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Project "New Master's Degree Curricula for Sustainable Bioeconomy in Uzbekistan" (BioEcUz)
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THE NEW MASTER LEVEL CURRICULA "BIOECONOMY"

QUALITY ASSURANCE METHODOLOGY (D5.1)

2022

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INTRODUCTION

The quality assurance and assessment methodology has been elaborated within the project "New Master's Degree Curricula for Sustainable Bioeconomy in Uzbekistan" (BioEcUz), funded by the European Union Erasmus+ Programme and being in implementation of the consortium of Uzbekistan's and European Union universities, as well public and private sector partners.

CONSORTIUM MEMBERS:

Universities and public bodies of Uzbekistan:

- Tashkent State Agrarian University
- Tashkent Institute of Irrigation and Agricultural Mechanization Engineers
- Bukhara State University
- Samarkand Branch of Tashkent State Agrarian University
- Ministry of Agriculture of the Republic of Uzbekistan

Universities in the European Union:

- Latvia University of Life Sciences and Technology, Latvia
- Vytautas Magnus University, Lithuania
- Jyväskylä University of Applied Sciences, Finland

Associates:

- Ministry of Higher and Secondary Special Education of the Republic of Uzbekistan
- Association of Agribusiness of Uzbekistan
- Council of Farmers, Farmers and Owners of Household Lands of Uzbekistan

The development and implementation of the methodology are geared towards achieving the project goals - *to empower involved UZ HEIs with a tool creating the preconditions for the well-structured, clear and systematic evaluation of the new master's study programme, which creates the preconditions for the timely identification of challenges and risks and planning of measures for necessary academic content and process improvements*.

The methodology is elaborated with financial support of the European Union Erasmus+ Programme.
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1. DESCRIPTION OF THE MASTER'S STUDY PROGRAMME (MSP)

1.1. Goals and objectives of the Master Study Programme

Goals:

The project aims to support the achievement of the main goal (need) of the **Innovation Development Strategy of Uzbekistan for 2019-2021**, which is "**the development of human capital** as the **main factor enhancing** Uzbekistan's **competitiveness and innovation**" and particularly the implementation of two tasks: 1) **improvement of quality and coverage of education at all levels, based on the needs of the economy**, 2) **supporting, facilitating the integration of education, science and industries –** areas where achievements and progress are currently seen as insufficient.

It is planned to develop a new multidisciplinary master's study programme (MSP) (120 ECTS) in the fields of science, being part of the bioeconomy, and to implement measures necessary for ensuring MSP quality and sustainability.

The goal of the new master's study programme is to prepare academically-trained specialists and researchers with creative ideas and the ability to make competent and independent decisions, thus fostering improvements in bioeconomy-related industries of Uzbekistan on domestic and international markets, encouraging exports to the countries of the European Union.

Tasks:

1. To enable students to acquire modern knowledge on bioeconomy and to develop skills to critically evaluate the performance, impact and development of bioeconomy in terms of sustainability, as well as to creatively solve economic or managerial problems related to bioeconomy or separate bioeconomy sectors.
2. To provide students with basic knowledge on sustainable forestry, aquaculture, crop and livestock production and consumption through concepts of climate smart agriculture and smart farming techniques, acquiring professional skills needed to evaluate and plan sustainable food production chains, addressing practical tasks and analysing real situations, and preparing students for further studies and higher professional qualifications.
3. To increase food proficiency through understanding the economic and environmental impact of food production using several technologies including emerging technologies and consumption choices; develop critical thinking through the analysis and evaluation of sustainable food practices.
4. To provide students with a multidisciplinary foundation of circular economy knowledge and to strengthen students' ability to tackle global sustainability challenges by benefitting the potential of circular economy and developing innovative solutions towards circular bioeconomy.
5. To teach the ability to select and use research methods for solving current problems in bioeconomy sector industries.
6. To prepare students for independent research as part of further education in master's programmes, and for learning new research methods.

1.2. Syllabuses of the new master's programme implemented by involved universities in Uzbekistan

The study programme will be implemented in four universities of Uzbekistan. A multidisciplinary approach will be realised by blending the knowledge of the selected sciences with an emphasis on the efficient and sustainable use of biobased (natural) resources, reuse of waste and production side streams for the production of materials and energy, widespread use of natural and environmentally friendly technologies.

If higher educational institutions plan to implement the educational programme in full in their institution, it is necessary to prepare the teaching staff and improve the competencies related to the subject in areas where the existing volume of knowledge and specialists of the institution cannot provide this.

The MSP will provide students with an integrated set of theoretical knowledge and practical competences in the bioeconomy fields, those related to food production and processing, forestry and fisheries, manufacturing and processing of textile, engineering, where the sustainable use of biobased resources, both: biotic and abiotic, are in focus, where the enhancement of creativity, innovation and leadership skills prepare graduates for careers in research, management of bioeconomy sector's organisations and enterprises, becoming innovation and technological development pioneers.

The syllabus of an MSP is designed by the responsible teaching personnel member from EU universities in collaboration with Uzbekistan teaching personnel according to the programme's map and goal. Information about the syllabuses implemented by each of the universities is provided below.

1.2.1. Tashkent State Agrarian University (TSAU)

Specialisation of the University

Tashkent State Agrarian University is a leading institute of higher education in Central Asia, which was founded on 26 May 1930 under the name of the Central Asian Agricultural Institute. In 1934, it was renamed Tashkent Agricultural Institute, and in 1991 it obtained the status of Tashkent State Agrarian University.

Today, Tashkent State Agrarian University is a temple of agricultural knowledge and science, where the established traditions are developed and improved further to meet the challenges of the future.

Highly-qualified specialists are trained in the offered 32 Bachelor's degree majors, 35 Master's and 24 PhD programmes, as well as, doctorate programmes (DSc). Up to now, 79.4 thousand qualified specialists have graduated from the university, and among them 2.8 thousand are masters.

