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<b>Abstract</b>	The report presents the results of the development of educational programs 6B08111 Agroecology in three partner universities, the results of analytical work to determine the relevance, content, goals and objectives of the EP. The qualification requirements and the graduate model of the Bachelor of Agroecology have also been developed, taking into account the opinions of employers and potential consumers.
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## Content

DEFINITIONS, ABBREVIATIONS .....	- 5 -
1 Content, goals and objectives .....	- 9 -
2 EP analysis in Kazakhstan .....	- 13 -
3 Discussion with the main consumers.....	- 15 -
4 Development of RO.....	- 18 -
5 Planned development results .....	- 26 -
6 Area of professional activity of the graduate.....	34
7 Planned learning outcomes.....	35
8 Structure and content of the program.....	50
Conclusion .....	- 0 -
Regulatory and legal support .....	- 1 -



## DEFINITIONS, ABBREVIATIONS

The following basic concepts and definitions are used in this report:

**An academic degree** is a degree awarded by educational organizations to students who have mastered the relevant educational curricula, based on the results of the final certification.

**The academic period (Term)** is the period of theoretical study, established independently by the educational organization in one of three forms: semester, trimester, quarter.

**Academic hour** is the time of contact work of a student with a teacher according to a schedule for all types of training sessions (classroom work) or according to a separately approved schedule within a set time frame in order to achieve certain educational goals.

**Descriptors** are ones that reflect the full range of learning outcomes or competencies.

**Descriptors used in the field of higher education** are level descriptors that differentiate into knowledge and understanding, application of knowledge and understanding, reasoning (the ability to understand correctly), the ability to learn, communication skills).

**The European Credit Transfer System (ECTS)** is loans that are assigned to qualifications and curricula in general, as well as their educational components.

**Knowledge** is the result of the assimilation of information through learning and personal experience, a body of facts, principles, theory and practice relevant to the field of study or work, a component of a qualification that must be assessed.

**Qualification** is an official recognition of value in the form of a diploma, certificate confirming that a person has competencies that meet the requirements for performing labor functions within a specific type of professional activity (requirements of a professional standard or requirements formed as a result of practice), formed in the process of education, training or work (on-the-job training), giving the right work activity.

**Qualification level or** is a generalized set of requirements for the competencies of employees, differentiated by the parameters of knowledge, skills, complexity, non-standard work contexts, responsibility and independence, established and described in the qualifications framework



**Competencies** are the qualities of the subject of activity that ensure the fulfillment of the tasks of professional activity of a certain qualification level.

**The national qualifications system** is a set of mechanisms supporting the qualifications framework, including mechanisms for legal and institutional regulation of the demand for workers' qualifications from the labor market and the supply of qualifications from the education and training system.

**The National Qualifications Framework** is a systematic and structured description of the skill levels recognized in the labor market.

**A module** is an educational component of the curriculum that is allocated when designing curricula, taking into account national qualification structures, level descriptors, qualification descriptors and with an assigned number of credits.

**The Industry Qualifications Framework** is a structured description of the qualification levels recognized in the industry. Each level is described by a set of uniform parameters (criteria) descriptors.

**Course Description - a short description of the discipline** (consists of 5-8 sentences), including the goals, objectives and content of the discipline.

**Experience** is a conscious activity, knowledge and skills that can be acquired and effectively used over a certain period of time

**Assessment** is a general concept that applies to all methods and actions for evaluating the results (knowledge, skills and competencies) of a person, which leads to an understanding of the level of knowledge, skills and competencies.

**Postrequisites** are disciplines that require knowledge, skills and abilities acquired upon completion of studying this discipline.

**Prerequisites** are disciplines that contain knowledge, skills and abilities necessary for mastering the discipline being studied.

**Intermediate certification of students** is a procedure carried out during the examination session in order to assess the quality of students' mastering the content of part or the entire volume of an academic discipline after completing its study.

**The profile of a specific training program** is a description of the program in terms of its main functions and specific goals and the corresponding learning outcomes. Profile – specialization.



**The working curriculum** is a document developed and approved by the university on the basis of the standard curriculum of the SCES in the specialty and individual curricula of students, taking into account the conditions of a specific professional activity, the stages of the educational process. It contains a complete list of disciplines grouped into cycles of general, basic, professional indicating the minimum credits required for students to master, forms of control, as well as additional types of training and final certification. The structure of the working curriculum is determined by the university independently.

**Learning outcomes (Lernergebnisse)** are competencies acquired in the process of formal and informal learning and confirmed and recognized upon receipt of qualifications. They are defined as knowledge, skills and competencies.

**Midterm control** is the control of students' academic achievements upon completion of a section (module) of one academic discipline.

A standard that defines a professional standard in a specific field of professional activity, requirements for the level of qualification, competence, content, quality and working conditions.

**Independent work of a student (IWS)** is work on a specific list of topics allocated for independent study, provided with educational and methodological literature and recommendations, controlled in the form of tests, control papers, colloquiums, abstracts, essays and reports.

**Skills** – the ability to apply knowledge and demonstrate competence in order to carry out activities and solve problems (the use of logical, intuitive, creative and practical thinking).

**Educational achievements of students** - knowledge, skills and competencies of students acquired by them in the learning process and reflecting the achieved level of personal development.

**Training programs** are a systematically organized package of activities, content and teaching methods that must be implemented

**Elective disciplines** are academic disciplines included in the elective component within the framework of established credits and introduced by educational organizations, reflecting the individual training of the student, taking into account the specifics of socio-economic development and the needs of a particular region, established scientific schools of higher education institutions.



## Abbreviations

AI - Academic Issues

DB – disciplines of the basic cycle

SCSE – The State Compulsory Standard of Education

EQF – European Qualification Framework

FSC – Final State Certification

DCC – Disciplines of the Component of Choice (elective)

CTS – Credit Training System

CLT – Credit Learning Technology

CED – Catalog of Elective Disciplines

M – module

NQF – National Qualifications Framework

OHPE - Organization of Higher Professional Education

IQF – Industry Qualifications Framework

MC – Disciplines of the Mandatory Component

DGC – Disciplines of the General Cycle

MEP is the Main Educational Program

PD – Disciplines of the Profiling Cycle

TS – Teaching Staff

SIW – Student's Independent Work

EP - Educational Plan





## 1 Content, goals and objectives

The content of the educational program of higher education in agroecology with dual education provides for the study of a cycle of general education disciplines (DGC), a cycle of basic disciplines (DB), a cycle of profile disciplines (PD), as well as professional practice in relevant areas of training with a focus on learning outcomes and compliance with the national qualifications framework and industry qualifications framework.

The educational program "Agroecology" is based on a new model of on-the-job training, which will allow overcoming the structure, volume and quality of labor resources from the real needs of specific farms or enterprises with an innovative approach through dual training.

A new pedagogical approach based on dual higher education will allow agroecology students to acquire more relevant knowledge and skills, combining formal education with digital training received at the workplace in companies. The training results will be compatible with the requirements of agricultural companies. As a result, this will provide them with competencies that are more in line with the needs of companies, and they will be able to get a job more easily.

The activities of the EP are aimed at solving this problem:

at the systemic level – by providing support in the field of politics, industry and education in the development of a regulatory framework, national concepts and standards;

at the level of educational institutions and the Agrokaz project, through the introduction of dual training into the curriculum at the higher education level, which combine academic teaching and on-the-job training, and are developed jointly with employers;

at the regional level, by facilitating regional exchange between partners in the three countries, as well as jointly developing common approaches and formats before implementing programs at the national or institutional levels.

Within the framework of the Agrokaz project, a working group consisting of representatives of selected universities was formed to develop the bachelor's degree program "Agroecology".

The aim of the work was to develop a new type of curriculum, in a consortium of universities and employers/companies, in which practical experience in the workplace is an integral part of the academic program, curriculum and syllabus. The



stages of study at the university and at the workplace are related in time and content, and academic credits are awarded for structured work experience. This approach was chosen in order to ensure that the training of future graduates meets modern requirements for resource-saving crop cultivation technologies, methods for obtaining high-quality crop products, effective methods for reproducing soil fertility and methods of agroecological monitoring. At the same time, the program has been developed in compliance with academic standards, which creates conditions for the academic development of the future graduate.

Another priority in the development process was to ensure that the educational program is properly aligned with the guidelines of the European Higher Education Area (EHEA) to ensure its international recognition and competitiveness, as well as opportunities for regional exchange and mobility.

Thus, the main goal of the educational program is to meet the needs of society for qualified personnel by training specialists in the field of agriculture and bioresources who are able to assess the environmental condition in modern conditions and reduce the impact of the growing man-made load on agricultural territories and the agro-industrial complex.

The Bachelor's degree program "Agroecology" offers practice-oriented training with a special focus on the food production sector, combined with systematic training at the enterprise, which is an integral part of the training.

The program prepares its future graduates for the management of agriculture and bioresources, as well as for work in the field of environmental protection, to ensure the sustainability of geographical patterns within the biosphere and to preserve environmental safety. Graduates will have the professional competencies of an environmental engineer, an agrometeorologist, an ecologist, a soil scientist, an ecologist, an agronomist who is able to work in administrative and managerial positions related to agro-industrial management at the level of low- and middle-level specialists with high potential for career growth.

The program is aimed at promoting and actively cooperating with relevant companies in the agricultural industry sector.

After successful completion of the program, the student will be able to:

- to organize and introduce into production modern agrotechnical techniques for the cultivation of vegetable and fruit crops, taking into account the achievements of science and production experiments, storage and processing of fruit and vegetable products and other household work;



- plan, organize and implement systems of agrotechnical measures for the breeding of new resistant varieties and hybrids of agricultural crops;
- carrying out agrochemical analyses of nutrient solution, soil, substrate, plant analyses and application of mineral fertilizers, and maintaining an optimal agrochemical background that ensures normal growth, development and formation of a high-quality harvest of greenhouse crops;
- to carry out issues related to the control of harmful organisms in order to create an optimal phytosanitary condition of plantings;
- use biotechnological processes to obtain high-quality planting material;
- to introduce new ecological methods and technologies for restoration of disturbed ecosystems and rational use of natural resources;
- possess independent academic, practical and learning skills for continuous professional development, including further education at the undergraduate level.

The Bachelor's degree program "Agroecology" is a 4-year (8 semesters) program with a total credit volume of 240 ECTS, characterized by a constant alternation of phases of theoretical education at the university and practical phases in the company, and modern, practice-oriented teaching. Combining theory and practice is a top priority and represents one of the main features and benefits of the Bachelor's degree program. The theoretical content is formed during the phase of study at the university, and then applied in practice. Due to regular training in companies, it is assumed that students never lose touch with practice and are always ready for new situations. Upon graduation, students have broad practical knowledge in the field of agriculture and additional related business areas, can apply this knowledge in practice, and are familiar with various functions and activities of the company's departments, which allows them to be best prepared for the requirements of the labor market. From the company's point of view, such training is also beneficial. Since students return to the same company over and over again during their studies, after graduation they have an established connection with the company, know all the relevant functions and processes in the company and, therefore, are already full-fledged employees of the company during or, at least, after graduation. This means that the company no longer needs the time-consuming and lengthy stages of education and training that university graduates usually go through.

Basically, each semester consists of a university study phase and a practical phase. In general, the duration of both stages is approximately the same. When



implementing the program at the national level, the following distribution is also possible: 60% at the university and 40% at the enterprise, but a further sharp reduction in the practical phase is undesirable, because otherwise the implementation of the basic idea of higher education and the integration of students into the enterprise processes may be difficult. Admission to the program is carried out on an annual basis. There are modules at the university and modules in practice. While university modules are traditional modules that are taught at the university, practical modules take place during practical training at the workplace.

The main modules are modules of specialization related to the agricultural field, where students in the program must pass to gain knowledge and skills in the subject. If the basics of crop production are studied in the first semesters, then during further studies students master topics such as the introduction of new environmental methods and technologies for the restoration of disturbed ecosystems and environmental management, digital technologies in the agro-industrial complex and the design of global ecological systems. In addition, in the fifth and eighth semesters, students can choose to study elective modules also related to the agro-industrial complex. Writing a thesis is also part of the core module.

Additional modules are modules that are required within the framework of the Bachelor's degree program in Agroecology to provide students with knowledge in the field of agriculture and other fields. These include: higher mathematics, economics, finance, management, law, etc. Since agriculture is linked to other business lines, such extensive knowledge is necessary to prepare students for their future responsibilities in practice.

General education modules are modules that are necessary for all bachelor's degree programs, regardless of the field of study, and which are determined on the basis of regulatory documents of each country. The total number of credits for general education modules is 56 ECTS.

