In preparing this publication valuable contributions are provided by heads of departments and other employees of the Faculty of Agriculture.

Zagreb, May 2016
Dear reader,

University of Zagreb Faculty of Agriculture is proud of its nearly century old tradition in education and scientific research in the field of agriculture and related sciences with emphasis on cooperation with business sector, local community and Croatian society, thus taking care of agricultural and rural areas.

Our Faculty is located in the vicinity of the Maksimir Park, sharing natural surroundings and serenity of the park as well as vividness of over 2,400 students and 420 employees dedicated to education of young people and lifelong learning in the field of agriculture. Although not intended by our founders and predecessors, we are now comprised in the City of Zagreb, with footpaths and pathways leading numerous citizens daily from Maksimir Park and neighbourhood to the Faculty. Thus, the Open Days last literally for the entire vegetation period or even longer.

Therefore, it is our greatest pleasure to present you this publication with detailed review of our scientific capacities, both human and infrastructural, resulting in numerous academic research activities in cooperation with related faculties and universities, business sector and different scientific, professional and social institutions.

Scientific work of the University of Zagreb Faculty of Agriculture is closely connected with our mission - dedication to the education of students, experts and farmers. This mission is supported by research activities which facilitate cooperation with national and international institutions, while our achievements published in scientific journals worldwide guarantee our place in the prestigious international academic community.

As an institution important to the society and financed by the state budget, we have the responsibility and obligation to present our achievements and work results. I firmly believe it can be recognised in this publication, as well as our dedication to the research in the field of agriculture, food production, sustainable development of the rural areas and related sciences for the benefit of the society in Croatia and abroad.

Research capacities and work results are presented objectively, aimed to demonstrate our dedication to investments in our researchers and experts and to strengthen scientific capacities, innovative technology and application of the research results.

This publication is dedicated to our partners in research, production and services, cooperates from research and public institutions, alumni, Croatian scientific community and business sector interested in utilising the scientific and professional potential of our Faculty.

Prof. Zoran Grgić, PhD
Dean
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Introduction
The colors of autumn within the Faculty of Agriculture

The Faculty of Agriculture was founded in 1919 as the fifth faculty of the University of Zagreb. During this almost a century-old existence, in a turbulent and difficult times, and in the politically unstable region, many generations of professors and students have contributed to the status and reputation that the Faculty of Agriculture enjoys today - it is the most important Croatian higher education and scientific institution in the field of agriculture and related sciences, and one of the leaders in the region.

Our primary mission is education of highly qualified experts, development and broadening of professional knowledge in the field of agriculture and related sciences. Applying the highest academic standards we enable students to acquire competences based on the newest scientific knowledge, for the benefit of the society.
Educational processes have been changing in accordance with the economic needs, the interests of students, but also the political and social conditions of each period. Today, the University studies at the Faculty of Agriculture are harmonized with the “Bologna process” and organized in three educational cycles: undergraduate, graduate and postgraduate doctoral studies (3+2+3) and students are offered nine undergraduate, thirteen graduate and two postgraduate doctoral studies as well as three postgraduate specialist studies. Annually, about 450 new students enrol in the undergraduate and 250 in the postgraduate studies, and a total number of students is over 2,600 (AY 2015-2016).
Scientific research projects

Scientific research projects are, besides teaching, the basic activities of the Faculty of Agriculture. During the whole period of existence, the Faculty of Agriculture has devoted particular attention to the development of science, as well as the practical application of research results. Our scientists have enjoyed a great reputation in the world, and many scientists from neighbouring countries obtained their academic qualifications under the guidance of our teachers. Today, many of our researchers are well known and recognized in the scientific world and with a large number of published papers and conducted research projects, the Faculty has secured itself a leading position in Croatia and the region.

The main research activities are currently focused on the following areas:

- Molecular characterization, selection and cultivation in microbiology, plant and animal sciences;
- Sustainable agriculture and organic production;
- Environmentally friendly plant protection against pests;
- Soil and water protection;
- Biodiversity and preservation of wild and domestic species, varieties and breeds;
- Quality and safety of food;
- Croatian landscapes and their implementation into the legislative system;
- Introduction of wild ornamental species into horticulture;
- Renewable agricultural energy sources, “Green energy”.

Scientific activities of teachers and researchers at the Faculty of Agriculture are based on the developing and applied research projects, national and international. Project information (titles, keywords and abstracts) are available on the website: http://www.agr.unizg.hr/eng/research/projects/

Most research projects also include researchers from partner institutions in Croatia and other countries.

In accordance with the objectives of the University of Zagreb, the Faculty of Agriculture strives to become a research institution. That is why our priority is the development of graduate and postgraduate studies, especially those taught in English.

The Faculty of Agriculture employs teachers from other disciplines which are actively involved in teaching and in the university projects and scientific work. Thus, research in the field of kinesiology focuses on the analysis of physical activity and student’s health which is confirmed by a large number of published scientific papers presented at the international scientific meetings in the field of kinesiology. Teachers from the Chair of Physical and Health Education are involved in the developing project of the University of Zagreb “Strategy for Development of Sport and Exercise at the University of Zagreb (2012). Among other projects, we emphasize the international IPA IV project “Multioutdoor Activity” (2012) and project in Croatia “The athletes in the educational system” (2008).

At the same time, an intensive professional cooperation has been established with local government and business sector. This kind of cooperation is aimed at solving various problems in agricultural production for which analytical studies, project documentation and reports are prepared, surveillance systems and surveys are conducted, as well as other forms of professional services. In the last five years there is an increase in professional cooperation projects.

Due to the intensive research and professional engagement, the Faculty of Agriculture has increased non-budget revenues by 25%.
Library and publishing activities

Central agricultural library (CAL) is the largest library of agriculture in the Republic of Croatia with a collection of 82,000 volumes of monographic and serial publications. This is where a valuable archive of the cultural, historical and national interest is maintained.

The Faculty of Agriculture publishes scientific journal Agriculturae Conspectus Scientificus (ACS) and is one of the founders of scientific journal Journal of Central European Agriculturae (JCEA).

Organization

The Faculty is organized into corporate services (the Dean’s Office) and departments and is directed by a dean and four vice-deans. In 2016 the Faculty had a total of 417 employees, including 250 scientific - teaching staff.

The deanery consists of the Dean’s Office, corporate, legal, students’ and human resources services, maintenance service, accounting, Central Agricultural Library (CAL), International Relations Office (IRO), and the Department of Physical and Health Education.

The Faculty of Agriculture has a total of 28 departments, organized according to scientific and educational field of interest and activities. The departments are responsible for the implementation of the basic Faculty activities, and they manage human, material and financial resources used in their activities. The departments of the Faculty of Agriculture are as follows:

Department of:
- Chemistry
- Agricultural Botany
- Information Science and Mathematics
- Soil Science
- Microbiology
- Plant Nutrition
- Soil Amelioration
- General Agronomy
- Plant Breeding, Genetics and Biometrics
- Field Crops, Forage and Grassland
- Seed Science and Technology
- Vegetable Crops
- Pomology
- Viticulture and Enology
- Plant Pathology
- Agricultural Zoology
- Herbolgy
- Animal Science
- Animal Nutrition
- Animal Science and Technology
- Dairy Science
- Fisheries, Beekeeping, Game Management and Special Zoology
- Agricultural Engineering
- Agricultural Technology, Storage and Transport
- Agricultural Economics and Rural Development
- Management and Rural Entrepreneurship
- Marketing in Agriculture
- Ornamental Plants, Landscape Architecture and Garden Art
Maksimir
For the purpose of conducting experiments, demonstrations and all forms of practical work and scientific and professional activities, the Faculty of Agriculture has seven separate objects: experiment stations, at the following locations:

**Maksimir**, Zagreb, Svetosimunska 25, next to the Faculty of Agriculture: the experiment station is used for teaching and scientific research related to production technology for economically important field, vegetable, industrial and ornamental crops. The Department facilities are equipped for research on growing vegetables and flowers in a greenhouses;

**Jazbina**, located on the slopes of Medvednica mountain, a few kilometers away from the Faculty of Agriculture (Jazbina 142): the experiment station is used for teaching and scientific research in the field of viticulture and pomiculture; modern scientific and teaching facility with exemplary vineyards and fruit species of this area; equipped experimental cellar for teaching and research in enology.

**Center for Grasses**, located on the northern slopes of Medvednica, at an altitude of about 700 m, it is used for teaching and experimental work in cattle breeding, sheep breeding and mountain agriculture, experiment station has its own pastures and grasslands, an equipped laboratory and a classroom;

**Historical Gardens and Landscape Development Center – Dubrovnik**: used in the research of historical gardens and other open spaces design;

**State-owned hunting grounds III/29 Josip ban Jelačić, Prolom Buzeti** – ten kilometers from the city of Glina, established to accommodate practical work for the modules in hunting, beekeeping, phytocenology, botany, pedology, etc.;

**Šašinovec**, near Zagreb, used for teaching and scientific research related to production technology and breeding of field crops.

**Šiljakovačka Dubrava**, near Zagreb, used for teaching and scientific research related to production technology and breeding of field crops.

Experiment stations at Maksimir, Jazbina, Sljeme, as well as the Development Center in Dubrovnik, have been owned by the Faculty of Agriculture for a long time. Experiment stations „Prolom“ Buzeti and Šašinovečki lug are owned by the Faculty of Agriculture for a relatively short period of time: experiment station „Prolom“ is owned by the Republic of Croatia which has granted the Faculty a 30-year concession, in 2006; Šašinovečki lug is in the ownership of the Faculty of Agriculture from July 2007 (previously 1921 – 1947). Šiljakovačka Dubrava is entrusted to the Faculty of Agriculture by the Ministry of Agriculture in 2001.

Experiment stations Šašinovečki lug and „Prolom“ Buzeti are managed by the Faculty of Agriculture, and other experiment stations are managed by certain departments of the Faculty of Agriculture that use them in their research and practical teaching.
### Table 1. Experiment station management

<table>
<thead>
<tr>
<th>Experiment station</th>
<th>Area (ha)</th>
<th>Management</th>
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<tbody>
<tr>
<td>Šašinovečki lug</td>
<td>78.8</td>
<td>Faculty of Agriculture - Dean's Office</td>
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<td>Hunting grounds Prolom</td>
<td>7,709.0</td>
<td>Faculty of Agriculture - Dean's Office</td>
</tr>
<tr>
<td>Maksimir</td>
<td></td>
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<tr>
<td>- agriculture</td>
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<td>Department of Field Crops, Forage and Grassland</td>
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<tr>
<td>- vegetable farming</td>
<td>2.0</td>
<td>Department of Vegetable Crops</td>
</tr>
<tr>
<td>- plant breeding</td>
<td>5.0</td>
<td>Department of Plant Breeding, Genetics and Biometrics</td>
</tr>
<tr>
<td>- seed production</td>
<td>4.5</td>
<td>Department of Seed Science and Technology</td>
</tr>
<tr>
<td>- ornamental plants</td>
<td>1.0</td>
<td>Department of Ornamental Plants, Landscape Architecture and Garden Art</td>
</tr>
<tr>
<td>- pomology</td>
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<td>Department of Pomology</td>
</tr>
<tr>
<td>Jazbina</td>
<td></td>
<td></td>
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<td>- viticulture and enology</td>
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<td>Department of Viticulture and Enology</td>
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<tr>
<td>- pomology</td>
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<tr>
<td>Center for Grasses</td>
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<td>Department of Field Crops, Forage and Grassland</td>
</tr>
<tr>
<td>Šiljakovačka Dubrava</td>
<td>146.6</td>
<td>Department of Animal Science</td>
</tr>
<tr>
<td>Historical Gardens and Landscape Development Center, Dubrovnik</td>
<td>—</td>
<td>Department of Ornamental Plants, Landscape Architecture and Garden Art</td>
</tr>
</tbody>
</table>
Departments
Areas of research
Scientific research at the Department of Chemistry covers the following areas: molecular recognition of plant growth regulators, the study of quantitative relationship between the structure and biological activity and physicochemical properties of organic molecules; the interaction of surface-active substances with biopolymers (carrageenan) and proteins (casein), intermolecular interactions of food colloids and the control of food components properties at the nano level.

A very important area of research is the encapsulation of bioactive component important for nutrition and plant protection which is carried out in collaboration with researchers of the Department of Plant Pathology, Department of Vegetable Crops and Department of Ornamental Plants and Landscape Architecture.

The specificity of basic scientific disciplines such as chemistry and biochemistry is the direct application of scientific research in various areas of everyday life and education. Chemistry and biochemistry are fundamental subjects in the education of agronomists that are represented in the undergraduate (BS) and graduate (MS) studies. Research and education cover the area of plant and animal biochemistry, chemistry and quality control of animal feeds and instrumental methods of chemical analysis. Chemistry is also an important science area in graduate studies at the Faculty of Agriculture (hydrochemistry and basic hydrophysics).

Research infrastructure
Research laboratories are equipped with basic laboratory equipment sufficient for simple chemical analysis (spectrophotometer, centrifuge, conductometer, pH meter, laboratory oven, water redistillation appliance, outdoor thermostat application, analytical balances, laboratory mill MM 200 RETSCH, planting device AS 200 basic RETCH, viscometer and necessary laboratory dishes).

Research and production services
Laboratory analyses offered by the Department include the analyses of phosphorus, nitrate, nitrite and ammonium nitrogen with spectrophotometric methods and total nitrogen by the Kjeldahl method. Encapsulation of active components in nutrition and plant protection.

Development of new encapsulated and enzyme technology for production of biologically active substances and other food components with to increase competition, quality and safety of food
2010. – 2015.; Ministry of Science and Technological Development of the Republic of Serbia; Marija Bujan; mbujan@agr.hr

Molecular Recognition of Plant Growth Regulators
2007. – 2013.; Ministry of Science, Education and Sport; Milan Šoškić; msoskic@agr.hr

Intermolecular interactions in food colloids and nanolevel control of properties
2008. – 2010.; Ministry of Science, Education and Sport; Marija Bujan; mbujan@agr.hr

Biotech formulation plant growth promoters with encapsulation of fungal component
2013. – 2015.; scientific support to the Ministry of Science, Education and Sports; Marija Bujan; mbujan@agr.hr

Scientific and professional projects
Areas of research
The scientific and expert activities of the Department of Agricultural Botany are focused on floristic, morpho-anatomical and eco-physiological research of various cultivated and wild vascular plants of the Croatian flora. In light of this, we need to emphasize the studies referring to the influence of the increased concentrations of the tropospheric ozone on the anatomical structure of the agricultural cultures. The most significant are the research activities dealing with flora and vegetation, which primarily refer to the grassland and weed vegetation, as well as the succession stages of the grassland vegetation. We also investigate potential new localities, endangered habitats and the general distribution of rare and endemic plants in Croatia. Within the floristic studies, the Department is involved in the flora mapping of the Adriatic region and continental parts of Croatia. Within broader taxonomic research activities, involving the morpho-anatomical, cytological and molecular aspects, special attention is paid to certain plant genera, as well as to endemic and rare species of Croatian and Mediterranean vascular flora that bears wider botanical significance. Part of the Department’s scientific research refers to morphological and molecular diversity of forage species in order to maintain and preserve the diversity of plant genes in banks, and their in situ and ex situ protection.

