?
Q6 **Course modification**	Would you change any part of the course? if Yes, What / Why ?
Q7 **Most useful learning**	What was the most useful thing that you have learned in this course/training?
Q8 **Change in perspective**	Did the course/training make you think differently about a certain topic ? Why ?
Q9 **New unfamiliar topic**	Name one topic that you didn't know anything about.
Q10 **Confidence in application**	How confident are you in applying what you have learned in this course /traning ? confident slightly confident neutral not confident
Q11 **Additional comments**	Do you have any additional comments, questions, or concerns you would like to share?

1. Course Evaluation Results - PLANT BASED PROCESSING

1.1. COURSE - VEGAN AND VEGETARIAN DIETS IN NUTRITION*

*the number of the question(s) from the survey referring to the selected topic is provided in brackets e.g. [Q1]

[Q1-Q3] Evaluation of structure, quality and difficulty

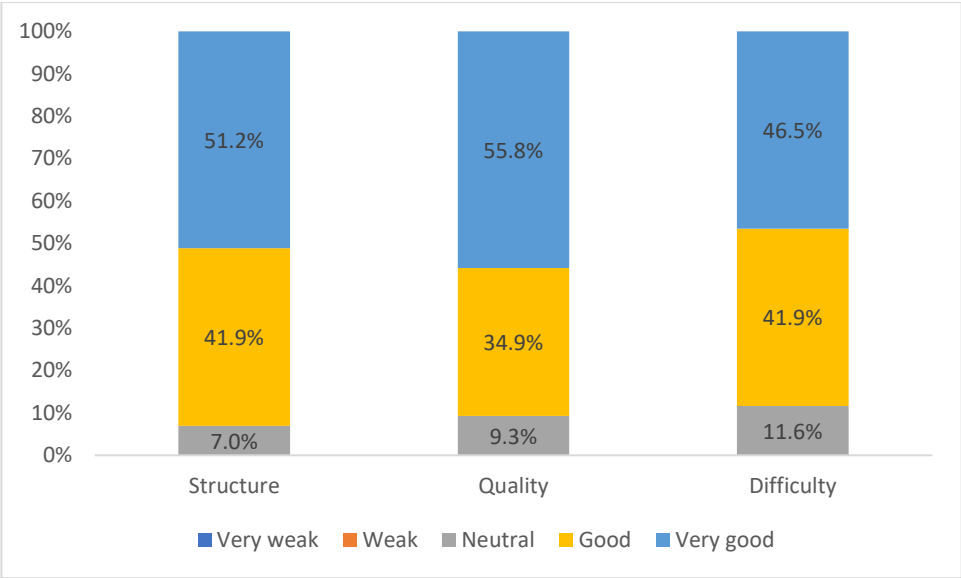

Fig. 1. General evaluation of the course
Source: own elaboration based on survey data, n=43

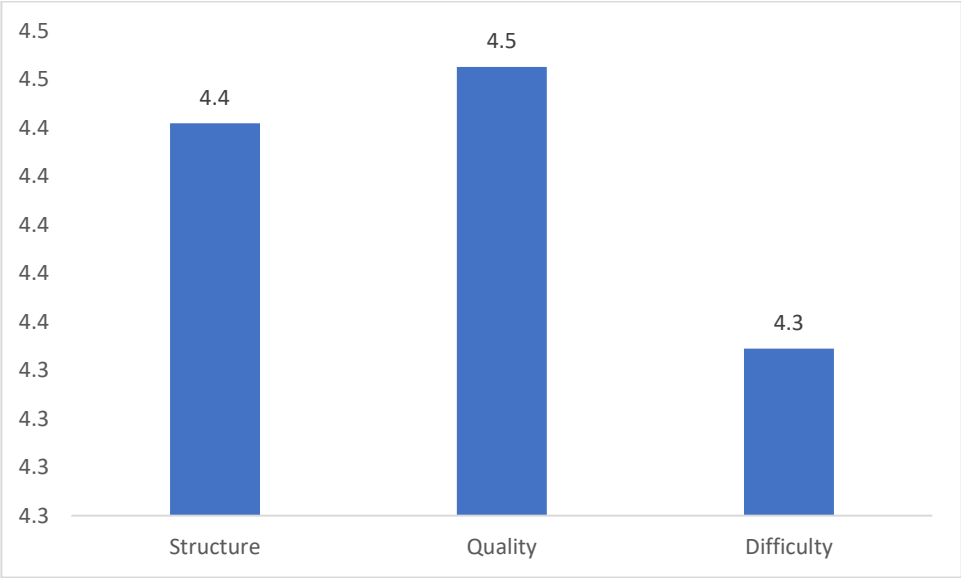

Fig.2. Average score for structure, quality and difficulty of the course.
Source: own elaboration based on survey data, n=43

[Q4] Suggested in-depth topics

Based on the student comments, most of the students found the course content to be comprehensive and complete, and they did not feel the need for further in-depth presentation on specific topics. However, some students expressed interest in learning more about the types of processing and specific food choices for different types of vegetarianism.

[Q5] Parts that were recommended to skip

Based on the student comments, it appears that most students found the course content to be relevant and did not feel the need to skip any part of the course. However, one student mentioned that the PDF file was too long. On the other hand, one student recommended adding a specific topic related to organic farming.

[Q6] Suggested changes to the content
Based on the student comments, the majority of students found the course content satisfactory and did not feel the need to change any part of the course. However, two students suggested specific changes: adding a link in the reference list and reducing the amount of text on some slides.

[Q7] The most useful topic
Classification of students' answers on the most useful topic yielded actionable categories.
Based on the student comments, topics related to protein complementation, balancing vegetarian diets, health benefits and risks of plant-based diets, nutritional information, and terminology are highly useful for students. Additionally, topics about bioavailability, bioaccessibility, and antinutrients in vegan diets are also essential for a comprehensive understanding of plant-based nutrition.

[Q8] Changes in thinking about issues related to the topic of the course
Based on the student comments, topics related to health benefits and risks of plant-based diets, vitamin B12 awareness, types of vegetarian diets, balancing a vegetarian diet, dietary practices, bioavailability of nutrients, and antinutrients were highly influential for students.

[Q9] Topic that the participants didn't know before the course
Based on the student comments, topics related to different types of vegetarian diets, the health benefits of a vegan diet, nutrient information, and dietary guidelines were not known before the course.
[Q10] Confidence in applying the concepts from the course [%]

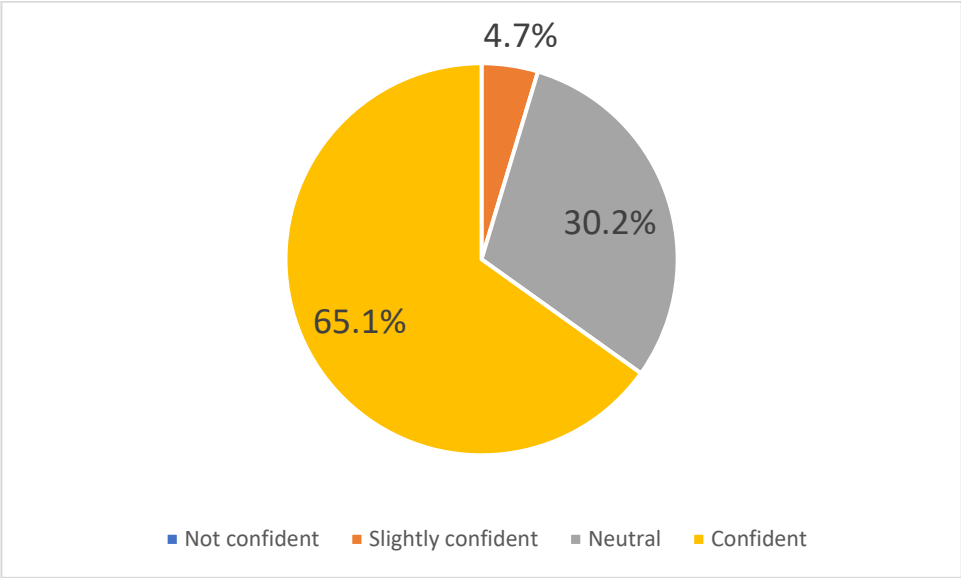

Fig.3. Confidence in the application of course topic [%].
Source: own elaboration based on survey data, n=39

65% of participants were confident about their ability to apply the concepts from the course. Nearly 30 % remained neutral and only 5% admitted that they are slightly confident. No one reported a lack of confidence. The average evaluation of the capability of the application was based on a scale of 1-4, where 1 is "not confident" and 4 is "confident". The average score amounted to 3,6 out of 4.

[Q11] Additional comments as listed by students:

No, I am very satisfied.
Some of the slides are "too full" of information. For instance, NUTRITION CONSIDERATIONS FOR VEGETERIANS slides. I can't complete the Learning templates.Thank you!

1.2. COURSE - LEGUMINOUS PRODUCTS*

*the number of the question(s) from the survey referring to the selected topic is provided in brackets e.g. [Q1]

[Q1-Q3] Evaluation of structure, quality and difficulty

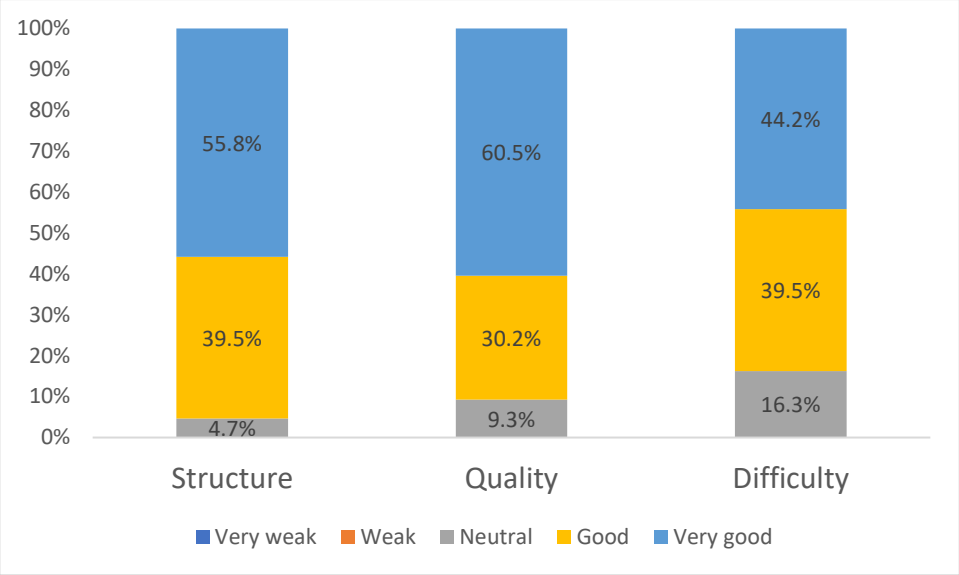

Fig. 1. General evaluation of the course
Source: own elaboration based on survey data, n=43

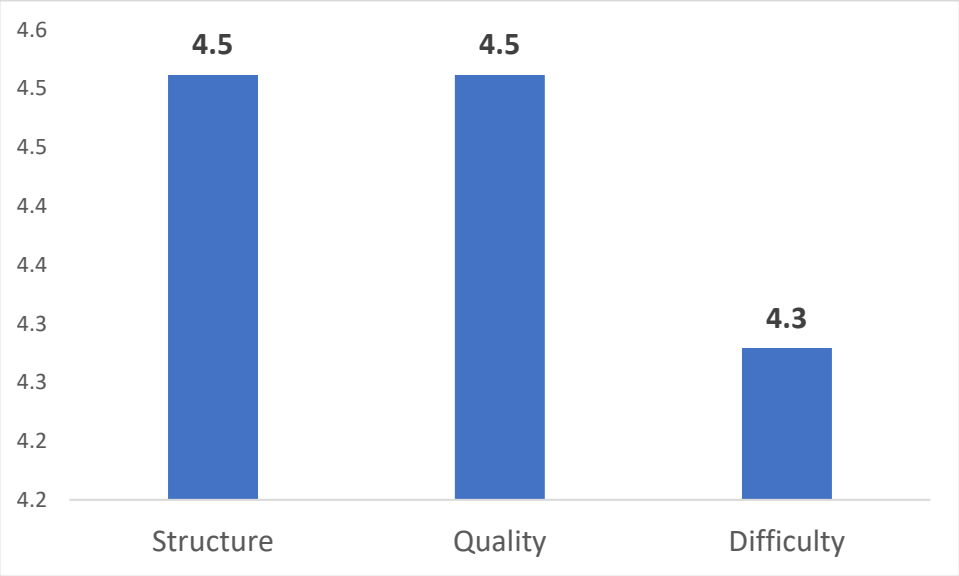

Fig.2. Average score for structure, quality and difficulty of the course.
Source: own elaboration based on survey data, n=43

[Q4] Suggested in-depth topics

Students would like to receive more information about anti-nutritional compounds in legumes and methods for reducing their content, soya fermentation, processing legumes in the Mediterranean

diet, less known/utilized legumes like mung bean and fava bean, and novel and innovative processing approaches for improved quality, green processing, and improved safety in legume-based products. Additionally, students expressed interest in learning more about texturized protein (Extruded Legume-Based Products), considering its significance for plant-based (meat) manufacturing.

[Q5] Parts that were recommended to skip

The vast majority of students expressed that they would not skip any part of the course and found the content to be well-balanced, easy to follow, and informative. However, some students mentioned that certain aspects related to the nutritional aspect of legumes were repeated, and a few suggested skipping some PDF files or summarizing lengthy documents to avoid redundancy.

[Q6] Suggested changes to the content

The majority of students expressed satisfaction with the course and felt that no changes were necessary.

A few students suggested minor improvements, such as using a consistent template for all course materials and potentially replacing some text files with video content to enhance the learning experience.

[Q7] The most useful topic

Classification of students' answers on the most useful topic yielded actionable categories.

Based on the student comments, topics related to the processing of legumes and their applications in various food products are considered the most useful. Additionally, students appreciated the nutritional aspects of legumes and their role in a vegetarian diet could enhance the course's content and provide valuable insights for learners.

[Q8] Changes in thinking about issues related to the topic of the course

Based on the student comments, the most useful topic for learners appears to be the utilization and potential of legumes in various applications, including their use as snack products and gluten-free food options.

[Q9] Topic that the participants didn't know before the course

Based on the student comments, the most useful topics for learners are those related to legume processing, different legume products, and their applications in various industries. Students show interest in learning about legume snack products, gluten-free options, and the utilization of aquafaba. Additionally, exploring specific legume types and their potential in different applications can be valuable information for learners.

[Q10] Confidence in applying the concepts from the course [%]

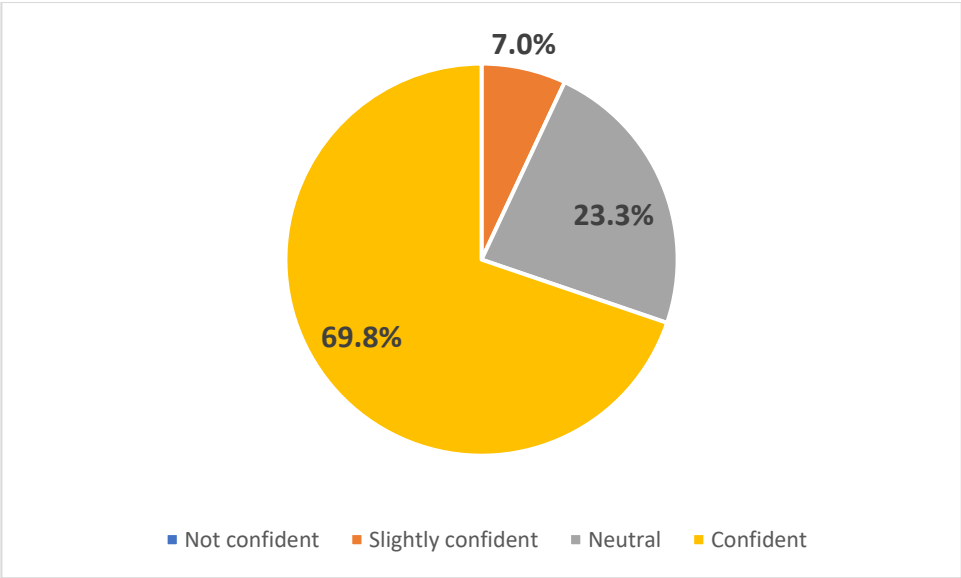

Fig.3. Confidence in the application of course topic [%].
Source: own elaboration based on survey data, n=43

70% of participants were confident about their ability to apply the concepts from the course. 23 % remained neutral and only 7% admitted that they are slightly confident. No one reported a lack of confidence.

The average evaluation of the capability of the application was based on a scale of 1-4, where 1 is "not confident" and 4 is "confident". The average score amounted to 3,6 out of 4.

[Q11] Additional comments as listed by students:

Lack of information on lupine, one of the main legumes
A good, compact unit.
Thank you!
Good job!

1.3. COURSE - VEGETABLE DRINKS*

*the number of the question(s) from the survey referring to the selected topic is provided in brackets e.g. [Q1]

[Q1-Q3] Evaluation of structure, quality and difficulty

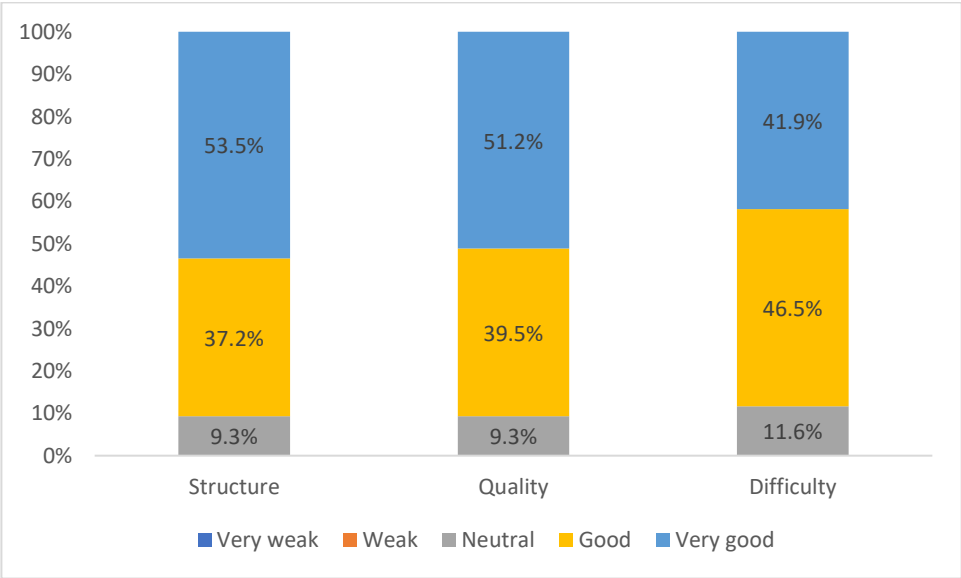

Fig. 1. General evaluation of the course

Source: own elaboration based on survey data, n=43

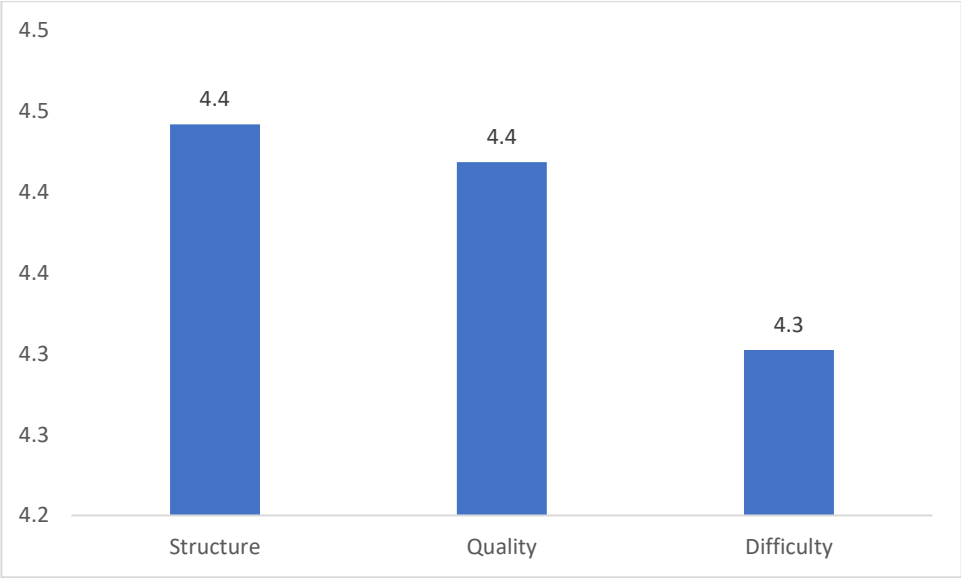

Fig.2. Average score for structure, quality and difficulty of the course.
Source: own elaboration based on survey data, n=43

[Q4] Suggested other topics to the course (yet not covered in the content)
Based on the student comments, it appears that most learners are satisfied with the level of depth in the presented topics. However, there are specific areas that students are interested in exploring further. These include innovative processing approaches, such as sustainable processing techniques for legumes, and a more detailed discussion on wet milling. Additionally, providing more visuals, such as photos of sample products is recommended.

