

MATRIX of the existing Master course (Alecu Russo Balti State University)

Name of compulsory courses	Year	Semester	Number of ECTS	Number of elective courses	List of available elective courses	Short description	Relation between the contents and RETHINK's theme
AGRICULTURAL ECOLOGY							
Soil fertility and crop productivity	1st year	1 st semester	5			Soil fertility is fundamental aspect in ensuring sustainable development of the agricultural sector. Soil fertility is often confused with its fertilization, which is unacceptable because soil fertility is influenced not only by fertilizers, but also by a number of other agro-technical methods (soil cultivation and irrigation, crop rotation and diversity). The basic index of soil fertility is soil organic matter. Transformation processes of soil organic matter largely determine plant nutrition. Master students will find out the best methods of soil fertility management in modern agricultural systems.	Providing people with food commodities is a current ecologic problem. Given the contemporary demographic pressure, this problem is becoming more pressing and can be solved by increasing crop productivity, based on efficient management of soil fertility.
Scientific basis for the development of sustainable agriculture	1 st year	1 st semester	5			Sustainable development of agriculture involves harmonizing environmental, economic and social aspects. Modern agriculture both in Moldova and in the world is not sustainable. The problem becomes more acute in the times of increasingly growing prices for non-renewable energy. They will continue to grow due to the limited amount of non-renewable energy resources in the world. The key issue for world agriculture, including Moldova, is how to reduce the dependence of agricultural households on the use of non-renewable energy sources. Moreover, the solution of this problem allows us to improve the ecological state of the environment and enhance the stability of rural communities.	Sustainable development of humanity, which is an ecological concern, involves sustainable development of all the areas of human activity, including agriculture. It is necessary to look for the possibilities of decreasing inputs of synthetic fertilizers and non-renewable resources that will improve the ecological condition of the environment, and thus, lead to the stability and health of the rural communities.
Comparative analysis of natural ecosystems and agro-ecosystems	1 st year	1 st semester	5			Natural ecosystems, unlike agro-ecosystems, are characterized by a balance in the transformation of energy and matter. Human intervention has led to a misbalance of natural ecosystems and brought the need for external inputs, such as fertilizers, irrigation, breeds, hybrids, and others to ensure high productivity. Unfortunately, inputs have aggravated the environmental problems (soil and water degradation and pollution, loss of biodiversity, global warming, etc.). The given course will enable the students to understand that natural ecosystems can serve as a model for the development of agro-ecosystems.	Knowledge of the basic operational principles of natural ecosystems is a decisive condition necessary to properly manage the environment and the agricultural and ecological processes in order to avoid, as far as possible, the degradation of the ecological balance in them and maintain their sustainability.
Sociology of management	1 st year	1 st semester	5			Organizational creativity, management innovation t is the basis of success in any field social activity. Master students will study the organizational structure of rural society, the organizational principles of labour community, principles of integration and cooperation in the social group.	Organizational and managerial skills are necessary for any specialist, as they facilitate the adaptation of the person to a new team.