Research infrastructure
Light microscopy laboratory: light microscopy and plant material morphometry.

Research and production services
The employees of the Department are trained for providing scientific and professional services such as determination of plant species, development of environmental studies and assessment of the condition of plant diversity.

Plant diversity and nutritive value of sheep pastures in the Adriatic region
2006 - ; Ministry of Science, Education and Sport
Mihaela Britvec, mbritvec@agr.hr

Management of semi-natural pastures in the Adriatic region
2003 - 2005; Ministry of Agriculture, Forestry and Water Management
Mihaela Britvec, mbritvec@agr.hr

Preservation of Plant Diversity on Pastures in the Adriatic Region
2002 - 2005; Ministry of Science and Technology
Mihaela Britvec, mbritvec@agr.hr

Wild grown flavourings and aromatic plants of the Adriatic coast on the web
2003 - 2004; Ministry of Science and Technology
Ivana Vitasović Kosić, ivitasovic@agr.hr

Digital atlas of grassland flora
2002 - 2003; Ministry of Science and Technology
Mihaela Britvec, mbritvec@agr.hr

Pasture vegetation - cattle-raising production factor
2001 - 2003; Ministry of Agriculture and Forestry
Mihaela Britvec, mbritvec@agr.hr

Multimedia in plant anatomy
2001 - 2002; Ministry of Science and Technology
Mihaela Britvec, mbritvec@agr.hr

Evolution, biodiversity and conservation of indigenous plant species of the Balkan Peninsula (BalkBioDiv)
2012 - 2012; SEE-ERA.net program
Sandro Bogdanović; sbogdanovic@agr.hr

Evolution of polyploid plant species on the Balkans
2012 - 2013; Austrian government and Government of the Republic of Croatia
Sandro Bogdanović; sbogdanovic@agr.hr

Scientific and professional projects
DATABASE

USER
- Name
- Password

WEB
- Upload 10
- Name
- Title
- Author (optional)
- Abstract
- Text

ENTRY
- Name
- Text (optional)
- Keywords 10
- Description 10
- Upload 10
Areas of research

The main areas of multiyear scientific and professional research are the information technology revolution, information science - communicology, development of computer systems, information technology and e-learning in agriculture. In the area of mathematics the research interest focuses on functional and mathematical analysis and applied mathematics.

Scientific activities of the Department of Information Science and Mathematics take place mainly through the participation of its employees in projects within the Department and other research projects. These projects explore the position of info base of Croatian agricultural system in relation to the information systems of modern agricultural systems in developed countries.

The Department’s employees are authors and co-authors of a large number of university textbooks, course books and scientific and professional papers which can be found in the Croatian library fund.

Research infrastructure

IT classroom

Research and production services

Given the competence of personnel and the available equipment, the Department may provide services in the area of assessing the allocation of info systems in agriculture and the effectiveness of global communication systems.

Scientific work in the field of mathematics provides the basis for the provision of research services in the field of functional analysis, mathematical analysis and applied mathematics.

The place and role of informatics in developing modern agricultural system: case study of Croatia
2008 - 2011; Ministry of Science, Education and Sport
Vitomir Grbavac; grbavac@agr.hr

Analytical aspects of the information base in the Croatian agricultural system
2002 - 2005; Ministry of Science, Education and Sport
Vitomir Grbavac; grbavac@agr.hr

The information base of the Croatian agricultural system
2000 - 2002; Ministry of Science and Technology
Vitomir Grbavac; grbavac@agr.hr

Scientific and professional projects
Areas of research
Scientific and teaching activities of the Department’s staff cover the areas of ameliorative pedology, hydropedology, water ecology, managing amelioration systems of waste drainage and irrigation, soil physics and chemistry and soil and water protection in agriculture. Much of the research relates to the origin and development of soil, pedocartography, classification and land information systems.

In recent years numerous successful research of soil and water contamination in agro-ecosystems of the river Sava and Drava catchment areas and karst have been carried out in order to determine nitrate, ammonia, heavy metals and pesticide residues concentration in soil and water, followed by research related to land degradation with the primary objective of monitoring soil acidification, as well as research of the correlation between the existing Croatian soil classification and the World reference base for soil resources.

Research infrastructure
Experimental field trials
The Department’s staff carries out the research for which controlled and experimental field trials have been set up:
- controlled field trial of Croatian Tobacco near Vukosljevic in the area of Virovitica,
- controlled field trial of Croatian Tobacco near Ovčara in the area of Kutjevo,
- experimental field trial Kotoriba (agricultural crops),
- experimental field trial Belica (agricultural crops),
- experimental field trial Kapelna, near Donji Miholje – agricultural crops on hydroameliorated soil,
- experimental field trial Nedelišće – intensive apple production,
- experimental field trial Valtura – Pula – vegetable crops.

Laboratories
In the Department of Soil Science the laboratories are organized as follows:
- soil chemistry laboratory,
- soil physics and soil mechanics laboratory.

Equipment
The Department of Soil Science has modern soil research equipment:
- soil physics laboratory is equipped with a pipette apparatus (Eijkelkamp, 2006), pressure membrane extractor (Soil moisture equipment, 2008), sand box apparatus (Eijkelkamp, 2008), apparatus for serial permeability measurements (Eijkelkamp, 1980), Casagrande apparatus for plasticity measurements (Soil test, 1975), probe for measuring the viscosity of liquids - Kaczynski (1983), and the apparatus for measuring the swelling (1965),
- for the research of soil chemistry the Department has the following laboratory equipment: spectrophotometer, pH meter, conductometer, Scheibler-calcimeter, rotary shaker, centrifuge
- pedological field research equipment includes pedological probes for soil drilling and other tools, apparatus for measuring air permeability, infiltration measurement equipment, equipment for measuring horizontal water permeability, penetrometer for measuring soil compaction, soil sampling equipment, GPS
Research and production services

Field studies
The Department of Soil Science employees conduct detailed field pedologic research, which includes soil sampling (natural and disturbed soil samples) and measurements of hydro-pedologic soil properties (infiltration, horizontal water permeability), soil compaction and air permeability.

Laboratory analyses
Analyses of standard and specialized physical and chemical characteristics of soils.

The soil physics laboratory determines: soil mechanical composition, capacity for water and air, bulk and particle density, total porosity, water permeability, structural aggregates stability, compaction, swelling, plasticity, adhesion, capillary rise, pore structure, available soil water content, inaccessible soil water content.

Soil chemistry laboratory determines: soil reaction (pH), total carbonate content, humus content and humus character, total nitrate and ammonium nitrogen, soil adsorption complex, lime requirement to rise pH to 6.0 or 7.0, physiologically active phosphorus and potassium nutrients, physiologically active lime, electrical conductivity.

Cartographic research
The Department has the capacity to produce digital pedologic maps and land information systems using GIS technology.

Pedological data base and the services of preparing pedological studies
The Department of Soil Science has the adequate pedological data base for the needs of various specific services.

Correlation of Croatian Soils with World Reference Base for Soil Resources (WRB)
2007. - 2011.; Ministry of Science, Education and Sport; Stjepan Husnjak; shusnjak@agr.hr

Influence of agriculture on soil and water pollution
2007. – 2011.; Ministry of Science, Education and Sport; Aleksandra Bensa; abensa@agr.hr

Soil acidification and dehumidification in agroecosystems of continental Croatia
2007. – 2010.; Ministry of Science, Education and Sport; Igor Bogunović; ibogunovic@agr.hr

Croatian coastal karst zone – geomorphological and ecological features
2008. – 2013.; Ministry of Science, Education and Sport; Kristina Krklec; kkrklec@agr.hr

Soil analyses for the ZOOB project
2011. – 2012.; IPA; Mario Sraka; msraka@agr.hr

The study of determining the areas under influence of natural or other specific constraints in agriculture with calculations
2012. – 2013.; Ministry of Agriculture; Stjepan Husnjak; shusnjak@agr.hr

Geomorphological inventarisation of Vransko jezero Natural Park
2012. – 2014.; Public institution “Vransko jezero” Nature Park; Kristina Krklec; kkrklec@agr.hr

Preparation of the irrigation system Dalj project documentation
2013. – 2015.; Osijek – Baranja county; Stjepan Husnjak; shusnjak@agr.hr

Late Pleistocene glaciation of Central Spanish System.
Modelling, reconstruction and paleoclimatic quantification
2014. – 2016.; Ministry of Economy and Competitiveness, Government of Spain; Kristina Krklec; kkrklec@agr.hr

Preparation of the designing irrigation project Donje Polje – Jadrtovac, agronomic part
2014. – 2015.; Šibenik – Knin county; Stjepan Husnjak; shusnjak@agr.hr

Scientific and professional projects
Areas of research
Research activities include the study of beneficial interactions between plants and microorganisms as well as the study of natural diversity and characterization of microorganisms that are essential for agricultural production. Special attention is directed toward the study of symbiotic nitrogen fixation, microbial soil quality indicators, microbiological quality control of traditional ewe’s cheeses and molecular characterization of wine yeasts. The Department of Microbiology is a modern and well equipped unit within the Faculty of Agriculture. The Department’s staff strives to follow contemporary trends in science through an extensive cooperation with other departments within the Faculty and with prominent Croatian and foreign researchers and research institutions.

Research infrastructure
Laboratory for soil microbiology and biotechnology
For many years this laboratory has been studying the enzymatic activity as well as the quantitative and qualitative composition of microbial populations in different types of agricultural and forest soils and natural environments. Microbiological analyses of soils are mainly aimed at assessing the abundance of key functional groups of soil microbiota. In addition to soil analyses, microbiological analyses of a variety of organic fertilizers and growth biostimulators are carried out. The laboratory also studies the impact of agrotechnical and hydroamelioration measures on quantitative and qualitative composition of microbial populations in soil. The activities of this laboratory include testing the symbiotic effectiveness of rhizobial strains, determining cultivar and strain compatibility and selecting the most effective strains for legume inoculations.

Laboratory for molecular identification of microorganisms
The study of biodiversity in natural populations of nitrogen fixing bacteria led to the introduction of new molecular techniques that allow rapid and reliable differentiation of closely related bacterial strains. Thus, in 1993 the laboratory for molecular identification of microorganisms has been established and it is fully equipped to carry out methods based on PCR amplification such as PCR-RFLP, RAPD-PCR, rep-PCR. These methods are used for species and strains identification of bacteria. By applying these methods species and strains of various nitrogen fixing bacteria as well as lactic acid bacteria have been identified. In addition to prokaryotic microorganisms, since 1996 the research has been conducted related to the identification and characterization of indigenous yeasts from Croatian vineyards. The Department posses a strain collection of all characterized indigenous strains of yeasts, nitrogen fixing bacteria and lactic acid bacteria.

Laboratory for food microbiology
The laboratory for food microbiology conducts polyphasic studies of microbial communities in food products. In these studies we apply cultivation dependent methods as well as cultivation-independent methods that are based on direct isolation of DNA/RNA. The laboratory is equipped to analyze samples by standard microbiological methods and to research in situ diversity and abundance in microbial communities (DGGE, AP-PCR, Real-Time PCR) and molecular characterization of bacterial strains and species (PCR, RAPD). The Department has established a collection of indigenous isolates of lactic acid bacteria isolated from milk and cheese samples that will find application in the production of fermented dairy products, after detailed analysis and technological characterization.

Laboratory for microbiology and biotechnology of wine
Microbiological analyses of must and wine are performed in this laboratory. Also, the vitality and viability of yeast and bacterial starter cultures that are used in winemaking are determined. Yeasts selection programs are also carried out for specific vineyards and cultivars, as well as the production of inoculum of yeast, since 1996. A collection of yeasts of the most important wine regions of Croatia has been created. The ecology of different vineyards in Croatia is investigated as well as the application of molecular methods in the study of different types of yeast and their impact on wine.
Research and production services
The Department conducts microbiological research of products that are used to increase production and product quality in agriculture, vegetable and fruit growing and cattle feeding. Various studies are made covering the estimation of microbiological soil quality for agro- and hydro-amelioration measures planning. The Department conducts a variety of studies related to growth biostimulators of agricultural and vegetable crops, and the control of organic fertilizers obtained by different production methods. The Department produces microbial fertilizer BiofixN-S for the inoculation of soybean and other leguminous crops (alfalfa, clover, faba bean, lupine, field pea, common bean and pea).

Microbiological quality control of autochthonous soft and hard sheep cheeses
2007. - 2013.; Ministry of Science, Education and Sport; Sulejman Redžepović (2007-2008, 2010-2013); sredezepovic@agr.hr; Mihaela Blažinkov (2008-2009); mihaela@agr.hr

Beneficial microbial associations in sustainable legume production
2007. - 2013.; Ministry of Science, Education and Sport; Sanja Sikora; ssikora@agr.hr

Microbial biotechnology in function of increasing the competitiveness of common bean production
2012. -2014.; Ministry of Agriculture; Sanja Sikora; ssikora@agr.hr

Abundance and diversity of bacteria of the genus Enterococcus in cheese products with multiple resistance against antibiotics
2012. -2013.; Government of the Republic of Croatia and Federal Republic of Germany; Mirna Mrkonjić Fuka; mfuka@agr.hr

Phenotypic and molecular characterization of indigenous rhizobial populations that nodulate alfalfa (Medicago sativa L.)
2013.-2014.; Ministry of Science, Education and Sport; Sanja Sikora; ssikora@agr.hr

Technological potential of indigenous lactic acid bacteria isolated from artisan Croatian cheese
2013. - 2014.; University of Zagreb; Andrea Skelin

Tracking of pathogenic and beneficial microflora from fresh wild boar meat and fermented wild boar meat sausages produced by traditional procedures in Croatia and Austria
2014. - 2015.; Natječaj za razmjenu sudionika u projektima između Republike Hrvatske i Austrije; Mirna Mrkonjić Fuka; mfuka@agr.hr

Conservation of microbial diversity associated with the production of Croatian traditional game meat sausages: biotechnological and safety characterization (miCROgame)
2014. - 2017.; Croatian science foundation; Mirna Mrkonjić Fuka; mfuka@agr.hr

Phenotypic and genotypic characterization of bacterial cultures isolated from different agroecosystems
2014.; Ministry of Science, Education and Sport; University of Zagreb; Mihaela Blažinkov; mihaela@agr.hr

Application of microbial cultures in the production of traditional sausages from wild boar
2014.; Ministry of Agriculture; Mirna Mrkonjić Fuka; mfuka@agr.hr

Scientific and professional projects
Areas of research
During its many years of existence the Department of Plant Nutrition has developed into a well-established scientific, educational and professional unit within the Faculty of Agriculture. Scientific research and teaching activities of the Department’s staff are focused on the optimum plant nutrition in the physiological, nutritional, toxicological as well as the ecological and landscape aspect. In research conducted by the Department considerable attention is devoted to the fertilization of different agricultural crops in conventional and organic production, as well as the influence of fertilization with organic and mineral fertilizers on the environment. Special attention is paid to the treatment of physiological disorders caused by abiotic stress factors, especially lack of microelements. The findings of these research projects are published in scientific and scholarly publications and are applicable both in teaching and in professional practice.