[Q5] Parts that were recommended to skip
Based on the student comments, it appears that there is no specific part of the course that students find unnecessary to skip. The overall feedback suggests that the course content is well-balanced and relevant to the topic. However, there are some questions or concerns about certain sections, such as the focus on oat in the milk substitutes tab, and the possibility of providing more nutritional information.

[Q6] Suggested changes to the content
Based on the student comments, it appears that the majority of students are satisfied with the course content and do not find the need for significant changes. However, there are a few suggestions for improvement: Include a section on novel and innovative processing approaches for sustainable processing.Address health risks, such as contamination of plant products and their impact on the finished product, especially in terms of arsenic and other potential hazards.
Clarify information, such as the presence of gluten in oats, to avoid confusion.

[Q7] The most useful topic
Based on the student comments, it is clear that the topics related to the processing and technology of plant-based milk are the most useful and interesting for the students. Additionally, the course was appreciated for emphasizing the nutritional value and benefits of plant-based drinks compared to dairy-based beverages.

[Q8] Changes in thinking about issues related to the topic of the course
Based on the student comments, it is clear that the course has had a positive impact on their perception and interest in plant-based drinks. Another influential topic was related to the potential and benefits of plant-based drinks.

[Q9] Topic that the participants didn't know before the course
Based on the student comments, it is evident that the most novel topics for students are related to the production process of plant-based drinks, including specific steps and techniques involved. Additionally, topics focusing on nutritional value comparisons between plant-based and dairy-based drinks specific ingredients and particular examples of drinks are all also new to some students.

[Q10] Confidence in applying the concepts from the course [%]

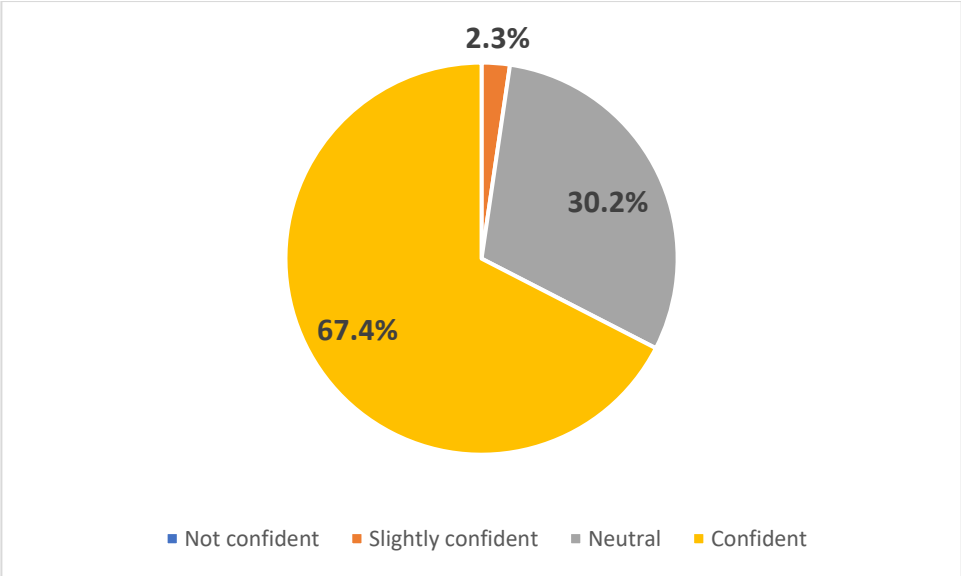

Fig.3. Confidence in the application of course topic [%].
Source: own elaboration based on survey data, n=43

67% of participants were confident about their ability to apply the concepts from the course. 30 % remained neutral and only 2% admitted that they are slightly confident. No one reported a lack of confidence.
The average evaluation of the capability of the application was based on a scale of 1-4, where 1 is "not confident" and 4 is "confident". The average score amounted to 3,7 out of 4.

[Q11] Additional comments as listed by students:
very clear, logically organized course
Maybe narration during presentation could be little more dynamic.
I liked everything.
Maybe more pictures and less text... Some slides were quite heavy to read.
Thank you for a really nice course.

1.4. COURSE - EGG ANALOGUES*

*the number of the question(s) from the survey referring to the selected topic is provided in brackets e.g. [Q1]

[Q1-Q3] Evaluation of structure, quality and difficulty

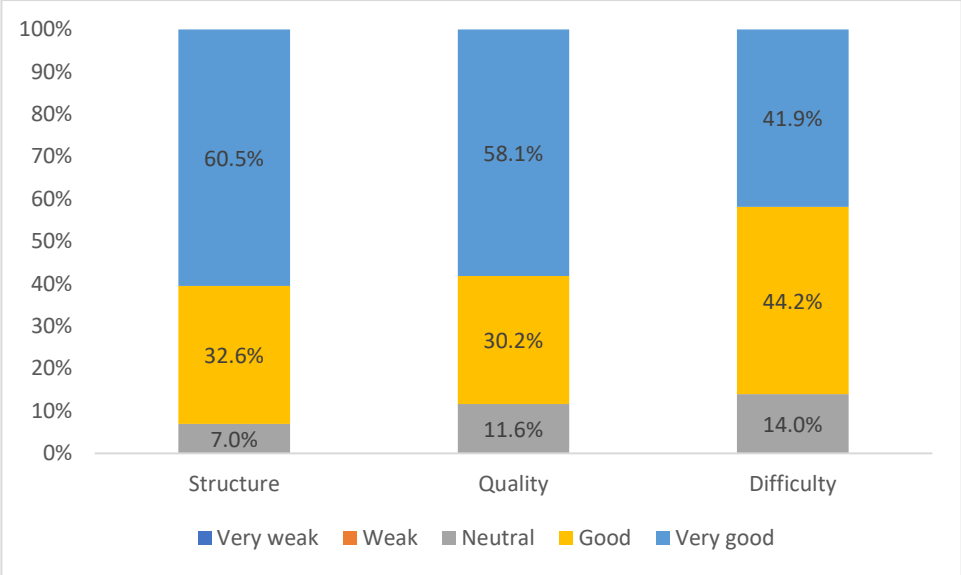

Fig. 1. General evaluation of the course
Source: own elaboration based on survey data, n=43

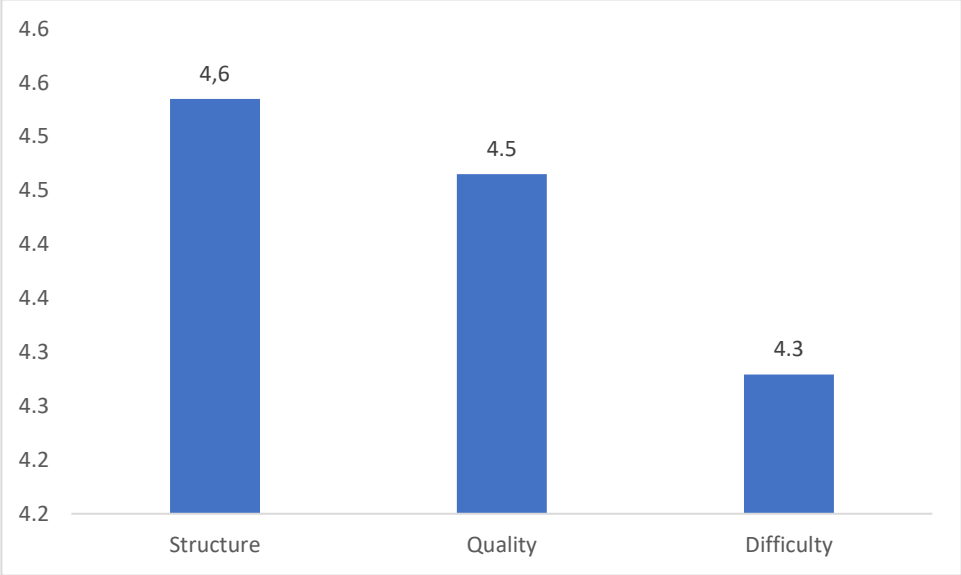

Fig.2. Average score for structure, quality and difficulty of the course.
Source: own elaboration based on survey data, n=43

[Q4] Suggested in-depth topics

Based on the student comments, the suggested in-depth topics are related to technology and processing focusing on egg analogues. Students expressed interest in learning about the processing technology for egg analogues and desired more examples and case studies to understand the production process better.

[Q5] Parts that were recommended to skip

Based on the student comments, it appears that there is a consensus among the students that there is no need to skip any part of the course. However, some students provided feedback on specific aspects that they found unnecessary or redundant, such as the long introduction about eggs and a list of production processing without direct examples.

[Q6] Suggested changes to the content

The majority of students expressed satisfaction with the course content and did not suggest any changes. However, there were a few students who provided valuable feedback regarding potential improvements:

Inclusion of Health and Nutrition Information, In-Depth Processing and Functional Properties, Free Access to Papers

[Q7] The most useful topic

Based on the student comments, it seems that the most useful topic for the students is "Plant-Based Egg Alternatives." Many students found value in learning about egg substitutes and plant-based alternatives, especially in the context of food industry applications and bakery products

[Q8] Changes in thinking about issues related to the topic of the course

Based on the student comments, it seems that the most influential topic for the students is "Exploration of Egg Alternatives." Many students appreciated learning about different options for egg analogues and alternatives, especially due to various reasons like dietary preferences, health considerations, and industrial applications.

[Q9] Topic that the participants didn't know before the course

Based on the student comments, it seems that the students before the course were notably lacking knowledge about egg analogues. Many students found value in learning about the different types of egg analogues, their production processes, and the challenges in creating suitable alternatives to eggs.

[Q10] Confidence in applying the concepts from the course [%]

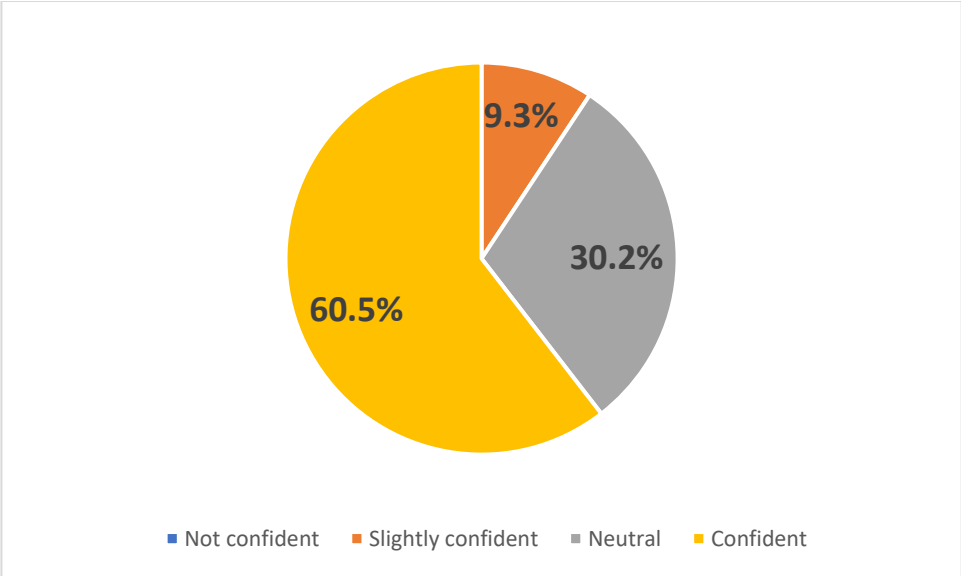

Fig.3. Confidence in the application of course topic [%].
Source: own elaboration based on survey data, n=43

60% of participants were confident about their ability to apply the concepts from the course. 30 % remained neutral and only 9% admitted that they are slightly confident. No one reported a lack of confidence.

The average evaluation of the capability of the application was based on a scale of 1-4, where 1 is "not confident" and 4 is "confident". The average score amounted to 3,5 out of 4.

[Q11] Additional comments as listed by students:
I would like to see the references from the presentation
Thank you!

1.5. COURSE - DAIRY ANALOGUES*

*the number of the question(s) from the survey referring to the selected topic is provided in brackets e.g. [Q1]

[Q1-Q3] Evaluation of structure, quality and difficulty

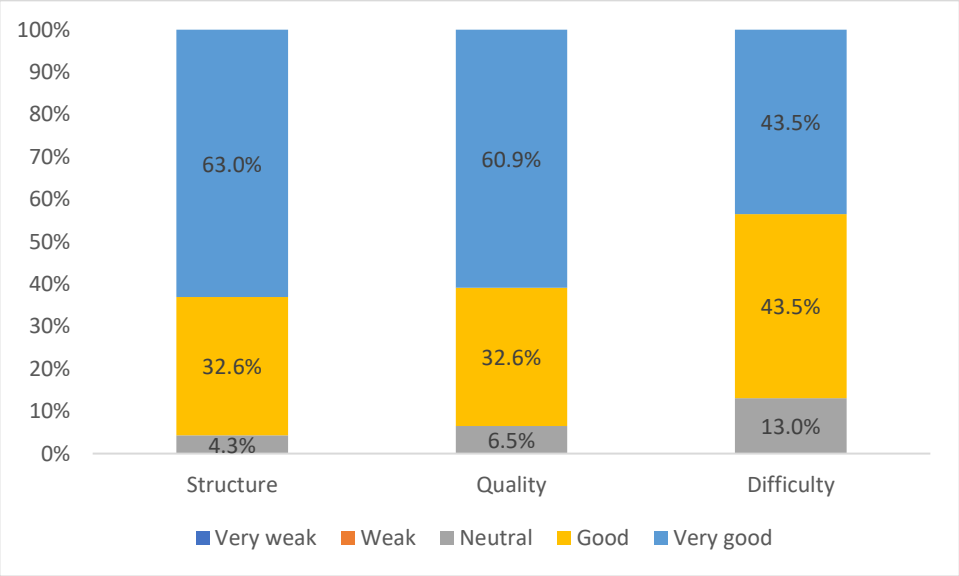

Fig. 1. General evaluation of the course
Source: own elaboration based on survey data, n=46

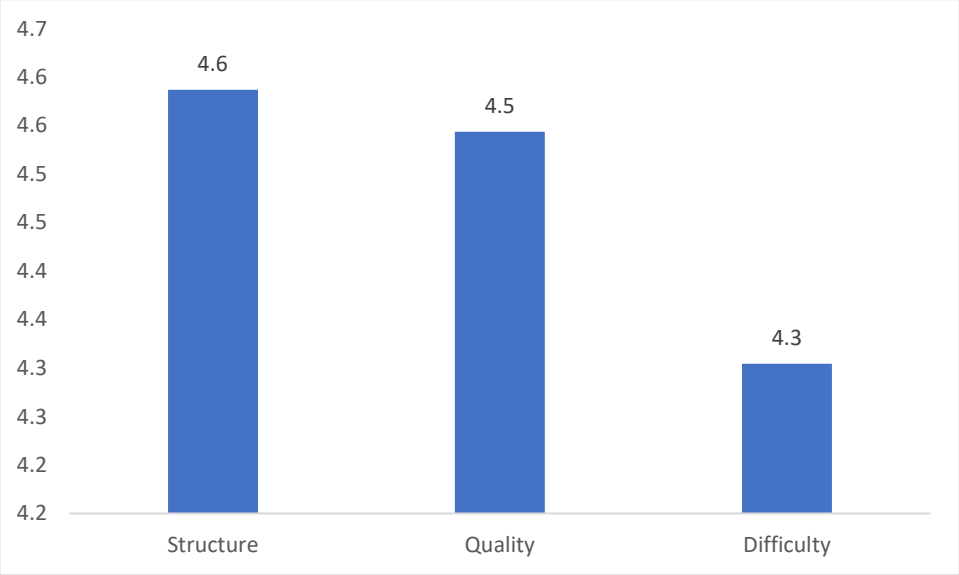

Fig.2. Average score for structure, quality and difficulty of the course.
Source: own elaboration based on survey data, n=46

[Q4] Suggested in-depth topics

Based on the student comments, the suggested topic to cover more in-depth is sustainability aspects related to production technologies. Additionally, the student's request for further information on legislation, especially regarding the use of terms like "milk" in analogues of dairy products, highlights the importance of understanding regulatory aspects in the industry.

[Q5] Parts that were recommended to skip
Nobody would skip any part of the course as unnecessary.

[Q6] Suggested changes to the content
Based on student comments suggested changes are: additional details on specific topics, such as cheese analogues, integrating information on sensory aspects and taste differences between analogues and conventional products. Additionally, considering the sequencing of topics to provide a smoother flow and coherence in content could be helpful for student learning experiences. Overall, it appears that students found the course content satisfactory.

[Q7] The most useful topic
Based on the student comments, it seems that the most useful topic for the students is "Comparison and Similarities". Many students found value in learning about the similarities between dairy products and dairy analogues, as well as the comparison of nutritional values and processing methods.

[Q8] Changes in thinking about issues related to the topic of the course
Based on the student comments, it seems that the most influential topic for the students is dairy analogues. Many students expressed that the course expanded their knowledge and awareness of the wide range of plant-based analogues available for dairy products.

[Q9] Topic that the participants didn't know before the course
Based on the student comments, it seems that the less know topic is quark analogues, and generally dairy analogues – fermented, substituting dairy and their production specificity.

[Q10] Confidence in applying the concepts from the course [%]

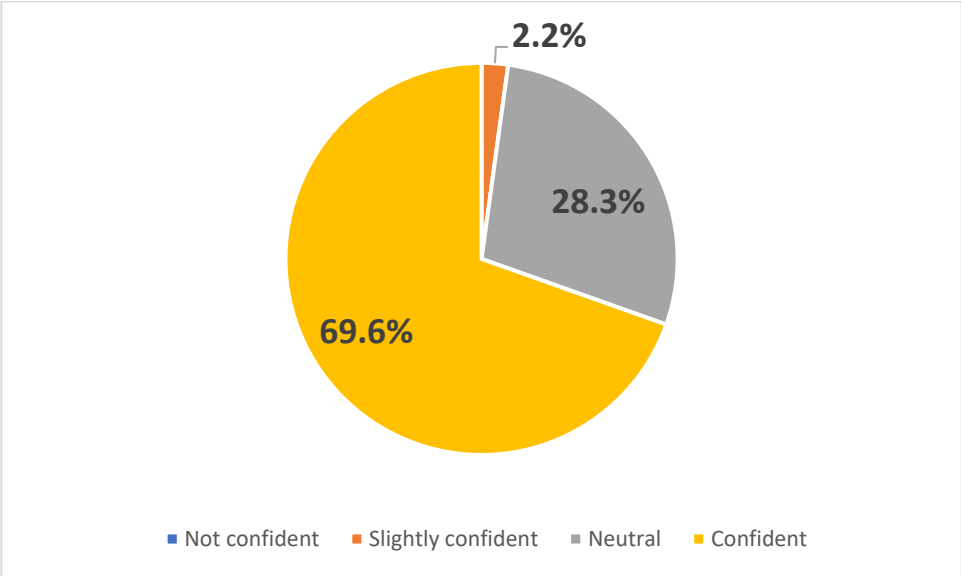

Fig.3. Confidence in the application of course topic [%].
Source: own elaboration based on survey data, n=46

Almost 70% of participants were confident about their ability to apply the concepts from the course. 28 % remained neutral and only 2% admitted that they are slightly confident. No one reported a lack of confidence.

The average evaluation of the capability of the application was based on a scale 1-4, where 1 is "not confident" and 4 is "confident". The average score amounted to 3,7 out of 4.

[Q11] Additional comments as listed by students:

Thank you!

Very well, communicative presentation. An excellent idea to put in the same slides technological diagrams of dairy products and analogues

Please be aware of plant milks - I believe that they cannot be called milks according to the valid legislature rules.

One of the quark slides were misplaced in the wrong section. Too much text -> tiresome to concentrate during the presentation.

This was one of the best prepared course.