Although the exact distribution is determined depending on the specific module, the goal of each module is to provide about 30% of the load on the contact clock and about 70% for independent work. In addition, the entire curriculum and, consequently, most modules at the University are characterized by a high degree of practice-oriented training, including case study, group work and other teaching methods that ensure the achievement of higher education goals.

During the practical training, students also master practical modules. They are assisted in this by mentors both at the university and at enterprises. ECTS credits are



awarded for completing practical modules, but completing practical modules is only one part of the practical phase. Most of the work during the practical phases includes work at enterprises, for which ECTS credits are not directly assigned, but this work partially counts towards the completion of practical modules.

During their studies at universities and enterprises, students are offered the following educational and methodological resources:

- educational resources: textbooks, local and international multimedia/online libraries, IT laboratory, Internet access, methodological manuals (reference book) for laboratory work, local and international online training resources, infrastructure and resources of the company during production practice;
- Academic support for students: individual mentoring, scheduled meetings, interest clubs, international competitions and student exchange;
- support for students in enterprises: individual mentoring;
- other student support: for example, student clubs, sports complexes to ensure the physical and emotional well-being of students.

## 2 EP analysis in Kazakhstan

The management of the educational process in Kazakhstan includes a number of stages: constant analysis of the needs of the labor market, analysis of employment and questionnaires of stakeholders, formation of the necessary competencies of graduates based on the requirements of professional standards and requests of employers, formation of goals, content and structure of the educational program, selection of approaches to training and methods of assessing the quality of educational program implementation, further improvement of educational programs.

Educational programs are updated in connection with changes in the regulatory documents of the Ministry of Education and Science of the Republic of Kazakhstan, the demands of the labor market and stakeholders. Also, taking into account the demand for specialists in the labor market and the ongoing transformations in the country's economy, the university is opening new educational programs.

The development of educational programs in the field of agroecology was predetermined by intensive socio-economic changes, new priorities in the development of the education system and the country as a whole; fundamental changes in the system of higher and postgraduate education of the Republic of Kazakhstan. Design and development of educational programs due to new



challenges, as well as changed priorities of State policy, arising from the Message of the President of the Republic of Kazakhstan N. A. Nazarbayev to the People of Kazakhstan dated December 14, 2012 "Strategy "Kazakhstan-2050" – a new political course of an established state", Decree of the President of the Republic of Kazakhstan dated March 1, 2016 No. 205 "On approval of the State Program for the Development of Education and Science of the Republic of Kazakhstan for 2016-2019"; Decree of the President of the Republic of Kazakhstan dated August 1, 2014 No. 874 "On approval of the State Program of Industrial and innovative Development of the Republic of Kazakhstan for 2015-2019 and on amendments to the Decree of the President of the Republic of Kazakhstan dated March 19, 2010 No. 957 "On approval of the List of state programs"; Decree of the President of the Republic of Kazakhstan dated February 1, 2010 No. 922 "On the Strategic Development Plan of the Republic of Kazakhstan until 2020", the State mandatory standard higher education, approved by Resolution of the Government of the Republic of Kazakhstan dated October 31, 2018 No. 604 (as amended by Resolution of the Government of the Republic of Kazakhstan dated May 05, 2020 No. 182).

The design and development of educational services in the Republic of Kazakhstan are carried out on the basis of: - input data – Dublin descriptors, national qualifications framework, industry qualifications framework, professional standards, state mandatory education standards (GOSVO, GOSPO), other regulatory requirements and labor market requirements.

In general, the procedure for developing an educational program includes the following stages:

1. The study of Dublin descriptors.
2. The study of the NRK, ORC, Professional standards, SCSE.
3. Study the requirements of the labor market to identify the main requirements for the content of modules and disciplines.
4. Identification of interdisciplinary correspondences for the formation of modules and competencies. Each module assumes uniqueness in the formation of the competencies of future specialists. The competencies being formed cannot be duplicated in other modules.
5. Involvement of teachers in order to make proposals for the formation of modules in accordance with the goals and objectives of the disciplines, indicating the results of the module's training, volume and duration.



6. The formation of the initial version of the educational program and the suggestions of teachers.

7. At the meeting of the Academic Committee, the correctness of the compilation of modules, its effectiveness in training future specialists, compliance with the requirements for the formation of modular educational programs, established Rules of CLT, SCSE, etc. are analyzed.

8. Based on the results of the analysis, adjustments are made to the initial version of the modules of the educational program.

9. General compulsory modules include disciplines of the compulsory component of the DGC cycle, are developed by the relevant special departments and are mandatory for all educational programs.

10. Compulsory modules in the educational program include compulsory disciplines (CD) of the DB and PD cycles, may include elective disciplines (DCC), taking into account the specifics of the socio-economic development of the region and the needs of the labor market, established scientific schools.

11. Elective modules for a specific educational program consist of one or more options for learning paths or a set of modules (Minor) (the total amount of credits for each option should be the same, in terms of modules they may be different) depending on the individual interests of students.

### **3 Discussion with the main consumers**

In the course of work on determining the needs of the market, business sectors and competencies in the national labor market, the main consumers of OP and stakeholders were identified:

- applicants for a bachelor's degree in the direction 6B08111 – Agroecology, focused on professional activity in the field of natural sciences;
- secondary vocational educational institutions;
- universities that train specialists in the profile 6B08111 – Agroecology;
- industrial and research enterprises of the region and the country.

The main tasks of the processes related to consumers are set:

- collection and analysis of marketing information about potential consumers of the service provided;
- attracting potential consumers;
- identify and meet the current and future needs and expectations of current and potential consumers.



The department conducts research to study potential consumers of the services provided, their requirements and assess the possibility of meeting these requirements.

Work with employers is carried out at Kostanay University of Engineering and Economics, NAO "Toraigyrov University", KazNARU and at departments in the following areas:

- involvement of partner representatives in quality control of education by means of questionnaires, examination of educational institutions, participation in graduate certification procedures (reviewing graduation papers, work in the Academy).
- providing a forecast of the need for specialists of the required level of professional competence in specific areas of education development in the region and the country;
- forecasting the need for the formation of a recruitment plan for the new academic year;
- development of cooperation with partners in the development and improvement of the content of educational programs (curricula and programs, the list and content of elective subjects);
- implementation of professional development programs for teaching staff and teaching staff of the University.

At the meetings of the department, the heads of the enterprise, the heads of the branch of the state institution "Republican Plant Quarantine Center" of the State Inspection Committee in the agro-industrial complex of the Ministry of Agriculture of the Republic of Kazakhstan, as well as the Deputy Chairman of the Board of LLP "Agricultural Experimental Station Zarechnoye", KazNIIZiKR, etc., were invited. During the meeting, the problems and needs of Kazakhstan related to education in the field of agroecology.

All the heads of the enterprise within the framework of the consortium took part in the discussion of agricultural enterprises and professional competencies in the field of agroecology. The result of the meeting was a proposal for the development of an educational program.

The needs of the labor market and the competencies in the labor market of future bachelor of agroecology were discussed with representatives of the business communities at the annual regional agricultural fairs.





Ideas and prospects for the development of the educational program "Agroecology" were discussed at a meeting of academic committees, members of the committee for the development of educational programs in partner universities.

All potential employers were introduced to the planned new bachelor's degree courses: "Biogeocenology", "Soil remediation", "Ecological Chemistry", "Fundamentals of environmental regulation and expertise", "Water protection", "Environmental protection and rational use of natural resources", etc. As well as with courses that will be updated using a dual methodology, Fundamentals of Forestry, Phytopathology, Plant Protection, Agricultural Entomology, Biochemistry of Agricultural Plants, Agrochemistry, Inorganic and Analytical Chemistry, Agricultural Machinery and Technology, Irrigation and Reclamation of crops.

Employers emphasized that Professional Standards create the basis for educational institutions to create educational programs and develop courses. Through which the qualifications necessary for an employee to carry out a certain type of professional activity are characterized. The characteristics of qualifications in the professional standard include, for each generalized work function corresponding to a certain level of qualification, a description of work functions, work actions, skills and knowledge, as well as possible job titles, educational requirements, practical work experience and special conditions for admission to work.

Most employers have proposed to change the planned new bachelor's degree courses in accordance with the Industry Qualification Framework and professional standards.

The wishes of students are determined by conducting a process of choosing individual educational trajectories, by means of questionnaires and surveys of students on issues of satisfaction with the educational program. The wishes of the teachers in the construction of the EP are taken into account when discussing them at the meetings of the departments. All changes in the curriculum affect the contingent of students, the content of curricula and programs, and the structure of the teaching load. The purpose of registering students for disciplines and teachers in three universities is to create conditions for maximum individualization of training and meeting the needs of the student in obtaining the necessary competencies within the framework of the studied modular educational program, taking into account the specifics of the socio-economic development of the region, the needs of the labor market and established scientific schools. Registration is regulated by the Rules of registration of students for disciplines and teachers at three universities.



In general, the content of both the educational program as a whole and each discipline individually is determined by the system of Dublin descriptors.

The educational program provides a balance between intellectual development and the development of managerial skills, professional and special competencies (Figure 1.1).

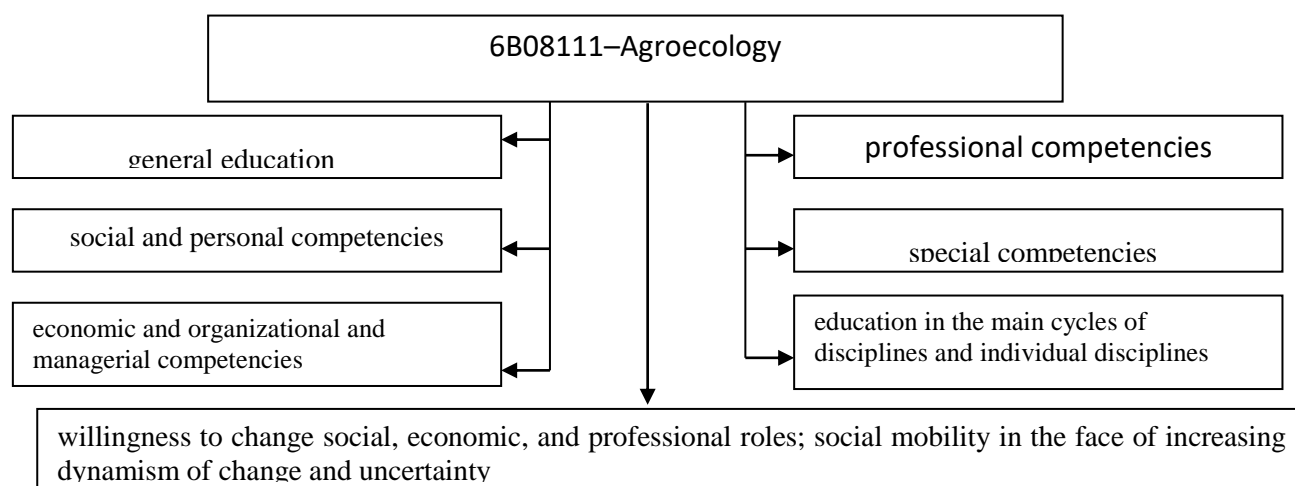


Figure 1.1 – Bachelor's competence model 6B08111–Agroecology

## 4 Development of RO

The goals of the educational program have been developed, which necessarily correspond to the level of development of science and reality so that they are presented as certain results, results that should be achieved within the specified time frame. Taking into account the substantive and functional aspects of goal-setting, several goal-setting planning strategies were identified: the national hierarchy of educational goals, goal-setting at the graduate level, goal-setting in the educational field.

The national hierarchy of educational goals is a long-term strategy for transformations in the state education system and the formation of a national education model, which is reflected in the State Educational Standard of the Republic of Kazakhstan. The general tactical program for the implementation of a common long-term program is called goal setting at the graduate training level and will be reflected in the graduate's qualification characteristics. The element-by-element mechanism of transition from a general long-term program and from a general tactical program to a systematic mechanism for planning the educational



process is considered to be goal-setting in the educational field. They will be reflected in the educational and methodological complexes of the educational program. These goal-setting strategies can be presented in the form of a model that consists of several levels (Table 1.1).