Tashkent State Agrarian University, with its modern infrastructure, is a place for competitive fundamental and applied research, orientated towards enhancing agricultural practices for the sustainable development of the sector. At present the university lecturers, staff and students contribute with their professionalism, competence and creativity to the progress of society towards knowledge-based economy, innovation and shared academic values. There are 22 departments in 7 faculties (Faculty of Agrobiology, Faculty of Plant Protection and Agrochemistry, Faculty of Fruit and Vegetable Growing and Viticulture, Faculty of Storage and Processing of Products Based on Innovative Technologies, Faculty of Zooinjeneriya, Faculty of Forestry and Ornamental Gardening, Agrologistics and Business); more than 5450 students and masters study at the university.

The university conducts 120 graduate, postgraduate courses and specialities such as:

- 32 Majors in bachelor’s degree
- 35 Specialities in master’s degree
- 1 special correspondence course and 20 correspondence directions
- 24 Specialities in Doctor of Philosophy
- 15 Specialities in Doctor of Science

Information Resource Centre of Tashkent State Agrarian University is one of the best funded libraries in the Republic's Higher Educational Institutions.

Syllabus	Credits as part of the system used in the EU (ECTS)	University strengths, specialisation in respective field
1. Bioeconomy policy and development of bioeconomy sector	8	Tashkent State Agrarian University trains specialists in the field of Economics, Management, Logistics, Marketing, Agribusiness (bachelor’s, master’s, PhD, DSc). At the Faculty of Agrologistics and Business, the Department of Agroeconomics and Tourism operates, which produces economists who have received a bachelor's and master's degree. More than 50 faculty members work in this direction, including 6 Doctors of Science (DSc) and professors, 15 Candidates of Science (PhD), and assistant professors. As part of the Master's programme in Agribusiness and Investment Activities, the subject of Economics of Resources and the Environment is taught. In the areas of economics, logistics, the subjects “Actual Problems of Agroeconomics”, “Economics of Resources” are taught. In the areas of undergraduate studies subjects such as “Economic Theory”, “Agricultural Economics”, “Agrarian Policy and Food Security”, “Digital Economics”, “Innovative Economics”, “Economics of Agricultural Production”, “Logistics”, “Marketing”, “International Economic Relations”, “Strategic Marketing” and other economic disciplines are taught. The department cooperates with the production units of clusters and other agricultural enterprises, where students undergo an internship, which provides an opportunity to obtain certain qualifications and skills in this speciality.
2. Circular economy	7	
3. Sustainable logistics	5	
4. Environmental economics	4	
5. Markets and international trade of bio-based products	5	
6. Bio-based RTD, innovations and business models	5	In the Department of Agribusiness and Tourism, the subjects “Innovative Economics”, “Organisation of Scientific Research”, “Innovative Activities in Agriculture”, “Innovative Management” and others are conducted, with questions relating to the use of innovations. These developments and curricula can be used and improved during the implementation of the programme in this subject. The Department of Agroeconomics and Tourism participates in a number of international projects to improve academic disciplines, in which modern research and evaluation methods are mastered on the use of innovations in agribusiness. In particular, university teachers participate in the USAID agribusiness development project to develop new modern and in-demand curricula, as well as improve existing specialised subjects, together with specialists from the University of Missouri. The department conducts research on applied projects to improve the use of resource-saving innovative technologies used in agribusiness. In addition, the teaching staff constantly conduct training seminars for farmers on innovative technologies. These events, in turn, ensure the integration of science, education and production.
7. Bioeconomy data analysis and statistics	5	The university has various departments that can provide material on data analysis in biological, natural and economic subjects. Since the university is agrarian and is also under the

		coordination of the Ministry of Agriculture, approaches to the collection, processing and analysis of data that make up the factors of bioeconomy can be used and improved. The departments in economic areas teach some subjects on economic and financial issues related to environmental issues, natural resource management, adaptation to climate change, combatting desertification, and biodiversity conservation. These developments and training programmes can be used and improved during the implementation of the programme of this subject. For example, corporate governance in agriculture, Accounting in the agro-industrial complex, Accounting, Economic analysis and audit, Agricultural statistics, Information technology in agriculture and others. Bachelor's degree students gain basic knowledge of statistics and working with databases. Over recent decades, the university has been involved in a number of international projects to improve academic disciplines, within which modern methods for creating a database and statistical accounting of indicators related to bioeconomy are being mastered. It will also help to master this subject and increase the interest of graduate students.
7. Bioeconomy research design and methods	5	The university has sufficient experience in the field of research and development. University scientists use various methods of scientific research and conduct a wide range of research projects in various areas of natural sciences, social sciences and technical sciences. At the university management level, there is a Vice-rector for Science, Department of Applied Research, who coordinates the work of teachers and scientists of the university. - The Department of Scientific and Scientific-pedagogical Training provides doctoral students with the necessary conditions for deepening theoretical knowledge in their chosen speciality and proper documentation of the personal work of doctoral students. - The Department of organisation of research works of gifted students is a branch of Tashkent State Agrarian University. The main tasks of the department are: • attracting students to research, teaching students continuous research work, individual and collective development of their scientific and technical creativity; • increasing the level of professional and creative readiness of students, improving the forms of their participation in scientific research, support and development of academic schools; • effective use of students' creative potential to solve topical issues of science and technology, preparing students for scientific and pedagogical work, developing their scientific, technical and creative abilities, preparing scientific methods for their profession and speciality; • creating the necessary conditions for the creative abilities of students, the formation of qualifications of skills that are important for a qualified specialist or researcher, as well as the preparation of foreign languages and study abroad; • assistance in the effective implementation of scientific and practical work, in particular, of the teaching staff of the TDAU and the “Youth Union” of students in acquiring national, moral and ethical qualities of students. Various research projects are being conducted with international funds and programmes such as UNDP, GIZ, ICARDA, FAO, etc. Thus, there is high potential for the development and testing of various scientific projects and research methods. This serves as a basis for the development of masters' knowledge and skills for mastering the subject material. The presence of departments in a wide range of areas of science
9. Scientific writing and reporting	5	