Research infrastructure
Laboratory of the Department of Plant Nutrition is an analytical laboratory for the analysis of soil, plant materials, substrates, organic and mineral fertilizers, soil improvers, waste materials and nutritive solutions. The analyses for scientific and educational activities as well as research projects in the field of agriculture and environmental protection are carried out according to the official analytical methods (ISO-standards, AOAC, European directives, etc.). Laboratory employees are actively involved in the activities of technical committees (TC-134 Fertilizers and soil conditioners, and TC-190 Soil quality) at the State Office for Standardization and Metrology. Laboratory operates in compliance with HRN ISO 17025:2009 standard 'Laboratory Organization' and it is currently in the process of accreditation according to this standard. In analytical procedures modern techniques and equipment are used (atomic absorption spectrometer (AAS - flame technique, AAS flameless (graphite) technique), UV/VIS spectrophotometers, flame photometer, conductometer, pH meters, microwave oven, centrifuges, Kjeltec system (degradation and distillation of samples), refractometers, growth chambers for achieving accurately controlled conditions, scanner which determines the root surface area, net photosynthesis meter, chlorophyll meter, press chamber, etc.).

The Department of Plant Nutrition has an authorized laboratory for testing the quality of fertilizers and soil improvers (authorized by the Ministry of Agriculture, Fisheries and Rural Development) and analysis of waste materials (authorized by the Ministry of Environmental Protection, Physical Planning and Construction, in accordance with the Waste Act, the Ordinance on management of waste sludge and the Ordinance on the protection of agricultural land against pollution caused by harmful substances.

In order to control the quality of the obtained analytical data, the laboratory is involved in national and international intercalibration study for soil, plant material and organic and mineral fertilizers.

Research and production services
Laboratory analysis
The analysis of soil, plant material, substrates, organic and mineral fertilizers, organic and mineral soil improvers, sludge and waste materials and nutrient solution (determining the amount of total and physiologically active macro and microelements, organic matter, cations and anions (salt %), determining pH, heavy metals and other harmful substances).

Certified analysis of fertilizers and soil improvers in accordance with the authorization of the corresponding ministry. Reviews for their registration in the Register on the basis of
the results (comparison - confirmation of nutrients declaration in fertilizers).

After the analysis of the organic material the Department will issue an opinion for the application in agricultural production under the provisions of legislation (Ordinance on the protection of agricultural land against pollution caused by harmful substances).

Conducting studies and surveys for the soil fertility control, assessment of soil suitability for cultivation of different agricultural crops, establishing the degree of soil, water and plant materials contamination by nitrates and heavy metals, recommendations for fertilizing agricultural crops aimed at safe and sustainable agricultural production.

Controlled grapevine nutrition, vineyard sites and wine quality
2006 - 2011; Ministry of Science, Education and Sport
Mirjana Herak Ćustić; mcustic@agr.hr

Guidelines for controlled grapevine nutrition and wine production
2006 - 2011; Ministry of Science, Education and Sport
Mirjana Herak Ćustić; mcustic@agr.hr

Soil reaction influence on heavy metals dynamics in the soil-water-grapevine system
2006 - 2011; Ministry of Science, Education and Sport
Lepomir Čoga; lcoga@agr.hr

Role of organic fertilizers in grapevine nutrition
2006 - 2011; Ministry of Science, Education and Sport
Tomislav Ćosić; tcosic@agr.hr

Integrated potato production on acidic soils of Croatia
2006 - 2011; Ministry of Science, Education and Sport
Milan Poljak; mpoljak@agr.hr

Agricultural pollution control project (APCP): fertilizers response experimental plots in Varaždin county
2010 - 2011; World Bank; Milan Poljak; mpoljak@agr.hr

Application of new methods of nitrogen management in the potato cultivation on the family farm
2009 - 2011; Ministry of Agriculture, Fisheries and Rural Development; Milan Poljak; mpoljak@agr.hr

Integrated production and protection of geographical origin of potato variety Poluranka
2008 - 2010; Federal Ministry of Agriculture, Bosnia and Herzegovina; Milan Poljak; mpoljak@agr.hr

Development of trade mark „Lički krumpir“ as brand name with geographical origin
2005 - 2008; Ministry of Agriculture, Fisheries and Rural Development; Milan Poljak; mpoljak@agr.hr

Prototype equipment development for the fertilizer production made of laying hens excrement
2005 - 2006; Ministry of Science, Education and Sport
Tomislav Ćosić; tcosic@agr.hr

Scientific and professional projects
DEPARTMENT OF

Soil Amelioration
Areas of research
Scientific Research of the Department of soil amelioration is focused on the areas of sustainable land and water management (agriculture and resource management), protecting the environment (terrestrial and aquatic ecosystems monitoring, water use and protection) and natural risks management (drainage, protection from excess water, siltation). The Department develops multidisciplinary approach to research, bringing together a team of scientists engaged in hydro-technical amelioration, drainage and irrigation, soil and water protection and monitoring, the impact of agriculture on the environment. Therefore, it has developed scientific cooperation with numerous institutions in the country and the world and professional projects for the economy and national and regional institutions and agencies is an important part of our activities.

Department’s staff has published a number of scientific and professional papers in these areas and are currently project managers leading a number of scientific and applied projects.

Research infrastructure
Analytical laboratory of the Department of Soil Amelioration is engaged in physical and chemical soil analysis and chemical analysis of water and plant material for the purpose of teaching, scientific research and professional activities in the field of agriculture and environmental protection. Modernly equipped laboratory uses sophisticated instrumental techniques in its activities: microwave sample preparation technique, UV/Vis spectrophotometry, single or multielement flame atomic absorption analysis / emission spectrometry (AAS / AES) and inductively coupled plasma optical emission spectrometry (ICP-OES), examining solution ionic composition by using segmented flow method (SFA) and more. In order to achieve quality control of analytical data, the laboratory uses calibrated devices, applies standard procedures and validated methods and has been involved in the international intercalibration study for soil, sediments and plant material.

The Department has all necessary appliances, instruments and equipment for field research.
Research and production services

The Department has fully adapted its scientific and professional activities to the needs of agricultural production improvement through managing production areas, elaborating and proposing appropriate measures of agricultural amelioration, especially drainage systems. In recent years, the Department has focused its scientific, professional (and service) activities mainly on solving problems in the field of irrigation and environmental protection. The Department’s employees were the authors of the largest part of Croatian Government project: “National project of irrigation and management of agricultural land and waters in the Republic of Croatia”. Parallel to irrigation, environmental problems in agriculture are being solved, either as part of research projects or via various legal and physical entities.

Monitoring the reduction of soil carbon and nutrient losses in Croatia: quality assessment /quality control of soil sampling procedures and soil analysis-CROCAN. Co-operation programme between Flanders and Central and Eastern Europe

2010 - 2013; Flanders Government; Davor Romić; dromic@agr.hr

Water regime and water quality monitoring of agricultural soils in the area of an Ameliorative canal for irrigation of Bić-bosutsko field

2009 - 2013; Hrvatske vode; Dragutin Petošić; dpetosic@agr.hr

Installation of the field lysimeters and applied research.
Agriculture Pollution Control Project (APCP) within Croatia Agricultural Acquis Cohesion Project (CAACP)

2011 - 2012; GEF Trust Fund Grant; Davor Romić; dromic@agr.hr

Soil salinization: identifying, processes and effects on crops

2007 - 2011; Ministry of Science, Education and Sport
Davor Romić; dromic@agr.hr

Spatial variability of potentially toxic metals in agricultural soils of Croatia

2007 - 2011; Ministry of Science, Education and Sport
Marija Romić; mromic@agr.hr

Effects of herbicides and fertilizers on water and soil quality in hydroameliorated areas

2007 - 2011; Ministry of Science, Education and Sport
Ivan Šimunić; simunic@agr.hr

Level of salinity and sustainable use of soil in the Lower Neretva region

2009 - 2010; GEF Neretva and Trebišnjica Menagement Project
Davor Romić; dromic@agr.hr

Monitoring of soil and water salinization in the Neretva River Valley

2009 - 2010; Hrvatske vode; Davor Romić; dromic@agr.hr

Effects of agriculture on water pollution in the water protected area of a pumping site

2007 - 2009; Ministry of Science, Education and Sport
Dragutin Petošić; dpetosic@agr.hr

Scientific and professional projects
Areas of research
Activities of the Department include educational and scientific research and cooperation with business sector in the area of crop production, permanent soil and agro-ecosystem monitoring, soil management and its impact on climate change. Department research includes organic and/or conventional agriculture, agro-technical land reclamation interventions such as improving soil fertility, environmentally friendly processing technologies, methods of precision agriculture in soil fertility research, remote research in plant cultivation, proper fertilization, soil enrichment with various amendments, liming acid soils, soil erosion and general improvement of all physical, chemical and biological soil properties. Professional activities of the Department’s researchers include preparing studies which are aimed at protecting the soil against permanent conversion from agricultural land to urban areas, roads, water reservoirs and other facilities.

Research infrastructure
Field trials
- monitoring soil quality in the area of CPS Molve, the investigations are being conducted continuously since 1991,
- Blagorodovac, Poljodar, d.d. Daruvar - 1 ha, the investigations are being conducted continuously since 1994,
- Potok, Moslavka d.d. Popovača – 5 ha, the investigations are being conducted continuously since 1995,
- Veliki Žitnik, Starčević family farm, Veliki Žitnik, Gospić – 2.5 ha, the investigations are being conducted continuously since 1997,
- Lepoglava penitentiary, Holcim d.o.o. - 0.5 ha, the investigations are being conducted continuously since 2008.

Laboratory
Analytical laboratory uses highly sophisticated analytical equipment (spectrophotometer, flame photometer, ion chromatograph, CHNS analyzer, spectroradiometer etc.) and numerous laboratory and field equipment (scale, centrifuge, shaker, ultrasonic bath, penetrometer, ultra-pure water device etc.). Physical and chemical analyses of soil, plant and water in the field of agroecology are performed in the laboratory.
Annually, the laboratory participates in various interlaboratory quality control programmes in the field of analysis: soil, water and plant material, in order to confirm its technical competence and validity of its results. In the laboratory students of BS and MS studies perform their professional practice on daily basis, and prepare professional projects and final and graduation theses, while postgraduate students work on scientific research related to their doctorates and scientific and professional projects.

Research and production services
The Department conducts research of soil pollution and degradation by a variety of inorganic and organic substances. Also, by contemporary and internationally recognized methods the Department’s staff is able to determine the type and degree of soil contamination and pollution consequences on biological and landscape diversity.
The Department carries out special studies in which it determines ways of soil rehabilitation and re-cultivation, proposes treatments and performs quantification of various organic and inorganic substances usage for soil remediation. In addition, the Department’s experts carry out efficacy evaluation of the completed rehabilitation projects.
The Department conducts soil sampling based on precision agriculture methods with the determination of the exact location of each sampling point by using GPS, soil analysis, mapping spatial distribution of soil fertility parameters, recommendation on fertilizing procedures and calcification in the form of professional studies.

Risk Identification and Land-use planning for Disaster Mitigation of Landslides and Floods in Croatia
2009 - 2014; Government of Japan and Government of the Republic of Croatia; Ivica Kisić; ikisic@agr.hr

Calcification with dolomite
2007 - 2011; Holcim; Milan Mesić, mmesic@agr.hr

Influence of different land management on climate change
2001-2014; Environmental Protection and Energy Efficiency Fund; Željka Zgorelec; zzgorelec@agr.hr

Soil and Plant Monitoring in Environment of Central Gas Station Molve, Podravina
1991 - 2021; Institute of Public Health of the County of Koprivnica-Križevci; Ferdo Bašić

Impact of tillage and fertilization on probable climate threats in Hungary and Croatia, soil vulnerability and protection
2009 - 2011; Hungarian government and Government of the Republic of Croatia; Milan Mesić, mmesic@agr.hr

Agrotechnical measures aimed at improving quality of organic products
2007 - 2011; Ministry of Science, Education and Sport
Ivica Kisić; ikisic@agr.hr

Agrotechnical Measures Aimed at Improving Quality of Organic Products
2007 - 2011; Ministry of Agriculture, Fisheries and Rural Development; Ivica Kisić; ikisic@agr.hr

Development of the Croatian Soil Monitoring Programme With a Pilot Project
2006 - 2009; LIFE III: LIFE05 TCY/CRO/000105
Ivica Kisić; ikisic@agr.hr

Reintegration of Coal Ash Disposal Sites and Mitigation of Pollution in the West Balkan Area
2005 - 2008; FP6, EU; Ferdo Bašić

Corrections of Soil Acidity with Different Liming Materials, on Agriculture Acid Soils in Croatia
2003 - 2006; Ministry of Agriculture, Fisheries and Rural Development; Milan Mesić; mmesic@agr.hr

Scientific and professional projects
DEPARTMENT OF
Plant Breeding, Genetics and Biometrics
Areas of research
The Department focuses on the following areas of research:
- application of biotechnology laboratory methods, especially DNA markers, in the study of genetic variability of various cultivated plants and improving methods of plant breeding and development of in vitro plant regeneration methods and obtaining Somaclonal variation of certain properties in tissue culture,
- practical application of theoretical knowledge of plant breeding, genetics and biometrics in the creation of new genotypes of wheat, soybeans, tobacco; Department's staff recognize more than 40 varieties of different crops,
- collection, preservation and application of plant genetic resources in plant breeding programs

Research infrastructure
Maksimir
The Department uses 4.5 hectares of Maksimir experiment station for the research in the field of genetics of wheat, corn, soybeans and small grain forage legumes and grasses as well as implementation of plant breeding programs for winter wheat, soybeans and forage crops. On the experiment station a collection of inbred maize lines and populations is maintained, as well as forage crops that are included in the National Plan of Action for the Conservation and Sustainable Utilization of Plant Genetic Resources for Food and Agriculture in the Republic of Croatia. Experiment station is used to perform exercises in the field of genetics, plant breeding and biometrics in different studies. Every year an increasing number of undergraduate and graduate students conduct their professional practice at the experiment station and the results of field experiments are used for their final theses and doctoral dissertations.