**Table 1.1 - Level goal setting model**

	The level model of educational and pedagogical goal-setting	The focus of goal-setting in the educational field
1	Global goal setting	Continuous multi-level education
2	National goal setting	Ensuring the high quality of special education. Ensuring the convertibility of higher education documents for the equal participation of the Republics of Kazakhstan in the educational space
3	The goals of education at the graduate level	Obtaining a full-fledged and high-quality professional education, professional competencies in various fields of agriculture and related disciplines
4	Goal setting in the educational field	Mastering the knowledge of humanitarian disciplines, ethical legal norms regulating the attitude of a person to a person, society, the environment, culture of thinking and the ability to organize their work on a scientific basis.
5	Goal setting in the real learning process	Mastering the scientific foundations of labor organization, computer technologies used in professional activities; mastering the system of knowledge and skills that ensure the preservation of health, development and improvement of physical abilities



The composition of the goals of specific educational programs is determined by the direction and level of training: programs of higher professional education (bachelor's degree) (Table 1.2).

**Table 1.2 - Hierarchy of objectives of the educational program 6B08111– Agroecology**

<b>Purposes</b>
The main national goals of education in accordance with the Concept of the development of the education system of the Republic of Kazakhstan are to satisfy the interests of society, the state and the individual in obtaining high-quality higher education, providing everyone with ample opportunities in choosing the content, form and duration of education.
The purpose of undergraduate education (basic education) is to provide broad basic professional training aimed at achieving the fundamental nature of the subject knowledge of future specialists. Providing a bachelor with a general integrated methodology of professional activity, developing professional creativity skills among future specialists, and creating a need for further improvement of the educational level.
The purpose of the educational program is to train farmers capable of carrying out agroecological activities that ensure food security in the agricultural sector based on the rational use of biological resources.
The purpose of the cycle of general education disciplines is to train a specialist of a new formation with broad fundamental knowledge, proactive, adaptive to the changing demands of the labor market and technology, able to work in a team. Providing conditions for the acquisition of a high general intellectual level of development
The purpose of the cycle of basic disciplines is to form a set of fundamental knowledge on general education and practice-oriented knowledge in the professional field; to train a specialist with the necessary knowledge in the field of agroecology. Creating conditions for the development of creativity, initiative and innovation.



The purpose of the cycle of core disciplines is to complete the fundamental training of bachelors in the specialty and improve professional competence. Preparation of a specialist for creative, active professional and social activities, high-quality performance of practical tasks in conditions of uncertainty and risk. Improving the competitiveness and mobility of graduates in the market of certified specialists of the region and the Republic of Kazakhstan.

Academic objectives are reflected in syllabuses

The goals of EP 6B08111–Agroecology are formulated taking into account the requirements and requests of potential consumers, and based on the assessment of the demand for OP, which is determined by the interests of potential employers, applicants, the potential of the university, the requirements of the state and society. Therefore, the proposals of potential employers, students, etc. are taken into account when developing.

The objectives of 6B08111–Agroecology define the main tasks that implement the functions of the educational process. So Goal 1 is implemented in the following tasks:

mastering the system of scientific concepts, theoretical and methodological categories of basic and professional disciplines, definitions of the categorical apparatus of scientific research;

formation of skills to apply modern research methods in agriculture

development of the ability to participate in the development and testing of new technological systems, tools and methods designed to solve professional problems in agro-industrial and agriculture.

Goal 2 defines the following tasks:

formation of special competencies for the organization and management of the activities of the workforce, students, etc.;

formation of competencies for choosing target and semantic attitudes for their actions and deeds, to be able to make decisions.

possesses the skills necessary for critical thinking, observation, the ability to interpret, analyze, draw conclusions, and the ability to give estimates;

has the quality of creativity (creativity): the ability to move from one aspect to another, the ability to put forward ideas that differ from the obvious ones,



social, generally accepted, banal or firmly established, the ability to see the essence of the problem, the ability to resist stereotypes;

understands and is able to lead an active life position, can carry out independent behavior towards other individuals, strive to lead in a group, a team, without harming them and within the framework of regulatory regulations;

He is able to work in a team, correctly defend his point of view, offer new solutions, and is able to adequately navigate various social situations.

Goal 3 is implemented in the following tasks:

formation of special competencies for the organization of professional activities for planning and conducting agronomic, agroecological events;

meeting the needs of employers for qualified specialists;

Goal 4 is implemented in the following tasks:

formation of competencies related to project development, development of the ability to turn ideas into actions, plan and manage projects to achieve professional goals, understands ethical values; development of the ability to work with people, knowledge in the field of interaction with customers, personnel management, interaction with users, work with authorizing and authorized bodies, work with government representatives; knowledge of the basics of the legal system and legislation of Kazakhstan, trends in the social development of society.

formation of subject competencies for the development of projects of agricultural facilities;

Goal 5 is implemented in the following tasks:

formation of professional competencies in the management of a group of employees with taking responsibility for the result of their actions at the site of the technological process; training in the ability to develop, implement, control, evaluate and adjust the components of the agrotechnological process;

formation of professional competencies for planning and conducting agricultural activities aimed at rational, permanent, sustainable use of land, increasing crop productivity, preserving environmental, water protection, protective, sanitary, hygienic, health and other useful functions of nature.

the ability to carry out production and technological activities related to the cultivation of crops using intensive or resource-saving technology and the organization of labor in crop production and other agricultural work;



Goal 6 is implemented in the following tasks:

meeting the needs of the individual in intellectual, cultural and moral development through higher professional education;

mastering the methods of physical, spiritual and intellectual self-development, emotional self-regulation and self-support.

The concept of the program structure should be built in combination with a combination of individual modules, taking into account the formulated goals, forms of learning and teaching.

The goals of the educational program have been developed, which necessarily correspond to the level of development of science and reality so that they are presented as certain results, results that should be achieved within the specified time frame. Taking into account the substantive and functional aspects of goal-setting, several goal-setting planning strategies were identified: the national hierarchy of educational goals, goal-setting at the graduate level, goal-setting in the educational field. The national hierarchy of educational goals is a long-term strategy for transformations in the state education system and the formation of a national education model, which is reflected in the State Educational Standard of the Republic of Kazakhstan. The general tactical program for the implementation of a common long-term program is called goal setting at the graduate training level and is reflected in the graduate's qualification characteristics and specialty passport. The element-by-element mechanism of transition from a general long-term program and from a general tactical program to a systematic mechanism for planning the educational process is considered to be goal-setting in the educational field. They are reflected in the EMC of the specialty, EMC of the disciplines of the specialty. These goal-setting strategies can be presented in the form of a model that consists of several levels (Table 1.3).

In accordance with this model, the educational programs of the specialty realize the goals of the State Mandatory standard of Higher Education and the mission of the department.

The composition of the goals of specific educational programs is determined by the direction and level of training: programs of higher professional education (bachelor's degree) (Table 1.3).

**Table 1.2 - Hierarchy of objectives of the educational program 6B08111– Agroecology**



<b>Purposes</b>
<p>The main national goals of education in accordance with the Concept of the development of the education system of the Republic of Kazakhstan are to satisfy the interests of society, the state and the individual in obtaining high-quality higher education, providing everyone with ample opportunities in choosing the content, form and duration of education.</p>
<p>The purpose of undergraduate education (basic education) is to provide a broad basic professional training aimed at achieving the fundamental nature of the subject knowledge of future specialists. Providing a bachelor with a general integrated methodology of professional activity, developing professional creativity skills among future specialists, and creating a need for further improvement of the educational level.</p>
<p>The purpose of the cycle of general education disciplines is to train a specialist of a new formation with broad fundamental knowledge, proactive, adaptive to the changing demands of the labor market and technology, able to work in a team. Providing conditions for the acquisition of a high general intellectual level of development</p>
<p>The purpose of the cycle of basic disciplines is the formation of a set of fundamental knowledge on general education and practice-oriented knowledge in the professional field; training of a specialist with the necessary knowledge in the field of the agricultural sector (agrometeorology, soil science, breeding and seed production of agricultural crops, technology of storage and processing of crop products, plant biology). Creating conditions for the development of creativity, initiative and innovation.</p>
<p>The purpose of the cycle of core disciplines is to complete the fundamental training of bachelors in the specialty and improve professional competence. Preparation of a specialist for creative, active professional and social activities, high-quality performance of practical tasks in conditions of uncertainty and risk. Improving the competitiveness and mobility of graduates in the market of certified specialists of the region and the Republic of Kazakhstan.</p>
<p>Academic objectives are reflected in syllabuses</p>

To achieve this goal, the bachelor of specialty 6B08111–Agroecology masters the following key competencies, taking into account the qualification requirements:

**Generated learning outcomes according to OP 6B08111 Agroecology**





The following ROS have been formed in KEnEU:

ON1 Is capable of to interact in multilingual environment, orally and in writing introducing developed judgments using a variety of digital technologies and ICTs.

ON2 is able to interpret data obtained in the course of interdisciplinary research using digital technologies, using statistical and measurement methods, methods of system analysis, physical, mathematical models

ON3 is able to develop and implement projects as part of a team, constructively responding to criticism, demonstrating time management, using regulatory legal acts and regulatory documents in the professional field

ON4 Generates optimal solutions in a professional and social environment, interpreting and evaluating information, using critical thinking skills and TRIZ - "theory of inventive problem solving".

ON5 is able to implement the concept of lean manufacturing based on lean improvement methods, rationally organizing the workspace, including on the basis of 5S methods, and efficiently using resources

ON6 Minimizes the negative anthropogenic impact on the environment by using various tools for obtaining high-quality agricultural products to improve and preserve agricultural resources, biological diversity and optimal phytosanitary conditions of fields.

ON7 Develops ways to reproduce soil fertility, effectively using soil potential and cultivation technologies based on the study of soil science, agriculture, land management, agricultural machinery and agrochemistry.

ON8 is able to evaluate anthropogenic impact by laboratory methods during the exploitation of agricultural bioresources, using a wide range of methods of agrophysical, agrochemical, agrobiological analysis and monitoring.

ON9 is able to assess the phytosanitary condition of crops, identifying the presence of diseases, pests and quarantine facilities, implementing agrotechnical and biochemical methods of control and prevention.



ON10 is capable of producing biofertilizers using innovative methods of recycling, recycling and reclamation.

ON11 Evaluates the suitability of agricultural landscapes, eliminating risks based on the study of agrochemical, agrobiological, agrophysical properties of the soil and physiological, biochemical characteristics of cultivated crops.

ON12 Carries out work on seed production and breeding, including the propagation of zoned and promising seeds, accelerated variety exchange and variety renewal, varietal and seed control, adapting technologies for obtaining high-quality varietal seeds, taking into account the norms of legislative acts.

ON13 Compiles design and estimate documentation in the field of agriculture, including technological maps for the production and processing of agricultural products for agro-accounting of production costs and obtaining high yields and high-quality crop and fruit and vegetable production.

ON14 Develops recommendations for the sustainable development of rural areas and farms, offering bioindication and biotesting-based solutions to environmental problems.

ON15 Develops recommendations for obtaining high-quality "Organic" agricultural products, taking into account the agro-climatic forecast, environmental restrictions on all forms of land use in order to ensure the sustainability of agriculture and food systems.

## 5 Planned development results

As a result of mastering the bachelor's degree program, the graduate must: general cultural, general professional and professional competencies should be formed.

A graduate who has completed a bachelor's degree program must have the following general **cultural competencies**:

The ability to use the fundamentals of philosophical knowledge to form a worldview position;

The ability to analyze the main stages and patterns of the historical development of society in order to form a civic position ;



The ability to use the basics of economic knowledge in various spheres of life ;  
The ability to use the basics of legal knowledge in various spheres of life;  
The ability to communicate orally and in writing in Russian, Kazakh and foreign languages to solve problems of interpersonal and intercultural interaction;  
The ability to work in a team, to perceive social, ethnic, confessional and cultural differences with tolerance;  
The ability to self-organize and self-educate;  
The ability to use methods and means of physical culture to ensure full-fledged social and professional activities;  
The ability to use first aid techniques, methods of protection in emergency situations.

A graduate who has completed a bachelor's degree program must have the following general **cultural competencies**:

The ability to solve standard tasks of professional activity on the basis of information and bibliographic culture with the use of information and communication technologies and taking into account the basic requirements of information security;

The ability to use the basic laws of natural sciences in professional activities, to apply methods of mathematical analysis;

Ability to landscape analysis of territories;

The ability to recognize the main types of soils, assess the level of their fertility, and justify the directions of soil use in agriculture;

Willingness to carry out physical, physico-chemical, chemical and microbiological analysis of soils, plants, fertilizers and meliorants.