		will help to systematise materials for the integration of biological, agricultural, economic and fundamental sciences. Within the framework of the Master's programme, subjects related to the methodology of bioeconomy research are taught in each direction. For example, Methods of research work in Agronomy, Innovative technologies in Agronomy, Technology for growing environmentally friendly products, Resource-saving irrigation technologies, Methods of research work in organic farming and food security, Technologies for cultivating crops in organic farming, Efficient use of land in organic farming, etc. This also applies to other areas of the university's Master's programme.
10. Bioproducts and bio-based value chains	5	The university is the leading university in this field in the country. Trained specialists specialise in the cultivation, storage and processing of agricultural products and are directly compatible with this field.
11. Sustainable food production and consumption	7	The university trains specialists in the storage and processing of agricultural products. At the same time, it is the main institution of higher education in this area.
12. Renewable energy production and use (Biogas)	7	The advantages of teaching this discipline at our institute are: wider coverage of engineering tasks facing the energy sector, expanding the field of knowledge in biology (since the production of biogas from various raw materials entails obtaining deeper knowledge in biology and zootechnics), the search and study of new methods and the technical implementation of methods (that is, the study of electronics, electrical engineering, semiconductor materials, the use of electrical appliances and equipment), the study of modern methods of the engineering industry to obtain alternative forms of energy. That is, students are not just limited to obtaining agricultural knowledge; the horizons of interests of future specialists are expanding significantly. And in the future, specialists will have the opportunity to adequately navigate a large number of modern technologies offered for use and consideration.
13. Sustainable forestry	5	Since 1944, Tashkent State Agrarian University has been preparing personnel for the forest industry of Uzbekistan and foreign countries. More than 50 professors and teachers work at the university to train personnel for the forest industry, of which 8 are doctors of science, professors, 12 are candidates of science, associate professors. The material and technical base meets the requirements of the standards for training personnel for the forest industry.
14. Sustainable aquaculture	8	TSAU is a single university specialising in modern aquaculture (including intensive aquaculture) in the country. Qualified teaching staff, material and technical base (including RAS, raceway and cage systems). Good library with modern manuals.
15. Sustainable crop and livestock production and consumption (Livestock)	9	The following specialists are trained at the faculty of silkworm breeding and mulberry growing at TSAU: Zoo engineering (beekeeping); Zoo engineering (fishery); silk and mulberry; veterinary science; zoo engineering branches.

1.2.2. Tashkent Institute of Irrigation and Agricultural Mechanization Engineers (TIIAME)

Specialisation of University

Tashkent Institute of Irrigation and Agricultural Mechanization Engineers mainly specialise in the research fields of water resource management, state forestry cadastre, agricultural economics, electricity supply, sustainable aquaculture, fish management, international trade, international market, sustainable

water resource management, bio-based value chains, renewable energy supply, biogas, mini water energy generator at the bachelor's degree level.

Advanced courses such as biogas, bio-based products, Alternative energy, Advanced fish management, International market, Innovative economics, Green economics, Wetland forestry and Bio-based models are offered at Master's degree level, and there are also PhD courses.

Syllabus	Credits as part of the system used in the EU (ECTS)	University strengths, specialisation in respective field
1. Sustainable forestry	5	Staff at the Department of State Cadastre mainly focus on 21 cadastral services in Uzbekistan. Department staff deliver classes in state forestry cadastre and perform research in this field of science.
2. Markets and international trade of bio-based models	5	Staff availability with sufficient capacity in international trade of bio-based products, currently working at the university with either a Master's or PhD degree abroad. Moreover, international markets of bio-based product issues are one of the main directions of the research disciplines of the university.
3. Sustainable aquiculture and water management	8	The institute mostly focuses on water resource management. Therefore, there are many professors and assistant teachers who completed a PhD or Master's programme abroad such as in Germany, Austria, and China. Most research projects focus on water management, fish industry management.
4. Bioproducts and bio-based value chains	5	There is staff availability with sufficient capacity in a certain field of science, currently working at the university with either a Master's or PhD degree from abroad. Further, bioproducts and bio-based value chains are also involved as the main field of research disciplines of the university.
5. Renewable energy production and use	7	Department of Electricity and Renewable Energy Sources has associate professors who deliver classes in Water energy, Solar energy, and Biogas. Department staff work and perform research on renewable energy generated by solar, biogas and water energy.

1.2.3. Bukhara State University (BukhSU)

Specialisation of University

The BukhSU has many priorities such as the support of various governmental organizations and ministries. The BukhSU researchers closely work with many research organizations in Uzbekistan and abroad. The BukhSU has many labs related to water and land resource management. The university has different laboratories available for studies and research, for example, soil science laboratories; biology laboratories - analysis of various physiological processes in humans and animals; biotechnological analysis of fish and algae reproduction and feed quality; analysis of the role and importance of aquatic organisms in fish fry reproduction and care. The BukhSU has a high scientific and educational potential: accumulated scientific experience in the field of agriculture economics; special attention and support of the state on food safety matters; experience in international projects; experience in creating new educational programmes. The BukhSU has entered into more than 100 international cooperation agreements with foreign partners. The Bukhara State University ranks among the top universities in Uzbekistan and Central Asia with developed international partners network. The university is a constant member of international educational projects such as Erasmus+, UNICEN and others, it has established

close ties with numerous international organizations, e.g. JICA, KOICA, the British Council, etc. Special attention is given to double degree programs.