Biotechnology Laboratory
Biotechnology laboratory covers the area of 180 m² and is located on the second floor in the sixth pavilion of the Faculty of Agriculture. The laboratory is equipped with modern laboratory instrumentation and equipment for plant tissue culture and molecular analysis using different types of genetic marker systems. In addition to the implementation of national and international research projects, laboratory is also used for educational purposes. In this laboratory a number of undergraduate, graduate and postgraduate students of the Faculty, under the guidance of professional staff, acquire the basic and the latest knowledge and experience in the application of modern biotechnological techniques. Research results arising from the biotechnology laboratory, under the mentorship of scientists and teachers of the Department, are used by students in their final and graduate theses, as well as their doctoral dissertations.

Biometrics Laboratory
Multipurpose biometrics laboratory is located on the third floor in the sixth pavilion of the Faculty of Agriculture. It is equipped with four personal computers and adequate number of working stations. The main purpose of the Laboratory is conducting statistical analyses for the needs of graduate theses, dissertations and scientific research. It is also used as a classroom for smaller groups of students at undergraduate and graduate studies of the Faculty, and as a workspace for visiting scientists and students, when necessary.
Preservation and establishment of true-to-type and virus free material of endangered grapevine cultivars in Croatia and Montenegro
2010. – 2012.; SEE-ERA.net program; Ivan Pejić; ipejic@agr.hr

Development of wheat (Triticum aestivum L.) germplasm resistant to drought conditions
2007. – 2013.; Ministry of Science, Education and Sport; Marijana Barić; mbaric@agr.hr

Genetic variability of red clover and tolerance to abiotic stress
2007. – 2013.; Ministry of Science, Education and Sport; Snježana Bolarić; sbolaric@agr.hr

Improving research efficiency by using advanced biometrical models
2007. – 2013.; Ministry of Science, Education and Sport; Jerko Gunjača; jgunjaca@agr.hr

Micropropagation methods and introduction into horticulture of endemic irises
2007. – 2013.; Ministry of Science, Education and Sport; Snježana Kereša; skeresa@agr.hr

Recurrent selection of maize synthetic for N use efficiency and ASR resistance
2007. – 2013.; Ministry of Science, Education and Sport; Marija Pecina; mpecina@agr.hr

Genetic fingerprinting and genetic variability of grape and fruit cultivars
2007. – 2013.; Ministry of Science, Education and Sport; Ivan Pejić; ipejic@agr.hr

Nitrogen use efficiency and bread making quality in wheat
2007. – 2013.; Ministry of Science, Education and Sport; Hrvoje Šarčević; hsarcevic@agr.hr

Assessment of genepools and diversity of local populations of red clover in relation to commercial varieties
2012. – 2015.; Croatian science foundation; Snježana Bolarić; sbolaric@agr.hr

Sustainable production of high-quality cherries for the European market (COST Action FA1104)
2011.-2016.; EC; Aleš Vokurka; avokurka@agr.hr
Areas of research

The Department’s staff carries out teaching and research activities and cooperation with the business sector in the field crop production.

In their scientific activities, the Department’s staff conducts research in the field of agro-technology, plant physiology, seed and mercantile production of arable crops, grassland management, postharvest technology and preservation of field and forage crops. They also perform the selection and introduction of field crops and forage crops.

In the application of scientific and technical knowledge they cooperate with state and local governments and agricultural producers in the development of production technology for field crops, forage crops and energy crops.

Crop management and physiological research are conducted at the Maksimir experimental station on experimental fields, as well as plant breeding of soybean, forage pea, vetch and maize.

Research infrastructure

Experimental station Maksimir

The Department uses 17 ha of the experimental station in Maksimir, located around the Faculty of Agriculture. For most of the experimental area (7.5 ha) field experiments with maize, wheat and other small grain cereals and soybeans are conducted interchangeably. On a smaller part of the experimental station (1.5 ha) experiments are conducted with sugar beet, oilseed rape, fiber and oil flax, grain amaranth, spelt, alfalfa, field pea, vetch, sorghum and so-called energy species Miscanthus and Giant cane. Alfalfa is planted on approximately 8 ha of the experimental station, and is used for storing haylage, as well as for the demonstration of contemporary agro-technical measures in storing forage. On the experimental station teaching in several modules takes place at undergraduate and graduate studies on the subject of field crops and forage crops. In addition, the experimental station is used for student practice and conducting scientific research and plant breeding activities in which students choose their topics for the final thesis and postgraduates prepare doctoral dissertations. For the aforementioned research, the experimental station is equipped with necessary machinery (tractor John Deere 84 hp and Fendt 40 hp, sowing machine for corn and soybean, sowing machine for stubble cereal, maize harvester, stubble cereal “Wintersteiger” harvester and mounted tractor implements such as: plows, disc harrow, rotary harrow, combinator, chipper, cultivator, etc.). In addition, the researchers use the equipment known under common name ‘small machinery’ (cultivator, sprayer, lawn mower, etc.). The laboratory premises have the equipment for cleaning, drying and shredding plant material (separator, dryer, grain counter, mill, scales, etc.).

Experimental station on Mt. Medvednica – Center for Grassess

The Department has 55 ha of agricultural land at Mt. Medvednica, about 30 kilometers away from the Faculty of Agriculture, which is used for teaching and research of grassland. The experimental station has the facilities for researchers, lecture hall (50 seats), laboratory for the analysis of voluminous forages and facilities which accommodate students and residents. The experimental station is equipped with modern audio visual equipment for teaching activities. In this Center, apart from teaching and practical work for students of Faculty of Agriculture, the education of students of the Faculty of Veterinary Medicine also takes place, as well as high school students, Agricultural Advisory Service employees and agricultural producers. For the listed research the experimental station has a laboratory equipped for the analysis of voluminous forage (classical analysis, NIR spectroscopy, “in vivo” determination of forage digestibility and degradability, etc.) using standard analytical equipment (samples digester, oven, nitrogen, fiber and fat content in plant material analyzer, lyophilizator, NIR spectroscopy, “in vivo” degradation dynamics of forage, etc.). The laboratory participates in interlaboratory quality control study. In addition, the experiment station has experimental animals (cows, sheep) and the facilities in which to conduct biological experiments. A modern stable for cattle is located on the premises of the experimental station of the Center for Grassland, as well as the parent herd of Charolais breeding cattle, which also provides high-quality breeding animals for the production of calves for fattening in the Republic of Croatia. Experimental station fully equipped with the mechanization for sowing, harvesting and preserving forage..
Research and production services

Designing and improving technological processes in crop production and grassland management

The Department is committed to research activities that explore technological processes in the production of field crops, industrial crops, forage crops, grasses and energy crops, and it offers its knowledge to the market as part of planning the production of raw materials for processing industry and forage for animal breeding.

The Department's staff conducts:

- testing experimental hybrids and field crop varieties in agro-ecological conditions of the Republic of Croatia,
- biological studies of organic and mineral fertilizers on field crops by conducting field experiments,
- consultation in the development of technological processes and production monitoring in mercantile and seed production of field crops,
- education for target groups of manufacturers in the field of producing field crops, industrial crops, forage crops, grasses and energy crops.

Production of soybean varieties seed and winter field pea seed

The Department produces pre-basic seed of soybean varieties ‘Zagrepčanka’, ‘Sanja’ and ‘Ana’ for the production of basic seed (BS) and the lower categories, as well as winter field pea ‘Maksimirski rani’ and ‘Ozimi šampion’ for the production of basic seed (BS) and the lower categories.

Breeding livestock (cattle) Charolais breeds

In the Center for Grassland at Mt. Medvednica the Department breeds cattle and sheep for the research purposes and some representative animals are placed on the market.
Laboratory and “in vivo” determination of the nutritional value of voluminous forage
The Department conducts research of the nutritional value of voluminous forage (green, silage, dried). For this purpose, NIRS technology and experimental animals are used.

Application of GIS in the analysis and planning of agricultural production
The interpretation and analysis of satellite and aerial photographs of agricultural land (RS - remote sensing). The development of solutions and their implementation in agricultural production on grasslands aimed at nature protection.

Production possibilities of alternative cereals in the Republic of Croatia
2008 - 2012; Ministry of Science, Education and Sport
Ana Pospišil;apospisil@agr.hr

New technologies in pea and vetch production for the needs of animal production
2008 - 2012; Ministry of Science, Education and Sport
Zvonimir Štafa / Darko Uher; duher@agr.hr

Feeding potential of forage crops for wildlife
2007 - 2012; Ministry of Science, Education and Sport
Dubravko Maćešić; dmacesic@agr.hr

Evaluation and zoninig of sugar beet cultivars in the Republic of Croatia
2007 - 2012; Ministry of Science, Education and Sport
Milan Pospišil; mpospisil@agr.hr

Sustainable field crops production systems
2007 - 2012; Ministry of Science, Education and Sport
Boris Varga; varga@agr.hr

Evaluation of sustainable forage production systems in hilly-mountain regions
2007 - 2012; Ministry of Science, Education and Sport
Josip Leto; jleto@agr.hr

Threshold for maize replanting
2007 - 2012; Ministry of Science, Education and Sport
Zlatko Svečnjak; svecnjak@agr.hr

Ecological acceptable organic fertilizers management in forage production
2007 - 2012; Ministry of Science, Education and Sport
Mladen Knežević / Marina Vranić; mpavlak@agr.hr

The effect of nitrogen on agronomic traits and quality of fiber flax cultivars
2008 - 2010; Ministry of Science, Education and Sport
Jasminka Butorac; jbutorac@agr.hr

Application of new technologies of forage production in order to increase the competitiveness of family dairy farms
2012. - 2013.; Ministarstry of Agriculture, Fisheries and Rural Development; Krešimir Bošnjak; kbosnjak@agr.hr

Scientific and professional projects
Areas of research
Scientific activities of the Department of Seed Science and Technology include the development and utilization of molecular methods for cultivar identification, analysis of biodiversity and genetic structure of wild populations, plant phylogeny as well as in statistical genomics (gene mapping, analysis of quantitative trait loci, association mapping) and plant genetic resources conservation.

Particular attention has been given to collecting, conservation and documentation of medicinal and aromatic plant genetic resources including the studies of morphological, biochemical and genetic diversity and the development of specific agricultural techniques in order to promote the agricultural production of medicinal and aromatic crops in Croatia.

Research infrastructure
Experiment station Maksimir, Department of Seed Science and Technology
The experiment station Maksimir covers the area of 5 ha used for field trials, regeneration of accessions and seed production. Experiment station includes the Medicinal and Aromatic Plants Garden.

Collection of Medicinal and Aromatic Plants
Storage facilities for maintenance of the Collection of Medicinal and Aromatic Plants included in the National Bank of Plant Genes consist of a cold chamber of 75 m³ and a working space of 20 m² for the medium-term seed storage at 4 °C.

Research and production services
Department of Seed Science and Technology provides services concerning molecular analysis of plant genetic resources and biometrical analysis of molecular data and professional advice on seed production and cultivation of medicinal and aromatic plants.
Genetic basis of bioactive nutrient content in Croatian common bean landraces
2014. – 2017.; Croatian Science Foundation; Klaudija Carović-Stanko; kcarovic@agr.hr

Exploiting Bean Genetics for food Quality and Attractiveness Innovation (BEGEQA)
2013. – 2015.; Fundação para a Ciência e a Tecnologia, Portugal; Zlatko Šatović; zsatovic@agr.hr

Epigenetic vs. genetic diversity in natural plant populations: A case study of Croatian endemic Salvia species
2012. – 2015.; Croatian Science Foundation; Zlatko Šatović; zsatovic@agr.hr

Exploiting antioxidants, flavours and aromas diversity on “broa” bread maize breeding
2010. – 2013.; Fundação para a Ciência e a Tecnologia, Portugal; Zlatko Šatović; zsatovic@agr.hr

Conservation and utilization of the diversity of sage species; (Salvia ssp.) - Traditional food preservatives and spices (CONSAGE)
2010. – 2012.; SEE-ERA.NET PLUS; Zlatko Šatović; zsatovic@agr.hr

Conservation and sustainable exploitation of indigenous medicinal and aromatic plants traditionally used in the SEE, WB countries: A model approach for Sideritis spp. (Mountain tea) (MOUNTEA-CONSE)
2010. – 2012.; SEE-ERA.NET PLUS; Zlatko Šatović; zsatovic@agr.hr

 Croatian Bank of Plant Genes (CBPG)
2008. – 2013.; Ministry of Science, Education and Sport; Ivan Kolak; ikolak@agr.hr

Biodiversity of medicinal and aromatic plants
2007. – 2013.; Ministry of Science, Education and Sport; Zlatko Šatović; zsatovic@agr.hr

Scientific and professional projects
Areas of research
Scientific and research activity of the Department of vegetable crops is based on the introduction of new species, sorts and technologies of vegetable cultivation and protected autochthonic species of medicinal plants into agricultural production. Research in protected areas is focused on the hydroponic cultivation technologies of fruiting and leafy vegetables, possibilities of microclimate control and on the modern technologies of seedling cultivation.

A specific field of research involves cultivation of vegetables as a functional food and the relation of plant nutrition and nutritive values of vegetables. Part of the research activities concerns research of ecological and anthropological factors in the production of vegetables, medicinal and aromatic plants, integrated and organic-bio production of vegetables as well as selection of cabbage and zrnaš bean. Special attention is paid to the research of lesser-known tropical species of vegetables, promising to grow in Croatia.

Research infrastructure
Experiment station consists of open space (plow lands) and unheated and heated greenhouses (high tunnels, plastic houses) for growing plants on soil and, in soilless culture (equipment for cultivation on inert substrates and for floating hydropon).

Research and production services
For vegetables, spices, aromatic and medicinal plants:
- testing varieties and introducing new varieties of crops in production,
- introduction of new technologies and elements of technology in production,
- preparation of studies, investment programs, investigations and reviews,
- production of seeds in basic seed category and seedling production.
Revitalization of garlic production in Zadar County
2012. – 2015.; Zadar County; Sanja Fabek; sfabek@agr.hr

Fruit vegetable cultivar response to nutrient solution composition
2007 - 2011; Ministry of Science, Education and Sport
Josip Borošić; jborosic@agr.hr

Introduction of the indigenous medicinal plant Arnica montana into agricultural production
2008 - 2010; Ministry of Agriculture, Fisheries and Rural Development; Ivanka Žutić, izutic@agr.hr

Evaluation of sweet potato and yam technologies
2007 - 2009; Ministry of Science, Education and Sport
Bruno Novak, bnovak@agr.hr

Broccoli as a functional food
2007 - 2009; Ministry of Science, Education and Sport
Nina Toth; ntoth@agr.hr

Research work on Virovitica pepper protection by designation of geographical origin
2006 - 2008; Ministry of Agriculture, Forestry and Water Management; Josip Borošić; jborosic@agr.hr

Growing of leafy vegetables in floating system
2006 - 2008; City of Zagreb, City Office for Agriculture and Forestry; Nina Toth, ntoth@agr.hr

Soilless culture of tomato
2002 - 2006; Ministry of Science, Education and Sport
Josip Borošić; jborosic@agr.hr

Organic mulches in integrated lettuce production
2004 - 2006; Ministry of Agriculture, Forestry and Water Management; Nina Toth; ntoth@agr.hr

Modern production of medicinal plants and vegetables in County of Zagreb
2004 - 2006; County of Zagreb; Ivanka Žutić; izutic@agr.hr

Scientific and professional projects
Areas of research

The Department of Pomology has so far participated in scientific and professional projects of raising large plantations and orchards on agricultural complexes, which led to the organized production of fruit that has since been exported in considerable quantities. Significant role has been taken in the introduction of new fruit cultivars and rootstocks that previously have not been used in plantations. The Department’s staff has achieved great accomplishments in the scientific research which explore the impact of pruning, form, density, variety and substrate on the growth and yield as well as the chemical composition and fruit quality. Also, significant attention has been given to understanding the impact of environmental factors on the growth and development of fruit trees.