A graduate who has completed a bachelor's degree program must have **professional competencies**:

Willingness to participate in conducting soil, agrochemical and agroecological surveys of lands;

the ability to make soil, agroecological and agrochemical maps and cartograms;

the ability to optimize the water regime of plants on reclaimed lands;

the ability to assess and group lands according to their suitability for crops;

the ability to justify the rational use of technological techniques for the reproduction of soil fertility;

willingness to draw up crop rotation schemes, soil tillage and plant protection systems, to justify environmentally safe crop cultivation technologies;

the ability to analyze and evaluate the quality of agricultural products;

the ability to carry out plant and soil diagnostics, take measures to optimize the mineral nutrition of plants;



- the ability to conduct an environmental assessment of agricultural facilities;
- the ability to organize the work of performers, to find and make managerial decisions in the field of organization and rationing of labor in different economic and business conditions;
- the ability to determine the economic efficiency of the use of fertilizers, chemical means of land reclamation and technological methods of cultivation of agricultural crops;
- the ability to conduct marketing research in the markets of agrochemicals and agricultural products;
- willingness to cooperate with colleagues and work in a team of various organizational forms of ownership;
- the ability to conduct soil, agrochemical and agroecological research;
- the ability to generalize and statistically process the results of experiments, formulate conclusions.

The implementation of EP 6B08111–Agroecology is carried out in accordance with the mission of partner universities, which determines the specifics of the program, the characteristics of groups of students and the educational results they receive.

The targets of the adopted mission correspond to the main objectives of the national education system of the Republic of Kazakhstan until 2050.

Students of specialty 6B08111–Agroecology, teachers, teaching and support staff of the department accept the mission, goals and objectives of the University in general and the Department of Agrotechnology in particular, since they were involved in the process of developing both the mission and the development strategy in universities.

The objectives of the EP are characterized by concreteness, clarity and completeness. These goals clearly state the requirements for the level of preparedness of a graduate specialist. They correspond to the types of professional activity of the Bachelor of EP 6B08111–Agroecology.

The objectives for the development of EP 6B08111–Agroecology are:

- the development of science and technology through scientific research of scientific and pedagogical workers and students, the use of the results obtained in the educational process;
- satisfaction of the needs of the individual in cultural, moral and intellectual development, through higher professional education;
- meeting the needs of employers (feedback on the EP) in qualified specialists, and highly qualified scientific and pedagogical personnel;



- organization and conduct of fundamental and scientific research;
- training of personnel with higher professional education;
- preservation and enhancement of moral, cultural and scientific values of society, patriotic education of youth.

The main consumers of EP and stakeholders are:

- applicants for a bachelor's degree in the direction 6B08111 – Agroecology, focused on professional activity in the field of natural sciences;
- secondary vocational educational institutions;
- universities that train specialists in the profile 6B08111–Agroecology;
- industrial and research enterprises of the region and the country.

The main tasks of consumer-related processes are:

- collection and analysis of marketing information about potential consumers of the service provided;
- attracting potential consumers;
- identify and meet the current and future needs and expectations of current and potential consumers.

The requirements set by consumers are stipulated in the RUP of the specialty or areas of training in terms of the university component, elective courses or individual student training plans.

After determining the requirements of consumers, the following are established: the most important indicators of the quality of services for consumers in their opinion; the levels of indicators expected by consumers that characterize these services; consumer perceptions of this service.

The requirements of consumers are reflected in the following documents: RUP of specialty and areas of training; catalogs of elective disciplines (hereinafter referred to as QED); individual student training plans; contracts for training; work curricula of disciplines; contracts and agreements on joint activities concluded with enterprises.

The department conducts research to study potential consumers of the services provided, their requirements and assess the possibility of meeting these requirements. Based on the analysis of the information received, the interests of potential customers are taken into account.

To keep in touch with potential consumers, the following are conducted: periodic consumer surveys, open days; advertising and information work using communication resources, mass media, participation in exhibitions, conferences, seminars; reception by the rector on personal issues; holding fairs for student employment with the invitation of heads of enterprises, firms, companies. The



information received is communicated to all persons and departments who need it in order to identify ways to improve and further improve their work.

The formation of professional and special competencies is the first direction of the competence-based approach to modern education. In 6B08111–Agroecology is represented by two groups of disciplines: 1) disciplines that are mandatory for study, forming a general professional competence (B); 2) disciplines of the student's choice, forming a special and additional competence (C).

The professional competence of an agricultural specialist of a new formation is understood as an integrative personality quality characterized by the desire to master a profession, the presence of theoretical knowledge and practical skills in the field of forestry, allowing him to freely solve professional tasks. Competencies involve the training of a specialist through the implementation of the content of the State Mandatory Standard of Higher Education and the national qualification framework; the development of interdisciplinary knowledge and skills, including in other natural sciences; information, economic, communicative and legal training. The formation of each of the components of professional readiness is characterized by the results of graduate training not in each discipline, but in the cycle of disciplines as a whole, which requires strengthening interdisciplinary ties and contributes to the interdisciplinary transfer of knowledge. One of the ways to solve this problem is integration in the field of academic disciplines based on the consideration of interdisciplinary tasks of an applied nature. An example of the implementation of such a path in 6B08111–Agroecology is the integrated interdisciplinary modules that form entrepreneurial skills ("Socio-political knowledge and leadership", "Entrepreneurship Module (major)") developing trilingualism ("Information and Communication module")

The second direction is the formation of generalized subject competencies. Generalized subject competencies are responsible for the ability to use the content of various disciplines in solving specific tasks. In a certain sense, this trend is associated with the trend towards the universalization of education. At the same time, the horizons of students expand, the skills to search and find non-standard solutions to problems arising in professional activity and everyday life are formed. It is necessary for the student to understand the essence and vision of the connection of the course with the phenomena of reality. In order to penetrate into the processes (phenomena) under study and manage them, a future specialist should be able to find the appropriate mathematical apparatus that could provide a more accurate and logically rigorous method of analysis, choose alternative hypotheses correctly, and use modern IT technologies.



The third direction of the competence approach is to strengthen the practical, applied nature of education – the development of applied subject competencies. Applied subject competencies are related to the activity-based nature of professional training. In contrast to generalized subject competencies, in this case, the ability to effectively use specific knowledge and skills in the studied disciplines in professional activity is formed. This area is a development of the traditional education system. To this end, in accordance with the university's governing documents, the practical component of bachelor's degree training was strengthened: types of practice were established, the number of credits for each type of practice was fixed, and forms of control were established.

The fourth direction is mastering life skills. The development of this area involves preparation for social adaptation, which is no less important than vocational training. Students develop competencies in the household, cultural and leisure sphere, for example, knowledge of effective ways to organize their free time. This also includes the experience of mastering the human worldview, expanding to a culturological and universal understanding of the world. Life skills are important for a professional to successfully socialize in society.

**Rules for the establishment of three cycles and groups of disciplines.** The educational program of the specialty and the curriculum establish three cycles of academic disciplines, and in each cycle – three groups of academic disciplines. The criterion for their establishment is the degree of commitment and the degree of consistency of assimilation of the content of the educational program of the bachelor's degree.

Each cycle of disciplines consists of two components: a mandatory component and an optional component. The content of the mandatory component of the basic bachelor's degree provides graduate training in accordance with the academic degree. The content of the elective disciplines ensures that the graduate is trained in accordance with the basic competencies established by the national qualification framework and the Professional Standard.

Within each component, three groups of disciplines are distinguished, as a result of the assimilation of which key competencies of different levels of readiness are formed: disciplines of group A ensure the assimilation of the content of the educational program of a generally mandatory level; disciplines of group B – professional readiness to work in the industry; disciplines of group C – scientific and practical readiness to work in the specialty.

The rules for determining the complexity of the curriculum consist of two parts: determining the complexity of the invariant part of the curriculum; determining the complexity of the variable part of the curriculum.



The ratio between the academic disciplines of the variable part of the curriculum is not fixed in the basic curriculum. This condition allows you to have a different ratio between the number of disciplines and credits allocated for the implementation of the educational program according to the module. The curriculum includes three groups of disciplines, the complexity of which can be presented as follows (Table 1.4).

**Table 1.4 – The rate of distribution of credits for bachelor's degree in the specialty 6B08111–Agroecology (duration of study 4 years) by cycles, components and types of disciplines (approximate version) type of disciplines A/B/C**

The cycle of disciplines	Type of disciplines	Number of ECTS credits	Number of disciplines	Term	The percentage of loans by	
					cycles of disciplines	Type of disciplines
DGC 1	A	56	11	1-4	21%	
DGC OK 1.1	A	51	10	1-4		
DGC DCC 1.1	B,C	5	1	1--4		
DB 2		104			40%	
DB, DCC (university component)	A	58	11	1-5		56%
DB, DCC (university component)	B,C	36	16	4-7		39%
DB DCC (component of the student's choice)	B,C	5	1	7		
Practice		5		2.4		4%
PD 3		90			35%	





PD DCC	A	11	2	5.6		12%
PD DCC	B,C	50	11	5-8		56
Practice		29		5,6,7		32%
Final certification (Writing and defending a thesis)		8			4%	
The total is		258	50		100%	

To achieve the goal of the project, a characteristic of the professional activity of the Educational program 6B08111-Agroecology has been developed



## 6 Area of professional activity of the graduate

The area of professional activity of graduates who have mastered the Bachelor's degree program includes:

- soil, agrochemical, agroecological research and development aimed at the rational use and conservation of agrolandscapes in agricultural production;
- control over the state of the environment and compliance with environmental regulations for production and land use;
- agro-ecological assessment of agricultural lands and substantiation of methods of their rational use;
- development of environmentally safe technologies of crop production and soil fertility reproduction; agro-ecological models, soil-ecological standardization.

### **Objects of professional activity of the graduate:**

agrolandscapes and agroecosystems, soils, soil regimes and processes of their functioning, agricultural lands, agricultural crops, fertilizers and ameliorants, technologies of agricultural production and reproduction of soil fertility, agroecological models.

### **Types of professional activities of a graduate**

the main type of professional activity - production and technological;

additional types of professional activities - organizational and managerial, research.

### **Objectives of the graduate's professional activity:**

*production and technological activities:*

- Conducting soil, agrochemical and agroecological surveys of lands; organizing and conducting analyses of soil and plant samples;
- compilation of soil, agroecological and agrochemical maps and cartograms;
- agroecological assessment of plants, soils, fertilizers, plant protection products and ameliorants;
- grouping of lands according to their suitability for agricultural crops and optimization of erosion control organization of the land use territory of an agricultural organization;
- development of fertilizer systems and technological projects for soil fertility reproduction, taking into account the environmental safety of the



agrolandscape and measures to protect soils from erosion and deflation;

- chemical, water reclamation and agroforestry land reclamation;
- implementation of environmentally safe technologies for cultivation of agricultural crops and control over the quality of products;
- carrying out plant and soil diagnostics, taking measures for agro-ecological optimization of mineral nutrition of plants;
- carrying out environmental expertise of agricultural land use objects;
- soil-ecological standardization;

*organizational and management activities:*

- organization of work of teams of production units of organizations, agrochemical service centers (participation in preparation of operational and perspective plans, schedules, instructions, estimates, requests for consumables, instruments, equipment), preparation of reports according to approved forms and methods;
- organization of performers' work in field and laboratory conditions;
- conducting marketing research in the market of agrochemicals and agricultural products;
- making managerial decisions in crop production under different economic and weather conditions;

*research activities:*

- analysis of materials of soil, agrochemical and ecological condition of agrolandscapes;
- substantiation of ways to preserve and increase soil fertility and erosion resistance of lands;
- participation in soil, agrochemical and agroecological research;
- generalization and statistical processing of the results of experiments, formulation of conclusions;
- development of methods and techniques of soil fertility reproduction.

## 7 Planned learning outcomes

As a result of mastering the Bachelor's degree program, the graduate should: be formed general cultural, general professional and professional competences.

A graduate who has mastered the Bachelor's degree program shall possess the following **general cultural competencies**:



Ability to use the basics of philosophical knowledge to form a world outlook;

Ability to analyze the main stages and patterns of historical development of society to form a civic position;

Ability to use the basics of economic knowledge in various spheres of life ;

Ability to use the basics of legal knowledge in various spheres of life;

Ability to communicate orally and in writing in Russian, Kazakh and foreign languages to solve problems of interpersonal and intercultural interaction;

Ability to work in a team, tolerantly perceive social, ethnic, confessional and cultural differences;

Ability to self-organization and self-education;

Ability to use methods and means of physical culture to ensure full social and professional activity;

Ability to use first aid techniques, methods of protection in emergency situations.