Syllabus	Credits as part of the system used in the EU (ECTS)	University strengths, specialisation in respective field
1. Bioeconomy development and policy	8	Professors and teachers of BukhSU have extensive experience in the field of bioeconomy industries in Uzbekistan, especially in the field of production and processing of agricultural products. They are aware of the policies and government programmes in this area, as well as participate in the process of their development and provide expertise. They also prepare educational materials on various topics in this direction and conduct scientific activities.
2. Sustainable crop and livestock production and consumption (+smart farming)	9	In BukhSU, various levels of specialists are trained in a number of specialities related to agriculture and the application of smart technologies in the field, in areas such as: Agrobusiness, Agronomy, Biotechnology, Biology, Agrochemistry, processing and storage of agricultural products. Therefore, a team of highly qualified scientists has been formed in this direction at the university. They have published educational materials on the field as well as a great deal of scientific work.
3. Circular economy	7	The circular economy is also one of the important areas of science for BukhSU; currently, a number of educational developments related to technologies for the use of non-waste and recoverable resources are prepared, scientific works are published, and qualified specialists are also trained in this direction at the university.
4. Markets and international trade of bio-based products	5	In recent years, BukhSU scientists have been paying great attention to the issues of international trade and the international market. In this direction, of particular importance are the study of the world economy and international economic relations, the development of world agriculture, international tourism and agrotourism, and the further increase in agricultural exports.
5. Sustainable logistics	5	In our country, special attention is paid to the formation of logistics services and logistics centres. For this reason, bachelor's degrees in agrologistics are taught at the university; a wealth of experience is being formed in this field, as well as educational and scientific work is intensively conducted.
6. Bioeconomy data analysis and statistics	5	In BukhSU, the number of young specialists are being increased in areas such as economic analysis, statistical analysis, and econometrics. Along with the direction of economics, training sessions are conducted in the disciplines of agribusiness and agrologistics. This direction has a long history and many prospects for the university.

1.2.4. Samarkand branch of Tashkent State Agrarian University (SAMTSAU)

Specialisation of the University **–** Samarkand branch of Tashkent State Agrarian University mainly specialises in the research fields of agricultural economics, accounting and auditing (in agriculture), agrologistics, agribusiness and investment, agrotourism, agronomy sciences, technology for the storage and primary processing of agricultural products at bachelor's degree level.

Advanced courses such as Agricultural economics, Accounting and auditing (agriculture), Econometrics, Agronomy, Agricultural mechanisation, Protected land fruit and vegetable growing are offered at Master's degree level, as well as there are PhD courses.

Syllabus	Credits as part of the system used in the EU (ECTS)	University strengths, specialisation in respective field
1. Environmental economics	4	Staff availability with sufficient capacity in a certain field of science, which currently work at the university with either a Master's or PhD degree from abroad. Moreover, economic impacts of Climate change and Environmental issues are the one of main directions of the research disciplines of the university.
2. Circular economy	7	There is staff availability with sufficient capacity in a certain field of science, which currently work at the university with either a Master's or PhD degree from abroad. Further, agricultural economics and the potential prospects of the post harvesting economy are also involved as the main field of the research disciplines of the university.
3. Bioeconomy research design and methods	5	At the institute, the main professors conduct research in the field of agricultural economics in Uzbekistan and in high ranked foreign universities. Therefore, it could be considered that they have sufficient scientific knowledge, skills and experience in the design and methodology of bioeconomy research. Today, they teach graduate students who are studying in the field of economics and agriculture on design and methods of research.
4. Bioeconomy data analysis and statistics	5	One of the strategic goals of the institute is to conduct intensive research. Today, a number of research works at the institute are based on quality data collection and scientific experience on econometrics. Therefore, our teachers and professors are skilled in big data analysis and statistics. In this project, the institute places high priority on the quality of implementation of the disciplines related to bioeconomy data analysis and statistics.

1.3. Knowledge, skills and competences gained

After graduating, new specialists must have the following knowledge, skills and competences. At the same time, in setting the requirements for a specialist, one must account for the degree in question: bachelor's or master's. Masters have additional knowledge and skills in the field of quality management.

In the syllabus of a programme, the teaching personnel member defines the expected learning outcomes – knowledge, skills and competences – as well as the way they are achieved and the methods of learning. The syllabus of a course states: test and examination methods; assessment criteria and methods as well as criteria for awarding marks; the syllabus is available on Moodle and the lecturer, upon starting to deliver the course, familiarises the students with it; student assessment is based on the principle of summing up

positive performance, which allows the students to demonstrate the extent to which they have achieved the learning outcomes.

Information about expecting learning outcomes– knowledge, skills and competences of new MSP in overall is provided below.

1.3.1. Knowledge

- Latest knowledge of bioeconomy principles, the main global, regional, national and/or local drivers of bioeconomy development, the main bioeconomy sectors. Understand the basic principles of circularity of the bioeconomy, explain the cascading principles and their application in the bio-economy; describe the benefits of cascading use of biomass, the basic principles of the biomass supply chain and value chain, the structure and main features; identify differences between the two chains.
- Legal and regulatory framework knowledge of key policies related to bioeconomy, the role of science and innovation in the sustainable development of the circular bioeconomy, the substance and concepts of a bio-based innovation system, explain and critically evaluate its objectives; outline the key strategic objectives and actions leading the way towards a sustainable, circular bioeconomy in Uzbekistan.
- Analytical and constructive knowledge in the field of researching tools to list and explain indicators suitable for assessing the performance and impact of bioeconomy in terms of sustainability; gather information and analyse it, apply methods relevant to information; draw valid conclusions, identify economic, ecological and social problems in bioeconomy development as well as find creative solutions to them.
- Modern knowledge about the latest technological solutions of sustainable crop and livestock production and the factors affecting the quality of raw materials for food and feed. Specialist knowledge in the field of food production (using traditional and novel technologies) and quality of food products from organic and conventional agriculture to prevent its microbiological spoilage and to prolong shelf life; knowledge about by-product processing and application in different industries (food, cosmetics, pharmaceuticals, etc.).

1.3.2. Skills

- Ability to explain and justify endogenous and exogenous factors affecting the development of bioeconomy sector industries and rural areas as well as assess the sustainable use thereof.
- Ability to identify the principles of and criteria for the selection of a proper biotechnology method for the sustainable use of bioresources in producing products; explain and critically evaluate its objectives; outline the key strategic objectives and actions leading the way towards the sustainable development of circular bioeconomy at the regional, national and/or local levels.
- Ability to analyse any deviations and deficiencies of economic growth opportunities, in analysing the development of bioeconomic industries, in taking advantage of deeper, complete, and efficient processing of products that raise their value added, and in tackling the problems of integrating theory and practice.
- Ability to carry out risk analyses and solving current problems for the implementation of customer-orientated circular economy solutions.

