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Bio products and bio-based value chains
SYLLABUS

Study subject No: **2.1.**

Responsible Unit: **JAMK University of Applied Sciences, School of Technology, Institute of Bioeconomy (JAMK)**

Credits and distribution of academic hours*:

	Credits ECTS	Contact hours		Independent study hours	Total hours
		Lectures (academic hours)	Practical works or seminars		
JAMK	5	25	20	105	150
Total	**5**	**25**	**20**	**105**	**150**

** 1 ECTS = 30 hours (9 contact hours and 21 independent hours);*
1 academic hour = 40 minutes;
Theoretical lectures not less than 50% of contact hours.

Course developers:
JAMK University of Applied Sciences**, Auer Jaana, M.Sc. (agricultural bio-based products and value chains)**
JAMK University of Applied Sciences, **Knuuttila Kirsi, M.Sc. (forest bioeconomy products and value chains)**

Notes: General study course for the master programme Bioeconomy.

Prior knowledge: none.

Annotation:
Understanding the characters of bio products: bio products' possibilities and limitations; bio products' sustainability evaluation and measurements to evaluate different aspects of sustainability; recognition of possible products and services from the available bio-resources; markets of bio-based products. Understanding the elements of bio-based value chains: evaluating the prospects of the bio-based value chains; learning to build opportunities for establishing new bio-based value-chains. Transition from fossil-based economies towards bioeconomy: learning to support best practices in the business development regarding the limits of sustainability of biodiversity's (supporting soil quality and health in bio-based value chains and supporting water protection practices in bio-based value chains); circular economies in energy and nutrient productions.

The aim:
The student is familiar with innovative, novel bioproducts and bio-based value chains. The student is able to analyze and evaluate the requirements, possibilities and limitations of bio-based production chains. The student can assess business opportunities based on biomass potential in the area. Students are familiar with systems thinking in order to generate new solutions and innovations for systematic and feasible transition to bioeconomy. Students learn to support best practices in the business development regarding the limits of sustainability. E.g. students know how to support soil quality and health or water protection practices in bio-based value chains. Students recognize different business models of bioeconomy and circular bioeconomy. The student recognizes and utilizes various tools in

designing bioeconomy and circular bioeconomy business models. After completing the course, the student can generate a business model for a sustainable bio-based product.

Description of the organization and tasks of students' independent work:

Students take part into lectures according to course schedule. Students make 1 pair work, 2 group works and 1 individual examination. All these are scheduled and the deadlines for work is given in beginning of the course. One group work (=business model canvas) is represented to other students in a seminar and participation to this seminar is compulsory. This is necessary for peer-to-peer evaluation and feedback to students.

Learning outcomes (knowledge, skills and competences)

Learning outcomes	**Assessment methods**	**Levels of achievement**		
		Satisfactory	**Average**	**High**
KNOWLEDGE				
Novel, innovative biobased value chains and products	Examination	The student can identify and describe biobased value chains/products	The student can assess biobased value chains/products according to their sustainability features	The student can assess comprehensively and critically biobased value chains/products in terms of sustainability. The assessment is based on scientific knowledge or practise.
Systems thinking theory	Examination	The student knows the basics of systems theory and systems thinking	The student understands systems thinking as a way to solve complex problems. The student can describe linkages and interactions of a complex system.	The student can examine a system´s inter-relationships (contexts and connections) from different perspectives.
Sustainability assessment methods in business development	Examination	The student knows basics of sustainability assessment	The student understands the methods of sustainability assessment in business management	The student can apply sustainability assessment in business development
SKILLS				
Professional skills				
Value chain assessment and mapping skills	Pair work	The student can identify and map local bio-based value chains	The student can identify, map and assess local biobased value chains in terms on sustainability	The student can identify, map and assess local biobased value chains comprehensively in terms of sustainability. The assessments are validated with scientific knowledge.

Value chain and business development skills: Biomass potential assessment skills	Project work	The student can assess local biomass potential to some extend, but some elements are missing or are unrealistic	The student can assess local biomass potential with realistic insights	The student can assess local biomass potential realistically and development oriented
Business generation skills, Applying, analysing and evaluation skills of business models	Project work and presentation	The student can make a new business model based on local biomass potential. The business model canvas tool was not correctly used. The presentation is not satisfactory and does not show good understanding of the business line.	The student can generate a new innovative business model based on local biomass. The model takes sustainability aspects into account. The presentation shows that the business model is understood correctly, and it is feasible.	The student can generate an innovative, game changing, and feasible business model based on local biomass. The model takes sustainability aspects into account. The presentation shows in-depth understanding of business line in question.
Soft skills				
Teamwork, cooperation skills; Discussing and argumentation skills	Project work and presentation	The student can work in a team acting in a fair and responsible way. Difficulty in discussing and arguing the choices in the business model.	The student is a real team player who takes care that all are involved and takes responsibility voluntarily. Obey rules and timetables. Argumentation is good.	The student is a real team player and inspires others so that the team can achieve good results in the schedule. Argumentation is complete and shows in depth understanding of the business line.
COMPETENCE				
Business competences; define, describe and analyse bioproducts and biobased value chains; ability to apply sustainable business development methods in an enterprise	Examination	Some theoretical knowledge but based only on facts; difficulties in applying sustainable business development approach in an enterprise	Good theoretical knowledge and ability to define, describe and analyse bioproducts and biobased value chains; ability to apply sustainable business development approach in an enterprise	Excellent ability to apply the theoretical knowledge acquired and find creative and feasible solutions for sustainable business development in an enterprise