A graduate who has mastered the Bachelor's degree program shall possess the following **general professional** competencies:

Ability to solve standard tasks of professional activity on the basis of information and bibliographic culture with the use of information and communication technologies and taking into account the basic requirements of information security;

Ability to use the basic laws of natural science disciplines in professional activity, apply methods of mathematical analysis;

Ability to landscape analysis of territories;

Ability to recognize the main types of soils, assess the level of their fertility, justify the directions of soil use in farming;

Willingness to conduct physical, physico-chemical, chemical and microbiological analysis of soils, plants, fertilizers and ameliorants.

A graduate who has mastered the Bachelor's degree program shall possess **professional** competencies:

Willingness to participate in soil, agrochemical and agroecological surveys of lands;

ability to draw up soil, agroecological and agrochemical maps and



cartograms; ability to optimize water regime of plants on reclaimed lands;

ability to assess and categorize land according to its suitability for agricultural crops;

ability to justify rational application of technological methods of soil fertility reproduction;

readiness to draw up crop rotation schemes, soil tillage and plant protection systems, justify environmentally safe technologies of crop cultivation;

ability to analyze and evaluate the quality of agricultural products;

ability to conduct plant and soil diagnostics, take measures to optimize mineral nutrition of plants;

ability to conduct environmental expertise of agricultural objects;

ability to organize the work of performers, to find and make managerial decisions in the field of organization and rationing of labor in different economic and business conditions;

ability to determine the economic efficiency of the use of fertilizers, chemical means of land reclamation and technological methods of cultivation of agricultural crops;

ability to conduct marketing research in the markets of agrochemicals and agricultural products;

readiness to cooperate with colleagues and work in a team of different organizational forms of ownership;

ability to conduct soil, agrochemical and agroecological research;

ability to generalize and statistically process the results of experiments, formulate conclusions.

The structure of the working curriculum is determined by the higher education institution independently. It contains three parts: academic calendar of the educational process, summary data on the time budget, curriculum based on credits for each year of study.

Curriculum on the basis of credit units contains a complete list of academic disciplines grouped in the cycles of GED, BD and PD as a mandatory component, as well as the component of choice, required to be mastered by students with the indication of credits and academic hours. The working curriculum for each year of study in the specialty forms the schedule, on the basis of it the calculation of the



labor intensity of academic work of teachers and academic work of the student is made. Credit units for each discipline are gained during the semester.

Types of working curriculum of a specialty are determined by the form of training, training base, and training technology. According to the form of training, there are different working curricula for full-time, part-time and evening forms of training.

Work curricula are differentiated according to the basis of education on the basis of secondary general education, on the basis of secondary vocational education of the relevant profile, and on the basis of higher education.

Mechanism of development of curricula of specialty 6B08111-Agroecology. In working curricula and training programs clear definition of the logical sequence of courses of disciplines is built in accordance with the principles of competence-based approach to the formation of educational program, flexibility and mobility of educational programs.

**In accordance with the competencies, six types of modules are distinguished in the educational program:**

General compulsory modules are educational components of general education disciplines that form general competences of higher education. These modules include disciplines of the GED cycle of the standard curriculum of the specialty and form systemic, general cultural competences of students of the educational program 6B08111-Agroecology. Table 1.5.

**Table 1.5 - General compulsory modules of the educational program  
6B08111- Agroecology**

<b>Module (ECTS)</b>	<b>Formative competences</b>	<b>Disciplines included in the module</b>
Socio-political Knowledge and Leadership (18)	demonstrate leadership qualities on the basis of ideas of citizenship and patriotism, modernization of public consciousness-Rukhani Zhangyru, the third modernization of Kazakhstan in the	History of Kazakhstan, Philosophy, Sociology, Psychology, Political Science, Cultural studies



	organization and participation in events at the university, regional, national level.	
Information and Communications (25)	show mastery of basic communication skills in the state, Russian and foreign languages (level A2, B1, B2), including in the professional sphere; - demonstrate mastery of information and communication technologies to organize work and solve standard professional tasks	Kazakh/Russian language, Foreign language, Professional (Russian) Kazakh language, Professionally oriented foreign language, Information and communication technologies

**General compulsory modules** - educational components of basic disciplines, forming the basis of specialty and realized requirements for professional communicative and general professional (basic) competences. These modules include disciplines of the BD cycle of the typical curriculum of the specialty and form information and communication competencies.

**The general compulsory modules** include groups of basic disciplines that form the core of the relevant science and form the basis of the qualification characteristics of a specialist.

The formula for determining the scope of educational content for these modules is knowledge and understanding, application of knowledge and understanding, acquisition and expansion of knowledge. The name of the module is determined by the scientific branch. Table 1.6.



**Table 1.6 - Common compulsory modules of basic disciplines of educational program 6B08111-Agroecology**

<b>Module (ECTS)</b>	<b>Formative competences</b>	<b>Disciplines included in the module</b>
Science Module (14)	<ul style="list-style-type: none"><li>- know the main classes and species of lower and higher plants, their structure and diversity;</li><li>- Know and understand the structure of cells and tissues of living organisms, their functions and importance;</li><li>- be able to navigate through the classes of inorganic compounds, chemical reactions occurring in a living cell;</li><li>- apply methods of agroclimatic forecasts and improvement of forms of agrometeorological support of agriculture;</li><li>-be able to give agroclimatic justification of agronomic practices for the most complete and rational use of climate resources;</li><li>- consolidation of the obtained theoretical knowledge in practice.</li></ul>	Inorganic and Organic Chemistry, Mathematics, Biology and systematics of agricultural plants
Technical Service Land Use (15)	<ul style="list-style-type: none"><li>- be able to identify the main natural factors affecting the use of land in agriculture;</li><li>- Know the types and forms of land management;</li><li>- know types of agricultural machines and implements, their principle of operation and impact on soil cover;</li><li>- know the main types of soils, their physical, mechanical and other properties;</li><li>- be able to determine soil appraisal, soil structure and profile structure.</li></ul>	Land Management, Agroengineering, Soil Science

Compulsory modules on specialty - educational components of profiling





disciplines, forming subject-specific competences taking into account the profile of training in the research field, in the pedagogical field, in applied activity, in project activity, in organizational and managerial activity.

Within the framework of the educational program of Bachelor's degree they include disciplines of the component of basic and major disciplines. The formula for determining the volume of educational content for these modules is knowledge and understanding, application of knowledge and understanding, acquisition and deepening of knowledge (Table 1.7).

**. Table 1.7 - Compulsory modules for specialty 6B08111-Agroecology**

Module (ECTS)	Formative competences	Disciplines included in the module
Production Technology Module (32)	<ul style="list-style-type: none"> <li>- Know and incorporate into their work the laws of agriculture; plant life factors and their regulation;</li> <li>- apply methods of reproduction and improvement of soil fertility;</li> <li>- have knowledge of morphology and biology of field crops;</li> <li>- be able to apply the acquired knowledge and skills in drawing up technological maps of cultivation of field crops;</li> <li>- know the basics of storage and processing of plant products;</li> <li>- be able to navigate modern methods of storage and processing of products;</li> <li>- consolidation of the obtained theoretical knowledge in practice.</li> </ul>	Farming, Crop Production, Technology of storage and processing of crop products, System of fertilizer application in agriculture and production-technological calculations in agronomy (Project 1).

**Elective modules for a certain specialization** - blocks of disciplines on individual profiling, forming possible competences within the specialty. The formula for determining the scope of educational content for these modules is knowledge and understanding, application of knowledge and understanding, formation of knowledge for which there is a long-standing demand from consumers of educational services.

At Kostanay Engineering and Economic University and in Non-profit joint-stock



company "Toraigyrov University" to meet the demands of the employer there is a purposeful work on the study of module (minor) on entrepreneurship. In the educational program introduced micro qualifications at the choice of the student "Seed breeder-aprobator" and "Phytosanitary, agrophipatologist and entomologist". Mastering of micro qualifications provides an opportunity to obtain additional qualification corresponding to level 4 of the national qualification framework (vocational education (middle level specialist) (Table 1.8).

**Table 1.8 - Elective modules in the educational program 6B08111- Agroecology**

Module (ECTS)	Formative competences	Disciplines included in the module
<b>Specialty modules for the educational program "Field production with the basics of GIS-technologies"</b>		
Seed Aprobator (microqualification of choice) (15)	<ul style="list-style-type: none"> <li>- know the morphology and biology of seeds, agrotechnical conditions for obtaining high quality seeds;</li> <li>- have knowledge of plant crossbreeding, selection of genetic material;</li> <li>- possess the basics of seed production of field crops;</li> <li>- understand the breeding process and the development of new varieties;</li> <li>- be able to apply breeding methods in professional activity.</li> </ul>	Plant Genetics, Seed and Varietal Control, Regulatory legal acts on seed production, Technology of high quality seed production



Phytosanitary, Agrophytologist and Entomologist (microqualification) (11)	know the main types of diseases, pests, weeds, their morphology and biology; - be able to properly plan and carry out protective measures against pests, diseases and weeds of agricultural crops; - be knowledgeable about the use of chemical protective equipment and the environmental damage it causes; - Know the methods and timing of application of protection means, ecological thresholds of harmfulness;	Protection of agricultural crops from diseases and pests, Protection of agricultural crops from diseases and pests
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**Elective modules for a certain specialization** - blocks of disciplines on individual profiling, forming possible competences within the specialty. The formula for determining the scope of educational content for these modules is knowledge and understanding, application of knowledge and understanding, formation of knowledge for which there is a long-standing demand from consumers of educational services.

The restructuring of the ideology of the educational program development contributed to the introduction of practice-oriented educational modules into the educational program 6B08111-Agroecology (Table 1.9)

**Table 1.9 - Elective modules in the educational program 6B08111- Agroecology**

Module (ECTS)	Formative competences	Disciplines included in the module
<b>Specialty modules for the educational program "Field production with the basics of GIS-technologies"</b>		
Agroecology and Energy Culture (15)	Know and understand: the basic properties and structure of agroecosystems and their differences from natural ecosystems; centers and foci of origin of cultivated plants; the	Anthropogenic ecology, Ecological safety of agricultural products, Resource-



	<p>role of cultivated plants and their companions in the structure of agroecosystems;</p> <p>basic principles of rational nature management, optimization of agricultural landscapes and nature protection; basic legislative acts regulating the activities of industrial enterprises in the field of soil protection, land reclamation and handling of the</p> <p>with waste;</p> <p>be able to assess the impact of industrial enterprises on soil conditions; justify potential opportunities to change the technological process in order to use waste as a secondary raw material; navigate biological, ecological and environmental literature</p> <p>Apply the system of knowledge on</p>	<p>saving and organic farming</p>
	<p>biology and ecology of different species of living organisms for</p> <p>planning environmental protection measures</p>	
<p>Restoration of Disturbed Agro-landscapes (10)</p>	<p>As a result of studying the discipline, the student should:</p> <p>Know and understand: the basic properties and structure of agroecosystems and their differences from natural ecosystems; centers and foci of origin of cultivated plants; the</p>	<p>Water resources and Irrigation</p> <p>technologies in agriculture, Agromelioration and reclamation of disturbed lands</p>



role of cultivated plants and their companions in the structure of agroecosystems; the origin of farm animals and their impact on natural and artificial ecosystems; factors of soil formation and basic properties of soil as the basis of agrobiogeocenosis; the basic principles of environmental management, optimization of agricultural landscapes and nature conservation; the main legislative acts regulating the use of agroecosystems; the basic principles of environmental management, optimization of agricultural landscapes and nature conservation; the basic principles of environmental management, optimization of agricultural landscapes and nature conservation.

with waste;

be able to actively apply the basics of knowledge of biological systems in practice;

be able to assess the impact of industrial enterprises on soil conditions; justify potential opportunities to change the technological process in order to use



	<p>waste as a secondary raw material;</p> <p>to make the right choice of the method of reducing the volume of production waste and the method of its utilization; to be able to estimate the cost of damage from environmental pollution and the cost of all possible solutions to prevent damage;</p> <p>navigate biological, ecological and conservation literature;</p> <p>apply the system of knowledge on biology and ecology of different species of living organisms for planning environmental protection measures.</p>	
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<p>Greening of Agriculture (10)</p>	<p>Know and understand: types of environmental activities; principles and rules of environmental protection; normative documentation on environmental protection; environmental quality standards; principles of environmental expertise, environmental audit; peculiarities of assessing the impact of planned economic activities on the environment;</p> <p>understand and apply; basic principles and the most promising ways to prevent negative environmental consequences of project implementation;</p> <p>laws of the Republic of Kazakhstan in the field of environmental expertise and environmental protection; means of environmental quality control;</p> <p>to be able to assess the impact of various activities on the environment using norms and rules, regulatory documentation, environmental quality</p>	<p>Processing and utilization of agricultural waste and production of biofertilizers, Environmental monitoring and analytical methods in agriculture</p>
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	standards; to assess the quality of the environment by means of instrumental control, to make the right choice of the method of reducing the volume of production waste and the method of its utilization; to be able to estimate the cost of damage from environmental pollution and the cost of all possible solutions to prevent damage;	
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The strategic goal of the project is to develop a dual educational program, which requires special regulatory documents.