- Demonstrate the knowledge and understanding of the role of R&D in the development of enterprises, technology transfer and innovation. Good grasp of matters pertaining to science and the tools that enable high-tech and safe production.
- Ability to choose appropriate processing technology with the aim to increase output, to decrease the amount of pollution and by-products, water and energy use. Ability to find important differences among production aids and food additives allowed in organic and conventional farming, and understand their importance for food safety and quality.
- Ability to carry out risk analysis on the level of farming and production groups and to find ways to correctly eliminate them and ensure the high quality of the foods manufactured.

1.3.3. Competences

- Cooperate and develop own conclusions and proposals on the effects of agricultural and environmental policies on the bioeconomic sector and rural development, as well as methodologically correctly manage and analyse economic processes in bioeconomy sector industries and rural development.
- Integrate bioeconomy findings into the current paradigm and use them to create original solutions.
- Ability to justify choice, comparing organic and conventional food product production, by analysing significant differences in food production technologies, by assessing yields, by-products processing, and possibilities to apply novel technologies, products' nutritional value, and safety aspects.
- Ability to explain and handle problems and tasks pertaining from various fields for the purpose of the development of knowledge management systems and innovation.
- Ability to independently develop, manage and control international bio-based product business marketing activities in different geopolitical situations and different market competition conditions using theoretical knowledge and the practical application of qualitative and quantitative data analysis.
- Ability to develop efficient process schemes and creative solutions to implement climate smart agriculture and technological advances in smart farming technology and/or sustainable food systems to improve food security in Uzbekistan.

2. HIGHER EDUCATION PROGRAMME QUALITY ASSESSMENT PROCESSES

Regular assessment of study programme quality takes place in order to determine if the study programmes are of good quality and meet the needs of the food industries of Uzbekistan, using the mechanisms and criteria set forth in the third part of this document.

1. Each university sets up two teams to carry out the study programme assessment: (1) monitoring team (MT) and (2) programme assessment team (PAT). The number of members of each of the teams is determined internally by each university.

1.1. The monitoring team (MT) comprises university management, as well as student and social partner (for example, business company, business association) representatives. The functions of this body are as follows: to become acquainted with annual programme assessment results, to use the information acquired to implement activities aimed at contributing to the quality of studies; to maintain communication with bodies representing industry interests. Whenever possible, the management of the universities provides funding for taking the necessary measures. Proposal for membership in the monitoring team (Vice-rector for academic affairs, Dean of Faculty, social partner).

1.2. The programme assessment team (PAT) comprises specialists who directly organise or participate in the study process as part of the study programmes in question. PAT plans and arranges the assessment process, prepares the overall report and submits it to the monitoring team. It is responsible for planning programme improvements, whereby the measures to be taken during the next period are arranged in accordance with prior assessment results; developing proposals for necessary changes and additions and submitting them to the MT; maintaining communication with bodies representing industry interests. Proposal for membership in the programme assessment team (Programme leader/Head of new MSP in Bioeconomy, other members – administrators of faculty, teachers, students, social partners).

Members of the monitoring team (MT) and the assessment team (PAT) the first time must be appointed before the evaluation process begins, in later periods (after the project) - before start of each study year. The MT and PAT teams of each university are provided in Table 2.1-2.4.

2.1. Tashkent State Agrarian University (TSAU)

Monitoring team (MT):
1. Vice-rector for academic affairs 2. Dean of the Faculty of Agrologistics and Business 3. Head of the Master's Studies Department 4. Head of the Internal Control and Monitoring Department 5. Head of the Education Quality Department 6. Social partner/Private sector representative
Programme assessment team (PAT):
1. Programme leader/Head of new MSP in Bioeconomy – Abduvasikov Aziz 2. Head of the Educational and Methodological Department 3. Head of the Department "Agribusiness and Tourism" 4. Teaching staff of the Master's study programme 5. Social partner/Private sector representative - Head of Agro-cluster 6. Students' representative

2.2. Tashkent Institute of Irrigation and Agricultural Mechanization Engineers (TIIAME)

Monitoring team (MT):
1. Vice-rector for International Cooperation – Team Leader, Abdulkhakim Salokhiddinov 2. Vice-rector for Academic Affairs 3. Dean of Faculty of Organisation and Management of the Water Industry 4. Head of the Economics Department 5. Teaching staff of the Master's study programme 6. Social partner/Private sector representative
Programme assessment team (PAT):
1. Head of new MSP in Bioeconomy/Head of International Cooperation Department – Team Leader, Sherzod Rakhmonov 2. Teaching staff of the Master's study programme 3. Teaching staff of the Master's study programme 4. Teaching staff of the Master's study programme 5. Social partner/Private sector representative 6. Students' representative

2.3. Bukhara State University (BukhSU)

Monitoring team (MT):
1. Dean of Faculty of Economics and Tourism BukhSU – Team leader, Dilshod Yavmutov 2. Head of Department BukhSU 3. Dean of Faculty of Agronomy and Biotechnology BukhSU 4. Vice-dean of Faculty of Economics and Tourism 5. Teaching staff of the Master's study programme 6. Social partner/Private sector representative
Programme assessment team (PAT):
1. Programme leader/Head of new MSP in Bioeconomy – Team leader, Oripov Makhmud 2. Vice-rector of international relations 3. Head of department 4. Teaching staff of the Master's study programme 5. Social partner/Private sector representative 6. Students' representative