Requirements for awarding credit points:

Knowledge assessment and prerequisites for taking a test or examination
The final mark in the course is based on a cumulative score of 3 assignments (practicals) and an examination.

** 10 percent are equal to one point on a 10-point marking scale (or 10 percent are equal to 0.5 point on a 5-point marking scale).*

Topic	Type of assessment	Percen-tage	Assessment deadline
Pair work on mapping an Uzbekistan value chain and chain analysis; writing a report	Independent work; report	20%	Within the specified time for the report
Project work: Biomass potential assessment	Independent work in the project; Project report	20%	Within the specified time for the report
Group work: Generation of a business model using the business model canvas (BMC) -tool and presenting the business model in a seminar	Independent group work; BMC and a presentation	30%	Peer-to-peer evaluation within the specified time for presentations
Topics: novel, innovative bio-based value chains and products, systems thinking theory and sustainability assessment methods in business development (reading pointed books and scientific articles and lesson materials)	Examination	30%	Within the specified time for the test
Total		100%	-

The course contents

1. Lectures

1. Definitions: characters of bioproducts, bioproduct, bio-based value chains, value chain mapping, biomass potential, circular bioeconomy, biorefineries, industrial ecosystems.
2. Examples of current bio-based product value chains.
3. Analysis of advantages and disadvantages of current value chains of bioproducts.
4. Examples of innovative bio-based products (food, wood based, textiles, bio-plastics).
5. Value chain and business development: biomass availability in the area, biomass potential (theoretical, environmental, economic and sustainable measurement of biomass availability).
6. Value chain and business development: long-term innovative systems thinking; encourages the exploitation of organic waste/residues from agriculture, animal husbandry, domestic, industrial and commercial industries. Systems thinking generates new solutions and innovations and also enable systematic and feasible transition to bioeconomy.
7. Sustainable food system/sustainable food value chain: sustainable food production, consumption and waste/surplus management; nutrient cycling, recovering nutrients from manure, reusing nutrients in sewage sludge, cascading use of materials, supporting local farming, biodiversity, soil health.
8. Business models of bio-based products
9. Biobased products – from idea to market: 15 success stories in EU. The development of the success stories considers the history of the product development from idea to market, it provides descriptions of technology, product and feedstocks, and it considers how funding has been obtained as well as the existing and potential markets. All success stories provide a simple SWOT (identification of Strengths, Weaknesses, Opportunities and Threats) and they identify the key drivers of the observed success.
10. Generation of new business models: business model canvas (BMC) –tool
11. Value proposition and customer-oriented marketing.
12. Product development.

2. *Practicals*

1. Value chain mapping of a local Uzbekistan bioeconomy value chain (pair work); analysing the pros and cons of the value chain.
2. Project work (a group work): Biomass potential assessment. The student chooses one biomass in his/her home area and collects information about the availability of that biomass (quantity, quality, price, location, seasonal/always available, usability, users etc.). This is a starting point for the students to generate a business model upon it in later assignments.
3. Business model canvas (a group work): The students make a business model for a local existing company or for a fictional company (students' own business). The business model canvas tool is used. This new bioproduct uses the biomass which was looked into in the project work. The students represent their business model to other students in a seminar. Other students are supposed to ask questions or comment about the business model they also give peer-to-peer evaluation to the business model using the SWOT analysis method. In that way the students get feedback of feasibility of their business idea. Finally, the peer-to-peer evaluators give grades using scale 1-5.
4. Examination: Students read pointed books, scientific articles and lesson materials and take part into examination.