Rules of organization of dual training are regulated by the internal normative document O QMS 8.17.1-22 "Rules of organization of dual training", approved by the Member of the Board of Academic Affairs from 27.10.2022 order № 3.1-07/709. Rules of organization of dual training in NAO ToU are developed in accordance with the State obligatory standard of higher education (Order of the Minister of Education and Science of the Republic of Kazakhstan № 2 from 20.07.2022).

When implementing dual education, the university carries out planning and organization of educational activities on the basis of combining theoretical training with practical training in production. In this case, in accordance with paragraph 19 of the State Standard of Higher and Postgraduate Education, it is necessary to master at least 30% of the educational material of the discipline directly at the production site (technological process, financial and economic processes).

#### **Mandatory components of dual training:**

- 1) a bilateral agreement on dual training between an enterprise (organization) and a VET institution;
- 2) individual tripartite agreement on dual training between the learner, enterprise (organization) and VET;
- 3) working curriculum of dual training agreed with the organization (enterprise);
- 4) training, workplaces and (or) training production center in enterprises (organizations) equipped for implementation of industrial training and professional





practice, or training and production workshops, training farms, training grounds in educational organizations implementing educational programs of higher and postgraduate education;

5) mentors of industrial training and professional practice at enterprises (organizations).

Dual training is carried out in accordance with a bilateral agreement on dual training. Selection for dual training is conducted by the enterprise (organization) according to the results of an interview with students who have expressed a desire to be trained in dual training. In this case, students submit an application to the head of the department within the first two months from the beginning of the academic year in free form.

When selecting trainees for dual training, the enterprise (organization) takes into account the academic performance (GPA), which must be at least 2.0.

The organization of the educational process is carried out in accordance with the working curricula and programs developed and approved by the educational institution together with the enterprise (organization).

The educational process includes theoretical training in VET, as well as industrial training and professional practice, carried out under the guidance of a master of industrial training, head of practice in training and production workshops, training farms and training grounds, under the guidance of a mentor, master of industrial training, head of practice - on the basis of enterprises (organizations).

Forms, content and scope of industrial training and professional practice are determined on the basis of the current educational programs for the relevant educational program.

During the period of on-the-job training and professional practice, the trainee is subject to the rules of labor regulations of the enterprise in accordance with the requirements of the Labor Code of the Republic of Kazakhstan dated November 23, 2015 (hereinafter - the Labor Code).

During the period of industrial training and professional practice, the trainee performs certain functional duties, which are counted in the employment history of the trainee, and for this time, in accordance with Article 119 of the Labor Code of the Republic of Kazakhstan dated November 23, 2015, in accordance with the decision of the enterprise (organization) may make compensation and other payments.

The document confirming the labor activity of the learner is an individual tripartite agreement on dual training.



Persons undergoing on-the-job training and professional practice are subject to occupational health and safety requirements.

Interim certification shall be conducted by the educational institution, which forms an examination commission with the involvement of tutors and (or) specialists from the enterprise (organization) participating in dual training. Upon agreement with the Board Member for AV - Vice-Rector, it is allowed to organize interim certification, in accordance with the academic calendar, on the basis of the enterprise, with the provision of the results of assessment of the achieved learning outcomes in the form of an official letter or minutes of the commission meeting from the enterprise.

The implementation of dual educational program allows to bring practical and laboratory classes to the employer's base, which allows to master professional competencies directly in the production field conditions.

All **types of practice** are included in modules and form methodical, organizational and managerial competencies, readiness to change social and professional roles.

**Final certification** is a separate module (8 ECTS), which forms research competencies and competencies of independent work, it includes a diploma work, pre-diploma practice, state exam on specialty. The enterprise (organization) participates in the intermediate and final attestation of students.

## 8 Structure and content of the program

1) The educational program consists of 8 semesters, each of which includes 30 credits. The total duration of the study program is four years and the number of credits is 245 ECTS.

2) Admission shall be on an annual basis.

3) The educational program is designed in accordance with the curriculum. The educational program is modular.

1) ECTS credit points are assigned to individual modules according to the European Credit Transfer and Accumulation System (ECTS).

2) Each module is designed for five ECTS credit points, with the exception of the module on thesis writing (8 ECTS).

3) One ECTS corresponds to 25-30 hours of student workload. The load includes attendance at lectures and seminars, independent study and other independent coursework, preparation for examinations, examinations, written



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papers and other study-related assignments and activities throughout the semester.

4) Five ECTS credits correspond to a full-time student workload that will enable the student to successfully complete one module; with the exception of the dissertation writing module (15 ECTS).

5) Faculty should consider this workload when designing and implementing modules.

For each practical phase, an enterprise mentor is identified, who acts as a contact person for the student and provides technical and organizational support to the student to complete his/her tasks for the credit of the practical modules as well as his/her daily work. The enterprise mentor and the academic supervisor from the HEI jointly assess the student's achievement of learning outcomes during the practical modules on the basis of a report, paper or practical assignment prepared and/or submitted by the student. The final assessment is left to the HEI.

The degree diploma reflects marks for all modules completed; this includes recognized academic achievements. The topic and assessment of the final thesis. The final grade is calculated on the basis of the module grades as a weighted average, according to the volume of credits, ECTS per module.



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1 semester	cr.	2 semester	cr.	3 semester	cr.	4th semester	cr.	
Foreign language <i>GED/OC</i>	5	Foreign language <i>GED /OC</i>	5	Physical education <i>GED /OC</i>	2	<i>GED /OC</i> philosophy	5	
Kazakh (Russian) language <i>GED/OC</i>	5	Kazakh (Russian) language <i>GED /OC</i>	5	1) Economics 2) Law and anti-corruption culture 3) Ecology 4) Life Safety 5) Entrepreneurship 6) Research methods for <i>GED /CV</i> research	5	Information and communication technologies <i>GED /OC</i>	5	
Physical education <i>GED /OC</i>	2	Socio-political knowledge module (sociology, political science, cultural studies, psychology) <i>GED /OC</i>	8					
Biology and physiology of plants <b><i>DB/VC</i></b>	5							
Inorganic and organic chemistry <b><i>DB/VC</i></b>	5	History of Kazakhstan (GE) <i>GED /OC</i>	5	General entomology <b><i>BD/VC</i></b>	6	Physical education <i>GED /OC</i>	2	
Higher mathematics <b><i>BD/VC</i></b>	5	Physical education <i>GED /OC</i>	2	Soil Science <b><i>DB/VC</i></b>	6	<b><i>BD/VC</i></b> farming	6	
Agricultural Zoology <b><i>BD/VC</i></b>	5	Agrometeorology <b><i>DB/VC</i></b>	5	Operation of machinery and equipment in crop production <b><i>DB/VC</i></b>	4	Fundamentals of Horticulture <b><i>DB/VC</i></b>	6	
		Training practice <b><i>DB/VC</i></b>	2	Physics (with the basics of biophysics) <b><i>BD/VC</i></b>	5	Industrial practice <b><i>DB/VC</i></b>	8	
<b>Bottom line:</b>	<b>32</b>	<b>Bottom line:</b>	<b>32</b>	<b>Bottom line:</b>	<b>28</b>	<b>Bottom line:</b>	<b>32</b>	
5th semester	cr.	6 semester	cr.	Semester 7	cr.	8 semester	cr.	
Crop Production <b><i>DB/VC</i></b>	5	Protection of crops from pests and diseases <b><i>BD/VC</i></b>	5	Nature protection, rational use and state control of <b><i>AP/VCs</i></b>	4	Environmental Mapping and GIS <b><i>PD/VCs</i></b>	5	
Agrochemistry <b><i>DB/VC</i></b>	5	Agrarian economics <b><i>DB/VC</i></b>	4	Agro-ecological monitoring of <b><i>PD/VCs</i></b>	5	Fundamentals of environmental regulation and expertise <b><i>PD/QA</i></b>	5	
Biogeocenology <b><i>DB/VC</i></b>	5	Fundamentals of bioindication of environmental pollution <b><i>PD/VC</i></b>	5	Environmental protection and rational use of natural resources <b><i>PD/CV</i></b>	5			Technical regulation in agroecology <b><i>PD/CV</i></b>
				Protection of aquatic ecosystems <b><i>PD/CV</i></b>				

Principles of agroecology <i>DB/CV</i>	5	Biogeochemistry and ecotoxicology <i>DB/VC</i>	5	Agroecological practices, systems and philosophies of <i>AP/CV</i>	5	Geographic Information Systems in Ecology <i>PD/CV</i>	5
Agriculture and Environment <i>BD/CV</i>		Soil remediation <i>DB/KV</i>	5	Artificial Systems and Environmental Risks <i>PD/CV</i>		Ecological modeling of agroecosystems <i>PD/CV</i>	
Agroecology of microorganisms <i>DB/VC</i>	5	Soil fertility management <i>BD/CV</i>		Logistics of production processes in agriculture <i>PD/VC</i>	5	Digitalization in agriculture <i>PD/VC</i>	5
Environmental Chemistry <i>DB/VC</i>	5	Industrial practice <i>PD / VK</i>	6	Environmental Ethics <i>PD/VC</i>	5	Final certification	8
				Industrial practice ( <i>PD / VK</i> )	4		
<b>Bottom line:</b>	<b>30</b>		<b>30</b>	<b>Bottom line:</b>	<b>33</b>	<b>Bottom line:</b>	<b>28</b>



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### Content of the educational program

#### 6B08111 Agroecology

№	Name of discipline	Brief description of the discipline (30-50 words)	Number of credits	Formative learning outcomes	Formative learning outcomes of the OP
<b>Cycle of general education disciplines University component / Elective component</b>					
1	Ecology and basics of life safety	Study of theoretical foundations and acquisition of practical skills in the field of safe human interaction with the environment (industrial, domestic, urban); basic regularities of interaction of all living organisms with the environment; regularities of the cycle of substances in nature and energy flow through living systems, as well as the functioning of ecological systems and the biosphere as a whole; safe human interaction with the environment; socio-ecological consequences of anthropogenic activity on the technosphere; basic laws of interaction of all living organisms with the environment; basic laws of the cycle of substances in nature and the flow of energy through living systems, as well as the functioning of ecological systems and the biosphere as a whole		1PO <sub>0</sub> K7	<b>ON7</b>



2	Ecology and sustainable development	<p>Study of the basic regularities of interaction of living organisms with the environment; distribution and dynamics of the number of organisms, the structure of communities and their dynamics; regularities of the flow of energy through living systems and the cycle of substances, the functioning of ecological systems and the biosphere as a whole; socio-ecological consequences of anthropogenic activity; basic principles of nature protection and rational nature management.</p>	5	2PO <sub>0</sub> K7	<b>ON7</b>
3	Basics of crop and livestock production	<p>Fundamentals of farm animal breeding. Growth and development of agricultural animals. Cattle breeding. Dairy productivity Main types of productivity of agricultural animals. Cattle breeding. Meat productivity. Sheep breeding. Wool productivity of agricultural animals. Pig breeding. Reproductive qualities of pigs. Fattening. Horse breeding. Productive horse breeding. Poultry breeding. Egg and meat poultry farming. Fundamentals of feeding farm animals. Chemical composition of fodder. Principles of normalized feeding. Feed norms and rations. Classification and brief characterization of forages. Digestibility of nutrients and factors affecting it. Basics of animal hygiene.</p>		3PO <sub>0</sub> K6	<b>ON7</b>
4	Fundamentals of law and anti-corruption culture	<p>The purpose of studying the discipline is to increase public and individual legal awareness and legal culture of students, as well as to form an anti-corruption model of behavior and public atmosphere of rejection of corruption, to form an active civic position in combating corruption.</p>		2PO <sub>0</sub> K2 4PO <sub>0</sub> K5 3PO <sub>0</sub> K6	<b>ON6</b>
5	Fundamentals of economics, leadership and innovative entrepreneurship	<p>The study of the discipline includes topics aimed at the formation of economic outlook, knowledge and skills necessary for the implementation of entrepreneurial activity, applying leadership qualities, including in innovative business. The student gets knowledge and skills of economic analysis, research in various spheres of the economic system; innovative thinking of a modern entrepreneur is formed</p>		1PO <sub>0</sub> K6 4PO <sub>0</sub> K6	<b>ON6</b>