1.6. COURSE - MEAT ANALOGUES *

*the number of the question(s) from the survey referring to the selected topic is provided in brackets e.g. [Q1]

[Q1-Q3] Evaluation of structure, quality and difficulty

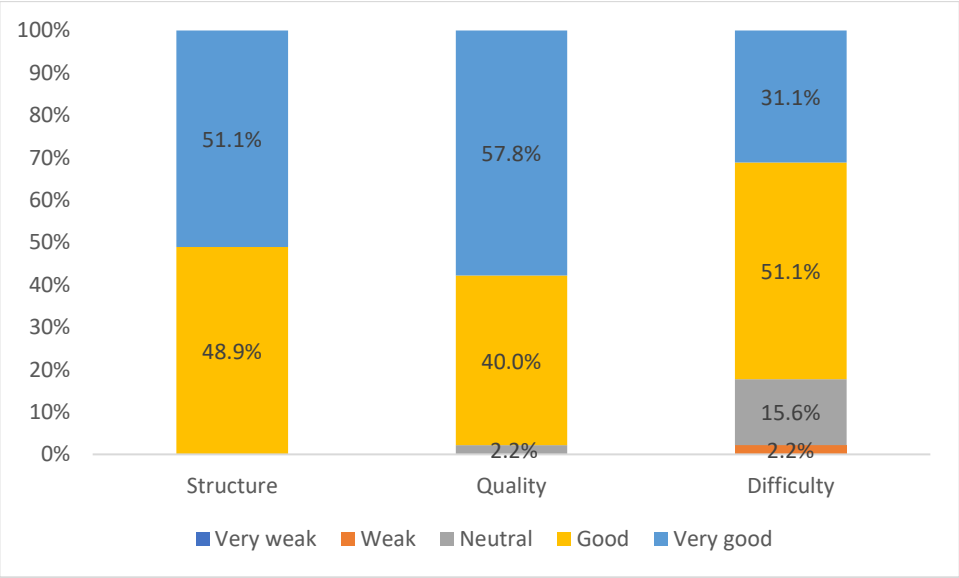

Fig. 1. General evaluation of the course
Source: own elaboration based on survey data, n=45

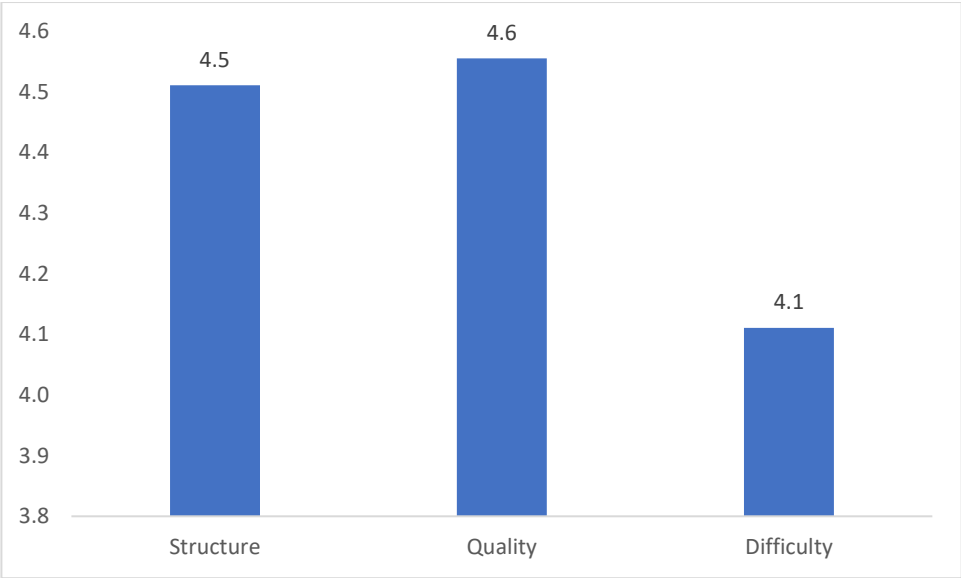

Fig.2. Average score for structure, quality and difficulty of the course.
Source: own elaboration based on survey data, n=45

[Q4] Suggested in-depth topics

The vast majority of students reported no need to extend the topics.

However, some students indicated an interest in learning more about texture in meat analogues, including other meat products beyond burgers and exploring plant-based seafood. Additionally, a few students highlighted the significance of the high moisture extrusion process and the importance of including insect meat alternatives and cell-cultured alternatives for comparison.

[Q5] Parts that were recommended to skip

Based on the student comments, it appears that students found the content of the course relevant and did not feel the need to skip any part.

[Q6] Suggested changes to the content

Based on the student comments, it seems that most students felt that no major changes were needed for the course. However, a few students suggested providing more information about other processing technologies besides extrusion, including high moisture extrusion and possible novel and innovative approaches like infrared processing in drying and sensory evaluation aspects. One student mentioned that the video presentation should include more details about the extrusion technology on slides rather than just spoken. Additionally, some students suggested incorporating videos of extrusion processes to enhance the learning experience.

[Q7] The most useful topic

Based on the student comments, it seems that the most useful topic for the students is related to "Extrusion Technology and Meat Analogues Processing." Many students found the information about extrusion methods and their application in meat analogue production to be valuable and insightful.

Moreover, topics related to "Meat Analogues and Plant-Based Meat Industry" were also highly regarded by the students. They appreciated learning about the possibilities of meat analogue production, the trends in the plant-based meat industry, and the importance of devising and designing meat analogues.

The sensory aspects and consumer acceptance of plant-based meat alternatives were also appreciated by some students.

[Q8] Changes in thinking about issues related to the topic of the course

Based on the student comments, topics related to industrial scale and technology for producing meat analogues, as well as the sensory characteristics and consumer acceptance of these products, are of great interest to students. The complexity of the process to make meat analogues and the opportunities for using various food materials high in protein were points that made students think differently about the topic. Additionally, the presentation of insect burgers and their consumer acceptance compared to plant-based burgers sparked interest.

[Q9] Topic that the participants didn't know before the course

Based on the student comments, topics related to extrusion techniques, mycoproteins (especially Fusarium venenatum and Quorn), consumer acceptance and perception of meat substitutes, and cell-based meat are of interest to students. The feedback also indicates that there is interest in the digestibility and gastrointestinal fate of plant-based meat, as well as the technological aspects of designing meat analogues.

[Q10] Confidence in applying the concepts from the course [%]

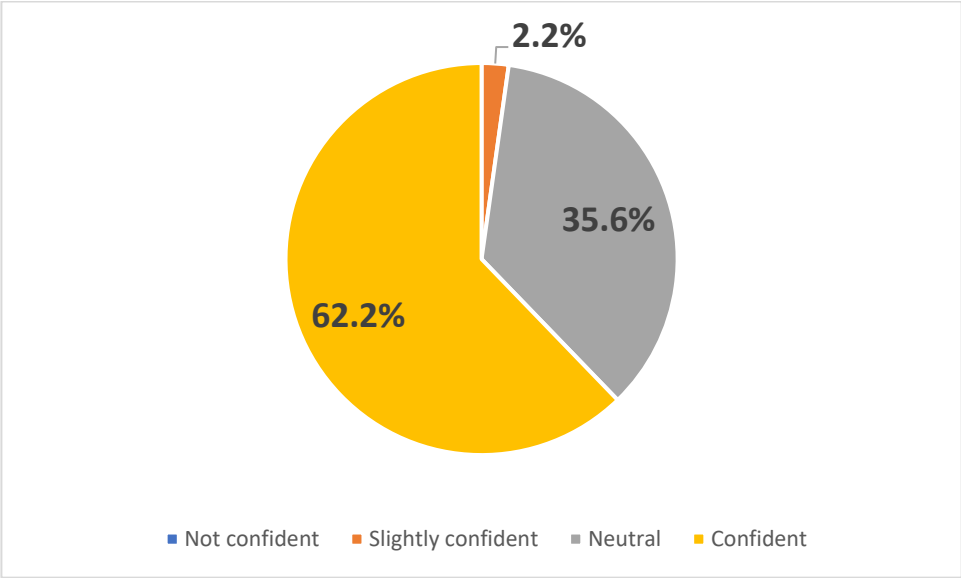

Fig.3. Confidence in the application of course topic [%].
Source: own elaboration based on survey data, n=45

62% of participants were confident about their ability to apply the concepts from the course. 35 % remained neutral and only 2% admitted that they are slightly confident. No one reported a lack of confidence.

The average evaluation of the capability of the application was based on a scale of 1-4, where 1 is "not confident" and 4 is "confident". The average score amounted to 3,6 out of 4.

[Q11] Additional comments as listed by students:

This lesson is really well put together and the technological part is very well explained.

We noticed that most of the presentation were taken from Extrusion Techniques for Meat Analogues by Brian Plattner. https://www.cerealsgrains.org/publications/cfw/2020/Documents/CFW-65-4-0043.pdf
No, the lecture is very well designed
In my opinion presentation was little to long (30 minutes is enough) and to many papers to read (3-4 are enough).
Excellent presentation, very well documented with examples, technical schemes of devices and processes

2. Course Evaluation Results - GREEN SKILLS

2.1. COURSE - SOCIETY AND VISIBILITY*

*the number of the question(s) from the survey referring to the selected topic is provided in brackets e.g. [Q1]

[Q1-Q3] Evaluation of structure, quality and difficulty

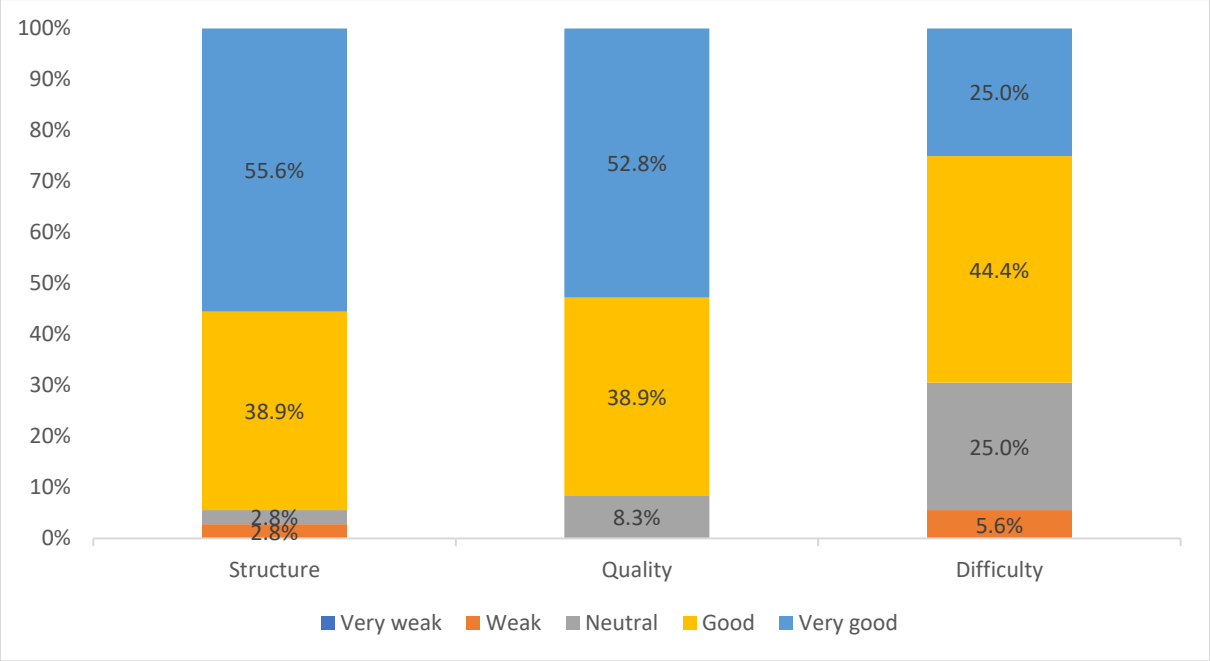

Fig. 1. General evaluation of the course
Source: own elaboration based on survey data, n=36

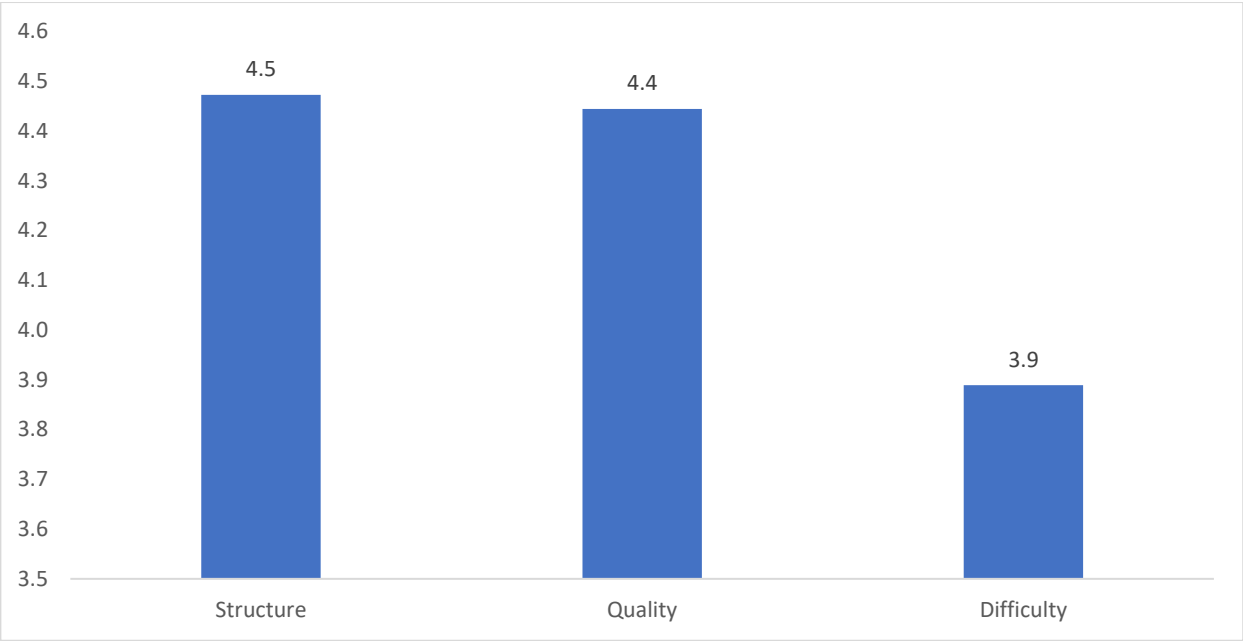

Fig.2. Average score for structure, quality and difficulty of the course.
Source: own elaboration based on survey data, n=36

[Q4] Suggested in-depth topics
For almost all participants completing the survey, the topics of the course were presented sufficiently in-depth. However, 4 students made reference to specific areas: farm to fork strategy, the environmental footprint of food systems and how GMOs affect biodiversity.

[Q5] Parts that were recommended to skip
Nobody would skip any part of the course as unnecessary.

[Q6] Suggested changes to the content
Only a few suggested changes to the course were proposed and pertain to:
- videos and oral presentation instead of only written materials.
- a list of themes would be also useful and quiz's questions were difficult and multiple-choice test would be easier.

[Q7] The most useful topic
The first significant topic that emerges from student comments is "Environmental Footprints," which received the most mentions. Students expressed interest in understanding different kinds of footprints, such as carbon and water footprints, and their impact on food production and the environment. They also highlighted the importance of considering environmental footprints in the food industry and gaining knowledge about the scale and measurement of these footprints (footprint calculator). This suggests a strong emphasis on sustainability and the need to address the environmental impact of the food systems.
The second prominent topic is "Climate Change and Food Systems." Students recognized the influence of climate change on food systems and vice versa. They expressed interest in learning about the effects of diets on reducing carbon and water footprints and how food loss and waste contribute to climate change. Students also emphasized the importance of understanding how food systems impact biodiversity and the complex relationship between sustainability and various stakeholders in the food industry.

The third topic is "Sustainable Food Systems," which emphasizes the concept of sustainability and its application in food systems. Students showed interest in grasping the broader concepts and paradigms related to sustainable food systems, including the food system wheel framework.
Lastly, there were miscellaneous topics that received single mentions, such as examples related to the promotion of green skills, the concept of plant-based diets, and the effects of thermal and non-thermal processing on food products rich in pectin.

[Q8] Changes in thinking about issues related to the topic of the course

Based on student comments, topics related to the environmental impact of food production and sustainability practices are the most thought-provoking.

[Q9] Topic that the participants didn't know before the course
Based on student comments, topics related to water footprints, sustainability, and footprint calculation are the most useful and relevant. These topics provide valuable insights into the environmental impact of food production and consumption. Additionally, exploring the concept of a sustainable food system and understanding the European Green Deal and sustainable practices in the food industry.

[Q10] Confidence in applying the concepts from the course [%]

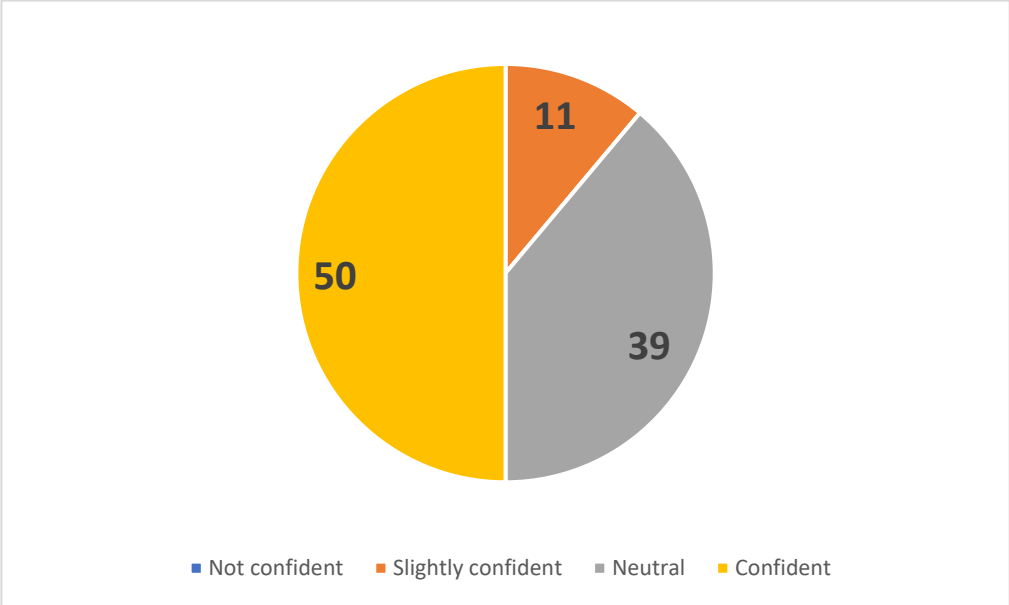

Fig.3. Confidence in the application of course topic [%].
Source: own elaboration based on survey data, n=36

The half of participants were confident about their ability to apply the concepts from the course. Nearly 40 % remained neutral and only 11% admitted that they are slightly confident. No one reported a lack of confidence.
The average evaluation of the capability of the application was based on a scale of 1-4, where 1 is "not confident" and 4 is "confident". The average score amounted to 3,4 out of 4.