List of sources of training, methodological and scientific literature and information

Compulsory reading (books, scientific articles, online sources etc.):

1. European Commission. 2019. Biobased products – from idea to market "15 EU success stories".pdf
2. Jurgilevich, Birge, Kentala-Lehtonen, Korhonen-Kurki, Pietikäinen, Saikku & Schösler. 2015. Transition towards Circular Economy in the Food System.
3. Osterwalder, A. & Pigneur, Y. 2010. Business Model Generation. A handbook for Visionaries, Game Changers, and Challengers.
4. Osterwalder, A., Pigneur, Y., Bernarda, G., Smith, A. & Papadakos, T. Value Proposition Design. How to create products and services customers want.
5. Sitra 2021. EU Biomass Use in a Net-Zero Economy. https://www.sitra.fi/en/publications/eu-biomass-use-in-a-net-zero-economy/
6. Greene, Joseph P. Wiley 2014. Sustainable plastics: environmental assessments of biobased, biodegradable, and recycled plastics
7. Vlathos, Ilias P. & Malindretos, George. 2015. Markets, Business and Sustainability. Bentham Science Publishers.
8. Griffith, C., Caiazza, R. & Volpe, T. 2016. Innovation in the agro-food value chain. Emerald Publishing Limited.
9. Kassel, K. 2013. The thinking executive´s Guide to Sustainability. Business Expert Press.

Further reading:

1. Utilizing Principles of Biodiversity Science to Guide Soil Microbial Communities for Sustainable Agriculture, 10.32942/osf.io/tm5eh
2. Circular Economy Action Plan. For a cleaner and more competitive Europe. COM (2020) 98 final. Published: 2020-07-23 in Brussels. ISBN 978-92-76-19070-7, https://op.europa.eu/s/ora7
3. A New Industrial Strategy for Europe. COM (2020) 102 final. Published in 2020-03-10 in Brussels. p. 9, https://ec.europa.eu/info/sites/info/files/communication-eu-industrial-strategy-march-2020_en.pdf
4. Understanding the role of ruminant systems on greenhouse gas emissions and soil health in selected Central Asian countries (2021) https://doi.org/10.4060/cb4447en
5. Sinclair, R. (Ed.). (2014). Textiles and fashion: Materials, design and technology. Retrieved from http://ebookcentral.proquest.com. Created from jypoly-ebooks on 2020-05-11 05:53:49.

6. Institute for European Environmental Policy 2020. Assessing contribution towards the SDGs? Guidance for evaluating bio-based projects, https://biconsortium.eu/sites/biconsortium.eu/files/downloads/Guidance%20for%20assessing%20bio-based%20projects%27%20contribution%20towards%20the%20SDGs.pdf
7. Websites of different bio-based industries, e.g.
    a. EU Bio-based Industries Platform, Home | Bio-based Industries Joint Undertaking (BBI JU) (europa.eu)
    b. Plastics Europe website, PlasticsEurope
    c. Finnish Plastic Industry Federation -website, Muoviteollisuus ry (plastics.fi)
    d. Bioeconomy-website, https://www.bioeconomy.fi/articles/
    e. European bioplastics website https://www.european-bioplastics.org/
    f. Bioplastics news website https://bioplasticsnews.com/
8. Sitra and Palmu 2019. What motivates smart consumption? https://www.sitra.fi/en/publications/what-motivates-smart-consumption-using-motivation-profiles-to-support-business-planning/
9. (193) Peter Senge: "Systems Thinking for a Better World" - Aalto Systems Forum 2014 - YouTube
10. FAO 2020. Support in Formulating National Export Promotion Strategies for Selected Products in Azerbaijan, Tajikistan, and Uzbekistan - TCP/SEC/3602, Support in Formulating National Export Promotion Strategies for Selected Products in Azerbaijan, Tajikistan, and Uzbekistan - TCP/SEC/3602 (fao.org)
11. Ellen MacArthur Foudation 2016. The New Plastics Economy – Rethinking the Future Plastics. https://emf.thirdlight.com/link/faarmdpz93ds-5vmvdf/@/preview/1?o
12. Case studies for upstream innovations, https://emf.thirdlight.com/link/qly64rii2775-je3k1d/@/preview/1?o

Periodicals and other sources:

1. FAO – Examples of sustainable bioeconomy from Central Asia, News | FAO Regional Office for Europe and Central Asia | Food and Agriculture Organization of the United Nations
2. Ellen MacArthur Foundation website: What is upstreamed innovation? https://plastics.ellenmacarthurfoundation.org/upstream
3. Website: Wood based solutions from Finland, https://www.magnetcloud1.eu/b/businessfinland/BF_Wood-based_Solutions/
4. The Bloom Bioeconomy Suitcase video https://www.youtube.com/watch?v=2fOGs3f-P0I
5. Bioplastics from sugerbeet -video 2020 https://bloom-bioeconomy.eu/2020/04/01/video-series-on-bioeconomy-bioplastics-from-sugar-beets/
6. Bioplastics from Bacteria -video 2020 https://bloom-bioeconomy.eu/2020/07/16/video-series-on-bioeconomy-bioplastic-from-bacteria/
7. Blue Bioeconomy Forum https://op.europa.eu/en/publication-detail/-/publication/c8b2f69f-4314-11ea-b81b-01aa75ed71a1
8. What do you know about bioeconomy, blog https://blogit.jamk.fi/tarvaalantarinoita/2021/01/14/what-do-you-know-about-bioeconomy/

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