Applied informatics	1 st year	1 st semester	5			Applied informatics will contribute to the provision of the course with all necessary information. Master students will learn new ways to search the Web and to manage the information. Effective processing of information requires the use of different software packages, including MS Office, advanced text processing and spread sheets. The course provides the students with the possibility to acquire experience in developing electronic presentations. Students will analyse possibilities to inform the society of the state of the agriculture and ecology in Moldova.	Applied Informatics familiarizes the learners with the means for searching and processing of information in agricultural ecology. Knowledge and skills in this area enable the learners to generate databases and develop various methods to inform the society about the current state of ecological agriculture in Moldova.
Ecological weed management in agro-ecosystems	1 st year	1 st semester	5			Domination of the chemical method of weed control in Moldova's agriculture disregards the ecological peculiarities of weeds. Simultaneously, the biological peculiarities of weeds are not taken into account. The issue of crop and weed interactions (allelopathy) remained outside the scope of agricultural research. Recent research has established that weeds have a very beneficial ecological role, which is within the economic damage threshold. Master students will learn how to use ecological peculiarities of the weeds to ensure their rational management.	New scientific views on the role of weeds in agro-ecosystems require a change in the attitudes towards them. Substituting the term "battle" by the concept of "management" and the respective actions provide for an ecological treatment of the agricultural system and reduce the negative environmental impacts on the environment.
	1 st year	1 st semester	5	1	Specialty terminology (English and French)	The course offers a variety of tools to analyse literary and non-literary text to enable the students to read critically and professionally. The students analyse texts from the fields of agriculture and natural science. The course offers strategies to teach students how to communicate effectively with colleagues abroad. The students will be involved in the interpretation of legislative texts in the field of agriculture and natural sciences. The students will work with the basic language structures, necessary for a real appropriate and professional communication.	Knowledge of the specialty terminology in a foreign language will enable the learners to deal with ecological problems worldwide. They will be able to read specialty literature in a foreign language and thus improve their knowledge.
Total		1st semester	30 (+5)				
Fertilization system in sustainable agriculture	1 st year	2 nd semester	5			The fertilization system in conventional agriculture is based on the use of synthetic fertilizers. As the non-renewable energy resources become more expensive, the synthesis of nitrogen fertilizers is becoming more expensive as well, which affects their prices. Apart from the economic aspect, the use of nitrogen fertilizers increases the risk of volatilization into the atmosphere (greenhouse effect) and eluviation of groundwater (nitrate pollution). Mankind is looking for alternative ways of providing plants with nutrients. Master students will learn new methods of alternative mineral nutrition of plants without any danger of environmental pollution or global warming.	Reviewing the traditional system in conventional agriculture, largely avoiding fertilization by introducing synthetic mineral fertilizers is an important goal that will prevent many adverse environmental effects: pollution, greenhouse gases, global warming etc. at the same time it is necessary to introduce new alternative ways of providing agricultural plants with mineral nutrients.

Soil ecosystem	1 st year	2 nd semester	5			Lack of a systemic (holistic) concept impedes us from preserving the soil as one of the supreme wealth of the nation. The soil cannot be treated only as a substrate for plant growth. It has a multifunctional role in the biosphere, which is far from being well-known. Providing agricultural production is only one of the functions of the soil. The soil biodiversity ensures its functionality. Often soil is regarded as a "black box" or "food chain" with a deeper understanding of the complex processes, taking place in it. This discipline will enable the students to discover the biological world of the soil that determines the effectiveness and ensures the sustainable use of soil resources.	Thorough knowledge of the depth of the soil as the supreme treasure of mankind, of the complexity of ecological processes within it, especially changing the view point with regard to the role and importance of its biodiversity and multi-functionality is a paramount condition to ensure ecological health of the soil, in terms of the need to permanently increase its productivity.
Landscape-based territorial planning	1 st year	2 nd semester	5			One of the most burning problems in the rational use of land in Moldova is the water erosion, and quite recently, wind erosion. The basic cause for the development of erosion is the lack of a landscape vision in farmland use. In other words, the use of agricultural land requires differentiation, depending on the location of the land on the slope. This is the only way to prevent, but not to "fight" the consequences of unfair exploitation of land.	Erosion is the most dangerous process of soil degradation. Landscape planning of slopes allows preventing erosion and contributes to the preservation of the main agricultural means of production - soil, which also performs important ecological functions.
Research methodology and ethics	1 st year	2 nd semester	5			The prevailing research methods in agriculture involve studying each factor separately, often with several gradations. For example, experiments with the study of different cultivation and fertilization systems in crop rotation and irrigation etc. Actually, overall factors affect crop productivity and soil fertility. It was necessary to make poly-factorial experiments studying simultaneously the action and interaction of basic agricultural factors. Research ethics includes presenting objective results and their correct interpretation. Master students will learn how to make the experiments and method of statistical processing of the results.	The notion of system analysis will be used to ensure effective management of production in the polyfactorial process. This discipline also provides methods to solve real problems (environmental, technical, scientific, managerial, etc.).
Certification and management of ecological production	1 st year	2 nd semester	5			Certification and management of ecological production. Ecological certification significantly differs from the certification of conventional agricultural products. Eco-production requires certification of the entire production process in conformity with the national and international standards (IFOAM). This forces the farmer to meet a number of requirements for the growth of eco-products. Unlike conventional agricultural production, ecological agricultural production is based on preventing pollution and environmental degradation. Master students will learn all the laws of the production process to help reduce or exclude the negative impact on the environment.	Knowledge of and compliance with national and international standards, used in the certification of agricultural products, will allow the learners not only to obtain organic production, but also to prevent pollution and environmental degradation.