[Q11] Additional comments as listed by students
- Quiz is really good!
-Please, try to add an index or a list of themes. For students a test will be helpful than a quiz

2.2. COURSE - ECONOMY, MARKETING AND ENTREPRENEURSHIP*

*the number of the question(s) from the survey referring to the selected topic is provided in brackets e.g. [Q1]

[Q1-Q3] Evaluation of structure, quality and difficulty

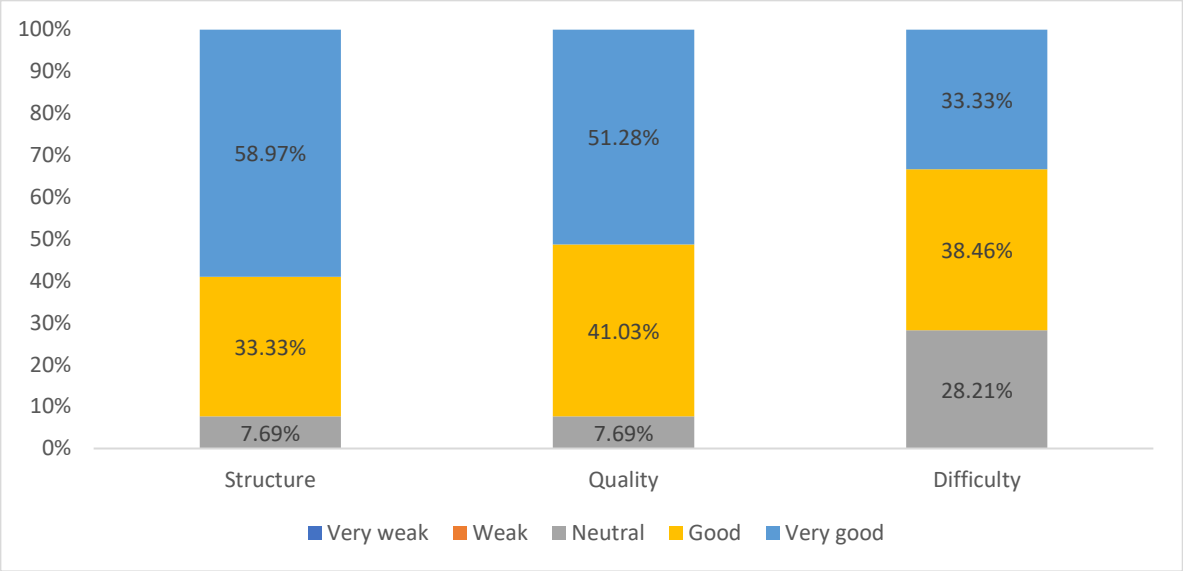

Fig. 1. General evaluation of the course

Source: own elaboration based on survey data, n=39

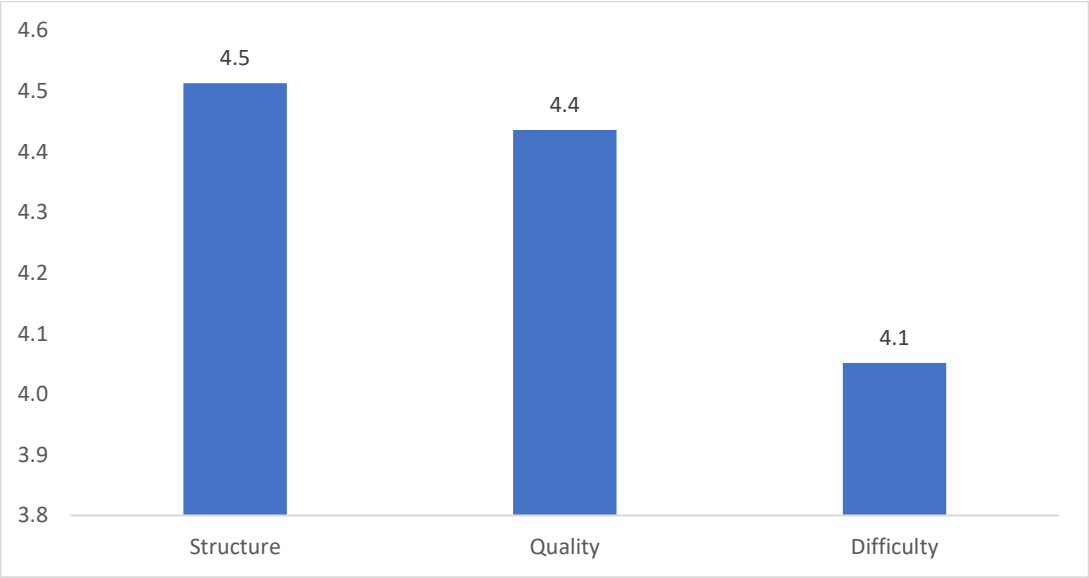

Fig.2. Average score for structure, quality and difficulty of the course.

Source: own elaboration based on survey data, n=39

[Q4] In-depth topic

For almost all participants completing the survey, the topics of the course were presented sufficiently in-depth. However 3 students referred to specific areas: Prevent food waste section, problems related to the green economy and the economy of whole food systems.

[Q5] Parts that were recommended to skip

Nobody would skip any part of the course as unnecessary but one mentioned that Entrepreneurship was too detailed.

[Q6] Suggested changes to the content
Only two suggested changes to the course were proposed and pertain to:
- Entrepreneurship - shorter with more real case examples
- Seeing how this won't be listen to at all the 4 levels (EQF4-EQF7), if I understood correctly, different subjects are presented to different audience. One thing that stood out to me was HACCP which was mentioned at EQF6, but not EQF7. Same for the EQF7 presentation about Entrepreneurship which might be difficult to understand by someone who didn't have a course about the matter, or listened to the EQF6 presentation.

[Q7] The most useful topic
Based on the student comments, the most useful topics in the video course appear to be Circular Economy and Green Economy. Traceability and sustainability also received notable mentions. The remaining comments cover miscellaneous topics such as the link between the economy and the environment, entrepreneurship, environmental problems, food ethics, food fraud, and design opportunities for healthier foods.

[Q8] Changes in thinking about issues related to the topic of the course
Based on the student comments, the most impactful topic in the video course appears to be the Circular Economy. Other notable topics that prompted students to think differently include the food system, designing healthier foods and its footprints, diet footprints, urban vs. rural communities and agriculture/environmental awareness.

[Q9] Topic that the participants didn't know before the course
Based on the student comments, it appears that the most useful topics in the video course revolve around Circular Economy and Green Economy. Other prominent topics are Traceability and Sustainability. The remaining issues are related to the Linear vs. Circular Food System, SCAMPER, lack of minerals, moral cognition, bioeconomy, and making the most of food.
[Q10] Confidence in applying the concepts from the course [%]

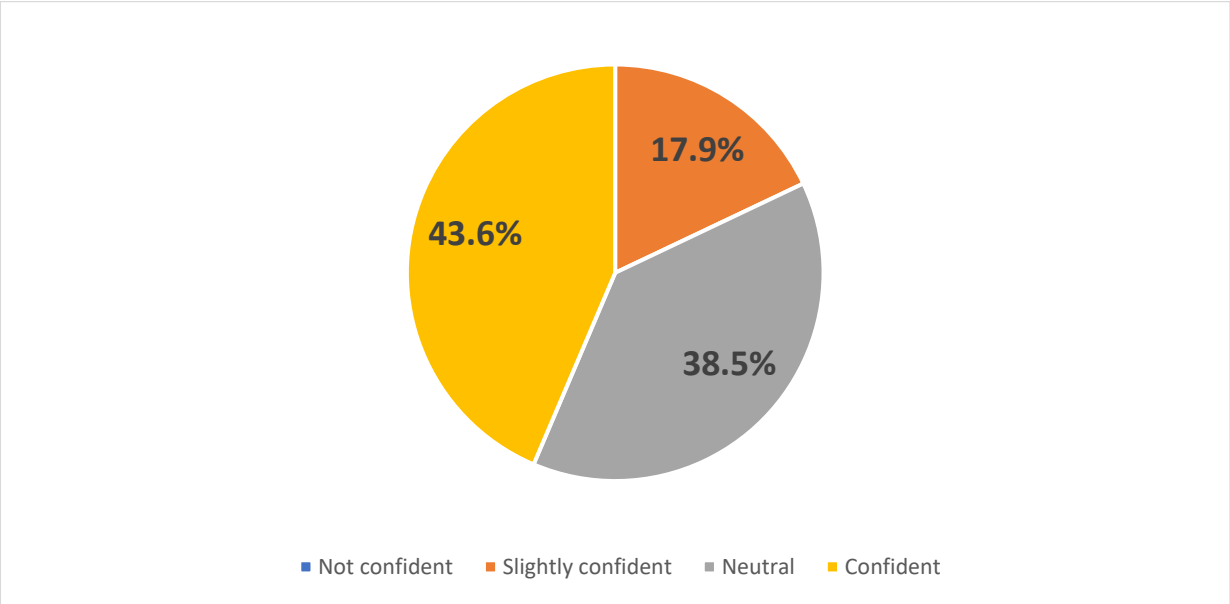

Fig.3. Confidence in the application of course topic [%].
Source: own elaboration based on survey data, n=39

Over 40% of participants were confident about their ability to apply the concepts from the course. Nearly 40 % remained neutral and only 18% admitted that they are slightly confident. No one reported a lack of confidence.
The average evaluation of the capability of the application was based on a scale of 1-4, where 1 is "not confident" and 4 is "confident". The average score amounted to 3,3 (out of 4).

[Q11] Additional comments as listed by students:
Good topics was taken up
The video in the presentation does not work (only audio is available), so I'd suggest giving a link to the video as well.

2.3. COURSE - FOOD LEGISLATION*

*the number of the question(s) from the survey referring to the selected topic is provided in brackets e.g. [Q1]

[Q1-Q3] Evaluation of structure, quality and difficulty

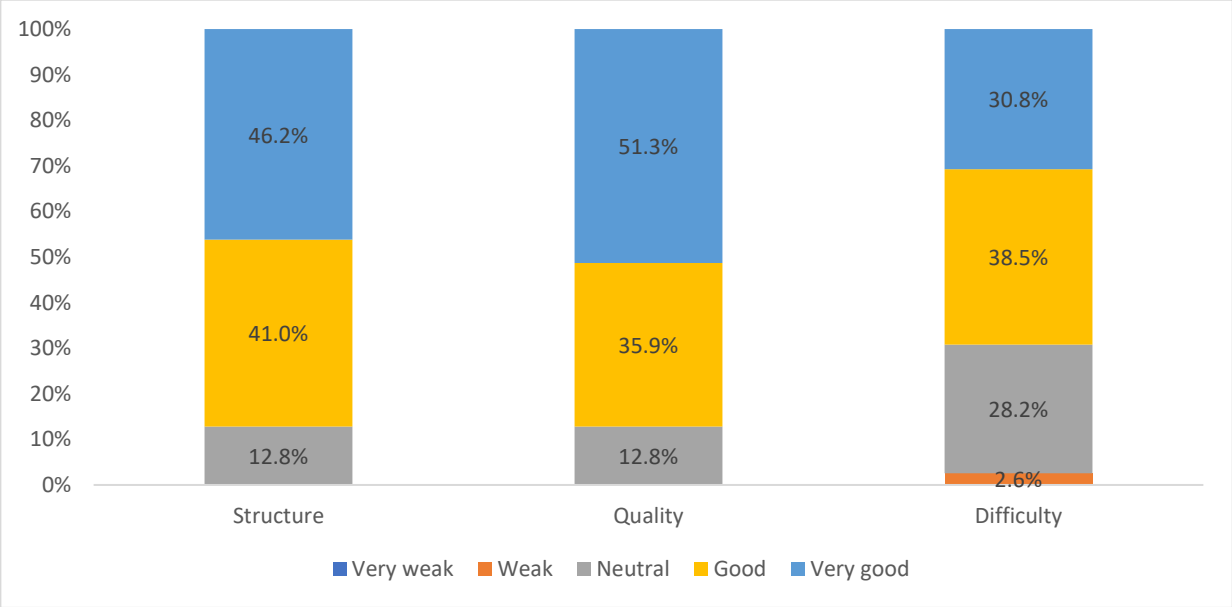

Fig. 1. General evaluation of the course
Source: own elaboration based on survey data, n=39

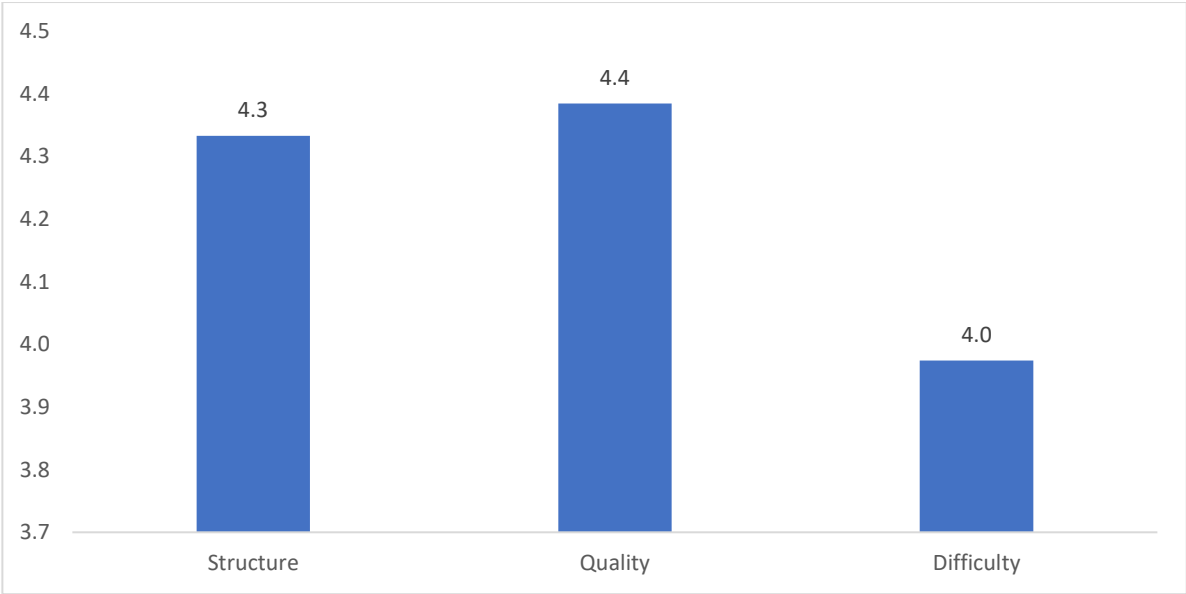

Fig.2. Average score for structure, quality and difficulty of the course.
Source: own elaboration based on survey data, n=39

[Q4] Suggested in-depth topic
For almost all participants completing the survey, the topics of the course were presented sufficiently in-depth. However, 2 students made reference to specific areas of Government policies associated with sustainable food systems with the approach of specific EU countries to the introduced law, Novel Food law and GMO section.

[Q5] Parts that were recommended to skip
Only one student suggested skipping a topic in the course. He mentioned the proposed activities in Food ethics and Voluntary Labelling.

[Q6] Suggested changes to the content
Only a few suggested changes to the course were proposed and pertain to:
- add more visual materials.
- extending the topic about methods of detecting adulterated foods.

[Q7] The most useful topic
Based on the student comments, it seems that the most useful topics in the video course revolve around Food Legislation. Food Ethics and Voluntary Labelling are also important topics. Other notable mentions include European legislation on food waste, government policies associated with sustainable food systems, food fraud, and the relationship between food policy and consumers. The remaining comments express that all topics were useful and highlight the importance of understanding vegetarian/vegan claims and nutritional/health claims in food labelling.

[Q8] Changes in thinking about issues related to the topic of the course
Based on the student comments, it appears that the most impactful topics in the video course revolved around Food Labelling and Legislation, with the importance of understanding food adulteration, labelling, and genetic engineering. Food Ethics and Sustainability also received notable mentions.

[Q9] Topic that the participants didn't know before the course
Based on the student comments, it appears that the most novel topic in the video course revolved around food legislation, Food Labelling, European Legislation on Food Waste, QUID Labelling, and Food Ethics also received notable mentions. Other topics mentioned include sustainable food system policies, voluntary food labelling, the TBT Agreement, food insecurity, and the role of policy in the context of sustainability and ethics.

[Q10] Confidence in applying the concepts from the course [%]

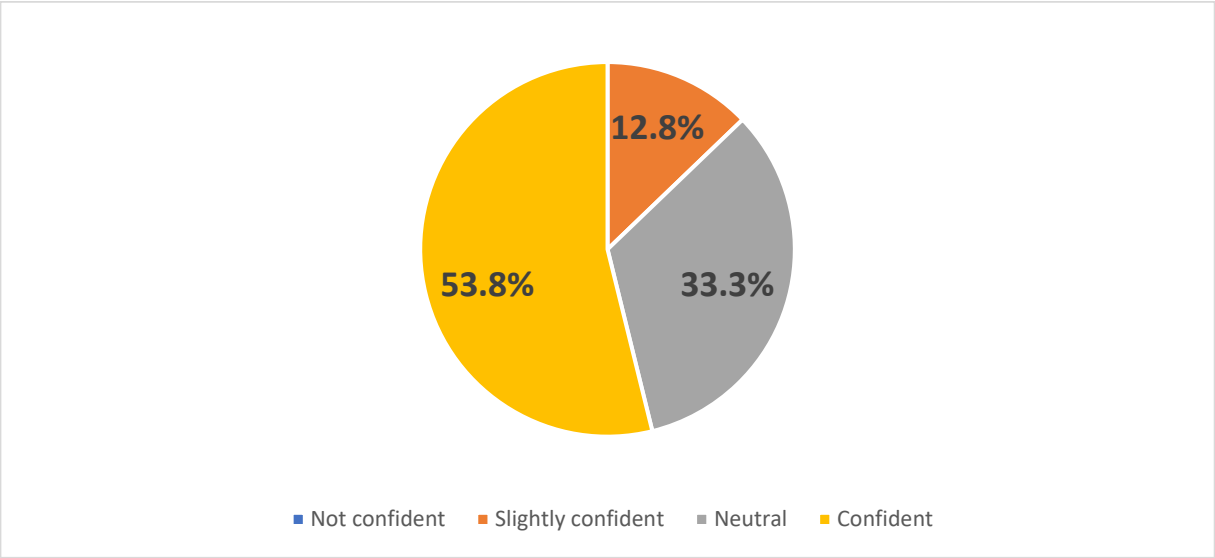

Fig.3. Confidence in the application of course topic [%].
Source: own elaboration based on survey data, n=39

Over half of the participants were confident about their ability to apply the concepts from the course. One-third remained neutral and only 13% admitted that they are slightly confident. No one reported a lack of confidence.
The average evaluation of the capability of the application was based on a scale of 1-4, where 1 is "not confident" and 4 is "confident". The average score amounted to 3,8 out of 4.

[Q11] Additional comments as listed by students
It was a very clear and straightforward course.
Very nice list of references. Thanks!

2.4. COURSE -SUSTAINABILITY*

*the number of the question(s) from the survey referring to the selected topic is provided in brackets e.g. [Q1]

[Q1-Q3] Evaluation of structure, quality and difficulty

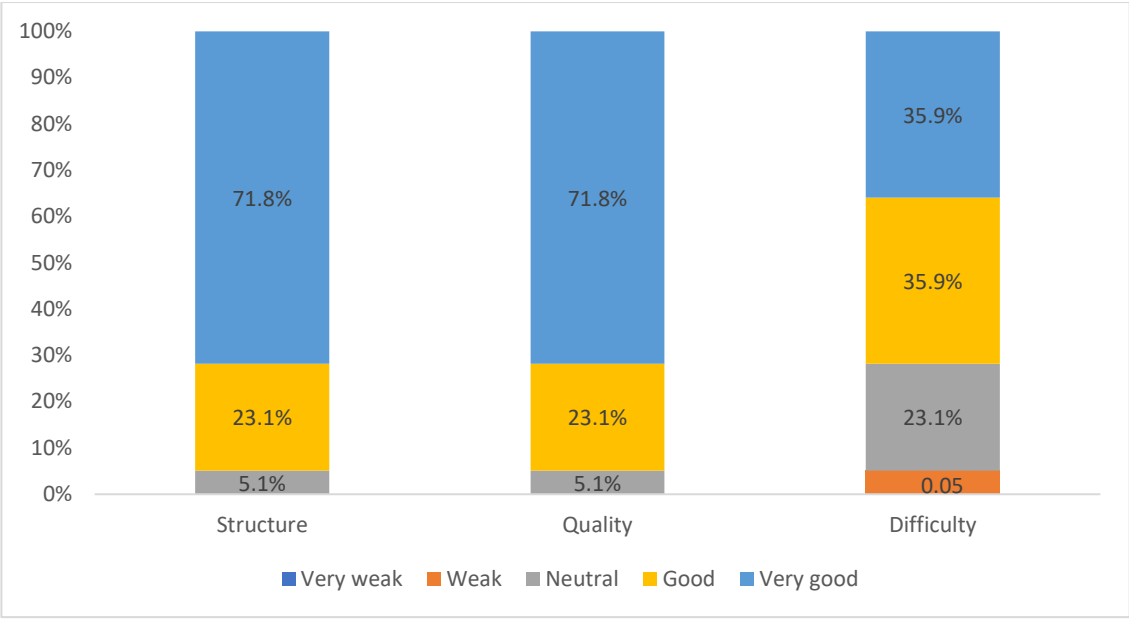

Fig. 1. General evaluation of the course
Source: own elaboration based on survey data, n=39

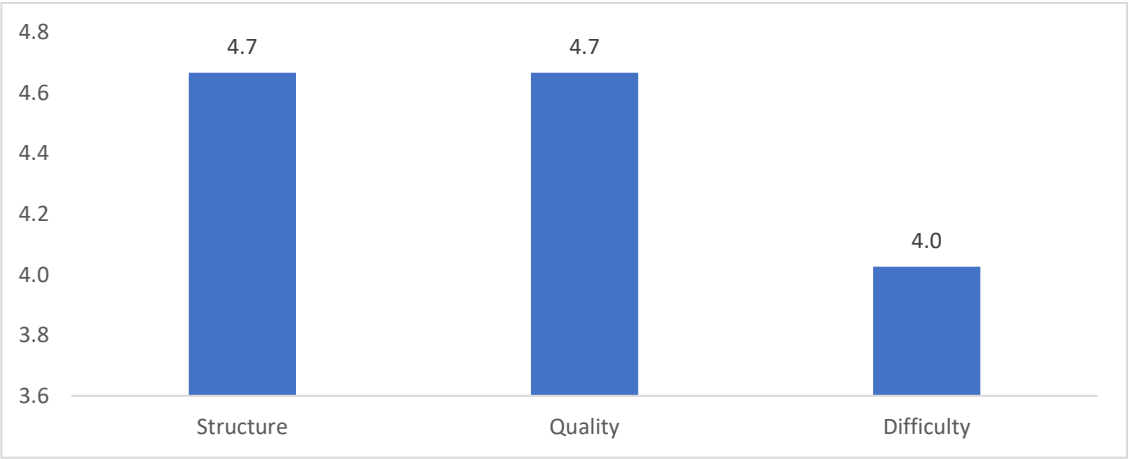

Fig.2. Average score for structure, quality and difficulty of the course.
Source: own elaboration based on survey data, n=39

[Q4] Suggested in-depth topic

For almost all participants completing the survey, the topics of the course were presented sufficiently in-depth. However, 2 students mentioned one topic each: future efforts towards the implementation of the Sustainable Development Goals and `Food waste strategies to reduce it`.