2.4. Samarkand branch of Tashkent State Agrarian University (SAMTSAU)

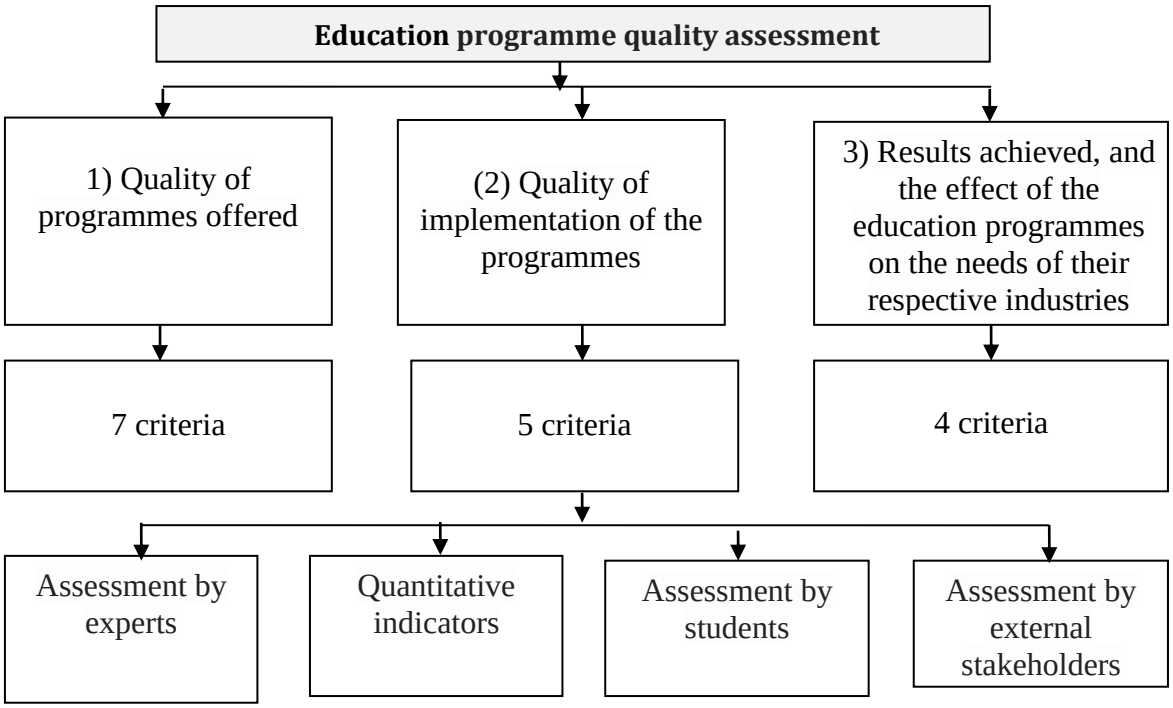
Monitoring team (MT):
1. Vice-director of academic affairs – Team leader, Khonkulov Khusniddin 2. Vice-director of research and innovations 3. Dean of the faculty "Agrobusiness and logistics" 4. Head of the department "Fundamental sciences" 5. Teaching staff of the Master's study programme 6. Social partner/Private sector representative
Programme assessment team (PAT):
1. Programme leader/Director of SamTSAU – Team leader, Hasanov Shavkat 2. Teaching staff of the Master's study programme 3. Teaching staff of the Master's study programme 4. Teaching staff of the Master's study programme 5. Social partner/Private sector representative 6. Students' representative

3. QUALITY ASSESSMENT CRITERIA

The internal quality assurance system represents a continuous cyclic process aimed at continuously improving and developing the study field and the programmes contained therein. The internal quality assurance system is based on E. Deming's cycle (plan-do-check-act). In order to ensure fact (data)-based decision-making ("plan" stage), as well as to assess the effectiveness of improvement and enhancement measures or the internal quality assurance system ("check" stage), there have to be individuals responsible for collecting data, targets have to be set and there have to be individuals responsible for achieving the targets.

Three key aspects are considered as part of the education programme quality assessment:

1) quality of programmes offered;
2) quality of implementation of the programmes;
3) results achieved, and the effect of the education programmes on the needs of their respective industries.



Each of the three aspects will be assessed using the criteria described in the details, on a scale of 1 to 4:

'4' for 'very good, excellent': in the context of criteria subject to assessment, the programme was implemented at a very good or excellent level. There may be minor and insignificant deficiencies, but there is no significant need for eliminating them.

'3' for 'good': in the context of criteria subject to assessment, the programme was implemented at a good level, in compliance with all requirements. Positive aspects predominate, and no significant deficiencies are found.

'2' for 'satisfactory': in the context of criteria subject to assessment, the programme was implemented at a satisfactory level, in compliance with minimum requirements. The quality of implementation has a relatively high number of deficiencies, with major problems in certain aspects. In order to eliminate the

deficiencies, it is necessary to develop and implement a plan with specific measures and deadlines, involving third parties and additional resources.

'1' for 'poor, not satisfactory': in the context of criteria subject to assessment, the programme was implemented at a non-satisfactory level, as deficiencies that require significant improvements, involving third parties and additional resources, predominate.

1. **Quality of programmes offered**

The procedure for the development and quality assessment of a new programme ensures that:

- ✓ the programme has been developed in line with the goal of the programme;
- ✓ expected learning outcomes have been clearly defined for the programme;
- ✓ the curriculum of the programme ensures that learning outcomes are achieved;
- ✓ the programme has been developed by involving teachers, employers, external experts and other stakeholders.

2. Quality of implementation of the MSP

The field of study involves carrying out the following quality assurance activities:

- ✓ preparing a regular self-assessment report for the field of study (responsible: the programme assessment team (PAT), Head of the programme);
- ✓ enhancing and developing the programmes (responsible: Head of the programme; PAT; the monitoring team (MT));
- ✓ planning and controlling the implementation of the programmes (responsible: Head of the programme, PAT, MT, heads of organisational units);
- ✓ enhancing and changing a study plan (responsible: Head of the programme, PAT, MT);
- ✓ enhancing the syllabuses of courses (responsible: Head of the programme, PAT, MT, teaching personnel);
- ✓ analysing the learning outcomes and attendance of students (responsible: Head of the programme, PAT);
- ✓ provision of material and technological resources (responsible: heads of organisational units);
- ✓ provision of methodologies and information for the learning process (responsible: MT, Library personnel, teaching personnel, heads of organisational units (faculty, university).