In addition to scientific research in the field of fruit growing, the Department is continually conducting research of the impact of breeding factors on the storage time and quality of food preservation. In this aspect, special emphasis is placed on the development of environmentally friendly treatments that maintain the quality of fruit after the harvest, especially essential oils and heat treatments.

Research infrastructure

**Experimental station Jazbina**

Fruit Production experiment station has been founded in 1939, and is nowadays operating as a part of the Department where research projects and the experimental part of graduation, master’s and doctoral thesis are conducted. All students whose curriculum includes working in the orchards carry out part of their exercises and practical work on the experiment station. The orchard area of 2.5 ha is under fruit tree crops as varieties collection of sweet cherries (over 20), plums, black elderberry, dog rose, service tree and rowan where a selection process is ongoing.

**Experimental station Maksimir**

Next to the Department’s building there is small experiment station which produces seedlings for the purposes of scientific research in the Department, and conducts professional practice and teaching. Two experiments with cherries and plums are set at this station.
Experimental station Šašinovečki lug
This experiment station has a collection of 90 varieties of apples that will soon be considerably expanded. Part of this collection (38 varieties) is involved in National gene bank.

Laboratory for physical and chemical analysis of fruits
Basic analysis of physical and chemical composition, analysis of fruit quality and potential storability; heat treatments for plant material

Research and production services
The Department has the capacity of performing the following services:
- studies on raising orchards and building cold storage for fruits,
- forecasts of the optimal harvest time,
- analysis of fruit quality and potential storability,
- basic analysis of physical and chemical composition,
- storage service in NA (normal atmosphere) cold storage

Internet of Things (IoT) based intelligent optimization of control technologies for food cold chain logistics (IPOC)
2015. – 2017.; Ministry of Science, Education and Sport; Tomislav Jemrić; tjemric@agr.hr

Biodegradable packaging materials applied in fruit production
2015.; University of Zagreb; Tomislav Jemrić; tjemric@agr.hr

Morphological and digital characterization of fruit species seeds
2015.; University of Zagreb; Martina Skendrović Babojelić; mskendrovic@agr.hr

LIFE13 ENV/HR/000580 „Low pesticide IPM in sustainable and safe fruit production”
2014. – 2017.; Tomislav Jemrić; tjemric@agr.hr

Plant Gene Bank – subgroup Continental fruit
from 2014.; Ministry of Agriculture; Tomislav Jemrić; tjemric@agr.hr

Plant Gene Bank – subgroup Mediterranean fruit
od 2014.; Ministry of Agriculture; Đani Benčić; bencic@agr.hr

Genetic identification and collecting Croatian indigenous olives genotypes
2013. – 2015.; ADRIS-group; Đani Benčić; bencic@agr.hr

Modern technology of growing sweet cherries
2012. – 2014.; Ministry of Agriculture; Zlatko Čmelik; zcmelik@agr.hr

Apple wine as a factor for increasing the competitiveness of apple production on family farms
2012. – 2014.; Ministry of Agriculture; Tomislav Jemrić; tjemric@agr.hr

The secret of old apple varieties
2012. – 2014.; Adris Foundations; Kristina Batelja Lodeta; kbatelja@agr.hr

Scientific and professional projects
Areas of research

Scientific research at the Department of viticulture and enology is directed towards the problems of physiology, nutrition and ecology of grapevine, the evaluation of different production systems (conventional, sustainable, ecological) and technological interventions in the vineyard (soil maintenance, fertilization, planting systems, ampelotechnical procedures, etc.) and their impact on yield and quality of grapes and wine. Special attention is given to indigenous grapevine cultivars, that is their inventorization, ampelographic and genetic identification, description and collecting as well as determining the economic and technological characteristics of certain indigenous varieties in order to revitalize their breeding. Furthermore, the scientific work covers the issues of seedling production and a lot of attention is paid to determining the sanitary status (contamination by economically important viruses and phytoplasmas) of grapevine cultivars in Croatia and to developing new methods for improving clone selection and virus grapevine recovery (plant tissue culture and cryotherapy). Enological research include the use of new technologies in the production of white and red wines with special emphasis on the impact of selected yeasts, the application of malolactic fermentation, sur lie technology and the technology of cold maceration on chemical composition and sensory properties of wine.

Endochemical research places the emphasis on determining the polyphenolic compounds in grapes, must and wine, and in this regard defining the phenolic maturity and optimum harvest time. Special attention is paid to the amino acid profile of indigenous varieties, determination of individual organic acids and fermentation aromas and defining precursors of the atypical aging aroma in wine.

Research infrastructure

Viticulture and Enology Experiment Station Jazbina

The area of more than 9 hectares of vineyards is where scientific research, experimental work for graduation, master’s and doctoral theses is carried out and all students whose curriculum includes viticulture and enology related content carry out their exercises and mandatory practical work in ‘Jazbina’.

National Grapevine Cultivars Collection is also situated on the experiment station, and it currently has 120 accessions. It was established in order to preserve all remaining grapevine cultivars on the Croatian territory, particularly those that were the most endangered and thus were saved from extinction.

The collectors plantation of the varieties typical for inland Croatia is intended primarily for the education of students (wine and table grape varieties, interspecific hybrids), as well as the rootstock mother vine collection where students can get familiar with a number of economically important grapevine rootstock.

The production vineyard is dominated by white grape cultivars of Chardonnay, Traminac and Graševina, and on a smaller area the following red grape cultivars are planted: Merlot, Cabernet Sauvignon, Pinot Noir and others. From these cultivars, the experiment station produces quality and top-quality wines Chardonnay, ‘Zlatarovo Zlato’, ‘Dora Krupiće’, ‘Kontesa Nera’, ‘Crni Vitez’ and others.

The experiment station also has farm buildings with a wine cellar and the area and equipment for primary fermentation, maturation and bottling. In a separate facility office premises and laboratory of the Department of Viticulture and Enology are located, as well as the experimental cellar.

In the experimental cellar there is a modern system for micro and mini vinification with automatic temperature control and the inert gas, which enables controlled and uniform sampling conditions and is therefore suitable for enological evaluation of cultivars and clones, as well as conducting various technological experiments.

Ampelometric laboratory is equipped for ampelographic description and determination of cultivars, and conducting ampelometric research.
Laboratory for grapes, must and wine, apart from the equipment necessary for conducting the basic analysis of must and wine, also has a liquid chromatograph (HPLC) with fluorescence detector and DAD, and gas chromatograph with mass detector (GC-MS). Among individual groups of compounds the most attention is devoted to the analysis of polyphenols and individual anthocyanins, flavan-3-ol, p-hydroxycinnamic acid derivatives, flavonols and trans-resveratrol. In addition, the analysis of indole-3-acetic acid and amino acids in must and wine is carried out. The laboratory also has UV/VIS spectrophotometer for determining total phenols, total anthocyanins, total flavonols, free and bound terpenes extracted from grapes, must and wine, and wine color. GC-MS is used for determining 2-aminoacetophenone.

Laboratory for tissue culture is equipped for in vitro cultivation of grape vine for rapid propagation, healing from viruses and various scientific researches that are necessary to provide a controlled environment conditions. In the laboratory, research is conducted related to the application of various cryotechniques suitable for long term storage of grapevine genotypes and elimination of viruses from plant tissue.
**Research and production services**

The Department offers the following services:

- improving the production of grapes and wines through cooperation with economic entities on technical and technological solutions improvement in grapes and wine production,
- designing investment and detailed projects for planting vineyards, mother plantations, etc,
- controlling the production of grapevine planting material in cooperation with the Department of Seed Science and Technology
- implementation of clonal selection process for grapevine varieties,
- identification and revitalization of rare indigenous grape varieties
- physical and chemical analysis of must and wine for business sector and private producers, grape ripening monitoring and defining the optimal harvest time,
- courses and educational wine tastings as part of lifelong adult education in the field of viticulture and enology for manufacturers and other interested parties,
- assessment courses for knowledge and wine tasting skills aimed at certification, based on which persons are appointed as members of the Commission for sensory evaluation,
- production and sales of wine produced in the viticulture and enology experiment station 'Jazbina'

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**Development of sintetic chimeras of grapevine (Vitis vinifera L.)**

- **2015. - 2018.**; Croatian science foundation; Darko Preiner; dpreiner@agr.hr

**Micorizal biotechnology in viticulture**

- **2013. - 2015.**; City of Zagreb; Marko Karoglan; mkaroglan@agr.hr

**Intravarietal heterogenity of vine germplasm and improvement of clonal selection**

- **2007 - 2011**; Ministry of Science, Education and Sport
  - Edi Maletić; emaletic@agr.hr

**Untypical aging off-flavor in wine**

- **2007 - 2011**; Ministry of Science, Education and Sport
  - Stanislava Herjavec; herjavec@agr.hr

**Potential of polyphenols in grape varieties**

- **2008 - 2011**; Ministry of Science, Education and Sport
  - Bernard Kozina; bkozina60@gmail.com

**Management & Conservation of Grapevine Genetic Resources - GrapeGen06**

- **2007 - 2010**; EU – Directorate for Agriculture and Rural Development; Edi Maletić; emaletic@agr.hr

**Improvement of “prošek” quality through the use of modern enological procedure and appropriate cultivar selection**

- **2006 - 2008**; Ministry of Agriculture and Forestry
  - Jasminka Karoglan Kontić; jkkontic@agr.hr

**Ampelographic and Genetic Evaluation of Croatia Native Grape Varieties**

- **2002 - 2007**; Ministry of Science and Technology
  - Edi Maletić; emaletic@agr.hr

**Revitalization model of autochthonous grapevine cultivars**

- **2003 - 2006**; Ministry of Agriculture and Forestry
  - Jasminka Karoglan Kontić; jkkontic@agr.hr

**Role of grapevine nursery in island development**

- **2003 - 2006**; Ministry of Agriculture, Forestry and Water Management; Nikola Mirošević; vitis@agr.hr

**Wine production on the lees in barrique barrels**

- **2003 - 2005**; Ministry of Agriculture and Forestry
  - Stanislava Herjavec; herjavec@agr.hr

**Control of grapevine phytoplasma in the Republic of Croatia**

- **2000 - 2003**; Ministry of Agriculture and Forestry
  - Bernard Kozina; bkozina60@gmail.com

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Scientific and professional projects
Areas of research
The Department’s staff is engaged in scientific and technical research in phytomicology, phytobacteriology, phytovirology, plant pathogen diagnostics (conventional and molecular) and phytopharmacy (the effectiveness of conventional fungicides, bio fungicides, enzymatic fungicides, resistance of plant pathogens, bio-agents and biotechnical products).

Research infrastructure
Mycological laboratory – isolation, cultivation and identification of phytopathogenic fungi by conventional methods, research of fungal resistance to fungicides, encapsulation of fungal bioagents into bio-preparations.
Collection of filamentous fungi
Phytobacteriological laboratory – isolation, cultivation and determination of phytopathogenic bacteria, characterization of phytopathogenic bacterial isolates, analysis of molecular markers, fire blight monitoring and forecasting fire blight in apples and pears.

Collection of plant pathogenic bacterial isolates
Phytovirological laboratory – diagnostics of phytopathogenic viruses (bio-tests, serological tests, molecular genomic techniques)
Laboratory for molecular diagnostics – diagnostics and molecular characterization of plant pathogens by using molecular laboratory techniques.
Collection of woody indicators for the purpose of grapevine virus testing (Kober 5BB, LN33, Vitis riparia, Vitis ruprestris and 110R) according EPPO’s (European and Mediterranean Plant Protection Organization) certification scheme for the production of healthy grapevine planting material.
Collection vineyard for the in vivo conservation of grapevine viruses
Greenhouse with facility for sterilization of the plant growing substrates and tools - cultivation of plants for bio-tests, growing and maintaining healthy plants and plants in the process of analysis.
Research and production services

The Department offers the following services: isolation and identification of plant pathogens (conventional laboratory techniques, serological and molecular techniques); preparation of nutritional substrates for the cultivation of microorganisms; microphotography services; recommendations for the control of plant pathogens; fire blight monitoring and forecasting in apples and pears; evaluation of fungicide efficacy; seeds and seedlings health analysis.

Improving the quality of cherry Maraska planting material through health selection and genetic evaluation
2014. - 2015.; Ministry of Agriculture; Darko Vončina; dvoncina@agr.hr

Sustainable control of grapevine trunk diseases
2013. - 2017.; COST Action; Marijan Bubola

Enhancement of collaboration between science, industry and farmers: Technology transfer for integrated pest management (IPM) in sugar beet as the way to improve farmer’s income and reduce pesticide use
2013. - 2015.; IPA IIIC; Renata Bažok; rbazok@agr.hr

Sustainable production of high-quality cherries for the European market
2012. - 2016.; COST Action; Aleš Vokurka; avokurka@agr.hr

The spread of pathogenic fungi on aromatic and medicinal plants in Croatia and Serbia
2010. - 2012.; Vlada Republike Srbije i Vlada Republike Hrvatske; Tihomir Miličević; tmilicevic@agr.hr

International Joint Master Degree in Plant Medicine (IPM)
2009. - 2013.; TEMPUS Programme; Zvonimir Ostojić; zostojic@agr.hr

Horology of pathogenic fungi on plants of special importance in Croatian flora
2007. - 2011.; Ministarstvo znanosti, obrazovanja i sporta; Tihomir Miličević; tmilicevic@agr.hr

Scientific and professional projects
Areas of research
In agricultural zoology the research includes harmful but also beneficial animal organisms in plant production as well as preventive and curative measures of plant protection which prevent harmful effects and enhance the role of beneficial organisms. The subject of research is beneficial and harmful insects, mites, nematodes, snails, birds and rodents fauna that occurs in various agricultural crops. Research is aimed at determining problems related to the suppression of certain economically important pests, especially the resistance of organisms to certain groups of zoocides and finding environmentally favorable pesticides application methods, according to the principles of plant protection and integrated pest management. In addition to preventive measures to suppress pests, apart from chemical protection measures, the research establishes the effectiveness and efficiency of the application of biological protective measures by using predatory and parasitic insects, mites and nematodes.