[Q5] Parts that were recommended to skip

Nobody would skip any part of the course as unnecessary.

[Q6] Suggested changes to the content

Most of the students don't want to change anything but one would like to merge Energy/water/waste because it was in two chapters.

[Q7] The most useful topic

Based on the student comments, it appears that Waste Management and Food Waste is the most prominent and useful topic in the video course. Sustainability and Green Skills are also key areas of interest. Life Cycle Assessment, as well as Plant-Based Products and By-Products all equally important. Other notable mentions include net zero roadmaps, and nutrition in the context of Sustainable Development Goals (SDGs).

[Q8] Changes in thinking about issues related to the topic of the course
Based on the student comments, the most impactful topics in the video course revolve around Sustainability and Environmental Impact. Food Waste is also mentioned as an impactful topic.

[Q9] Topic that the participants didn't know before the course
Based on the student comments, it appears that the unfamiliar topic before the course was Food Waste and Waste Management. Sustainability and Life Cycle Assessment are also key areas not known before. Vegan Food Processing and Sustainability were also indicated. Other notable mentions include software tools, technology readiness levels, the food economy, and familiarization with the extent of food waste in the EU.

[Q10] Confidence in applying the concepts from the course [%]

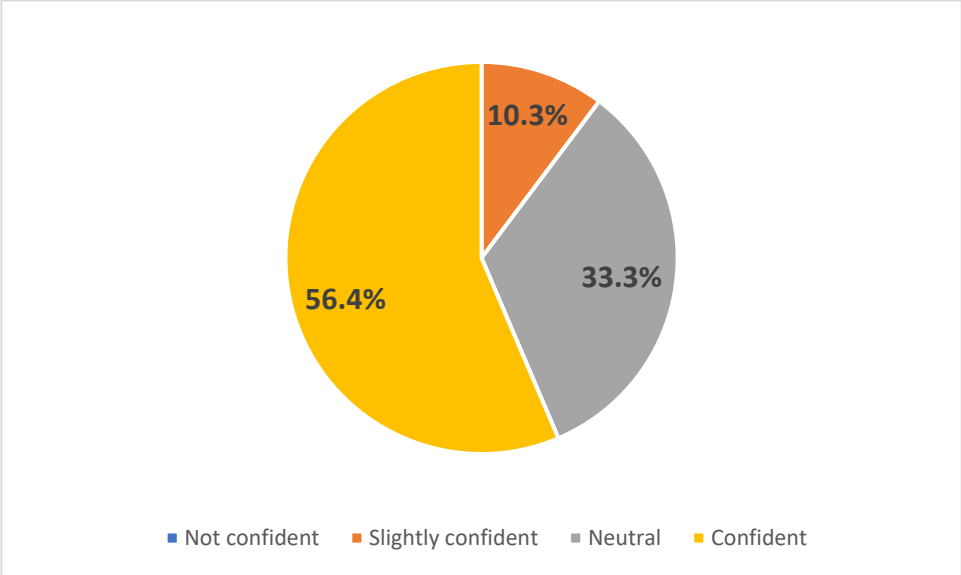

Fig.3. Confidence in the application of course topic [%].
Source: own elaboration based on survey data, n=39

Over half of the participants were confident about their ability to apply the concepts from the course. One-third remained neutral and only 10% admitted that they are slightly confident. No one reported a lack of confidence.
The average evaluation of the capability of the application was based on a scale of 1-4, where 1 is "not confident" and 4 is "confident". The average score amounted to 3,5 out of 4.

[Q11] Additional comments as listed by students:
Very well processed.
Thank you for providing this course, which is really informative.

3. Course Evaluation Results – DIGITALIZATION AND AUTOMATION

3.1. COURSE - AUTOMATION*

*the number of the question(s) from the survey referring to the selected topic is provided in brackets e.g. [Q1]

[Q1-Q3] Evaluation of structure, quality and difficulty

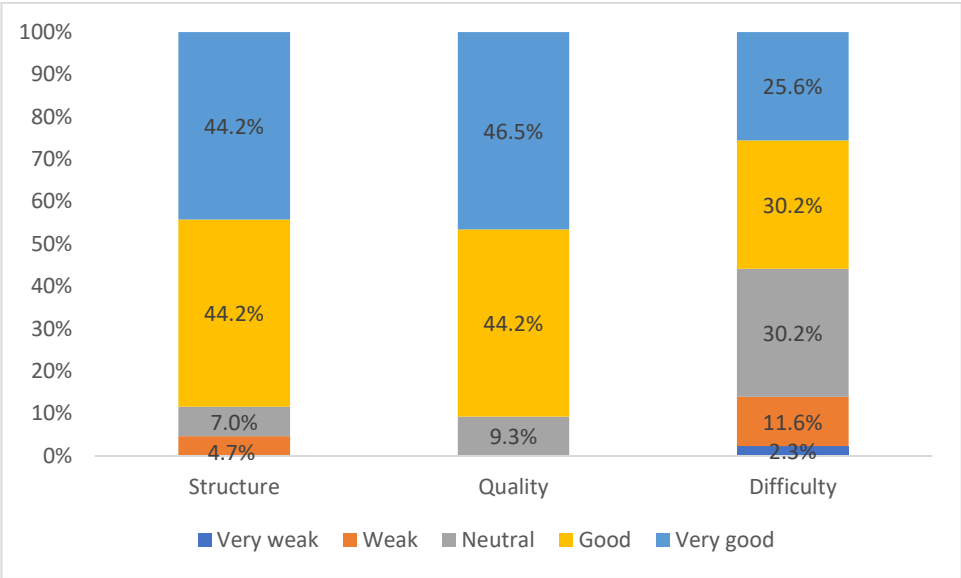

Fig. 1. General evaluation of the course

Source: own elaboration based on survey data, n=43

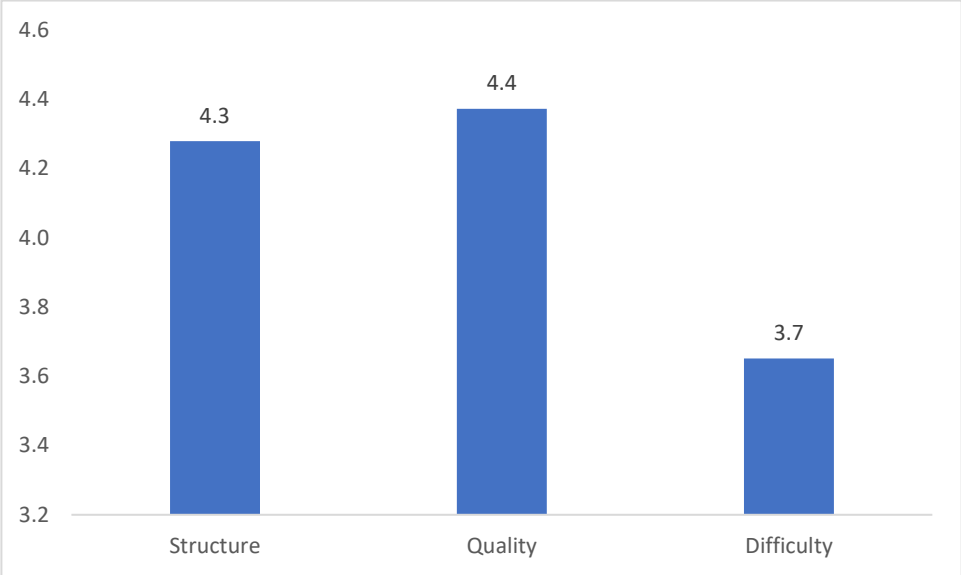

Fig.2. Average score for structure, quality and difficulty of the course.

Source: own elaboration based on survey data, n=43

[Q4] Topic to cover more in-depth

Based on the student comments thermal processing and its calculations are essential for food safety and process safety measures, so providing a more comprehensive understanding of this subject could be beneficial for students. Additionally, exploring the topic of sensors deployed in vegan food processing including thermal control, could be valuable to those with an interest in plant-based food production and quality control.

Individual students have expressed interest in subjects related to engineering, PLC programming, automatics, and robotics.

[Q5] Parts that were recommended to skip

Based on the student comments, it appears that most students find the content of the course necessary. They in general did not identify any specific parts they would skip as unnecessary. However, two students did mention some areas that could be considered for improvement.

Firstly, the depth of programming content might be challenging for some students, and it may require specialized cases.

Secondly, combining the material on programmable logic controllers, hardware, and software into one unit could help students better grasp the concepts and their practical applications.

Overall, the feedback indicates that the course content is relevant and valuable to students.

[Q6] Suggested changes to the content

Based on the student comments, it appears that most students are generally satisfied with the course content and structure, as they did not mention specific parts to change. However, some students suggested adding more video materials, visuals, and video presentations to enhance the learning experience.

[Q7] The most useful topic

Based on the student comments, topics related to PLC, automation, sensors, process control, thermal and non-thermal processing, robotics, IoT, and new technologies were highly valued by the students.

Additionally, the course content related to solving errors that prevent machines from working and maintaining HACCP principles in practice was highlighted as valuable, indicating that practical aspects of automation and process control are highly relevant for students.

[Q8] Changes in thinking about issues related to the topic of the course

Based on the student comments, topics related to automation, digitalization, 4.0 technologies, sensors for specific vegan food processes, and control engineering were highly valued by the students.

[Q9] Topic that the participants didn't know before the course

Based on the student comments, Programmable Logic Controllers (PLCs) and sensors in Vegan Food Processing were mentioned frequently.

[Q10] Confidence in applying the concepts from the course [%]

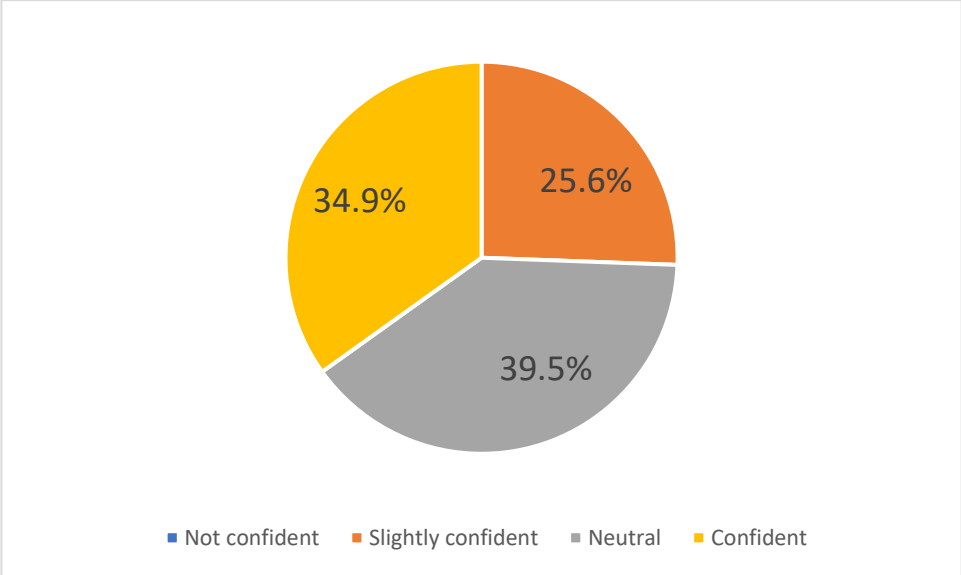

Fig.3. Confidence in the application of course topic [%].

Source: own elaboration based on survey data, n=43

35% of participants were confident about their ability to apply the concepts from the course. 40% remained neutral, 26% admitted that they are slightly confident. Nobody reported a lack of confidence.

The average evaluation of the capability of the application was based on a scale 1-4, where 1 is "not confident" and 4 is "confident". The average score amounted to 3,1 out of 4.

[Q11] Additional comments as listed by students:

Everything was fine. Thanks for the course!

I found it very helpful

Significance of automation and digitalization for process control. this is a rather important topic for a sustainable food processing.

very well prepared materials, all suggested learning outcomes can be achieved

This topic is very far from my area of expertise. So, it has been very difficult for me, in terms of vocabulary and concepts.

3.2. Course - ICT*

*the number of the question(s) from the survey referring to the selected topic is provided in brackets e.g. [Q1]

[Q1-Q3] Evaluation of structure, quality and difficulty

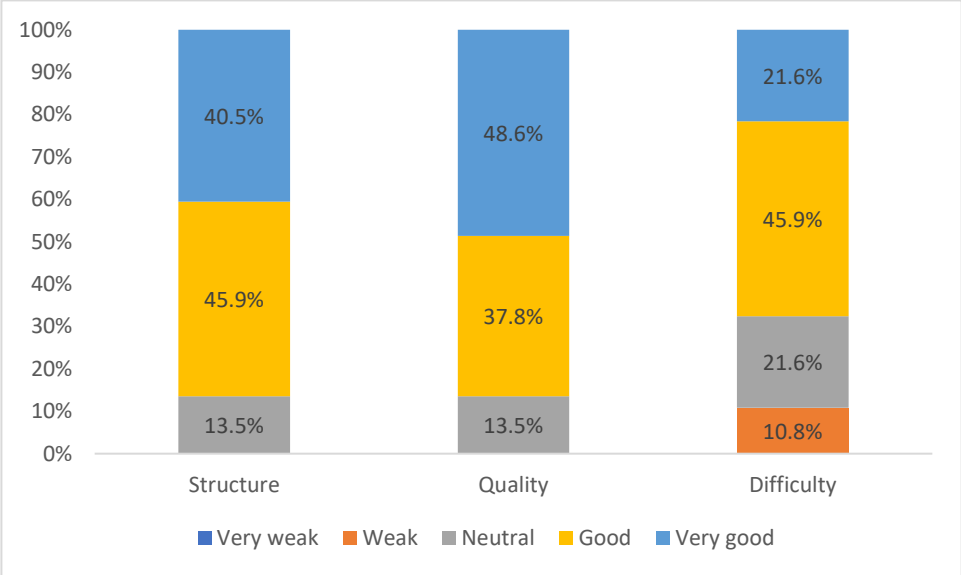

Fig. 1. General evaluation of the course

Source: own elaboration based on survey data, n=37

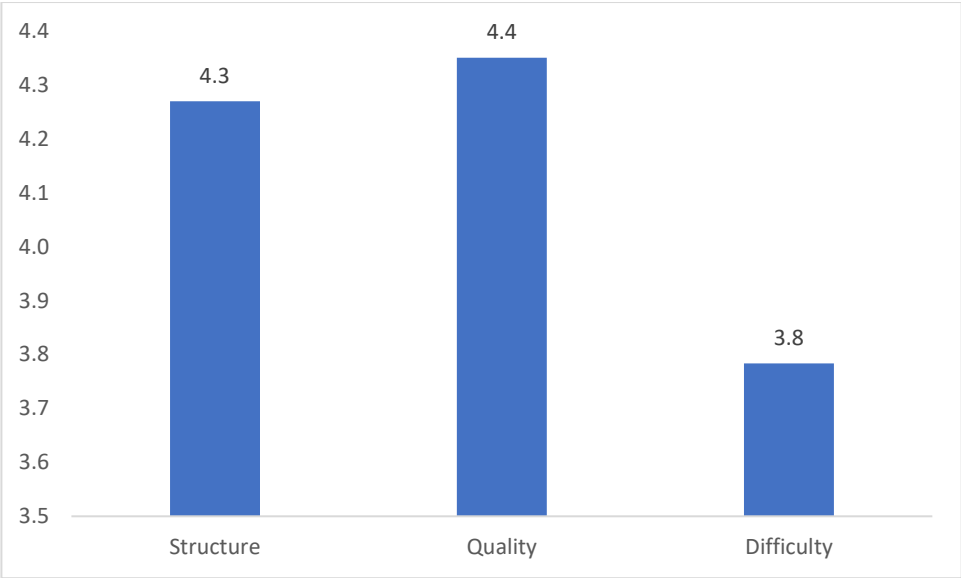

Fig.2. Average score for structure, quality and difficulty of the course.
Source: own elaboration based on survey data, n=37

[Q4] Suggested in-depth topic

For almost all participants completing the survey, the topics of the course were presented sufficiently in-depth. Students suggested adding some case examples about biosensors. There are also 2 comments listed below: The presentations must be more concise with information on what is asked in the tasks. It was hard for me to understand what the purpose of the lecture is without reading the introduction. The lecture itself is fine, there is not much text, and there is a table or a graph. However, its recording did not significantly help the reception, because initially the presentation is read from the slides, without additional comments. I was interested in the digitalization of the food and beverage slide, but also only the main names under the pictures were read, without any explanation, which unfortunately did not add anything to my knowledge in terms of using such great opportunities.

[Q5] Parts that were recommended to skip

Nobody would skip any part of the course as unnecessary.

[Q6] Suggested changes to the content

Some students have provided suggestions to improve the course's presentation design, format, and content.

There was one comment about adjusting the letter size on a specific slide.

There was also a request for a wider discussion of the content.

[Q7] The most useful topic

Based on the student comments, the most useful topics appear to be related to Industry 4.0/5.0 and its interaction with other pillars, automation, digitalization, IoT, and real-world applications of these concepts. To build on this positive feedback, future courses could focus on providing more in-depth explanations of Industry 4.0 and Industry 5.0 concepts, and practical examples of how these technologies are applied in food production. Finally, offering more insights into how Lean and Green management systems can be integrated with digitalization efforts can help students understand the importance of a holistic approach to modernizing food production processes.

[Q8] Changes in thinking about issues related to the topic of the course
Based on the student comments, the most impactful topics appear to be related to IoT systems and their importance in the food industry, the use of ICT in food production, the significance of computer literacy, and the potential for automation in various aspects of food production and sales. Additionally, the comments highlight the importance of exploring the application of IoT, automation, and sensors in the context of vegan food trends/production and biotech companies.

[Q9] Topic that the participants didn't know before the course
Based on the student comments, it is evident that topics related to IoT, smart factories, Industry 4.0, and Industry 5.0 are less known to the students. Additionally, there is a limited baseline knowledge of cybersecurity and mixed reality (AR/VR) as they relate to the industrial context. Biosensors and data measurement in manufacturing also appeared to be less known.

[Q10] Confidence in applying the concepts from the course [%]

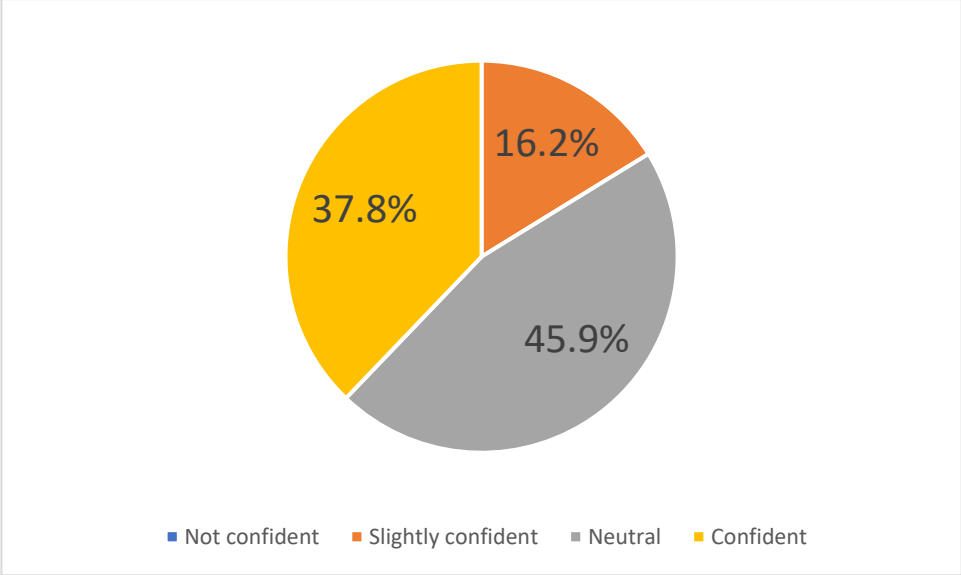

Fig.3. Confidence in the application of course topic [%].
Source: own elaboration based on survey data, n=37

38% of participants were confident about their ability to apply the concepts from the course. 46% remained neutral and 16% admitted that they are slightly confident. Nobody reported a lack of confidence.
The average evaluation of the capability of the application was based on a scale 1-4, where 1 is "not confident" and 4 is "confident". The average score amounted to 3,6 (out of 4).