The importance of gene pool in maintaining the biodiversity and targeted improvement of the field crops	1 st year	2 nd semester	5			Gene pool is the basis of plant breeding. Over the last 50 years, there has been a strong erosion of the gene pool at the global, regional and local level. Reduction in the diversity of cultures and genetic diversity within each species contributed and contributes to the increase of external inputs to maintain high levels of production. Due to the radical change in agriculture (global warming, expensive inputs, limited water supply, etc.) there is a need to adapt to the new abiotic and biotic conditions.	Biodiversity is the basis for sustainability in agriculture. Having the aim to develop field crops with a high level of adaptivity to ecological conditions (global warming, scarcity of water resources, etc.) significantly increases the importance of genetic inheritance.
	1 st year	2 nd semester	5	1	Specialty terminology (English and French).	The course offers a variety of tools to analyse literary and non-literary text to enable the students to read critically and professionally. The students analyse texts from the fields of agriculture and natural science. The course offers strategies to teach students how to communicate effectively with colleagues abroad. The students will be involved in the interpretation of legislative texts in the field of agriculture and natural sciences. The students will work with the basic language structures, necessary for a real appropriate and professional communication.	Knowledge of the specialty terminology in a foreign language will enable the learners to deal with ecological problems worldwide. They will be able to read specialty literature in a foreign language and thus improve their knowledge.
Total		2nd semester	30 (+5)	1			
Total	1st year		60 (+10)	2			
Breeding field crops with a high level of adaptability to environmental conditions.	2 nd year	3 rd semester	5			One of the trends in the contemporary crop improvement is to obtain new varieties and hybrids, resistant to drought and increased temperatures and other adverse factors. Research in this area is productive and is conditioned by such issues as the global warming, desertification, ozone depletion, etc. This goal may be achieved in two ways: improving crops through biotechnological processes to obtain genetically modified organisms and traditional improving. Resistance to unfavourable environmental factors is determined by multiple genes. But this complex issue is a priority for the XXI century.	Changing weather conditions determine the new efforts, aimed at improving crops production by way of achieving new varieties and hybrids with increased resistance to drought and high temperatures, and other unfavourable environmental factors.
	2 nd year	3 rd semester	5		Evaluation of agro-ecosystems	Comparative evaluation of agro-ecosystems depends on the goal. In market-oriented agro-ecosystems the main goal is to sell goods in order to obtain profit. As for the agro-ecosystems integrated with cattle breeding, the profit can be obtained by integrating the two branches and it is determined by the amount of protein produced, the balance of the animal ration. Not least important is the influence of agro-ecosystems on soil fertility. Evaluation of agro-ecosystems should be performed in conformity with a set of economic, environmental and social indicators.	Evaluation of the agro-ecosystems based on a set of economic, environmental and social indicators enables us to optimize and implement activities in agro-ecosystems based on ecological principles, which contributed to their durability.