6	Fundamentals of scientific research	Studying the role of science in the modern world in the sphere of agro-industrial complex, mastering the level of theoretical knowledge and practical skills in conducting scientific research and their effective organization. Adoption of adequate management decisions with the use of large amounts of accumulated knowledge, to engage in the process of conducting and implementation of scientific research. Ability to organize research activities and effectively use already known scientific developments.		1PO <sub>0</sub> K <sub>5</sub> 1PO <sub>π</sub> K <sub>6</sub> 2PO <sub>π</sub> K <sub>6</sub>	<b>ON2</b>
<b>Cycle of basic disciplines University component</b>					
7	Plant biology and physiology	Examines the diversity of plant forms of organisms and the relationship to the levels of organization of living things. Familiarizes students with the stages of evolutionary and ontogenetic development, the role of plants in the biosphere and human life, and the processes of plant life.	4	1PO <sub>π</sub> K <sub>1</sub>	<b>ON1</b>
8	Inorganic and organic chemistry	The basic concepts of analytical and organic chemistry are covered. Physical and chemical methods of separation, purification and analysis of substances. Standards of purity of a substance. Qualitative and quantitative analysis. Systematization of cations and anions. Analytical signal. Scheme of analysis of an individual substance. Nomenclature and classification of organic compounds. Theory of chemical structure of organic compounds. Classification of reactions and reagents in organic chemistry.	5	2PO <sub>π</sub> K <sub>1</sub>	<b>ON2</b>
9	Soil science with the basics of geology	The essence of the subject of physical physical-chemical, water-air and thermal regimes of soils, genesis of the main types of soils of RK and CIS. Soil as an independent natural and natural-historical body. Place and functions of soil in biogeocenosis and biosphere. Soil as a component of ecosystems transformed by man. Soils and soil cover, ecological memory of landscape.	3	2PO <sub>π</sub> K <sub>1</sub>	<b>ON1</b>





10	Minor 1 Leadership basics	The study of the discipline is aimed at creating conditions for the organization of a variety of content activities aimed at the development of personal qualities in students, revealing the potential of freshmen, which allow them to become leaders in their chosen field of activity,  creating human resources for public organizations at the university.		1PO <sub>П</sub> K10	<b>ON6</b>
11	Minor 2 Data visualization	The concept of data visualization. Relevance, role, functions. Sources of data. Basics of data visualization. Types of data. Types of data visualization. Basic errors in data visualization. Graph design. Using accents to create effective graphs. Tools and technologies for creating infographics and data visualization. Cartography. Basics of cartography, types of maps.	5	1PO <sub>П</sub> K11	<b>ON4</b>
12	Minor 3 English for everyday use	The discipline provides students of all levels and areas of study with the acquisition of common vocabulary in English and its use in everyday communication situations. In terms of the form		1PO <sub>О</sub> K3	<b>ON6</b>
		of classes, it is supposed to be a full language immersion and improvement of communicative skills and automaticization of certain language clichés used in certain situations. Special emphasis should be placed on practicing unprepared speaking skills in a foreign language.			
13	Minor 1 Entrepreneurial activity	The study of the discipline will form instrumental, socio-personal, systemic and subject competences in the sphere of entrepreneurial activity. Students will form a holistic theoretical understanding of entrepreneurial activity, learn to generate their business ideas and present them, study the peculiarities of using marketing methods and techniques, study the procedures of creation and liquidation of business entities.		2PO <sub>П</sub> K10	<b>ON6</b>



14	Minor 2 Automation of settlement operations	Basics of working in Excel. Entering and editing data. Creating tables. Basics of calculations. Using mathematical, statistical, logical, error checking and text processing functions. Formatting data, cells and tables. Principles of spreadsheet application development. Filtering a list to find the information you need. Summary tables. Array formulas. Interactive elements. Analysis tools.	5	2PO <sub>П</sub> K11	<b>ON4</b>
15	Minor 3 English in communicat ive situations	This discipline is intended for students of all levels and areas of study to improve communicative skills and use of common vocabulary in English in various situations of everyday communication. During the study of this discipline, students will develop the competencies necessary for practical use of English in the future, including the study of the language of specialty within the discipline "professionally-oriented English".		1PO <sub>О</sub> K3	<b>ON6</b>
16	Minor 1 Business organization	The study of the discipline is designed to develop rational and practical skills and abilities of students to identify sources of financing and crediting, as well as the implementation of the created business plans and projects. Students will learn to use available government and non-government sources of project financing, develop skills in attracting venture capital, develop practical skills in selecting government programs to subsidize SMEs, develop skills in promoting business plans through social networks, as well as skills in using online	5	3PO <sub>П</sub> K10	<b>ON6</b>
		services and portals.			
17	Minor 2 Data analysis and business planning	Using built-in functions of MS Excel for economic calculations. Performing basic and applied financial calculations using standard financial functions. Analyzing economic data using the graphical apparatus of MS Excel. Sparcline graphics. Methods of approximation. Analysis of economic data using lists in MS Excel. Consolidation of Excel tables. Analyzing data using summary tables. Solution search.		2PO <sub>П</sub> K11	<b>ON4</b>



18	Minor 3 English in situations of professional communication	This discipline will be studied by students of separate areas of study after or in parallel with the discipline "Professionally-oriented English" and is designed to improve the communicative skills of students thesaurus necessary for communication in the future professional sphere. Situations of professional communication should be constructed taking into account the profile of training.		1PO <sub>0</sub> K3	<b>ON6</b>
19	Higher mathematics	Systems of linear algebraic equations. Linear spaces over the field of real numbers. Vectors in the plane and in three-dimensional space. Euclidean spaces. Matrices. Determinants. The field of complex numbers. Polynomials. Linear mappings and linear transformations of vectors of spaces. Quadratic forms. Linear analytic geometry. Curves of second order. Second-order surfaces. Convex sets in the plane. Introduction to analysis: sets, functions and their properties. Limit of a numerical sequence, limit of a function. Continuity of a function at a point and on a set. Differential and integral calculus of functions of one variable. Differential and integral calculus of functions of several variables. Convergence of numerical series and power series. Ordinary differential equations.	5	1PO <sub>0</sub> K3	<b>ON6</b>
20	Agricultural Zoology	is not a special science, but only a department of zoology, studying animals useful or harmful in S. respect. Thus, the field of S. zoology includes the study of domestic animals (zotechnics) and	5	1PO <sub>0</sub> K3	<b>ON6</b>



		their parasites, the study of animals harmful to			
		fields, forests, orchards and generally to agriculture and its products, the study of enemies and parasites of these animals that help man in the fight against them, and in general all animals that have a direct or indirect relation to agriculture.			
21	Agrometeorology	Examines the most important agrometeorological factors that determine the living conditions and productivity of plants. Earth's atmosphere as an environment for agricultural production. Atmospheric and soil moisture. Circulation of the atmosphere. Unfavorable agrometeorological phenomena.  Basics of climatology. Agrometeorological support of agricultural production.	5	1PO <sub>0</sub> K3	<b>ON6</b>
22	General entomology	Study of principles of organization of works on diagnostics, forecasting of spread of pests and diseases of agricultural crops and signaling the terms of their control. Methods of mathematical and statistical processing of data on pests and diseases spreading and control efficiency, as well as determination of pest threshold.	5	1PO <sub>0</sub> K3	<b>ON6</b>
23	Soil Science	History of development of soil diagnostics of mineral nutrition and efficiency of fertilizer application. Soil nitrogen. Diagnostics of nitrogen nutrition of plants. Soil phosphorus. Diagnostics of phosphorus nutrition of plants. Phosphorus regime of separate types of soils. Soil potassium. Diagnostics of potassium nutrition of plants.	5	1PO <sub>0</sub> K3	<b>ON6</b>
24	Operation of machinery and equipment in crop production	Formation of a set of knowledge about processes and machines used in crop production; acquisition of skills in completing and highly efficient use of machine and tractor units and mastering the operational technologies and rules of mechanized work production.	4	1PO <sub>0</sub> K3	<b>ON6</b>



25	Physics (with the basics of biophysics)	Formation of ideas, concepts, knowledge about fundamental laws of classical and modern physics and skills of application of physical methods of measurements and research in professional activity	5	1PO <sub>0</sub> K <sub>3</sub>	<b>ON6</b>
26	Farming	Factors of plant life and the laws of agriculture. Biological factors of soil fertility. Agrochemical factors of soil fertility. Agrophysical properties of soil. Water regime of soils. Biological features of weed plants. Air, heat and food regime of soil.	6	2PO <sub>П</sub> K <sub>3</sub>	<b>ON2</b>
27	Fundamentals of horticulture	Supply of fresh fruits and vegetables to the population throughout the year of the year is an urgent task for the national economy of the Republic of Moldova. Kazakhstan. Increasing the quantity and quality of fruit and vegetable products in the country Nowadays it is impossible without the use of advanced technologies, so agriculture needs highly qualified specialists.	5	2PO <sub>П</sub> K <sub>3</sub>	<b>ON2</b>
28	Crop production	Crop production is the main branch of agriculture. Agrotechnology in crop production. Innovations in crop production. Fundamentals of seed production and seed science. General characteristics of grain crops. Winter grain crops. Early spring cereal crops. Late cereal crops. Grain leguminous crops. Oilseed crops. Essential oil and medicinal crops.	5	2PO <sub>П</sub> K <sub>5</sub>	<b>ON4</b>
29	Agrochemistry	Agrochemistry as a science. Subject, methods, goals and objectives of agrochemistry, its interrelations with other sciences. Scientific basis of plant nutrition and fertilizer application. Soil properties in connection with plant nutrition and fertilizer application. Chemical ameliorants of acid soils. Chemical ameliorants of alkaline soils. Classification and basic properties of fertilizers.	5	1PO <sub>П</sub> K <sub>3</sub>	<b>ON2</b>



30	Soil biology	studies in detail and comprehensively different groups of soil organisms (biodiversity): bacteria, actinomycetes, fungi, yeasts, algae, invertebrate animals. The properties of newly isolated soil microorganisms with unusual and useful properties, such as producers of antibiotics, vitamins, enzymes, hormones, are studied.	5	1PO <sub>П</sub> К3	<b>ON2</b>
31	Environmental chemistry	Agronomic and ecological assessment of nitrogen fertilizers in different zones of the Republic of Kazakhstan. Ways to improve the efficiency of nitrogen fertilizers. Phosphorus nutrition of plants. Coefficient of phosphorus use by plants from soils and fertilizers. Absorption of phosphorus fertilizers by soils. Phosphorus balance in agriculture. Potassium nutrition of plants. Peculiarities of potassium fertilizers application in Kazakhstan. Effectiveness of potassium fertilizers by agronomic zones of Kazakhstan	4	1PO <sub>П</sub> К4	<b>ON4</b>
32	Protection of agricultural crops from pests and diseases	teaching students theoretical knowledge and practical skills in issues related to crop cultivation; to learn to students to correctly identify pests and plant disease, control techniques with weeds, pests, for a quality crop.	5	1PO <sub>П</sub> К4	<b>ON4</b>
33	Agrarian economy	discipline that studies economic relations arising in the process of production, consumption, realization of agricultural products on a global scale.	4	1PO <sub>П</sub> К4	<b>ON4</b>
<b>Cycle of basic disciplines Optional component</b>					



34	Biogeochemistry and ecotoxicology	Definition of the scientific discipline of biogeochemistry and ecotoxicology. The emergence of ecotoxicology. The role of Academician Vernadsky in the formation of biogeochemistry. Modern tasks of ecotoxicology and biogeochemistry, their interrelation and development prospects. The role of living organisms in the formation of the biosphere. Its origin and evolution. Changes and stability of the biosphere and its components. Concepts of biosphere of J.B.Lamarck and E.Suss.Theory of biosphere of V.I.Vernadsky. Type of matter and its main role in the transportation of chemical elements. Dokuchaev's doctrine is the founder of soil science. Role of soil in biosphere. Construction of biosphere; increase of human anthropogenic activity in biosphere.		1PO <sub>п</sub> к1	<b>ON1</b>
20	Agriculture and environment	Environmental protection in agriculture is a complex of sciences that investigate the possibilities of agricultural land use for crop and livestock production while preserving agricultural resources (soils, natural forage lands, hydrological characteristics of agrolandscapes), biodiversity and protecting the ecological environment of human habitat and products from agricultural pollution. Environmental protection in agriculture was formed as a section of applied ecology in the second half of the twentieth century. It has developed especially rapidly in recent decades due to the sharp deterioration of the ecological situation in the agrosphere.	3	2PO <sub>п</sub> к1	<b>ON20</b>
21	Soil remediation	It studies the complex of works aimed at restoration of productivity and economic value of lands, as well as at improvement of environmental conditions, origin and development of soils, formation of fertility,	5	2PO <sub>п</sub> к1	<b>ON20</b>
		investigates peculiarities of soil structure, composition and properties, their spatial distribution on the globe.			