[Q11] Additional comments as listed by students:
In the material answers needed for the given tasks should be available in the presentations. This is unfortunately always the time.

3.3. COURSE - ROBOTICS*

*the number of the question(s) from the survey referring to the selected topic is provided in brackets e.g. [Q1]

[Q1-Q3] Evaluation of structure, quality and difficulty

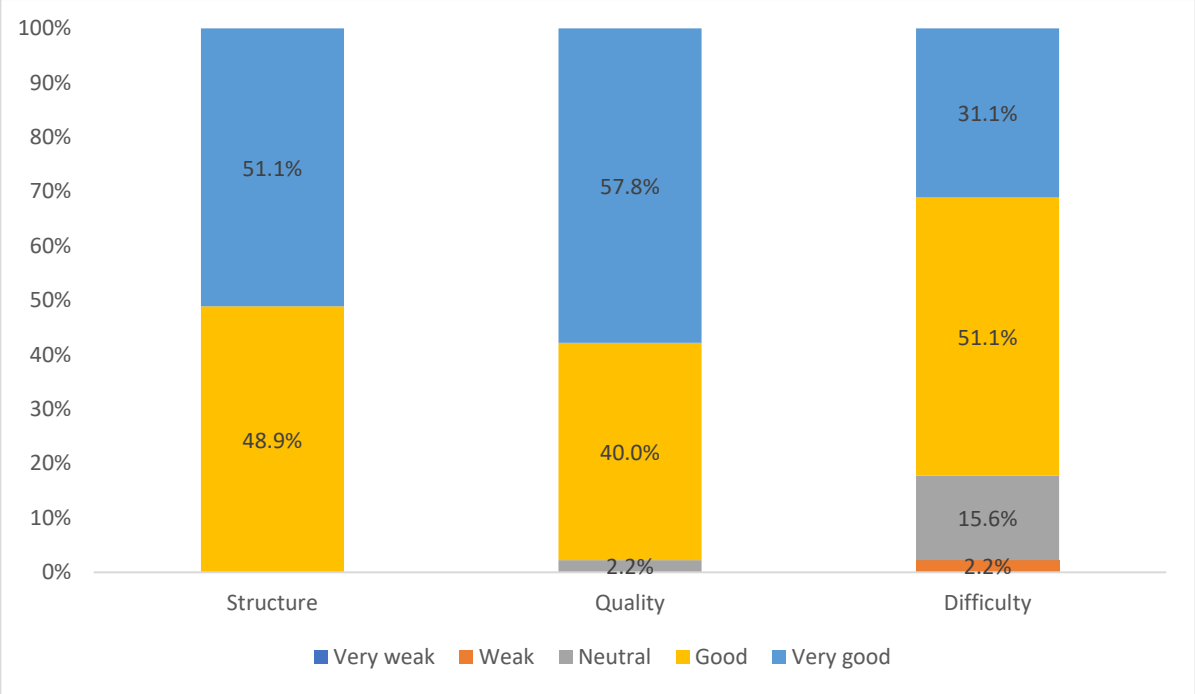

Fig. 1. General evaluation of the course

Source: own elaboration based on survey data, n=37

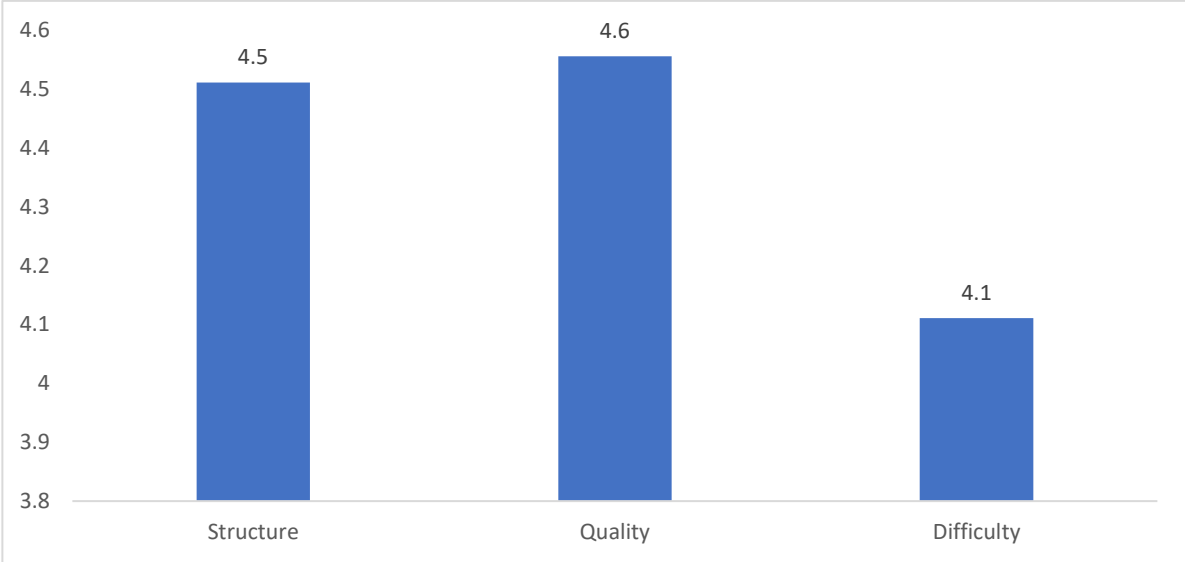

Fig.2. Average score for structure, quality and difficulty of the course.

Source: own elaboration based on survey data, n=37

[Q4] Suggested in-depth topics

For almost all participants completing the survey, the topics of the course were presented sufficiently in-depth. However, some of the students left the comment. One referred to specific areas: End effector and another one suggested adding more hands-on practice and demonstrations.

Some of the comments are listed below:

It's hard for me to be objective because this is a completely new topic for me. However, I consider the recording of the 3-part lecture to be incorrectly made. The recording is from the side, you can't see the presentation. Although the message itself is certainly very good in terms of content, it does not look professional.

No, because programming but not use interaction with robots. This is for users who projected robots.

[Q5] Parts that were recommended to skip
Two students left comments which are listed below:
A more concise presentation of the three lectures on robotics including the transcript version should be made in such a way that the material presented is visible and that the speech is following what is seen (not based on talk when scribbling on the whiteboard when the material is not visible).
Depending on the EQF level, this lecture seems appropriate for EQF6 or 7, depending on the practical tasks.

[Q6] Suggested changes to the content
Some students suggested changes and left comments, listed below:
make the robotics material more concise. Make the presentation on various robots according to the process.
Do industrial visits
Too many videos, difficult to follow
The method of recording the lecture mentioned above. Maybe I would add more about the possibility of using robotics in the food industry. Here is a very big focus on robotization itself.

[Q7] The most useful topic
Based on the student comments, it appears that topics related to Industrial Manipulator Robots, Robot Programming, Applications and Collaborative Robotic Systems were most useful to them.

[Q8] Changes in thinking about issues related to the topic of the course
Based on the student comments, the most influential topics appear to be related to the applications of robotics in the food industry, understanding the programming languages and techniques used in robots, and gaining insights into the components and features of industrial manipulator robots.

[Q9] Topic that the participants didn't know before the course
Based on the student comments, the unknown topics appear to be related to robot programming, applications of robotics in the food industry, and collaborative robotics (cobots), Denavit Hartenberg representation. These topics garnered the most mentions.

[Q10] Confidence in applying the concepts from the course [%]

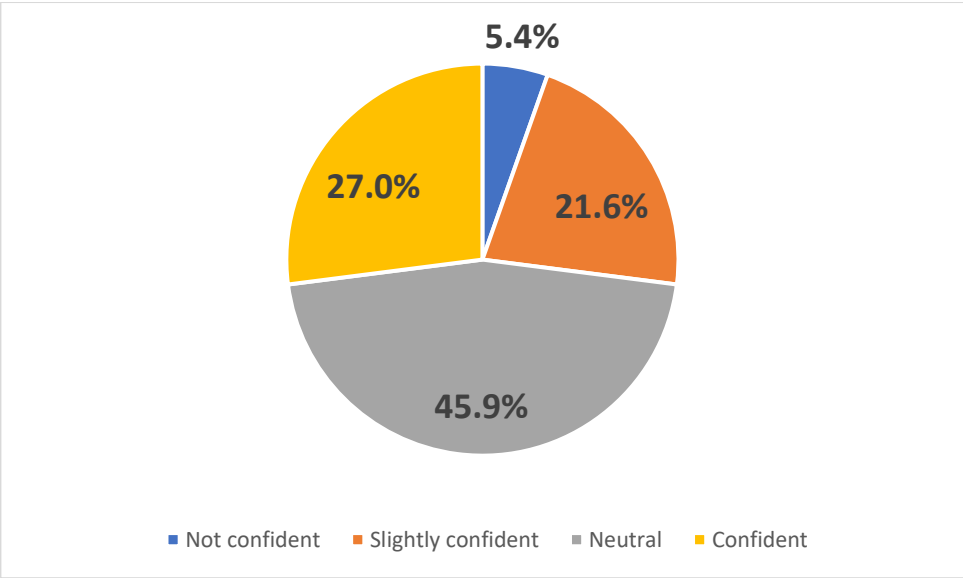

Fig.3. Confidence in the application of course topic [%].
Source: own elaboration based on survey data, n=37

27% of participants were confident about their ability to apply the concepts from the course. 46% remained neutral, 22% admitted that they are slightly confident and only 5% reported a lack of confidence.

The average evaluation of the capability of the application was based on a scale of 1-4, where 1 is "not confident" and 4 is "confident". The average score amounted to 2,9 out of 4.

[Q11] Additional comments as listed by students:

Recording of the lecture should be done again. The camera too far away and there are people blocking the screen.

More structured and concise material should be presented. The videos do not show the material presented (recorded far away) or then parts are performed on a whiteboard but this part is not included in the presented material even though you hear descriptions what is presented.

4. Course Evaluation Results – SOFT SKILLS

4.1. COURSE - INTRA AND INTERPERSONAL SKILLS*

*the number of the question(s) from the survey referring to the selected topic is provided in brackets e.g. [Q1]

[Q1-Q3] Evaluation of structure, quality and difficulty

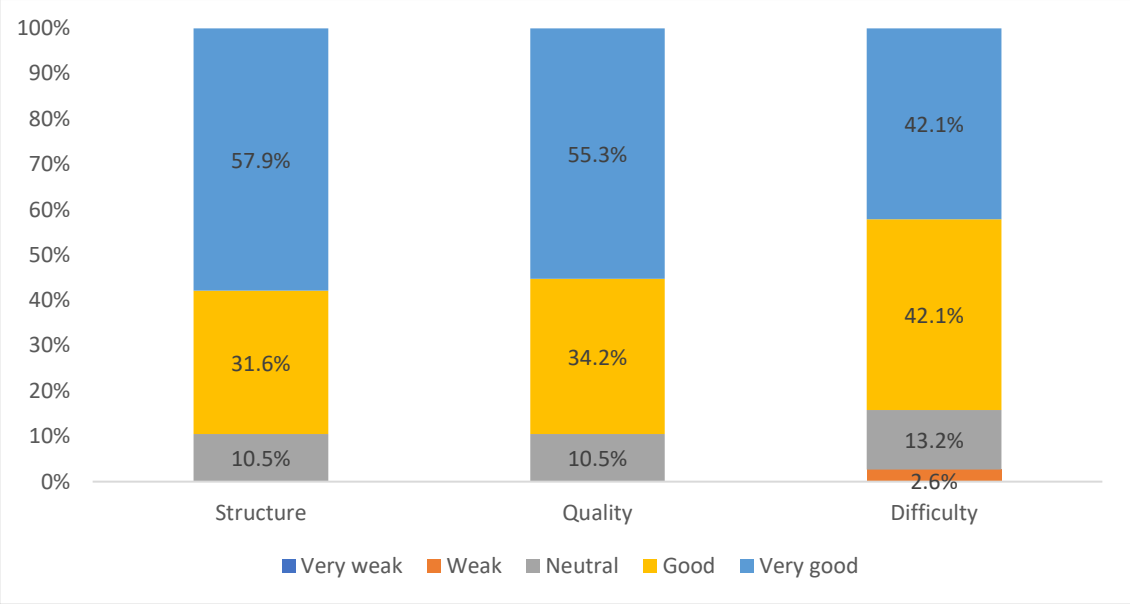

Fig. 1. General evaluation of the course
Source: own elaboration based on survey data, n=38

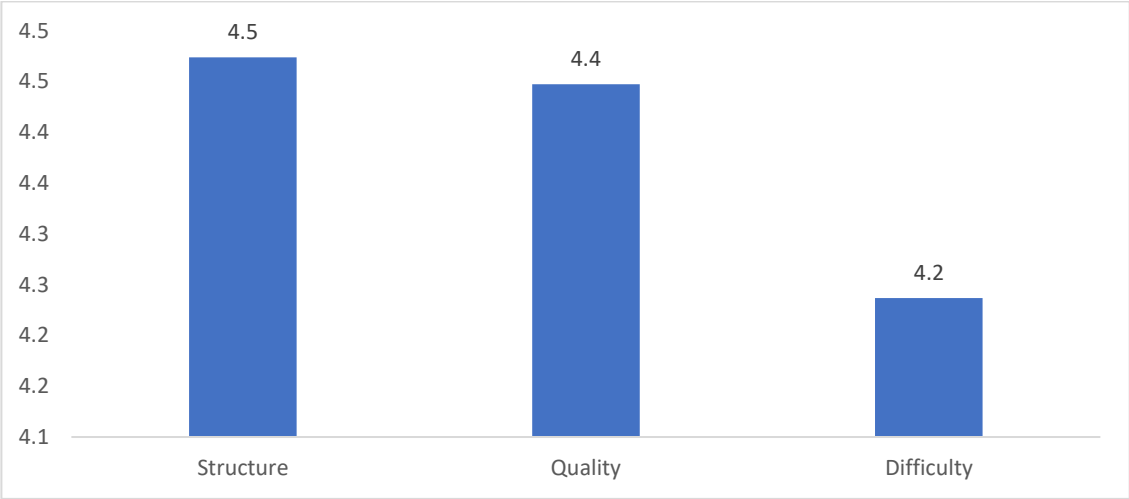

Fig.2. Average score for structure, quality and difficulty of the course.
Source: own elaboration based on survey data, n=38

[Q4] Suggested other topics to the course (yet not covered in the content)
For almost all participants the scope of the course was well-balanced. However, 2 students made reference to specific areas: template content and practical examples.

[Q5] Parts that were recommended to skip
Nobody would skip any part of the course as unnecessary.

[Q6] Suggested changes to the content
Only two students suggested that soft skills should be experienced not simply discussed, and that it would be beneficial to have an interaction with the lecturer over the material and tasks.

[Q7] The most useful topic

Based on the student comments, the most useful topic from the course appears to be the importance of intrapersonal and interpersonal skills. Practical application and techniques, along with self-development and reflection, also received positive recognition.

[Q8] Changes in thinking about issues related to the topic of the course
Based on the student comments, the most useful topic from the course appears to be the importance of intrapersonal and interpersonal skills. The focus on self-awareness and personal growth was also appreciated.

[Q9] Topic that the participants didn't know before the course
Based on the student comments, it is evident that the topics related to intrapersonal and interpersonal skills, as well as the use of Mentimeter and ice-breakers, were the most unfamiliar.

[Q10] Confidence in applying the concepts from the course [%]

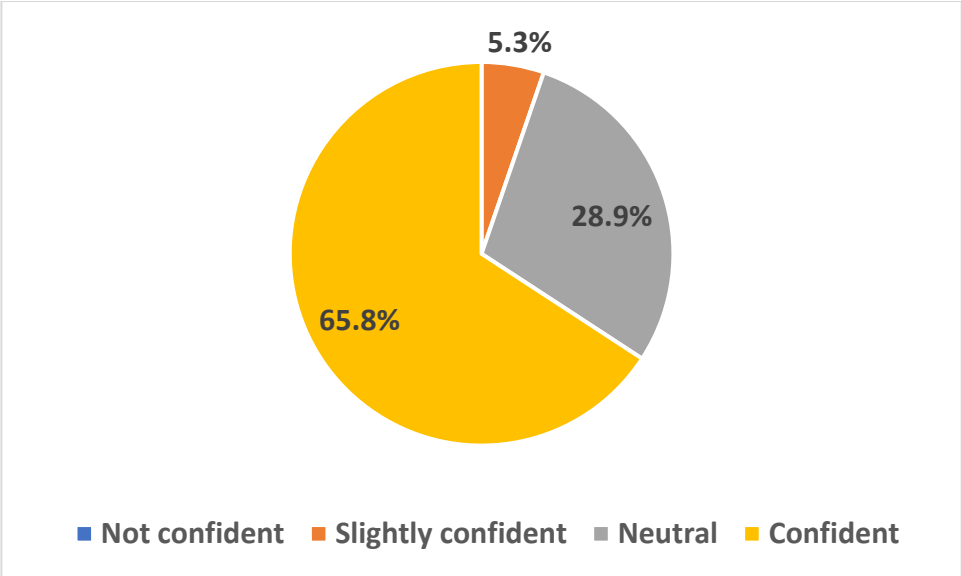

Fig.3. Confidence in the application of course topic [%].
Source: own elaboration based on survey data, n=38

Almost two third of participants were confident about their ability to apply the concepts from the course. Nearly 30 % remained neutral and only 5% admitted that they are slightly confident. No one reported a lack of confidence.
The average evaluation of the capability of the application was based on a scale 1-4, where 1 is "not confident" and 4 is "confident". The average score amounted to 3,6 out of 4.

[Q11] Additional comments as listed by students:
Very well presented.
The Learning template is not active.

4.2. COURSE - ACTIVE LISTENING*

*the number of the question(s) from the survey referring to the selected topic is provided in brackets e.g. [Q1]

[Q1-Q3] Evaluation of structure, quality and difficulty

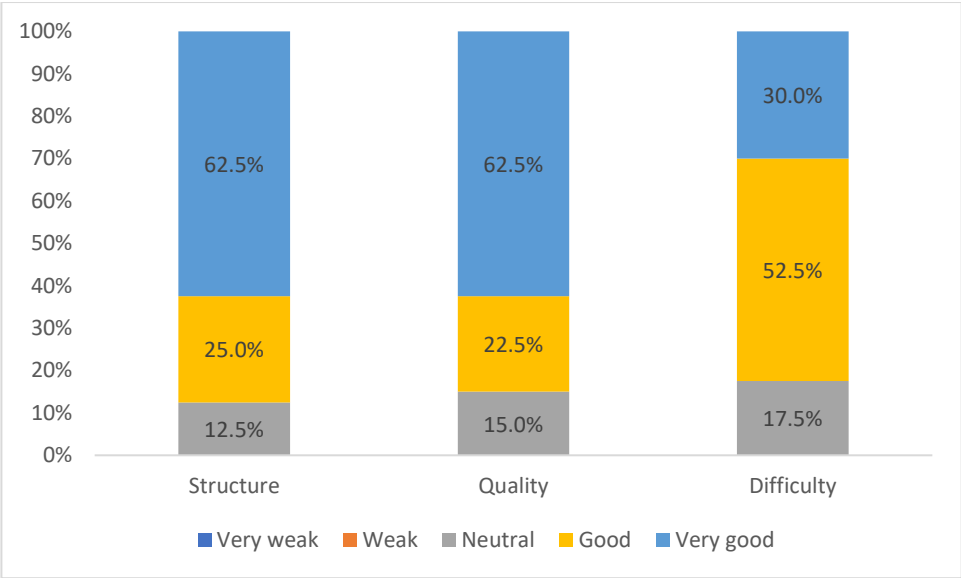

Fig. 1. General evaluation of the course
Source: own elaboration based on survey data, n=40

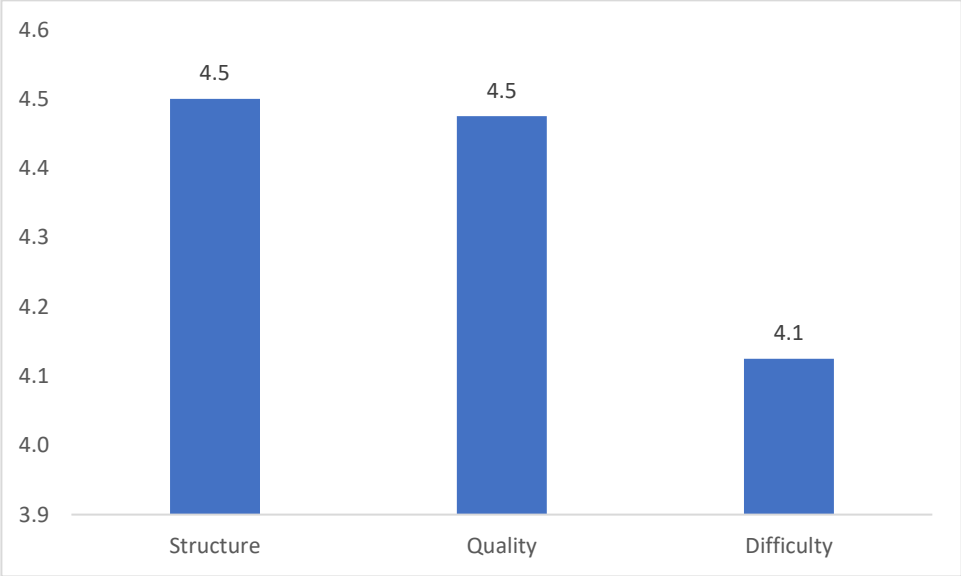

Fig.2. Average score for structure, quality and difficulty of the course.
Source: own elaboration based on survey data, n=40

[Q4] Suggested other topics to the course (yet not covered in the content)
For almost all participants completing the survey didn't suggest a new topic. However, 1 student made reference to specific areas: communication in relation to conflict management.