	2 nd year	3 rd semester	5		Laws of agricultural production.	Agriculture is based on some fundamental laws, which have to be obeyed. Failure to do so has led to serious economic, environmental and social problems in agriculture and rural communities. Agricultural laws are closely linked with the observance of the environmental laws, as agro-ecosystems are a continuation of natural ecosystems. The students will study the interactions between production and vegetation factors, the fundamental laws of agriculture and the consequences of noncompliance with them.	Agro-ecosystems are a continuation of natural ecosystems. It is necessary that environmental laws that apply to natural ecosystems, as well, should be known and strictly followed in the agro-ecosystems.
	2 nd year	3 rd semester	5		Globalization and zonality in agriculture.	"Green Revolution" in agriculture has greatly contributed to the globalization of agricultural markets. Transcontinental companies are interested in promoting seeds, technologies, pesticides, etc. in all the countries around the world. Unfortunately, the promoted genetic material, including genetically modified organisms, is not adapted to the climatic conditions of different regions, which leads to serious economic, environmental and social consequences. Thus, the vulnerability of the agricultural sector increases, the dependence on imported agricultural inputs grows and domestic producers are becoming less able to compete on the market. Master students will learn the necessary steps to ensure that the farmers can adapt to globalization and liberalization of the agricultural market, as well as the advantages of using zonality, including regionality.	Globalization of agricultural market takes place in the conditions of globalized world economy. In such circumstances, agricultural zoning is becoming increasingly important, given the zoning of abiotic and biotic environmental factors, as it helps to prevent negative economic, social and ecological consequences,.
	2 nd year	3 rd semester	5		Sustainable agriculture: achievements, problems, perspectives.	The need for the transition to a sustainable agriculture system was declared during the Summit, held at Rio-de-Janeiro in 1992, but the practical achievements in this area are very modest. This is proven by the results of the subsequent summits, held in Johannesburg, Rome, Copenhagen, etc. The reasons for this are different, but the key problem is the lack of a mechanism that takes into account the consequences of human activity for the environment and human health. These expenses are usually excluded from the production process. Master students will find out about the existing obstacles in promoting the new model to deal with the problems in agriculture and how they can be overcome.	Promoting sustainable agriculture can be achieved by solving economic, environmental and social problems, applying a holistic approach. Studying issues, related to the implementation of sustainable agriculture, may contribute to the development of the prospects of this branch of human activity.
	2 nd year	3 rd semester	5		Soil degradation and its ecological restoration.	Conventional agriculture has contributed to the degradation of the soil. More than 40 types of degradation are known at the moment. Soil degradation occurs because of failure to respect the fundamental principles of rational use of land. Master students will learn how to prevent degradation and restore degraded soils.	Soil degradation causes degradation of the entire ecosystem (either natural or agricultural), generating other negative ecological consequences globally. Preventing soil degradation and reconstruction of degraded soils is one of the most important environmental issues.

	2 nd year	3 rd semester	5		Innovative agricultural systems and their importance in enhancing sustainability.	Intensification of agriculture based on concentration and specialization contributed to the use of simplified schemes of crop rotation, domination of soil tillage, predominant use of chemical fertilizers as a means of influence on crop productivity and soil fertility. Despite the progress in crop improvement, the results of long-term experiments and of production prove the stabilization of production levels. Master students will analyse the enhancing factors in agriculture and innovation systems, used to assess their role in modern agriculture.	Analysing the factors of agricultural intensification by applying innovative systems, including those based on ecological principles, offers an efficient solution to the problem of providing the population with food commodities in conditions of demographic pressure.
Practical training	2 nd year	3 rd semester	10				
Total		3rd semester	30	6			
Master's thesis	2 nd year	4 th semester	30			Master students have to choose a topic for research according their professional interests. To carry out the research they will have to apply all the knowledge and skills, acquired during their studies. The master thesis shall contain the basic theoretical foundations and an experiment, carried out by the students. The results of the experiment have to be explained and stipulated in the thesis.	
Total		4th semester	30				
Total	2nd year		60	6			
Total for Master course:	2 years	4 semesters	120 (+10)	6			