The research, through the cooperation with business sector and state and local administration, cover the organisms in the Republic of Croatia that are on the list of quarantine pests and along with the research program of their distribution, the most appropriate measures of control and spread prevention are being determined at the same time. Special multiyear spread monitoring programs included the Diabrotica virgifera species (western corn rootworm) and Globodera rostochiensis and Globodera pallida species (potato cyst nematodes) which are also the subject of ongoing research.

The Department’s staff educates farmers on the implementation of plant protection and integrated pest management on the principles of “the field school”. Also, measures introduced in production include biological crop protection through the use of natural enemies of pests - predatory and parasitic insects, mites, nematodes and fungi. The studies have included parasitic nematode species Steinernema carpocapsae (for the suppression of codling moth) and Phasmarhabditis hermaphroditica (for the suppression of harmful snails in vegetable crops) as well as the parasitic wasp Encarsia formosa, entomophagous bug Macrolophus caliginosus and entomopathogenic fungus Verticillium lecanii (for the suppression of greenhouse whitefly in tomato greenhouses).

Research and production services
The improvement and introduction of integrated and environmentally friendly plant protection systems: in cooperation with agricultural, pomological, viticulture and vegetable crops producers and ornamental plant growers, systems of integrated and environmentally friendly plant protection against harmful insects, mites, nematodes and snails are introduced. Department’s staff educates farmers on the implementation of plant protection and integrated pest management on the principles of “the field school”. Also, measures introduced in production include biological crop protection through the use of natural enemies of pests - predatory and parasitic insects, mites, nematodes and fungi. The studies have included parasitic nematode species Steinernema carpocapsae (for the suppression of codling moth) and Phasmarhabditis hermaphroditica (for the suppression of harmful snails in vegetable crops) as well as the parasitic wasp Encarsia formosa, entomophagous bug Macrolophus caliginosus and entomopathogenic fungus Verticillium lecanii (for the suppression of greenhouse whitefly in tomato greenhouses).

Phytopharmaceutical research: in collaboration with manufacturers of plant protection products, research are conducted on registered plant protection products and their effectiveness, residual effects and environmental impacts, particularly concerning biodiversity. As part of this research, monitoring of distribution and resistance of certain pests to certain plant protection products is carried out.

The application of plant protection products: in collaboration with the producers of agricultural crops and ornamental plants and manufacturers of plant protection products, the application of modern equipment and new techniques is investigated as well as the possibility of applying reduced quantities and a combination of individual plant protection products. In the urban greenery protection from harmful insects the application of endotherapeutic methods of treating plants by injecting insecticide into the trunk of ornamental trees is being introduced.

The analysis of soil and plant samples for the presence of cyst and free living nematodes: morphological and molecular identification of harmful species of nematodes, determining the viability and number of nematode populations based on which recommendations for the producers are given.

Analysis of soil and plant samples for the presence of harmful and beneficial insects: determining harmful and beneficial insect fauna.
Studies, programs, advice: are made and given in accordance with the requests and needs of agricultural producers, manufacturers of plant protection products and other organizations.

Genetic research - molecular methods: molecular identification of harmful insects species (Agriotes sp.) and nematodes (Globodera rostochiensis Woll., Mulvey & Stone and Globodera pallida Stone) based on the basic molecular methods (DNA isolation, PCR, sequencing). Genotyping and analysis of intrapopulation and interpopulation genetic diversity of major pests in fruit, vegetable and crop production (Cydia pomonella L., Diabrotica virgifera virgifera LeConte) using molecular markers (microsatellites). Analyses of molecular phylogenetics that determine the relationship between species based on differences in DNA sequences.

Improving human capital by professional development through the research program in Plant Medicine

2015. - 2016.; Research Fellowships for professional development of young researchers and post-doctoral researchers; European Social Fund; Renata Bažok; rbazok@agr.hr

Innovative Real-time Monitoring and Pest control for Insects, INSECTLIFE (LIFE 13 ENV/HU/ 001.092)

2014. - 2018.; LIFE +; Božena Baric; baric@agr.hr

Enhancement of collaboration between science, industry and farmers: Technology transfer for integrated pest management (IPM) in sugar beet as the way to improve farmer’s income and reduce pesticide use (IPA 2007 IHR./ I6IPO/00 1-0405 11)

2013. - 2015.; Science and Innovation Investment Fund Grant Scheme; Renata Bažok; rbazok@agr.hr

Technology transfer in sugar beet production: improvements in pest control following the principles of integrated pest management (IPM)

2012. - 2014.; Croatian Science Foundation; Renata Bažok; rbazok@agr.hr

Pollen beetle resistance against pyrethroids and new control strategies

2012. - 2014.; Ministry of Agriculture; Tanja Gotlin Čuljak; tgotlin@agr.hr

Integrated control of wireworms in terms of climate changes and new insights

2012. - 2014.; Ministry of Agriculture; Antonela Kozina

Standardization of quality and food safety of strawberries

2012. - 2014.; Ministry of Agriculture; Aleksandar Mešić; amesic@agr.hr

Impact of oilseed rape production on functional biodiversity of predators and decomposers including means for their conservation and improvement in Croatia, Germany and Serbia

2011. - 2012.; SEE-ERA.NET plus; Tanja Gotlin Čuljak; tgotlin@agr.hr

Risk estimation system - the basis for integrated control of corn pests

2007. – 2013.; Ministry of Science, Education and Sport; Renata Bažok; rbazok@agr.hr

Integrated control of pests in rape for biodiesel production

2007. – 2013.; Ministry of Science, Education and Sport; Tanja Gotlin Čuljak; tgotlin@agr.hr

Scientific and professional projects
DEPARTMENT OF

Herbology
Areas of research

Employees of the Department independently or in collaboration with researchers from other departments and other institutions carry out scientific and professional research in the field of:

— biological effects of herbicides;
— behavior of herbicides in the environment;
— integrated and environment-friendly weed control;
— ecology of weeds;
— bank of weed seeds in the soil;
— possibility of weediness forecast;
— invasive species, especially allergens of Ambrosia artemisiifolia;
— and other research in the area of specialty

Research infrastructure

The Department has the basic equipment for the application of herbicidal compositions in field conditions survey. Field experiments are carried out in experimental areas of the faculty and areas of agricultural producers across Croatia. For research under controlled conditions, the Department does not have its own infrastructure, so the research is carried out in the laboratories of other Departments and other laboratories in collaborating institutions.

Research and production services

Department employees are competent for scientific and professional services in the field of weed control in various crops and in different types of plant production (conventional, integrated and organic) as well as on non-agricultural areas. Services include:

— education for the needs of agricultural businesses, family farms, associations, cooperatives, government and chemical companies;
— preparation of studies and programs in the field of rational, ecologically acceptable and conventional application of herbicides, harmonized with the legislation of Croatia;
— research of biological effects of herbicides for the needs of agricultural producers and companies engaged in transport of herbicides;
— consulting services in the field of weed control;
— participation in the work of expert bodies of the competent Ministry and other relevant institutions.

Sustainable management of Ambrosia artemisiifolia in Europe (SMARTER); 2013. – 2017.; FA COST Action; Maja Šćepanović; mscepanovic@agr.hr
Enhancement of collaboration between science, industry and farmers: Technology transfer for integrated pest management (IPM) in sugar beet as the way to improve farmer’s income and reduce pesticide use 2013. – 2015.; IPA 2007/HR/16IPO/001-040511; Renata Bažok, rbazok@agr.hr
The impact of agriculture on the pollution of surface and groundwater in Croatia 2013. - 2014.; Hrvatske vode; Davor Romić; dromic@agr.hr
International Joint Master degree in Plant Medicine 2009. - 2014.; TEMPUS Programme; Zvonimir Ostojić; zostojic@agr.hr
Weed control in onion regarding manner and purpose of cultivation 2010.; Ministry of Agriculture, Fisheries and Water Management; Klara Barić; kbaric@agr.hr
Ecological weed control in the system of integrated crop production 2007. - 2014.; Ministry of Science, Education and Sports; Klara Barić, kbaric@agr.hr

Scientific and professional projects
Areas of research
In order to further develop the field of animal molecular genetics, in 2005 Laboratory of Conservation Genetics was established to perform many molecular genetic analyses and educate future professionals in this field. Also, employees of the Department of Animal Science are actively involved in a new discipline of genetics of domestic animals - genomics, both in doctoral dissertations research and active participation in EU projects.

Main activities of the Department include biometrics and research planning in livestock breeding, numerical methods in quantitative genetics, linear models, while research project include the investigation of the factors of slaughter carcasses quality, muscle and adipose tissue and meat products, nutritional and organoleptic properties of meat and meat products as well as the characteristics of indigenous breeds and products.

Research infrastructure
Laboratory of Conservation Genetics
Laboratory of Quantitative Analysis
Equipment for meat quality evaluation (pH, redox potential, color and water holding capacity of meat)

Research and production services
The Department offers the following services:
- biometric processing, zoo hygiene, veterinary prevention,
- analyzing genome of domestic animals and their wild relatives by molecular genetic methods; these methods include DNA extraction (blood, tissue, hair, semen, etc.), amplification by the polymerase chain reaction, nucleotide sequencing and data processing by Mega 6.0, DNAsp and Network programs,
- analysis of SNP chip for domestic and wild animals
- meat quality assessment,
- optimization of the fatty acid composition of pork and beef,
- development of specifications of traditional meat products,
- development of technological projects for meat processing.

Utilisation of the whole mitogenome in cattle breeding and conservation genetics with acronym “MitoTauromics”
2014. – 2018.; Croatian Science Foundation (HRZZ); Ino Ćurik; icurik@agr.hr

Estimation of dominance components using fraternity coefficients in domesticated rabbits
2009. – 2011.; Government of the Republic of Croatia and the Republic of Hungary; Ino Ćurik; icurik@agr.hr

Strategies for elimination of genetic defects from selected populations #178-1780460-0546
2007. - 2012.; MZOS; Ino Ćurik; icurik@agr.hr

Advances in Farm Animal Genomic Resource’s (“GENOMIC-RESOURCES”)
2011. – 2014.; European Science Foundation; Ino Ćurik; icurik@agr.hr

A collaborative European Network on Rabbit Genome Biology - RGB-Net
2011. – 2015.; COST Action; Ino Ćurik; icurik@agr.hr

Utilisation of mtDNA sequence variation in the verification of pedigree correctness and estimation of cytoplasmatic effects
2014. - 2015.; Government of the Republic of Croatia and the Government of the Republic of Slovenia; Vlatka Ćubrić Ćurik; vcubric@agr.hr

TREASURE - Diversity of local pig breeds and production systems for high quality traditional products and sustainable pork chains treasure
2015. – 2019.; EU H2020; Danijel Karolyi; dkarolyi@agr.hr

Contribution of agriculture in the history of economy in Croatia
2007. – 2012.; RH MZOŠ; Danijel Karolyi; dkarolyi@agr.hr

„Slavonski kulen ili Slavonski kulin“ - Product specification for the national registration of protected geographical indication label
2012.; MPŠ HR; Danijel Karolyi; dkarolyi@agr.hr

„Drniški pršut“ - Product specification for the national registration of protected geographical indication label
2011.; MPŠ HR; Danijel Karolyi; dkarolyi@agr.hr

Scientific and professional projects
Areas of research
Scientific and research activities at the Department include animal and pet feeding, breeding and use of poultry and rabbits. Particular emphasis in research is given to nutritional value of domestic maize hybrids, and to the effect of various nutritive supplements in animal feed on the production results and quality of poultry meat and eggs. Furthermore, the Department is investigating phenotypic and genotypic characteristics of Croatian indigenous poultry species and the results of their breeding on family farms.

Research infrastructure
Chemical laboratory
In the accredited chemical laboratory of the Department about thirty different analyses of animal feed are carried out.

Poultry house
In a poultry house of 100 m² biological experiments with all types of poultry are carried out.

Research and production services
Scientific and professional cooperation with state institutions on improving livestock production. For several decades the Department has been cooperating with about thirty companies related to the production of animal feed, cattle breeding and fattening. Within this cooperation the Department provides services of chemical analysis of feed, composing fodder recipes, preparation of expert studies, consultations, expert lectures and seminars on breeding and feeding domestic animals, as well as implementation of nutritional researches on poultry.

Nutritive, antioxidative and prebiotic characteristics of mais for animals
2007 - 2013; Ministry of Science, Education and Sport
Darko Grbeša; dgrbesa@agr.hr

Reproduction and Rearing of Zagorje Turkey on Small Family Farms
2012 - 2014.; Ministry of Agriculture;
Zlatko Janječić; zjanjecic@agr.hr

Alternate Egg Production on Family Farms
2010 - 2012.; Ministry of Agriculture;
Zlatko Janječić; zjanjecic@agr.hr

Rape Seed Oil-cake in Hens, Turkeys and Geese Nutrition
2007. - 2010.; Ministry of Science, Education and Sport;
Stjepan Mužić; muzic@agr.hr
Areas of research
Research interests include the following topics:
- development of existing and introduction of new technologies in the cultivation of different species and genotypes of domestic animals,
- development of existing and introduction of new technologies in the production of animal products,
- standardization of methods of traditional production and products,
- characterization of phenotype and genotype of populations and breeds,
- improving genetic predispositions of production potential,
- developing a model for conservation of indigenous and protected breeds of domestic animals,
- determination of the physical, chemical and sensory characteristics of meat and meat products,
- determination of the housing and breeding parameters with the characteristics of carcass and meat at the farm animals.

Research infrastructure

Laboratory of genetic identification of domestic animals
Equipment for the standardization of populations and breeds phenotype.

