Institut za poljoprivredu i turizam

Institute of Agriculture and Tourism

STRATEGIC DEVELOPMENT PLAN OF THE INSTITUTE OF AGRICULTURE AND TOURISM

For the Period 2023–2030

Poreč, November 2023

1. INTRODUCTION

The Institute of Agriculture and Tourism in Poreč (hereinafter 'the Institute') is a public scientific institute operating under the auspices of the Ministry of Science and Education of the Republic of Croatia (MZO RH).

Throughout its history, the Institute has changed its name, content and level of scientific research and professional work. The Institute was founded on 5 September 1874. when the Istrian Parliament passed a decision on the establishment of the Provincial Wine and Fruit Station (*Stazione eno-pomologica provinciale*) with headquarters in Poreč. The Station began operations in April 1875 on assigned agricultural plots at the city periphery. Its current name, the Institute of Agriculture and Tourism, dates to 1989, and in 1996, by the decision of the Croatian government, it became a public scientific institute and integral part of the national institutional frame for research, science and innovation.

Considering the natural environment and traditional agricultural production, in the past, the Institute's basic task was to implement applied and developmental experiments with the aim of solving practical problems in agriculture and defining the development guidelines for the overall rural space. In the last 30 years, the Institute's activities have broadened to include research in the segment of tourism, fitting the Institute into the basic strategic economic directions of the development of the wider environment. The Institute specialises in scientific research and professional work in the scientific fields of biotechnical and social sciences, and therefore has developed human capacities and material infrastructure playing an important social role in the Adriatic area of the Croatian Republic and extended areas.

The Institute ratifies this document for the purpose of defining the strategic directions of its scientific research and professional activities in the forthcoming period (2023–2030), with the general aim of enhancing its existing human and infrastructural potentials to strengthen excellent research that will significantly enrich the national research arena, and further strengthen the Institute as a relevant and recognisable scientific, professional and educational authority in national and international frameworks. The intentions of the Institute's strategic directions given by this document assure the recognisability of programmes and projects through their autochthonous source, in a simultaneously comprehensively modernised way and in the spirit of worldwide aspirations, with the aim of progressively positioning the Institute in the European research space. Planned forthcoming research results should also serve to promote economic development in the Republic of Croatia, primarily in the sectors of agriculture, food industry, agro-economics and tourism. The continuous incorporation of the created knowledge is planned through inputs for the national and international scientific and economic politics as well as strengthening the Institute's active role in creating national and international programmes and strategies to continue fulfilling its social role in knowledge and technology transfer. The turning point at which the Institute gains momentum is defined by the planned establishment of a new, modern infrastructure within the project *Scientific platform for research and development of innovations in sustainable agriculture and tourism - Reconstruction, extension and equipping of the Institute for Agriculture and Tourism* within the framework of the programme *Preparation of IRI infrastructure projects* under the European Regional Development Fund (ERDF), and stands as one of the main objectives of the forthcoming period.

The Institute adopts this document with the aim of harmonising its activities with the new legislative framework in the Republic of Croatia defined by the new *Law on Higher Education and Scientific Activity* (Official Gazette - Narodne Novine NN nr. 119/22; hereinafter 'the Law') and the *Law on Quality Assurance in Higher Education and Science* (Official Gazette - Narodne

Novine NN nr. 151/22), as well with the aim of harmonisation with the main strategic documents on the national level, such as *National Development Strategy* (NRS 2030), *Strategy of Smart Specialisation for the Period up to 2029* (S3 2029) and the *National Plan of Recovery and Resilience 2021–2026 (NPOO)*.

2. VISION AND MISSION

2.1. Vision

The Institute is a respected, influential scientific and professional institution in national and international frameworks and is a relevant partner to economic entities, contributing to the sustainable development of agriculture and tourism.

2.2. Mission

The mission of the Institute is to carry out excellent scientific research and professional work in the field of biotechnical and social sciences, and to transfer knowledge that contributes to the preservation of biodiversity and natural resources, as well as to sustainable development of the economy and rural spaces in national and international frameworks.

3. ANALYSIS OF THE INSTITUTE'S POSITION AND POTENTIALS IN THE RESEARCH AND BUSINESS ENVIRONMENTS

3.1. Basic Starting Points and Legal Frameworks

The Institute operates according to:

- *Laws on Institutions* (Official Gazette - Narodne Novine NN nr. 76/93, 29/97, 47/99, 35/08, 127/19, 151/22),
- *Law on Higher Education and Scientific Activity* (Official Gazette - Narodne Novine NN nr. 119/22),
- *Law on Quality Assurance in Higher Education and Science* (Official Gazette - Narodne Novine NN nr. 151/22),
- and the laws and by-laws of the Republic of Croatia by which the work of public scientific institutions and the Institute is regulated, in accordance with the legal acquis of the EU.

The legality of the Institute's operations and activities are additionally regulated by internal acts (e.g. Statute, rulebooks).