[Q5] Parts that were recommended to skip
Nobody would skip any part of the course as unnecessary.

[Q6] Suggested changes to the content
Only two students suggested: more visual materials and TED presentations instead of written material. With activity 4 it might be good to propose at least 1 sample text to be provided to learners.

[Q7] The most useful topic

Based on the student comments, active listening emerged as the most useful and valued topic in the course. The topic of nonverbal communication also received significant recognition. Also, practical guidance on active listening, including activities and examples was appreciated.

[Q8] Changes in thinking about issues related to the topic of the course

Based on the student comments, the most useful topic from the course appears to be active listening, with a strong emphasis on its importance and the need to improve this skill. Nonverbal communication in the workplace also stood out as a valuable aspect. Additionally, the significance of silence in communication and the awareness of interrupting others were highlighted.

[Q9] Topic that the participants didn't know before the course

Based on the student comments, the least explored topic before the course was active listening, with several comments specifically mentioning the 7-day active listening challenge. Nonverbal communication in the workplace and the importance of proper communication were also highlighted. Additionally, the topics related to hearing and listening, such as Julian Treasure's talk and listening for total meaning, caught students' attention and were not known before.

[Q10] Confidence in applying the concepts from the course [%]

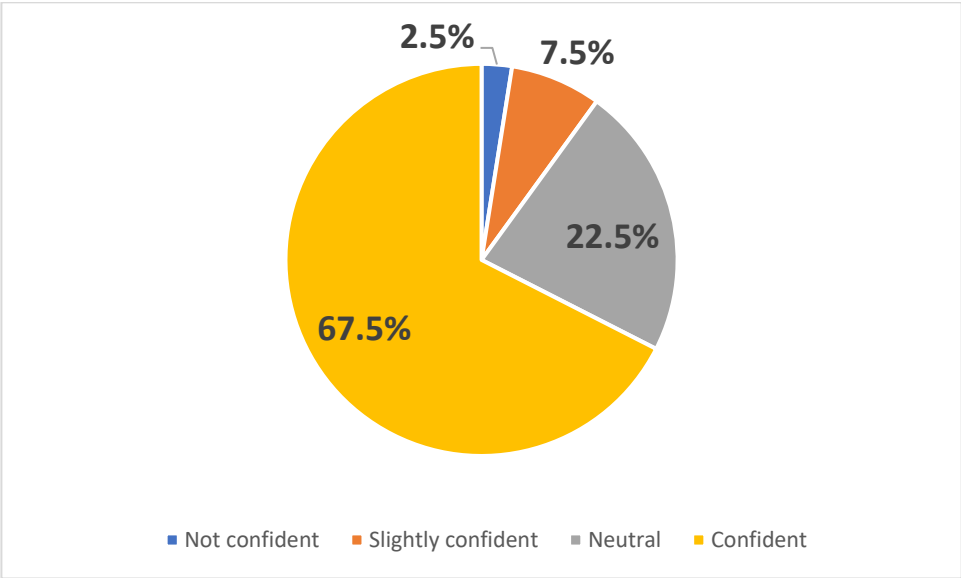

Fig.3. Confidence in the application of course topic [%].
Source: own elaboration based on survey data, n=40

Over two-thirds of participants were confident about their ability to apply the concepts from the course. Nearly 22,5 % remained neutral, 7,5% admitted that they are slightly confident and only 2,5% reported a lack of confidence.

The average evaluation of the capability of the application was based on a scale of 1-4, where 1 is "not confident" and 4 is "confident". The average score amounted to 3,6 out of 4.

[Q11] Additional comments as listed by students:

This part is OK when taking the magnitude of this part into account
I liked the varied forms of content presentation.
Very interesting and educative.

I agree that active listening is important, but I believe that this part of the course should be implemented at an earlier age, before college enrollment, since students from 1st year onward already have to know how to actively listen.

4.3. COURSE - LEADERSHIP, TEAM BUILDING, TEAM WORKING*

*the number of the question(s) from the survey referring to the selected topic is provided in brackets e.g. [Q1]

[Q1-Q3] Evaluation of structure, quality and difficulty

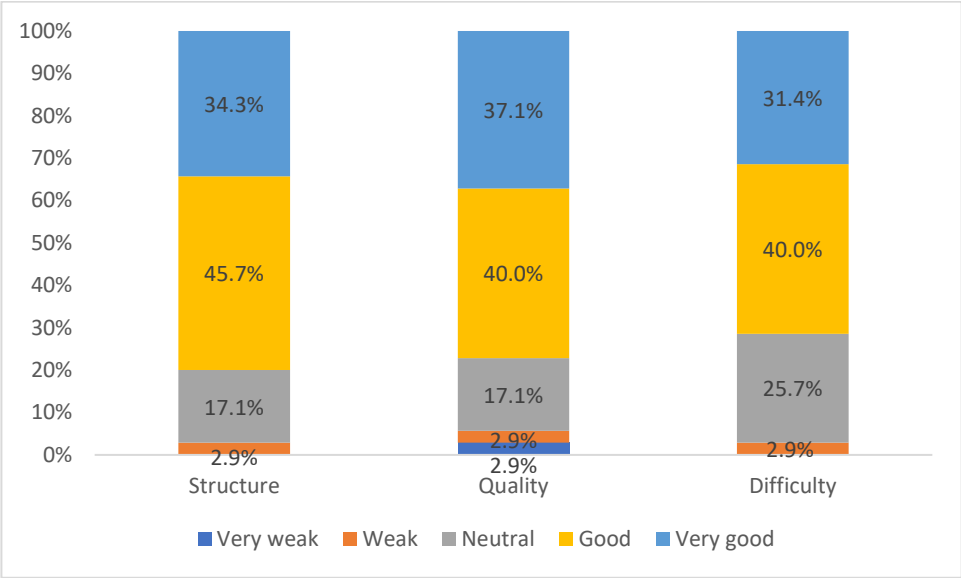

Fig. 1. General evaluation of the course
Source: own elaboration based on survey data, n=35

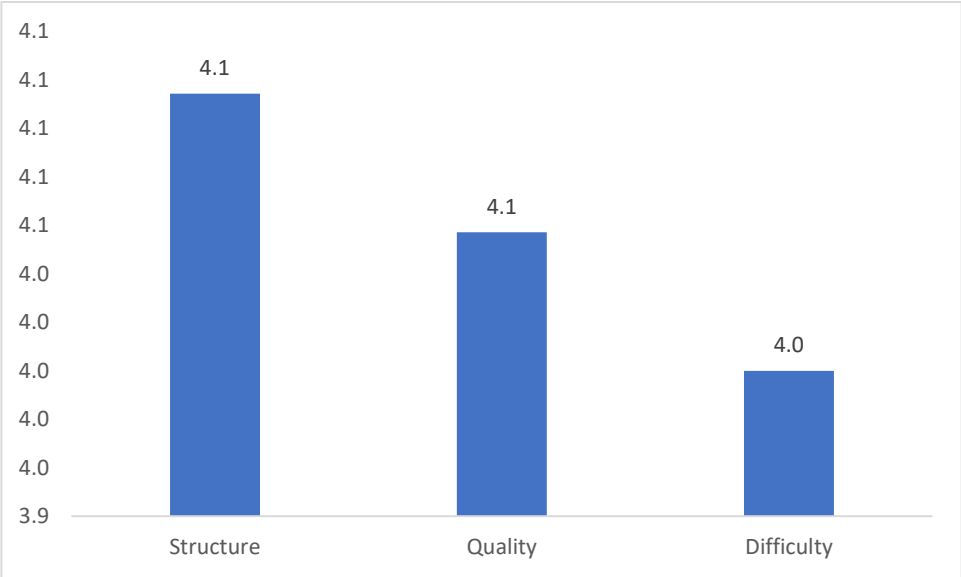

Fig.2. Average score for structure, quality and difficulty of the course.
Source: own elaboration based on survey data, n=35

[Q4] Suggested in-depth topics

For almost all participants completing the survey, the topics of the course were presented sufficiently in-depth. However, students mentioned that there is a lack of definitions and theory behind the topic and also it should be explained how to define roles and responsibilities.

[Q5] Parts that were recommended to skip

Nobody would skip any part of the course as unnecessary.

[Q6] Suggested changes to the content

Four students suggested that it would be better with more and a different form of presentation such as video and graphical.

[Q7] The most useful topic

Based on the student comments, the most useful topic from the course appears to be the difference between teamwork and team building. Team building activities and methods for improving teamwork were also equally useful. Additionally, the concept of good leadership and its role in organizations received attention.

[Q8] Changes in thinking about issues related to the topic of the course

Based on the student comments, the most impactful topic from the course appears to be the difference between teamwork and team building, with several comments highlighting the importance and impact on success. Additionally, the specific activity "Would you rather" was mentioned as a valuable solution/method.

[Q9] Topic that the participants didn't know before the course

Based on the student comments, the most unknown issue was the difference between Teamwork and Team Building, as it was mentioned multiple times and students showed that they were not aware of the difference before the course.

[Q10] Confidence in applying the concepts from the course [%]

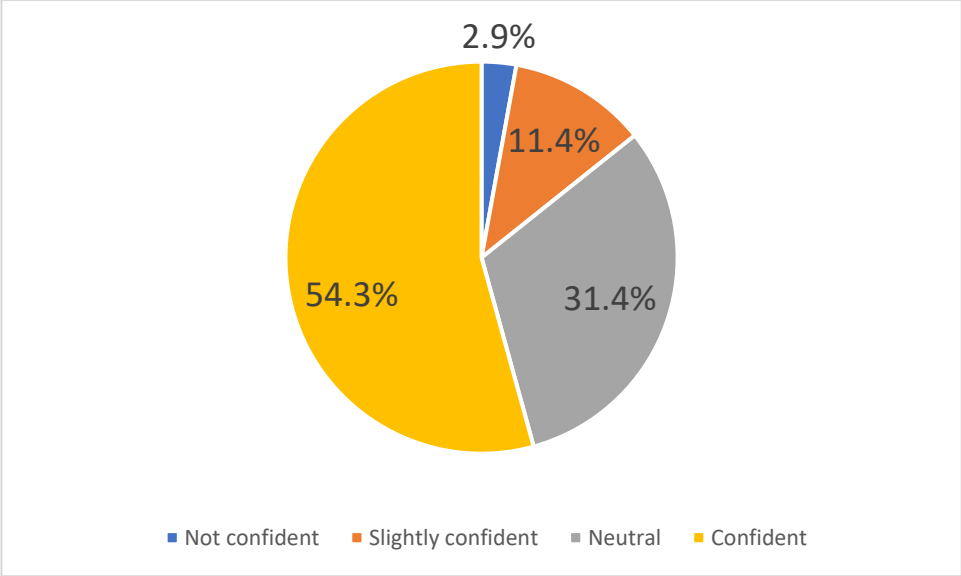

Fig.3. Confidence in the application of course topic [%].
Source: own elaboration based on survey data, n=35

Over half of the participants were confident about their ability to apply the concepts from the course. Over 30 % remained neutral, 11% admitted that they are slightly confident and only 3% reported a lack of confidence.
The average evaluation of the capability of the application was based on a scale of 1-4, where 1 is "not confident" and 4 is "confident". The average score amounted to 3,4 out of 4.

[Q11] Additional comments as listed by students:
I do not know what to say since I cannot complete any activity in this section.

4.4. COURSE - PROBLEM SOLVING*

*the number of the question(s) from the survey referring to the selected topic is provided in brackets e.g. [Q1]

[Q1-Q3] Evaluation of structure, quality and difficulty

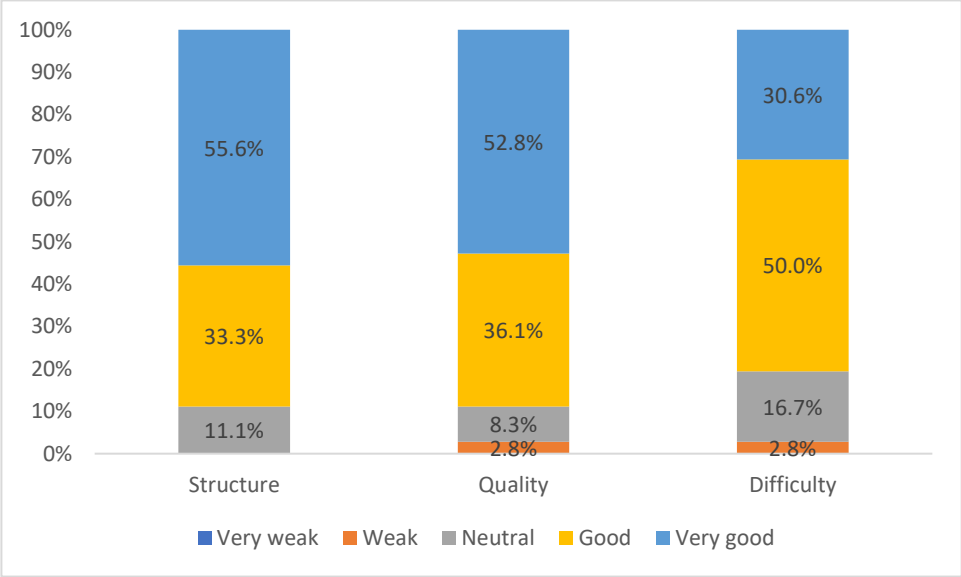

Fig. 1. General evaluation of the course
Source: own elaboration based on survey data, n=36

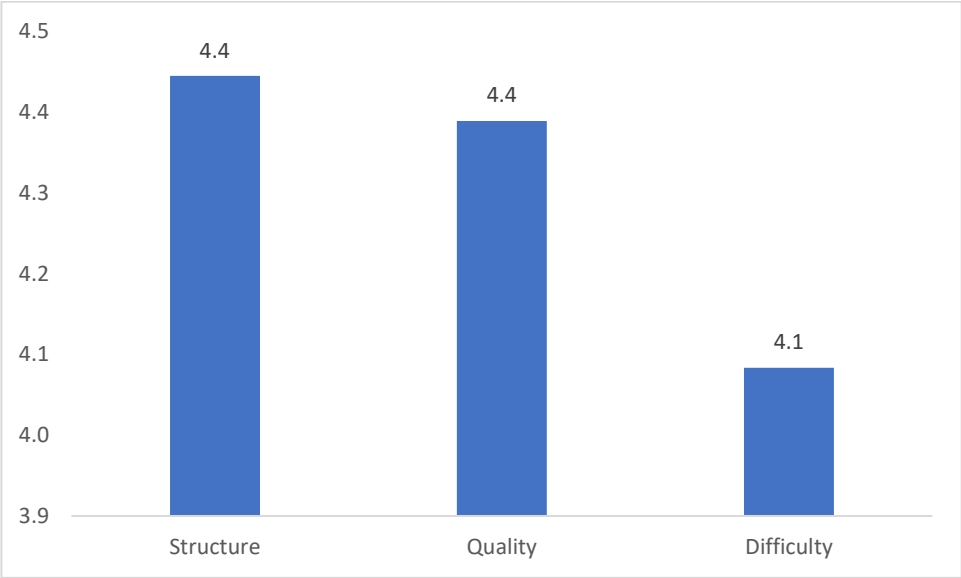

Fig.2. Average score for structure, quality and difficulty of the course.
Source: own elaboration based on survey data, n=36

[Q4] Suggested topics for a more in-depth presentation
For almost all participants completing the survey, the topics of the course were presented sufficiently in-depth. However, 2 students referred to specific areas: template content, and practical examples.

[Q5] Parts that were recommended to skip
Nobody would skip any part of the course as unnecessary.

[Q6] Suggested changes to the content
Only two students suggested adding presentation and case study-based training instead of introducing concepts and presenting websites.

[Q7] The most useful topic
Based on the student comments, the most useful topic appears to be Problem Solving Techniques, with various mentions of different problem-solving types, idea-generation techniques, and strategies for effective problem-solving. The Marshmallow challenge also stood out as engaging and insightful.

[Q8] Changes in thinking about issues related to the topic of the course
Based on the student comments, the most influential topic appears to be Problem-solving Skills, with several students mentioning the improvement of problem-solving abilities and the generation of new ideas. The concept of thinking innovatively and outside the box also stood out.

[Q9] Topic that the participants didn't know before the course
In summary, the student's feedback can be categorized into several clusters based on the similarity of their answers. The largest clusters are related to cooperative problem-solving and the Marshmallow Challenge. Idea generation techniques, problem-solving methodology, problem-solving techniques, and miscellaneous topics also received mentions.

[Q10] Confidence in applying the concepts from the course [%]

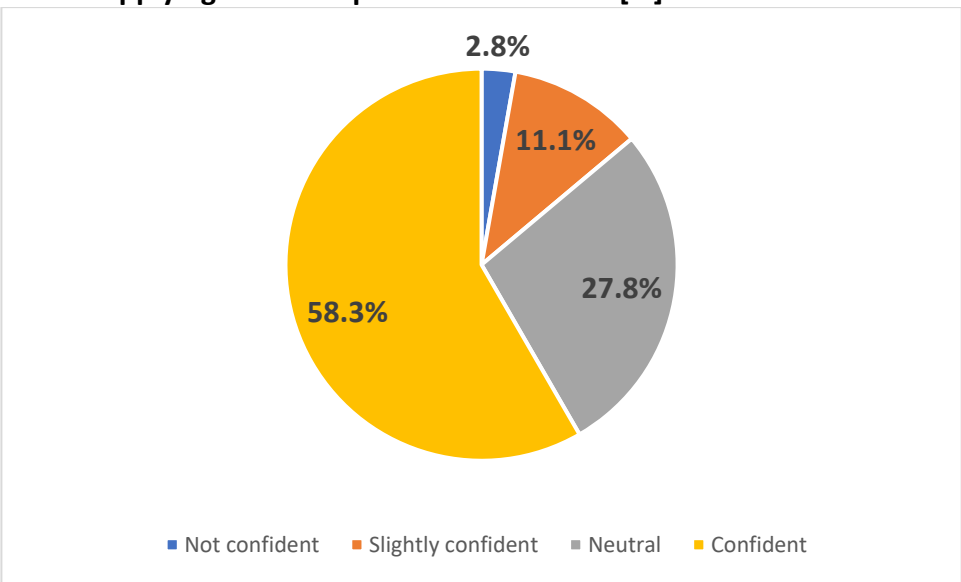

Fig.3. Confidence in the application of course topic [%].
Source: own elaboration based on survey data, n=36

58% of participants were confident about their ability to apply the concepts from the course. Nearly 30 % remained neutral, 11% admitted that they are slightly confident and only 3% reported a lack of confidence.
The average evaluation of the capability of the application was based on a scale of 1-4, where 1 is "not confident" and 4 is "confident". The average score amounted to 3,4 out of 4.

[Q11] Additional comments, questions, or concerns to share?
There were no additional comments listed by students.