The students are involved in enhancing the programmes during focus group meetings with the programme director. During such meetings, the learning process and the way it is organised, the content to be learnt, the work of teaching personnel, communication between the student and teaching personnel and the availability of material and technological resources are discussed. Students are also given an opportunity to express their opinions, suggestions and wishes. During focus group meetings, students get feedback on the matters of importance to them. If solving a problem requires additional activities and time, students are informed about the activities after they have been implemented. The head of the programme summarises the results of focus group meetings and reports the results to the institute responsible for implementing the programme as well as at the meeting of the Faculty Board when discussing the annual self-assessment report, in which students also take part.

3. Results achieved, and the effect of education programmes on the needs of their respective industries.

At the end of every academic year, a survey of alumni and a survey of employers are conducted. The survey results are aggregated, discussed and used to enhance the field of study and its programmes and courses.

3.1. Quality assessment criteria of the new curricula

The approach developed encompasses a maximum number of criteria, which, if used fully, will provide the best possible understanding of the quality of each programme. In view of the different mechanisms functioning within each of the universities, during the first two years after the implementation of this methodology, the universities will be allowed to use a limited number of criteria, gradually working towards the use of all of them. The period of transition must be completed within 4—5 years after the completion of the project, as part of which the plan and the criteria are developed. The 'X' symbol is used to mark the criteria that are already used to assess quality in the table.

Responsible: representatives of programme assessment team
Assessment frequency: assessment before pilot studies

Assessment criterion	Expected outcome	Indicator	Assessment method
1. Correspondence of the programme to the needs of the country's economy and society and the strategy of the institution	1.1. Correspondence of the goal and study outcomes of the programme to the needs of society and (or) labour market	1.1.1. The relevance and uniqueness of the programme are analysed, compliance with the needs of society and the labour market is substantiated 1.1.2. The areas of professional activity for graduates are indicated	Content analysis, round table (discussions) with social partners
	1.2. Correspondence of the goal and study outcomes of the programme to the mission, goals and strategy of the institution	1.2.1. The coherence of the goal and study outcomes of the programme with the mission, goals and strategy of the institution is presented	Content analysis
2. Compliance of the programme with the requirements of legal acts, the structure, content, teaching/assessment methods of the Programme enable students to achieve the study goal and outcomes	2.1. Compliance of the programme with the requirements of legal acts	2.1.1. The compliance of the programme's goal, expected study outcomes, structure, content of subjects with the type of study, level and academic and/or professional requirements, the adequacy of the programme scope to achieve study outcomes are substantiated	Content analysis
		2.1.2. The relationship between the programme's study outcomes and study subjects is provided	Content analysis
		2.1.3. The study plan of the programme in full-time and part-time study forms, including subjects, ECTS, semester and teacher is presented	Content analysis
		2.1.4. The coherence between the title of the programme, the study outcomes, the content of the programme and the qualification awarded is substantiated	Content analysis
	2.2. Compatibility of the study	2.2.1. The coherence of the programme's goal and expected study	Content analysis

	goals, study outcomes, teaching (learning) and assessment methods of the programme	outcomes with the study outcomes and assessment methods of study subjects is presented	
	2.3. Consistency of the programme content	2.3.1. The consistency of the programme content is justified	Content analysis
	2.4. Possibilities for students to individualise their studies	2.4.1. Possibilities for students to individualise their studies (to choose a specialisation, to learn foreign languages, to choose subjects freely, etc.) are presented	Content analysis
3. Integration of the latest achievements of science in the programme	3.1. Adequacy of the level of research activities carried out by the institution in the field of science related to the programme	3.1.1. Research activities by teaching staff (publications, participation in conferences and projects) directly related to the programme are presented	Collection of information and statistical data analysis
		3.1.2. Plans of research activities directly related to the programme and their financial validity are presented	Collection of information and data analysis
4. Assurance of the quality of study courses	4.1. Compliance of the content with the goal of the study course and the expected results	4.1.1. Topics and methods of the study course are suitable and sufficient to reach the goal and expected outcomes	Content analysis
	4.2. Adequacy of study courses' quality improvement process to the needs of society and (or) labour market	4.2.1. Study courses reflect the needs of society and (or) the labour market	Content analysis, society and market demand analysis
	4.3. Adequacy of study courses' quality improvement process to the latest achievements of science	4.3.1. Study courses reflect the latest achievements of science	Content analysis, analysis of the latest achievement of science
5. Suitability and sufficiency of academic staff	5.1. Number, qualification and competence (scientific, didactic, professional) of teaching staff	5.1.1. The sufficiency of expected number of teachers to achieve the expected study outcomes is substantiated	Collection of information and statistical data analysis
		5.1.2. Data substantiating the compliance of the teaching staff with the requirements of legal acts are provided	Collection of information and statistical data analysis, comparative analysis
		5.1.3. A list of teachers indicating the qualification and/or scientific degree, the position held or planned to be held, the subject to be taught, the field of scientific activity, years of professional activity related to the subject (practical work) is presented	Collection of information and statistical data analysis