22	Soil fertility management	History of development of soil diagnostics of mineral nutrition and efficiency of fertilizer application. Soil nitrogen. Diagnostics of nitrogen nutrition of plants. Soil phosphorus. Diagnostics of phosphorus nutrition of plants. Phosphorus regime of separate types of soils. Soil potassium. Diagnostics of potassium nutrition of plants.		2PO <sub>П</sub> К1	<b>ON20</b>
<b>Cycle of specialized disciplines University component</b>					
43	Minor 1 Technology Entrepreneurship and Startups	When studying the discipline, each student participates in the creation of a startup. The students gather in groups and make projects in teams. The course is designed to help students develop IT competencies, teamwork and business skills. The training program covers the entire process of creating a startup, from finding an idea to bringing a product to market. The result of this course is the preparation of a real MVP, its launching by students and getting into a business incubator or accelerator program.		4PO <sub>ПК1</sub> 0	<b>ON6</b>
44	Minor 2 E-business	Fundamentals of functioning of the global network Internet as an environment for economic activity and the basis of e-business. E-commerce and its place in modern economy. The main ways of network business. Internet marketing. Payment systems in the Internet. Models of electronic business. Organization of Web-site for conducting own e-business. Complex electronic market.	5	2PO <sub>ПК1</sub> 1	<b>ON4</b>
45	Minor 3 English for a specific purpose	During the study of this discipline it is envisaged that students will acquire such a level of language competence in a foreign language, which will allow them to independently study literature on specialty and communicate in the future with colleagues from foreign countries and get acquainted with the experience of their work. It is recommended to conduct classes in separate groups divided according to the specialization of students' training.		1PO <sub>OK3</sub>	<b>ON6</b>





46	Nature protection, rational use and state	to form the necessary knowledge in students on resource, sectoral and territorial naturemanagement, basics of resource-based nature management: the natural	4	1PO <sub>OK3</sub>	<b>ON6</b>
	control	<p>resource and ecological and economic potential of the Earth and the principles of rational use of natural resources.</p> <p>natural resources management, peculiarities of water, land and forest resources, state system of natural resources monitoring, cadastres, the concept of the quality of the natural environment as a habitat, the water management systems as natural-technogenic systems, about objectives, tasks and structure of the water sector; water management facilities;</p> <p>water management complexes and systems, sectoral water management; about peculiarities of different types of natural resourceuse, about ecologically harmful technologies, low-waste schemes of rawmaterial utilization,</p> <p>integrated development of mineral deposits, on the</p> <p>the need for nature protection during construction and operation</p> <p>water management systems, nature protection as a combination of sustainable environmental management and environmental engineering.</p>			



47	Agroecological monitoring	Agrocenoses as an example of disturbed natural landscapes. Ecological functions of soil, ecological significance of soil processes and regimes. Animals Soil biota as a dynamic, integral indicator for soil condition control. Trophic relations: predator-prey, competition (interspecific, intraspecific), metabiosis, syntrophy. Relationship of catabolic and anabolic processes. Cultural and weedy plants in agrocenosis. Chemical means of plant protection. Use of pesticides by microorganisms as a source of carbon and energy. History of development of alternative agriculture.	5	2PO <sub>ПК8</sub>	<b>ON3</b>
48	Technological map in crop production	General principles of storage of agricultural products, theory and practice of storage of seed grain and food-forage funds, processing of grain and oilseeds, storage of potatoes, vegetables and fruits, processing of potatoes, vegetables, fruits and berries, basics of mixed fodder production.	5	2PO <sub>ПК9</sub>	<b>ON7</b>
49	Environmental ethics	is a field of scientific knowledge that studies the moral attitude of man to nature with the aim of	5	1PO <sub>ПК8</sub>	<b>ON4</b>
		humanization and harmonization in the system of "man-nature" and "society-nature" relations.			
	Environmental mapping and GIS	give A holistic view of ecological mapping as a method of research and means of spatial representation of environmental problems and situations.	5	1PO <sub>ПК8</sub>	<b>ON4</b>
	Digitalization in agriculture	The discipline introduces the main technologies introduced primarily within the digitalization of agriculture in Kazakhstan, GPS navigation of agricultural machinery, parallel guidance, automation of work with mass, electronic site maps and drones.	5	2PO <sub>ПК10</sub>	<b>ON2 ON4</b>
<b>Cycle of specialized disciplines Optional component</b>					



50	Environmental protection and rational use of natural resources	<p>Natural resources and their classifications. Cadastres of natural resources. Protection of atmospheric air. Protection of water resources. Land and soil resources. Protection and rational use. Use and protection of subsurface resources. Extraction of minerals and environmental risks with it</p> <p>related. Technogenic earthquakes. Protection and sustainable use of plant life. Protection and rational use of animal life. Protection and rational use of landscapes.</p>	5	2PO <sub>п</sub> к7	<b>ON5</b>
51	Protection of aquatic ecosystems	<p>General concept of hydrosphere and atmosphere. Methods of hydrological and meteorological research. The role and practical significance of hydrometeorology. General regularities of spatial and temporal distribution of meteorological elements on the globe. Processes of solar radiation transformation in the atmosphere. Introduction to the processes of climate formation. General atmospheric processes (clouds, precipitation, atmospheric pressure, wind, atmospheric fronts, cyclones, anticyclones).</p> <p style="text-align: center;">1</p>		2PO <sub>п</sub> к4	<b>ON5</b>
52	Organic farming	<p>is a farming system based on careful soil management. It is less labor-intensive and costly than conventional farming.</p> <p>The founder of organic farming is a Russian scientist - agronomist I. E. Ovsinsky. He tested it for 10 years on the territory of Russian provinces and on the basis of this experience wrote in 1899 the book "New system of farming".</p>	5	2PO <sub>п</sub> к6	<b>ON5</b>
53	Artificial systems and environment a	<p>Modern methods and methodologies, basic concepts and definitions. Human security and of the environment, ensuring sustainable</p>		2PO <sub>п</sub> к8	<b>ON5</b>



	I risks	<p>the development of civilization.</p> <p>Atmosphere, hydrosphere, lithosphere - the main environmental components. Volcanic activity, earthquakes, tsunamis; atmospheric processes: cyclones (typhoons, hurricanes), tornadoes, etc., forest fires, floods. Technogenic systems: definition and Classification. Environmental security policy; mitigation and compensation for damage. Risk assessment methodology is the basis for quantification and comparison of hazardous of factors affecting human beings and environment</p>			
54	Fundamentals of environmental regulation and expertise	<p>Mechanism of environmental protection. Ecological -legal responsibility in in the field of natural resources management and environmental protection</p> <p>Environment. Ecology -legal regime of use and protection of individual objects of the Ecological -legal regime of special protected natural and ecologically of disadvantaged areas Internationally</p> <p>-legal protection natural environment</p>	5	1PO <sub>П</sub> K4	<b>ON5</b>
55	Technical regulation in agroecology	<p>Study of laws of the Republic of Kazakhstan on plant protection and quarantine; system of state control in the field of plant protection and quarantine; basic regulatory documents and systems of state phytosanitary control; safety requirements in the sphere of pesticide turnover.</p>		2ROP K4	ON5



56	Geographic information systems in ecology	General concept of geographic information systems. Application of GIS technologies in ecology. Organization of information in GIS. Data. Data structure in GIS. Working with raster and vector data - their differences, pros and cons. Binding of topographic map with known coordinates. Working with graphical and attributive information. Selections and queries - tabular and spatial with generation of new, derived layers. Formalization of maps for printing and exporting. Designing GIS. Working with tabular data. Project creation - loading data into	5	2PO <sub>п</sub> к6	<b>ON2</b>
		project and its structure			
57	Ecological modeling of agroecosystems	Ecological modeling. Modeling in ecology and agronomy. Modeling of processes in biological communities. The role of models in agronomic sciences. Classification of models. Basic principles and stages of modeling.		1PO <sub>п</sub> к7	<b>ON5</b>



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## Conclusion

Implementation of work package activities completed on time and executed fully according to the project plan.

The development of educational programs in the field of agroecology was predetermined by intensive socio-economic changes, new priorities in the development of the education system and the country as a whole; fundamental changes in the system of higher and postgraduate education of the RK. Designing and development of educational programs conditioned by new challenges, as well as changed priorities of the State policy, arising from the Message of the President of RK N.A. Nazarbayev to the people of Kazakhstan from December 14, 2012 "Strategy "Kazakhstan-2050" - a new political course of the established state", the Decree of the President of RK from March 1, 2016 № 205 "On approval of the State program of development of education and science of RK for 2016 - 2019 years"; the Decree of the President of RK from August 1, 2014 № 874 "On approval of the State program of industrial development of RK for 2016 - 2019 years"; the Decree of the President of RK from August 1, 2014 № 874 "On approval of the State program of education and science of RK for 2016 - 2019 years".

Educational Program 6B08111 Agroecology is developed, coordinated and approved in all partner universities, ready for implementation in accordance with the NAP in the field of education of the MES RK.



## Regulatory and legal support

- 1 Law of the Republic of Kazakhstan dated July 27, 2007 № 319-III "On Education".
- 2 "On Approval of the Classifier of directions of training of personnel with higher and postgraduate education". Order of the Minister of Education and Science of the Republic of Kazakhstan from June 5, 2020 № 234.
- 3 "On Approval of State Compulsory Standards of Higher and Postgraduate Education". Order of the Minister of Science and Higher Education of the Republic of Kazakhstan from July 20, 2022 № 2.
- 4 "On Approval of the Rules of organization of educational process on credit technology of education in organizations of higher and (or) postgraduate education". Order of the Minister of Education and Science of the Republic of Kazakhstan from April 20, 2011 № 152.
- 5 Guidelines for the development of educational programs of higher and postgraduate education. Annex 1 to the order of the Director of the National Center for Higher Education Development of MNVO RK from 04.05.2023 № 601 n/k.
- 6 Professional standards and sectoral qualification frameworks posted on the website of the National Chamber of Entrepreneurs "Atameken":
  - Professional standard "Gardening activities" - Annex No. 1 to the order of the Acting Chairman of the Board of the National Chamber of Entrepreneurs of the Republic of Kazakhstan "Atameken" from 26.10.2022g. №190 [https://atameken.kz/uploads/content/files/22\\_%20%D0%9F%D0%A1%20%D0%A1%D0%B0%D0%B4%D0%BE%D0%B2%D0%BE%D0%B4\\_%20%D0%B4%D0%B4%D0%B5%D1%8F%D1%82%D0%B5%D0%BB%D1%8C.docx](https://atameken.kz/uploads/content/files/22_%20%D0%9F%D0%A1%20%D0%A1%D0%B0%D0%B4%D0%BE%D0%B2%D0%BE%D0%B4_%20%D0%B4%D0%B4%D0%B5%D1%8F%D1%82%D0%B5%D0%BB%D1%8C.docx)
  - Professional standard "Growing legumes and oilseeds" Appendix #4 to the order of the Acting Chairman of the Board of the National Chamber of Entrepreneurs of the Republic of Kazakhstan "Atameken" from 26.10.2022r. №190 [https://atameken.kz/uploads/content/files/4\\_%D0%9F%D0%A1%20%D0%92%D1%8B%D1%80%D0%B0%D1%89\\_%20%D0%B1%D0%BE%D0%B1\\_%20%D0%BC%D0%B0%D1%81%D0%BB\\_%20%D0%BA%D1%83%D0%BB%D1%8C%D1%82%D1%83%D1%80.doc](https://atameken.kz/uploads/content/files/4_%D0%9F%D0%A1%20%D0%92%D1%8B%D1%80%D0%B0%D1%89_%20%D0%B1%D0%BE%D0%B1_%20%D0%BC%D0%B0%D1%81%D0%BB_%20%D0%BA%D1%83%D0%BB%D1%8C%D1%82%D1%83%D1%80.doc)
- 7 Atlas of new professions and competencies in the Republic of Kazakhstan