4.5. COURSE - ETHICAL UNDERSTANDING*

*the number of the question(s) from the survey referring to the selected topic is provided in brackets e.g. [Q1]

[Q1-Q3] Evaluation of structure, quality and difficulty

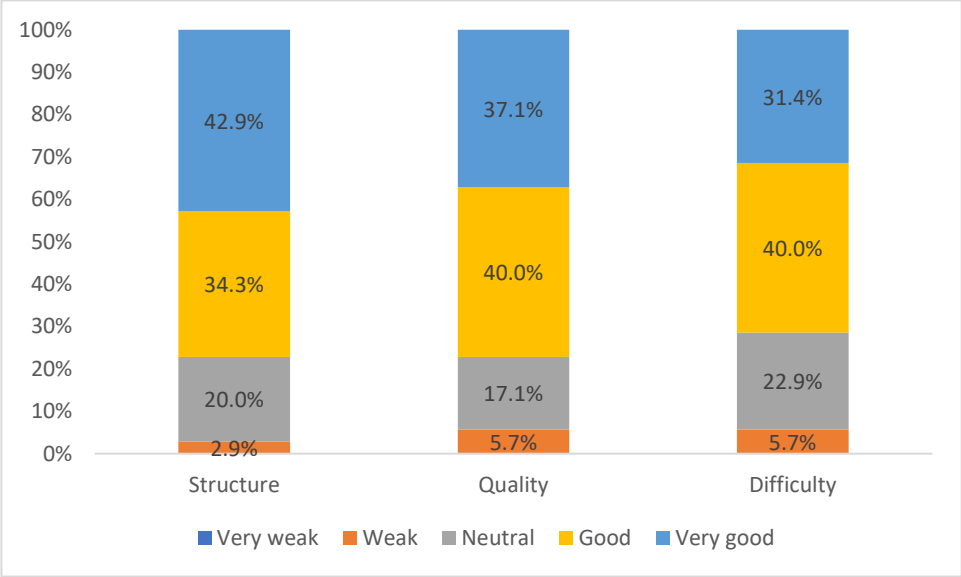

Fig. 1. General evaluation of the course
Source: own elaboration based on survey data, n=35

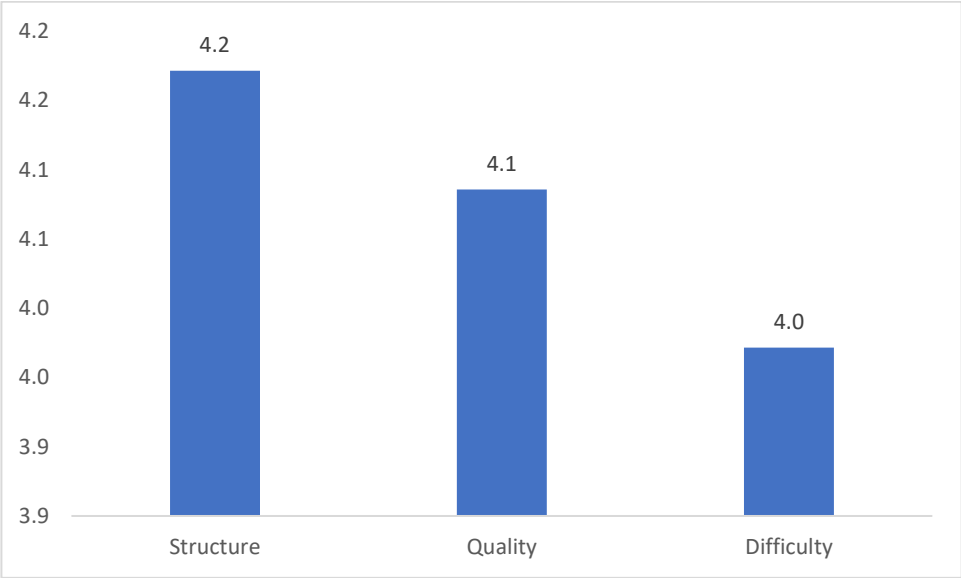

Fig.2. Average score for structure, quality and difficulty of the course.
Source: own elaboration based on survey data, n=35

[Q4] Suggested other topics to the course (yet not covered in the content)
For almost all participants completing the survey didn't suggest new content to add. However, 2 students made reference to specific areas: Food fraud issues and ethical reasons for increasing vegan trends like health, and animal welfare.

[Q5] Parts that were recommended to skip
Nobody would skip any part of the course as unnecessary.

[Q6] Suggested changes to the content
Only two students suggested adding more materials and more ideas regarding activities on the topic.

[Q7] The most useful topic
Based on the student comments, topics related to Ethics and the Ethical Matrix were the most useful, as they were mentioned the most frequently and highlighted the importance of ethical considerations in the food system. Topics related to food trends and food fraud were also of interest to the students.

[Q8] Changes in thinking about issues related to the topic of the course
Based on the student comments, topics related to Food Ethics and Food Fraud were the most impactful, as they were mentioned the most frequently and highlighted the importance of understanding ethical issues in the food system, especially in the context of food fraud. The course seems to have successfully influenced students' perception of the significance of ethical decision making and ethical considerations in food production and consumption.

[Q9] Topic that the participants didn't know before the course
Based on the student comments, the topic of the Ethical Matrix seems to be less known by participants as it was mentioned multiple times and students found it valuable in applying it to workshop exercises. Ethical issues and food fraud detection were also noted.

[Q10] Confidence in applying the concepts from the course [%]

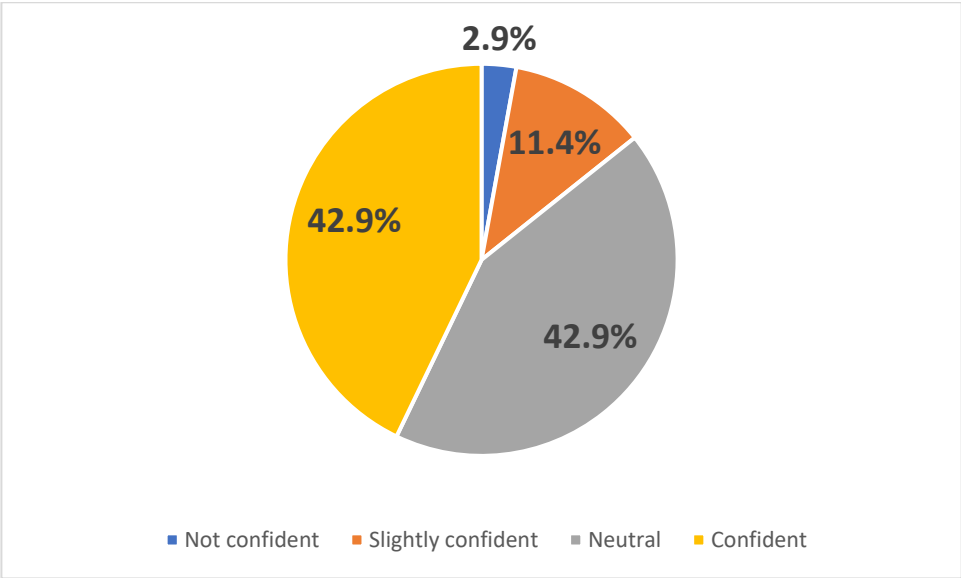

Fig.3. Confidence in the application of course topic [%].
Source: own elaboration based on survey data, n=35

43% of participants were confident about their ability to apply the concepts from the course. The same percentage remained neutral, 11% admitted that they are slightly confident and only 3% reported a lack of confidence.

The average evaluation of the capability of the application was based on the scale of 1-4, where 1 is "not confident" and 4 is "confident". The average score amounted to 3,3 out of 4.

[Q11] Additional comments as listed by students:

I'd like to see more detailed instructions and more resources on activities

The content is appropriate

Appendix 2 - COURSE QUALITY ASSESSMENT BY TRAINERS – DETAILED RESULTS

In the end of the entire trainings, TRAINERS were requested to evaluate the courses using the online questionnaire.
The detailed questions of the course quality assessment by the trainees relevant to all the Modules are presented below:

Questionnaire for Trainers in WP4.1 - Evaluation of trainings by trainers

Question #	Question
Q1 **Qualifications**	What professional qualifications do You have? (diploma, academic degree, position, other)
Q2 **Experience**	What experience You have got in professional teaching ? number of years in teaching number of years in preparing online training
Q3 **Employment**	What is your current employment ? institution, place, country
Q4 **Difficulties**	Did you encounter any difficulties during the preparation of the on-line training ? If yes, please explain
Q5 **Improvment**	If a second round of trainings would take place, would you change or improve anything in the content of your trainings? If Yes, please explain
Q6 **Overall satisfaction**	How do you evaluate your overall satisfaction from performing the on-line trainings ? very satisfied satisfied moderately satisfied unsatisfied

Feedback from Trainers
[Q1]* Professional qualifications

*The number of the question(s) from the survey referring to the selected topic is provided in brackets e.g. [Q1]

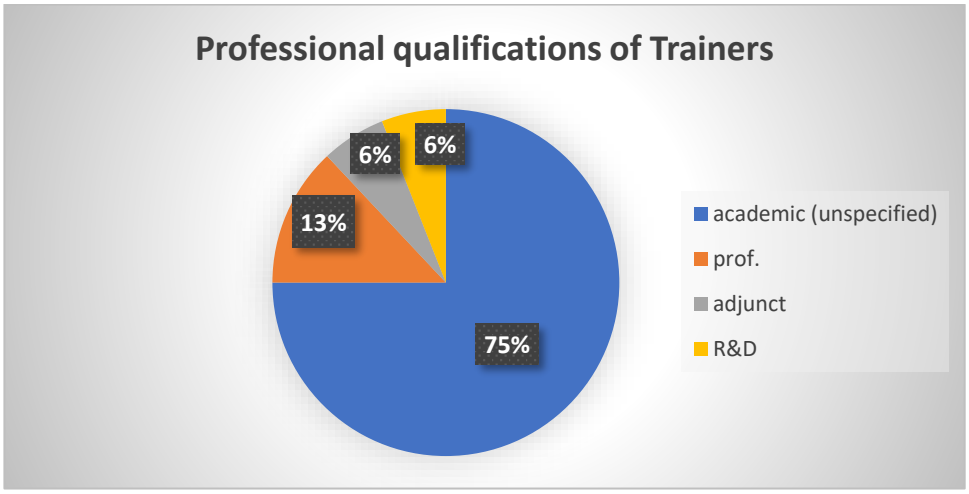

Fig.1. Structure of professional qualifications of trainers (positions)
Source: based o n survey data, N =16

All the respondents had academic degree. Most of them were academics but did not indicate their position (75% unspecified), 13% indicated professor position, 6% adjunct, 6% R&D manager.

[Q2] What experience have you got in professional teaching (in years)?

a) number of years in teaching

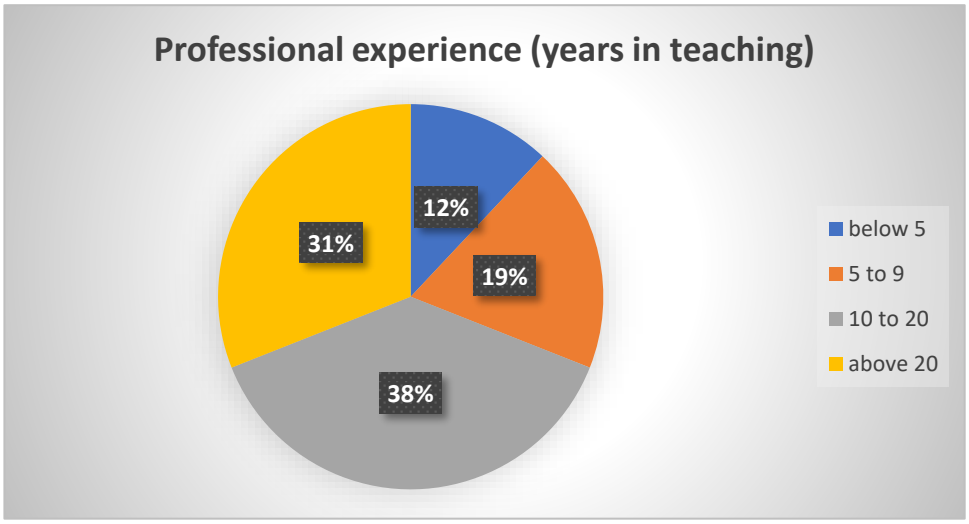

Fig. 2. Structure based on the number of years of teaching
Source: own elaboration, N=16

The majority of respondents declared a long track record in teaching (31% over 20 years, 38% 10 – 20 years), nearly one fifth (19%) between 5 and 9 years, while 12% below 5 years (1 no answer). The average teaching experience amounted to 18 years.

b) number of years in preparing online training

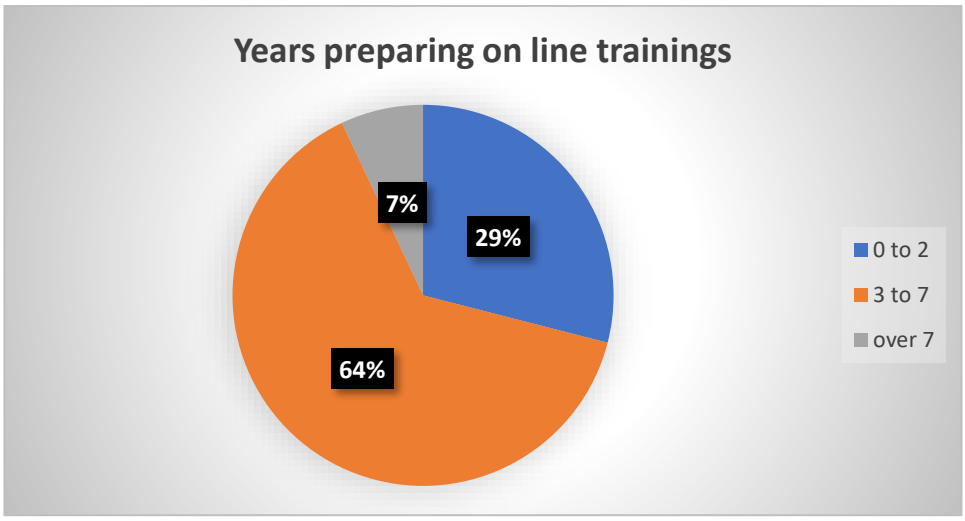

Fig.3. Structure based on experience in preparing online training (in years)
Source: own elaboration, N=16

A substantial fraction of trainers (64%) had 3 to 7 years of experience in online training, 29% had below 2 years of experience, 7% had over 7 years. One person did not give an answer, 1 person did not have experience at all. Average experience in online training amounted to almost 3,7 years.

[Q3] What is your current employment?

Affiliation	Nr of persons
Instituto Politécnico de Coimbra, Portugal	4
Poznań University of Life Sciences, Poland	4
University of Zagreb Faculty of Food Technology and Biotechnology, Croatia	2
Seinäjoki University of Applied Sciences, Seinäjoki, Finland	2
Central Research Institute of Food and Feed Control, Bursa, Türkiye	2
General Directorate of Agricultural Research and Policies, Türkiye	1
MCAST, Paola, Malta	1

Source: own elaboration, N=16

Four trainers represented the Instituto Politécnico de Coimbra, Portugal, 4 - the Poznań University of Life Sciences, Poland, 2- the University of Zagreb Faculty of Food Technology and Biotechnology, Croatia, 2 - Seinäjoki University of Applied Sciences, Seinäjoki, Finland, 3 - Government Institutions (TAGEM), Türkiye and 1 - MCAST, Paola, Malta.

[Q4] Did you encounter any difficulties during the preparation of the on-line training ?

If yes, please explain.

Almost all teachers declared that they experienced no difficulties. Only one person declared that was not sure if all the infromation introduced and the activities were the best for an online training.

[Q5] If a second round of trainings would take place, would you change or improve anything in the content of your trainings? If Yes, please explain

The majority of participants (11 out of 16 persons) declared that they wouldn't introduce changes to the content of the training. The remaining persons had additional comments, i.e. whould look a little more for advice/litereature on how to prepare online trainings, update some details, tackle the challenge of embedding ChatGPT as well, or do more individual exercises, allow students to be more creative reduce the number of slides in presentations..

[Q6] How do you evaluate your overall satisfaction from performing the on-line trainings

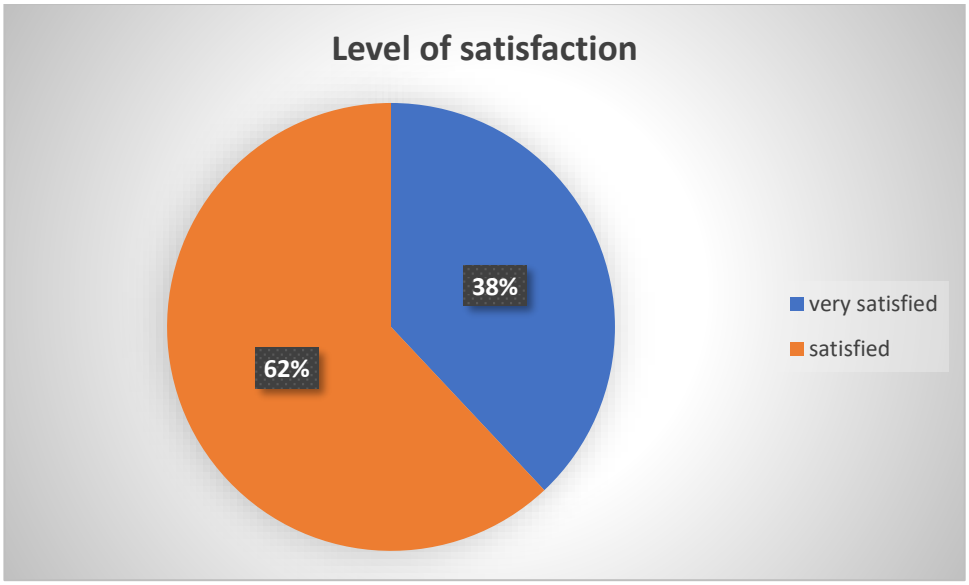

Fig.4. Level of satisfaction.
Source: own elaboration, N=16

All respondents declared their overall satisfaction from performing the on line trainings, more specifically 38% were very satisfied and 62% satisfied. No one reported dissatisfaction.

Appendix 3 - TRAINEES INVOLVED IN THE TRAINING OF TRAINERS

On the Train the Trainers, the results where the following. A total of 91 trainees registered, including on 1 from the associate partner, University of Deusto. The following table presents the numbers:

partners	n
PULS	34
FFTB	16
MCAST	10
SeAMK	8
ACTIA	7
IPC	6
ACTAE	3
AU	3
TAGEM	3
UDEUSTO	1

Additionally, 51 stakeholders registered for this training, which included mainly universities, even from countries outside of Europe:

Country	Organization	n
France	Vitagora	1
Ireland	Atlantic Technological University	1
Jordan	Al-Balqa Applied University	1
Macedonia	"Sts Cyril and Methodius" University	1
Peru	Universidad de La Molina	9
Poland	Gdynia Maritime University, Faculty of Management and Quality Science	2
Romenia	University of Agronomic Sciences and Veterinary Medicine Bucharest	6
South Africa	University of Venda	1
Spain	Hotel and Tourism School of Lleida	4
	Lea Artibai College	1
	Leartiker	1
Turkey	Bursa Technical University	4
	Bursa Uludag University Food Engineering Department	3
	Hacettepe University, Faculty of Medicine	1
	İstanbul abahattin Zaim University	1
	Istanbul Technical University, Department of Food Engineering	4

The duration of the online training of each of the 4 modules was measured in terms of e-learning hours (estimated time to read the documents and slides, watch the videos and working on execises):

Digitalization and Automation - 9 e-learning hours

Green Skills - 11 e-learning hours

Plant-based Processing - 11 e-learning hours

Soft Skills - 7 e-learning hours

Appendix 4 - THE LIST OF TRAINERS INVOLVED IN THE TRAINING OF TRAINERS

Name	Instutution
Anet Režek Jambrak	FFTB
Banu Akgün	TAGEM
Carla Rodrigues	IPC
Goreti Botelho	IPC
Ilkem Demirkesen Mert	TAGEM
Jarmo Alarinta	SeAMK
Jasenka Gajdoš Kljusurić	FFTB
Joshua Bugeja	MCAST
Juuso Kumpulainen	SeAMK
Kinga Stuper-Szablewska	PULS
Magdalena Człapka-Matyasik	PULS
Markus Ojala	SeAMK
Nuno Ferreira	IPC
Nurcan Ayşar Güzelsoy	TAGEM
Rui Costa	IPC
Ryszard Kowalski	PULS
Susana Gonçalves	IPC
Tomasz Szablewski	PULS