		5.1.4. The suitability of the qualification of the teachers of the programme for achieving the expected study outcomes is substantiated	Collection of information and statistical data analysis
	5.2. Conditions for improving teachers' competencies	5.2.1. The conditions for improving teachers' competencies in research, didactic or professional activities (formalisation, funding, areas of development, methods) are described	Collection of information and statistical data analysis
6. Suitability and adequacy of the physical, informational and financial resources	6.1. Suitability and adequacy of the physical, informational and financial resources of the field studies to ensure an effective learning process	6.1.1. Data on the premises to be used for the programme and the number of working places they provide	Collection of information and statistical data analysis
		6.1.2. The adequacy and suitability of the intended facilities and equipment, including computer programmes, for the intended learning outcomes, is substantiated	Collection of information and statistical data analysis
		6.1.3. The adaptation of the premises, facilities and equipment to be used for the studies to persons with special needs is described	Collection of information and statistical data analysis
		6.1.4. Data on the practice base to be used for study delivery are provided	Collection of information and statistical data analysis
		6.1.5. The number, relevance, and suitability for the evaluated programme of the teaching materials at the HEI's library and reading rooms are given	Collection of information and statistical data analysis
		6.1.6. Information on available access to electronic publications suitable for the programme is provided	Collection of information and statistical data analysis
7. Effectiveness of the development of the programme	7.1. Effectiveness of the internal quality assurance system of the programme	7.1.1. The structure of study management and decision-making, and the periodicity of internal assessment are described; information on the ways and means applied to ensure the quality delivery of the studies is provided	Content analysis
		7.1.2. Human resources and facilities and learning resources allocated to the effective management and development of the study programme are described	Content analysis
	7.2. Effectiveness of the involvement of stakeholders (students and other stakeholders) in internal quality assurance	7.2.1. Data on the involvement of stakeholders in the design, evaluation and development processes of the programme, the contribution of stakeholders and their feedback are provided	Content analysis

3.2. Quality assessment criteria for implementation of the new curricula

Responsible: representatives of the programme assessment team
Assessment frequency: assessment after each study semester

Assessment criterion	Expected outcome	Indicator	Assessment method
1. Effectiveness of the study process	1.1. Implementation of study courses characterised by coherence and interconnections among their disciplines	1.1.1. The place of study courses in the programme is appropriate/inappropriate	Content analysis, round table (discussions) with teachers and students
		1.1.2. The topics in the study courses are overlapping/not overlapping	
	1.2. Involvement and workload of teaching and support staff as part of the teaching process; their accessibility to students; cooperation and feedback between teachers and students	1.2.1. Share of workload of teaching and support staff as part of the teaching process	Collection of information and statistical data analysis
		1.2.2. Number of days/hours for student consulting	Collection of information and statistical data analysis
		1.2.3. Gap in cooperation and feedback between teachers and students	Round table (discussions) with teachers and students
2. Effectiveness of students' internships	2.1. Compatibility of students' competencies with the needs of employers during the internships	2.1.1. Identification of the demand/needs of students' competencies from the employers' point of view	Round table (discussions) with the employers
	2.2. Conformity of internships to the goals and theoretical components of the study programme	2.2.1. Identification of the gap between the purpose of the internship and real activities of the students during the internship	Round table (discussions) with the students
3. Effectiveness of the training of teaching staff	3.1. Development of professional, research, paper writing, language, communication, computer programming and organisational skills as well as critical thinking during training	3.1.1. Number of training cases in each category with a short description	Collection of information and statistical data analysis
4. Internationality of studies	4.1. International research experience reflected in the mobility of students	4.1.1. Number of students, countries and universities, new experience acquired	Collection of information and statistical data analysis; short survey of students/discussions
	4.2. International research experience of the teaching staff (mobility and participation in international research and projects)	4.2.1. Number of teachers, countries and universities of mobility, new experience acquired; number of research projects and their compliance with the study outcomes of the programme; cases of other international cooperation	Collection of information and statistical data analysis; short survey of teachers/discussions
5. Satisfaction of students	5.1. Satisfaction with the choice of study programme	5.1.1. Study Programme: Pros and cons	Round table (discussions) with the students
	5.2. Satisfaction with the study process	5.2.1. Satisfaction (using scores) with the study material, study and assessment methods, support by teaching staff among students	Survey of students (see questionnaire in more detail – Annex 1)

3.3. Criteria for assessing the results achieved, and the effect of the new curricula on the needs of the bioeconomy industries

Responsible: representatives of programme assessment team
Assessment frequency: assessment after pilot studies

Assessment criterion	Expected outcome	Indicator	Assessment method
1. Effectiveness of studies	1.1. The gap between the enrolled students and graduates	1.1.1. Number of graduates and number of students enrolled	Collection of information and statistical data analysis
		1.1.2. The reasons for the gap between the enrolled students and graduates	
2. Graduates' career progress	2.1. Employability of the graduates	2.1.1. Number of graduates working in their profession field, main positions of graduates, number of those unemployed etc.	Survey of graduates
	2.2. Continuity of studies	2.2.1. Number of students intending to continue their education with doctoral studies	Survey of graduates
3. Satisfaction of employers	3.1. Compatibility of students' competencies with the needs of employers	3.1.1. Identification of the demand/needs of students' competencies from the employers' point of view and comparison with the competencies acquired	Round table (discussions) with the employers
4. Internationality of graduates	4.1. The international attractiveness of the study programme	4.1.1. Number of foreign students who enrolled/graduated from the study programme	Collection of information and statistical data analysis

Annex 1

1. Teaching assessment

No.	Criterion	Score (1-10)
1.	The teacher clearly introduced the aim, content, learning outcomes, assessment methods and criteria at the beginning of the study course	
2.	Study methods applied by the teacher encouraged being actively involved in the study course and reaching the study outcomes	
3.	The teaching process was well organised and structured	
4.	The teacher assessed my study outcomes according to the presented assessment methods and criteria	
5.	The teacher provided constructive feedback on the tasks performed by me and/or the student group	
6.	The teacher provided basic study information in Moodle or another distance learning environment	
7.	The teacher was available for consultations	
8.	The teacher adhered to professional ethics	

2. How many contact and distance lectures/practical training sessions did you attend? Please, mark one answer:

All	
More than 50%	
Less than 50%	
None	

3. How many study assignments (homework, group work, preparation for academic classes and others) provided by the teacher did you complete? Please, mark one answer:

All	
More than 50%	
Less than 50%	
None	
No assignments were provided	

4. How would you evaluate your work (study) of the study course in general?

	Score (1-10)
Evaluate your work (study)	

5. Your comments about teaching and learning of the study course