Equipment for determining domestic animals carcass and meat quality - a device for meat color determining, pH meter, ultrasound device equipped with measuring probes for cattle, pigs and horses

Research and production services
Research and production services include:
- genetic characterization of units and populations,
- standardization of phenotypic characteristics of populations and breeds of domestic animals,
- standardization and qualitative characterization of meat and carcasses,
- development of technological projects in cattle, sheep, goat, pig and horse breeding,
- designing and overseeing the implementation of breeding programs,
- standardization of traditional production technologies and products
- physical, chemical and sensory analysis of meat
- preparation of the study on protected designations of agricultural and food products
Typization and inventory of genetic characteristics of cattle breeds in Croatia
2007 - 2011; Ministry of Science, Education and Sport
Ante Ivanković, aivankovic@agr.hr

Meat characteristic of Croatian sheep breeds
2007 - 2011; Ministry of Science, Education and Sport
Boro Mioč; bmioc@agr.hr

Genetic and phenotypic traits of autochthonous Croatian sheep breeds
2007 - 2011; Ministry of Science, Education and Sport
Vesna Pavić; vpavic2@agr.hr

Evaluation of Pig breeding value on family farms
2009 - 2011; Ministry of Agriculture, Fisheries and Rural Development; Zoran Luković; lukovic@agr.hr

Permanent Protection of Istrian Cattle through Commercial Exploitation
2005 - 2010; Agency for Rural Development of Istria
Ante Ivanković; aivankovic@agr.hr

Standard and conservation autochthonous Dalmatian dry-cured ham
2006 - 2010; Ministry of Agriculture, Fisheries and Rural Development; Romano Božac; rbozac@agr.hr

Development of regional network in function of sustainable breeding programs for transboundary breeds
2009 - 2010; European Regional Focal Point Project
Ante Ivanković; aivankovic@agr.hr

Standardization of Lika pramenka meat characteristics in order to create preconditions for conservation Lika lamb through quality marks
2009 - 2010; County of Lika-Senj; Boro Mioč; bmioc@agr.hr

Procedures of animal preparation, slaughter and storage of carcasses in order to improve the quality of beef meat
2008 - 2009; PIK Vrbovec; Ante Ivanković; aivankovic@agr.hr

Conservation and evaluation of Black Slavonian pig breed
2007 - 2008; Ministry of Science, Education and Sport
Marija Uremović

Scientific and professional projects
Areas of research
The Department of Dairy Science of the Faculty of Agronomy, University of Zagreb, has been founded in 1922, and has ever since been engaged in teaching, scientific, research and professional activities. Scientific activities of the Department are based on surveys covering the entire field of dairy science. Significant results were obtained in studies of milk protein polymorphism, traditional cheeses, identification of indigenous strains of lactic acid bacteria, the influence of thermal processing of goat milk on proteins, the influence of probiotic bacteria supplements on the functional properties of sheep milk. The current areas of research are:

- monitoring the ripening of traditional cheese it has been decided to determine the quantity and the ingredients of peptides by implementing a reversed-phase high performance liquid chromatography (RP-HPLC) with two detectors (diode array and Evaporative Light Scattering). For determination of free amino acids is compared standard method which include chemical transformation which absorb UV light $\lambda$ 254 nm and RP-HPLC-ELSD method.
- the free fatty acids and their metabolites, formed as a result of lipolysis during cheese ripening, are the main carriers of bioactive effects of milk fat. As well as, they directly affect the chemical composition and physical and sensory characteristics of cheese. Determination of the composition and quantity of individual free fatty acids, physico-chemical and sensory characteristics of cheese in a sack throughout ripening.
- detection, determining the form and concentration of the endogenous enzyme cathepsin D in sheep’s milk and the connection with chemical and hygienic parameters of sheep milk. A method of determining enzyme cathepsin D in sheep milk is carried out by Western blotting, the analytical method for the detection of specific proteins in the sample.
- functional sheep yoghurt with addition of probiotic bacteria was investigated, by using lower temperature of sheep milk heat treatment.
- determining the organoleptic quality of milk and dairy products, traditional cheeses.
- diversity and dynamic of autochthonous lactic acid bacteria associated with artisanal fresh sheep cheese during production season and shelf life period. Molecular identification of autochthonous LAB by culture-dependent and culture-independent molecular approach by PCR(16S rDNA)-ARDRA and PCR (V3-16S rDNA) DGGE techniques. Size distribution of casein particles in bulk raw sheep milk, cheese curd and fresh sheep cheese Karakačanski skakutanac by Dynamic Light Scattering during lactation period.

In order to determine the nutritional value and organoleptic quality of goat milk and cheese, in 2010 the Department has undertaken a study of content per cent and composition of fatty acids. Also, the investigations of milk safety, based on the determination of mycotoxins that may contaminate the milk, are in progress.

Research infrastructure
In order to enable scientific research, professional and neutral control of milk and dairy products, in 2001 the Department has established a Reference Laboratory for Milk and Dairy Science, which is equipped with contemporary analytical instrumentation:

- high-performance liquid chromatography (HPLC) and gas chromatography (GC),
- Rotational viscosimeter,
- spectrophotometer UV/VIS,
- Milkoscan instrument (FT 120) for determining chemical composition of milk and dairy products, by infra-red spectrometry,
- Tecator 2300, instrument for nitrogen determination by Kjeldahl (Block Digestion),
- Foss Electric instrument for determining somatic cells number in milk by fluoro-opto-electronic method,
- BactoScan FC instrument for determining the total number of bacteria in milk by flow cytometry method,
- Behr Labor Technik equipment for determining fat content in milk by Röse-Gottlieb method,
- Cryostar 1 instrument for determining freezing point of milk by cryoscopic method,
- transmission densitometry system,
- mini-vertical electrophoresis system,
- isoelectric focusing system,
- fluorescent microscope,
- CL-10 – instrument for determination of urea and lactose concentration in milk, by method of diferential pH-metric.
- Labtech LT 4000 – Microplate Reader – instrument for determination of aflatoxin content in milk and dairy products.

From 2005 to 2011 the Reference Laboratory of the Department of Dairy Science has accredited 42 analytical methods for the analysis of milk and dairy products according to international standard HRN EN ISO/IEC 17025. In addition, the laboratory is qualified for the implementation of 60 analytical methods, which, as a reference, standard or routine methods, are used for the analysis of milk and dairy products.

The laboratory verifies its competence, accuracy and precision through inter-laboratory comparative studies, organized by dairy laboratories in Germany, France, Italy and Slovenia. Also, the laboratory organizes inter-laboratory comparative studies for testing and control laboratories in Croatia and abroad.

Research and production services

The department provides the following services in Dairy Science:
- managing and coordinating scientific and professional projects,
- organizing educational seminars and expert lectures,
- conducting studies, strategies, investment programs,
- professional services of organoleptic evaluation of milk and dairy products quality, on national and international level,
- issuing expert opinions for dairy industry,
- maintaining our own collection of strains of lactic acid bacteria that are a part of microbial cultures and are used to produce dairy products with specific properties.

Improving the technology of goat milk by identifying the physiological limits of urea concentrations.
2014.-2015.; Ministry of agriculture; Neven Antunac; antunac@agr.hr

The development of rapid and simple methods for assessing the characteristics of processing milk and cheese authentication
2013. – 2014.; University of Zagreb; Neven Antunac; antunac@agr.hr

Application of indigenous lactic acid bacteria in the production of specific cheeses in Montenegro
2013. – 2014.; Government of the Republic of Croatia and Government of Montenegro; Neven Antunac; antunac@agr.hr

Quality control of cheeses on the market in order to increase competitiveness
2012.-2014.; Ministry of Agriculture; Jasmina Havranek; jhavranek@agr.hr

CILeuCS - Characterization of indigenous Leuconostoc spp. isolated from sheep cheese
2012.; FP7 Programme; Tomislav Pogačić, tomislav.pogacic@outlook.com

Characterisation and tracking the origin of specific features of traditional cheeses in Western Balkans Region
2010. - 2012.; SEE-ERA NET PLUS; Jasmina Havranek; jhavranek@agr.hr

Branding and characterisation of Turoš cheese
2009. - 2015.; Međimurje County; Samir Kalit; skalit@agr.hr

Ecological production and analytical methods for proofing cheese authenticity
2007. - 2011.; Ministry of Science, Education and Sport; Jasmina Havranek; jhavranek@agr.hr

Technological parameters of traditional cheesemaking for their protection
2007. – 2011.; Ministry of Science, Education and Sport; Samir Kalit; skalit@agr.hr

Functional dairy products made of sheep milk
2007.- 2011.; Ministry of Science, Education and Sport; Dubravka Samaržija; samarzija@agr.hr

Scientific and professional projects
Areas of research

Fisheries
The largest part of scientific activities is focused on studying the ecology and ichthyology of open inland waters for the purpose of fisheries management. This is the area in which the majority of scientific papers are published in international publications. Another important subject is the fish molecular genetics. Research is also being conducted in aquaculture, especially in the area of studying nutritional requirements of fish.

Beekeeping
From a scientific point of view the Department’s staff is devoted to the study of bees as indicators of environmental pollution and the analysis of bee products. In the area of bee biology, the research is aimed at better understanding the physiological, biological and economic features and behavioral characteristics of native bees. Many research projects were a part of the international cooperation.

Game Management
The basic direction of scientific research in game management is the study of morphology and molecular genetics of wild animals. Projects are also conducted in other areas of game management, such as the relationship between wildlife and habitat, and a deeper understanding of the biology and ecology of wild animals.

Research infrastructure

Fisheries laboratory with a hatchery
Laboratory is equipped for hydro-chemical, hydro-biological and ichthyological analysis and spawning and rearing experiments in tanks and aquaria.

Apiary
Experiment station has hives for the experiments and a laboratory for analysis in beekeeping.

Hunting ground
Faculty hunting ground Prolom is also used for the Department activities and it has some of the equipment that is required for hunting research.

Research and production services

Fisheries services
All types of consulting services for large and small family ponds, as well as management of open waters; hydro-chemical, hydro-biological and ichthyological analysis for fisheries.

Beekeeping services
All types of consulting and analysis services in beekeeping

Game management services
All types of consulting services in game management.
Prevention of honeybee colony losses
2008 -; COST programme, EU; Nikola Kezić; nkezic@agr.hr

Comparative studies on morphological and genetic diversity of common carp (*Cyprinus carpio*) in China and Croatia
Tomislav Treer; treer@agr.hr

Monitoring of freshwater fisheries
2002 - 2011; Ministry of Agriculture, Fisheries and Rural Development; Tomislav Treer; treer@agr.hr / Roman Safner; rsafner@agr.hr / Ivica Aničić; ianicic@agr.hr

Monitoring of chamois (*Rupicapra rupicapra* L.) in the Nature park Biokovo
2010 – 2011; Biokovo Nature Park Public Institution
Nikica Šprem; nsprem@agr.hr

Genetics, nutrition and introduction of new species in aquaculture
2006 - 2011; Ministry of Science, Education and Sport
Ivica Aničić; ianicic@agr.hr

Honeybee varroa tollerace
2006 - 2010; Ministry of Science, Education and Sport
Nikola Kezić; nkezic@agr.hr

Biological aspect in freshwater fisheries and in game management
2006 - 2011; Ministry of Science, Education and Sport
Tomislav Treer; treer@agr.hr

Comparison of genetic variability of Hungarian and Croatian common carp strains bred in fish farms and kept in live gene banks
2007 - 2009; Hungarian government and Government of the Republic of Croatia; Tomislav Treer; treer@agr.hr

Palynological characteristics of nectar and honey of sage (*Salvia officinalis*)
2008 - 2011; Ministry of Science, Education and Sport
Dragan Bubalo; dbubalo@agr.hr

Fish processing at the family fish farms
2001 - 2003; Ministry of Agriculture, Fisheries and Rural Development; Roman Safner; rsafner@agr.hr

Scientific and professional projects
Areas of research
Since its establishment in 1919/1920, the activities of the Department, besides teaching, research and professional work, have been focused on the popularization of agricultural techniques with a wide range of agricultural producers. Since the Republic of Croatia has gained its independence, the scientific activities of the Department’s staff, through research projects, have been directed towards the research of energetically, economically and environmentally friendly tillage systems in crop production, the research of possibilities of the use of pruning residues from orchards and vineyards as drying fuel and the research of environmentally friendly methods of plant protection in urban spaces.

Research infrastructure
Maksimir - tractors, agricultural machinery and tools testing station for teaching and demonstrations
Within the total polygon area of 16000 m² there are:
- paved runaways used for testing traction characteristics of tractors,
- laboratory used for testing the engines with a hydraulic brake Schenck UJ-40 for engines up to 300 kW,
- workshop
- warehouse

Research and production services
Verification of conformity to Croatian standards of tractors imported into the Republic of Croatia, as well as tractors produced in the Republic of Croatia. Based on the decision of the Croatian Office for Standardization and Metrology, issued in October 2001, and according to Regulations on basic requirements for agricultural and forestry tractors, Official Gazette No. 73/01, the Department of Agricultural Engineering became the authorized entity to verify the conformity of tractors to Croatian standards. The procedure of verifying conformity of tractors to Croatian standards officially began on February 1st 2002.

Conferences
From 1970 the Department’s staff annually organizes the international symposium “Actual Tasks on Agricultural Engineering”, and publish the Proceedings. Since 1997, papers published in the Proceedings are indexed into the ISI Index to Scientific & Technical Proceedings, ISI Proceedings - a part of Web of Knowledge, CABI - Agricultural Engineering Abstracts, Cambridge Scientific Abstracts - Conference papers Index, InterDok. The Symposium web address is http://atae.agr.hr.

Ecological, economical and energetic effects of reduced tillage in arable farming
2006 - 2010; Ministry of Science, Education and Sport
Silvio Košutić, skosutic@agr.hr

Possibilities of decreasing soil compaction by tractor wheels
2007 - 2009; Ministry of Science, Education and Sport
Dubravko Filipović; dfilipovic@agr.hr

Application of different drills for vegetable crops
2007 - 2009; Ministry of Science, Education and Sport
Stjepan Ivančan; sivancan@agr.hr

The use of pruning residues from orchards and vineyards as a fruit-drying fuel
2006 - 2009; Ministry of Science, Education and Sport
Stjepan Sito, ssito@agr.hr

Scientific and professional projects
DEPARTMENT OF
Agricultural Technology, Storage and Transport
Areas of research
Since its establishment the Department has continually been involved in teaching, scientific research and cooperation with business sector. In particular, it specializes in the area of preparation, processing and storage of crops, fruits and vegetables, medicinal and aromatic plants, as well as external and internal transport and animal feed manufacturing technology. In addition, the Department engages in researching methods and procedures of cooling and refrigeration technologies in agriculture, as well as designing technological systems and plants, preparation and processing of agricultural products, energetics, regulation, automation and the instrumentalisation of agricultural processing. The Department expanded its activities to research projects related to the issue of renewable energy from agricultural sources and participates in the National energy program - Biomass and Waste Use Program - BIOEN, as well as the PROHES energy project.

As a result of further research projects, new curriculum content in the Bologna system of education were introduced, and the Department is one of the founders of Agricultural Engineering undergraduate and graduate study. In the last ten years five doctoral, ten master’s and more than a hundred graduate thesis have been defended at the Department. The Department has established and organizes the International Congress of Technologists for Post-harvest technology.

Successful research and professional activities of members of the Department are reflected in their active role in social and professional community and prominent institutions such as: Scientific Council for Agriculture and Forestry and Food Industry Section of the Croatian Academy of Sciences and Art, Environmental and Sustainable Development Advisory Council of the Croatian Government, Croatian Standards Institute, Croatian Chamber of Economy and Environmental Protection Committee of the Croatian Parliament.

Research infrastructure
- Laboratory of agricultural raw materials and products
- Laboratory of calibration of hygrometers for cereal and oilseed
- Laboratory of biomass, biofuels and agricultural waste research

Research and production services
The activities of the Department in cooperation with the industry include: organizing, testing and certification of drying facilities for crops, fruits, vegetables, medicinal and aromatic plants, equipment and technology in the factories and animal feed mixing plants, authorized calibration of hygrometers for cereal and oilseed in the Republic of Croatia, feasibility studies and preliminary project designs for factories and animal feed mixing plants, preparation and processing capacity of agricultural food products, plants for the production of renewable energy from agricultural sources, ancillary equipment and transport systems, consulting and supervision thereof.

New technologies of Stevia preprocessing and application in agricultural products
2014.; Ministry of Education, Science and Sports; Sandra Voća; svoca@agr.hr

Processing of commercially unacceptable fruits and vegetables and their use in animal feed
2014.; Ministry of Education, Science and Sports; Stjepan Pliestić; spliestic@agr.hr

Aronia (Aronia melanocarpa (Michx.) Elliott) powder antioxidant potential
2015.; Ministry of Education, Science and Sports; Nadica Dobricević; ndobricevic@agr.hr

Modern technologies of plum drying with energy save
2012. – 2014.; Ministry of agriculture; Sandra Voća; svoca@agr.hr

The introduction of Miscanthus grass as energy crop for heating greenhouses on the family farm
2012. - 2014.; Ministry of Agriculture; Tajana Krička; tkricka@agr.hr

Utilization of pumpkin residue as a component in the production of biogas for the needs of renewable energy sources
2014.; University of Zagreb; Tajana Krička; tkricka@agr.hr

Converting agricultural biomass and energy crops into energy and added value products – bio-oil and biochar production
2014. - 2018.; Croatian Science Foundation; Tajana Krička; tkricka@agr.hr

Energy characteristics of postharvest residue of new soybean varieties
2015.; University of Zagreb; Tajana Krička; tkricka@agr.hr

Utilization of pumpkin pulp as raw material in green energy production
2014. - 2015.; Ministry of Education, Science and Sports of the Republic of Croatia and Ministry of higher education, Science and Technology of the Republic of Slovenia; Ana Matin; amatin@agr.hr

Nutritive value of fruiting and subtropical vegetables
2007. – 2014.; Ministry of Education, Science and Sports; Stjepan Pliestić; spliestic@agr.hr

Scientific and professional projects
Areas of research
Main areas of research are agricultural and rural policy, education of agricultural experts and farmers, institutional upgrading in agriculture, economics of agricultural resources and infrastructure use in agribusiness, integrated rural development, the competitiveness of agriculture and the accession to the EU, cooperatives and business associations in agriculture, social and demographic characteristics of agriculture, family farms and rural areas. A special field of research involves the preparation of expert background documents for introducing key legislation and policy documents of Croatian agriculture.

Research infrastructure
The Department has the adequate computer equipment and computer programs for processing statistical data and producing agri-economic and agri-policy models and projections.

Research and production services
The Department’s researchers cooperate with corresponding ministries, particularly the Ministry of Agriculture, Fisheries and Rural Development in the preparation of strategic and legal documents (Agricultural development strategy, Agricultural land management strategy, Rural development strategy...
of the Republic of Croatian, IPARD, Agricultural Law, Law on State support for agriculture and rural development, etc.), as well as state and local government units in the preparation of the professional foundations for local development strategies. The Department’s staff also provides consultancy services in agricultural and rural policy management, that is, they prepare operational documents for local community policy implementation.

In cooperation with international scientific and professional institutions and organizations (World Bank, FAO, UNDP, European Commission, Universities and research institutes), the researchers participate in the preparation of statistical databases and provide expertise for agri-policy and socio-economic studies, especially in the process of European enlargement and cooperation with countries in the region.

The application of scientific research findings from the studies of agricultural economics, sociology and policies is reflected in the collaboration of the Department’s researchers with agricultural cooperatives, farms and other economic entities, for which expertise and reviews are prepared and strategic guidelines directions are proposed. Research activities are also related to macroeconomic balancing, input-output balancing (resource and production - consumption) at the level of national and local economies, designing projects for the optimal infrastructure location and network designs in agribusiness.

Specific activities of the Department’s researchers and teachers are focused on the process of improving the quality of teaching, studies and teaching programs in relation to the agricultural economics, which is reflected in a close cooperation with educational institutions in the field of Agriculture / Agronomy and the Ministry of Science, Education and Sports.

Socio-demographic reproduction of family farms 2007 - 2013; Ministry of Science, Education and Sport
Đurđica Žutinić; dzutinic@agr.hr

Development of the model for estimation of Government intervention in Croatian agriculture 2007 - 2013; Ministry of Science, Education and Sport
Ramona Frančić; ramonaf@agr.hr

Competitiveness of Croatian sugar beet and sugar production sector under the conditions of EU accession 2009 - 2012.; Viro sugar factory;
Ramona Frančić; ramonaf@agr.hr

Socio-economic and production assumptions for integral and organic agricultural production on water protection area of the City of Zagreb – threats and opportunities 2013.; City of Zagreb; Ivo Grgić; igrgic@agr.hr

Estimation of agricultural policy measures and analysis of co-operative linkage in crop-production sector 2014.; Ministry of Science, Education and Sport;
Ivo Grgić; igrgic@agr.hr

Co-operative organisation of young farmers in strengthening agricultural competitiveness 2014.; Ministry of Science, Education and Sport;
Đurđica Žutinić; dzutinic@agr.hr

Socioeconomic aspects of organic agriculture 2014. -2015.; Ministry of Science, Education and Sport;
Ramona Frančić; ramonaf@agr.hr

The contribution of government support to the economic sustainability of family farms 2015.; Ministry of Science, Education and Sport;
Lari Hadelan; lhadelan@agr.hr

Scientific and professional projects
Areas of research

From the outset, the Department’s staff participates in systematic research and professional activities at the micro-agro economic level, administration and transactions, agricultural accounting and other. In recent years special attention has been drawn to management and entrepreneurship, financial management and risk management in agriculture. The main areas of multiannual scientific and professional research are the economics and organization of agricultural production, the efficiency of business and financing farms, and theoretical and methodological study of production and economic systems of agricultural production, their modeling and testing. In accordance with contemporary trends in agro economical surveys, in recent years the Department has extended its areas of research from farms to agribusiness, that is, the entire food chain.

Research infrastructure

The Department is equipped with computer equipment, and special attention is paid to obtain new computer programs that facilitate performing everyday teaching and research activities.
Research and production services

The Department offers research and production services in the field of management and entrepreneurship in rural areas. The knowledge and experience of the Department’s staff enables provision of services in developing business plans, prefeasibility and feasibility studies, analyzing the economic efficiency and preconditions for sustainable development, giving guidance in the development of various branches of agricultural production, restructuring plans for businesses, land management plans and risk assessments.

The Department is actively involved in the implementation of agricultural accounting systems in Croatia by providing services in the domain of economic analysis of agricultural holdings and establishing statistical basis for the system establishment (calculation of coefficients of standard income, typology of agricultural economy, standard results, etc.). The Department has developed good cooperation with economic entities which allows access to quality information for many analyses and numerous international projects in which the employees cooperate also contribute to the Department’s expertise.

Scientific and professional projects

PRIMA Prototypical Policy Impacts on Multifunctional Activities in rural municipalities
2008 - 2011; FP7, EU; Mario Njavro; mnjavro@agr.hr

Entrepreneurial model of assessment family farm competitiveness
2007 - 2010; Ministry of Science, Education and Sport
Zoran Grgić; zgrgic@agr.hr

Using multicriteria analysis in business decision making in family farm
2007 - 2010; Ministry of Science, Education and Sport
Vjekoslav Par; vpar@agr.hr

Productive Partnerships in the Fruit and Vegetable Sector in Croatia
2009; World Bank; Mario Njavro; mnjavro@agr.hr

National programme draft for agriculture and rural areas 2006 - 2008
2006 - 2008; Ministry of Agriculture, Forestry and Water Management; Vjekoslav Par; vpar@agr.hr

Strategic programme for rural development of Istria county
2007 - 2008; Agency for Rural Development of Istria
Vjekoslav Par; vpar@agr.hr

Assessment of expected benefits and costs of accession and the cost of Croatian accession to the European Union in the field of agriculture and rural development
2008; Institute of Economics, Zagreb
Zoran Grgić; zgrgic@agr.hr

Agricultural Insurance Fact Sheet for Croatia
2007; EUROPEAN COMMISION - DIRECTORATE GENERAL
JRC (Joint Research Centre, Italy)
Njavro Mario; mnjavro@agr.hr

Agro economic performance of sustainable agriculture on family farm
2003 - 2005; Ministry of Science, Education and Sport
Zoran Grgić, zgrgic@agr.hr
DEPARTMENT OF
Marketing in Agriculture
Areas of research
Scientific and research activities of the Department are focused on the area of market and marketing of agricultural and food products and rural development. In the period since the establishment of the Department until the beginning of 1990s, the Department mostly explored sales channels of agricultural food products, elasticity of demand and price parity of agricultural and non-agricultural products, to be followed by greatly expanded activities of the Department on the market research and consumer behavior concerning agricultural products and food. The Department Projects are focused on the development of expert analyses, pilot projects, market research projects, branding and consulting services for state and local governments, foreign partners and domestic economy, especially small and medium-sized family farms.

Research infrastructure
The Department owns the computer equipment and programs (e.g. SSI Web platform - for the development and implementation of on-line surveys and SMaRT platform - for market analysis and simulations) that enable the implementation of market research and analyses.

Research and production services
The Department offers the following research services:
- market analysis and research,
- market segmentation,
- product branding,
- consumer product testing,
- product testing - test marketing,
- marketing strategies development,
- marketing cooperatives organization,
- agricultural development strategies

Stimuli presentation and methods for examining consumer preferences
2007 - 2010; Ministry of Science, Education and Sport Damir Kovačić; dkovacic@agr.hr

Agripolicy (Enlargement Network for Agripolicy Analysis)
2008 - 2010; FP7, EU; Marija Cerjak; mcerjak@agr.hr

Training, Cooperation and Knowledge in Rural Development
2007 - 2008; InterReg, EU; Marija Cerjak; mcerjak@agr.hr

Preparation of supply balance sheets for agricultural and food products and calculation of self-sufficiency
2008; Ministry of Agriculture, Fisheries and Rural Development Damir Kovačić; dkovacic@agr.hr

The Agricultural Marketing Resource Center Croatia (AgMRC-Croatia)
2006 - 2007; World learning, Inc., USAID Marija Cerjak; mcerjak@agr.hr

Development of the county brand of apple vinegar
2003 - 2006; Zagreb County; Marija Cerjak; mcerjak@agr.hr

Marketing of pelagic fish from the Croatian Adriatic sea
2003 - 2005; Ministry of Agriculture and Forestry Damir Kovačić; dkovacic@agr.hr

Development of the wine road in Zadar county
2005; Zadar County Tourist Board; Ante Kolega

Slavonian home-made kulen
2001 - 2004; Ministry of Science and Technology Damir Kovačić; dkovacic@agr.hr

Croatian wine market and wine export from Croatia
2003; Ministry of Agriculture and Forestry Damir Kovačić; dkovacic@agr.hr

Scientific and professional projects
Areas of research

Contemporary scientific research and professional activities of Department’s staff are focused on two separate areas of research:

- The area of ornamental plants which includes the study of ornamental plant species in rural gardens, production and use of indoors ornamental plants, the introduction of wild ornamental species in the horticulture, the analysis of morphological variability of natural populations of ornamental wild woody plants and horticultural therapy,

- Professional field of Landscape architecture includes landscape planning, landscape design and landscape management. Landscape planning is directed to systematic research for development of optimization approaches for landscape qualities protection, landscape evaluation and fostering the public participation in spatial planning and development of new methodologies in environmental planning. Landscape design is focused on theory of landscape design, evaluation and characterization of urban and rural landscapes, planning and design of urban and rural open spaces as a part of integral system. Landscape management covers researches based on landscape typology and characterization, making development, production of the landscape characterization maps and the preparing the guidelines for landscape character protection.

Research infrastructure

Maksimir

The Department uses the area of 1 ha on the experimental field of the Faculty in Maksimir, where the open and protected space is used for performing student experiments and the experiments on introduction of wild species in horticulture.

Dubrovnik

In Historical Gardens and Landscape Development Center in Dubrovnik surveys of historical heritage of garden art in Croatia, especially of Dubrovnik Renaissance garden, are carried out.
Research and production services
The Department is equipped for, and the employees are professional in performing the following services:

- design – planning and public open space design,
- landscape values assessment, optimization of decision-making about and for the open spaces,
- preparation of projects and studies in the field of landscape architecture,
- preparation of surveys and studies in the field of ornamental plants: breeding technology, maintenance and care of urban greenery, trees values assessment.

Scientific and professional projects

**Landscape Character Assessment - National Park Krka**
2015.; Public institution NP Krka; Goran Andlar; gandlar@gmail.com

**Conservation study of cultural landscape – Starogradsko polje**
2015.; City of Stari Grad; Goran Andlar; gandlar@gmail.com

**The importance of linking the green system of urban region with nature protected areas**
2015.; University of Zagreb; Petra Pereković; pperekovic@agr.hr

**Principles Of Landscape Architecture In Transition Between Sustainable Development, Climate Change And Green Building**
2014.; University of Zagreb; Petra Pereković; pperekovic@agr.hr

**Mediterranean landscape as an identity factor of Croatia – its protection and development**
2007. – 2011.; Ministry of Science, Education and Sport; Branka Aničić; banicic@agr.hr

**Protection of Landscape Qualities Within Rural Development Policies in Republic of Croatia**
2008. - 2011.; Ministry of Science, Education and Sport; Sonja Butula; butula@agr.hr

**COAST project, Protection and Sustainable Use of Biodiversity and Landscape Diversity of Dalmatian Coast through Sustainable Development of Coastal Areas**
2007. - 2009.; UNDP/GEF; Sonja Butula; butula@agr.hr

**Study of the historical plan (matrix) in the protected zone with the Square of marshal Tito and its reconstructing proposal**
2009.; APZ – engineering; Branka Aničić; banicic@agr.hr

**Concept design, Master and detail plan of the cemetery Kušanec in Velika Gorica**
2004. - 2008; City of Velika Gorica; Branka Aničić; banicic@agr.hr

**International summer workshop Design & Build, Zagreb 2015**
2015.; Stanko Stergaršek; sstergarsek@agr.hr; Iva Rechner Dika, irechner@agr.hr

**Training in preparation for work in ornamental horticulture**
2013. - 2015.; European Social Fund - Agency for Vocational Education and Training and Adult Education; Miroslav Poje; poje@agr.hr

**Sweet violet (Viola odorata L.) production**
2006. – 2008.; Ministry of Agriculture, Forestry and Water Management; Vesna Židovec; vzidovec@agr.hr

**Introduction of indigenous ornamental species into horticulture**
2001. – 2006.; Ministry of Science, Education and Sport; Ines Han Dovedan; ihan@agr.hr

**Protection of Ruscus hypoglossum L. through introduction into cultivation**
2003. – 2006.; Ministry of Science, Education and Sport; Ksenija Karlović; karlovic@agr.hr
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