The Institute's overall activities and strategic goals for the next period are defined on the basis of a series of strategic documents adopted by the government of the Republic of Croatia or the central bodies of state administration:

- *National Development Strategy* (NRS 2030),
- *Strategy of Smart Specialisation for the Period up to 2029* (S3 2029),
- *National Plan of Recovery and Resilience 2021–2026* (NPOO),
- *Competitiveness and Cohesion Programme 2021–2027* (PKK),
- *Development Plan for Research infrastructure in the Republic of Croatia 2023–2027*,
- *Croatian Qualification Framework* (HKO),
- *Perennial Financial Framework 2021–2027* (VFO),
- *Strategic Plan of Common Agricultural Policy of the Republic of Croatia 2023–2027*,
- *National Programme of Preservice and Sustainable Use of Plant Genetical Resources for Food and Agriculture in the Republic of Croatia for the Period from 2011–2027*, and
- other series of international strategic documents and guidelines.

3.2. Institute's Activities

Scientific activity in the field of biotechnical and social sciences is the Institute's basic activity as a part of international – predominantly European – scientific space. The Institute encourages the implementation and systematic enhancement of scientific activities and disseminates research results due to strengthen the competitiveness of the Croatian economy. Beside such basic activities, the Institute carries out other activities defined by its Statute.

The Institute carries out scientific activities based upon:

- liberty and autonomy of scientific ingenuity,
- open science and innovations,
- scientific methods as instruments to create new knowledge,
- ethics of science and business,
- public availability of scientific research results,
- care for researchers career development,
- encourages career development for young scientists – assistants and higher assistants,
- research with the purpose of generating innovations and developing technologies in the national and European research space,
- links with the education system,
- international standards of quality measures and networking in the European institutes network,
- encouraging and accepting the specifics of national contents,
- protection of intellectual property,
- safeguarding and protection of natural resources, and
- social responsibility of scientists.

3.3. Organisation Structure

Internal organisational units are:

- Head office,
- Expert services:
    - Department of General, Legal, Human Resources Business,
    - Department of Accounting and Financial Business,
- Departments:
    - Department of Agriculture and Nutrition:
        - Wine Laboratory,
        - Food Technology and Biotechnology Laboratory,
        - Soil, Plant and Water Laboratory,
        - Genetic Laboratory,
        - Plant Protection Laboratory,
        - Phenotyping Laboratory,
        - Wine Cellar *Minivinification*,
    - Department of Economics and Rural Development,

    - Department of Tourism,
- Experimental Agricultural Estate,
- Technology Development Centre (TRC), and
- Office for Internal Science Assurance and Quality Enhancement.

The Institute is governed by the Administrative Council and the head of the Institute. The Scientific Council executes the work of the Expert Council of the Institute. The other bodies of the Institute are the International Scientific-Economic Advisory Board, the Ethics Committee and the Disciplinary Commission.

3.4. The Scientific and Business Environment

In harmony with its vision and mission, the Institute carries out scientific research and professional work in the field of biotechnical and social sciences, developing knowledge that contributes to the preservation of biodiversity and natural and traditional values, as well as to developing the economy and rural spaces in national and global frames. The Institute carries out basic, developmental and applied research through activities in the framework of a series of scientific research, developmental and professional projects. The development roles of the Institute in the surrounding, in the branch of agriculture and tourism are strengthened through research carried out with the aim of solving actual challenges and needs on national level, but also with international importance. The Institute scientific activity in international plans is recognisable through numerous collaborations on scientific research projects, as well as by employee participation in the work of international scientific and professional bodies. The relevance of the Institute's scientists' ideas was confirmed by carrying out projects financed from the Croatian Science Foundation, EU funds (e.g. EPFRR, Interreg, MED), as well in the EU Horizon 2020 programme. The successful accomplishments of projects were confirmed through the publication of scientific papers in prestigious international scientific journals with the highest impact factors and with a continuous progressive increase of the number of published papers each year. The Institute is a unique institution in the Republic of Croatia and beyond, which nurtures a multidisciplinary approach in research connecting agriculture and tourism – two tightly connected, interdependent and indivisible sectors. Therefore, the leading research activities have an interdisciplinary character and are conducted towards the enhancement of agricultural activities, food production and synergy with tourism in the Adriatic environment, respecting the existing spatial–environmental specifics. The Institute's strategic commitment is to establish a strong scientific research infrastructure as a major factor in creating sustainable, wholesome and functional agricultural food systems while also developing sustainable tourism in the Mediterranean.

The Institute is successfully collaborating with the business sector through projects of applied and developmental character, as well through service activities, thereby contributing to societal development, responding to the challenges and needs of the business sector in national frameworks. By accomplishing these tasks through the realisation of scientific research projects and the application of achieved results, the Institute facilitates the development of strategic economic branches in the environment, namely agriculture, food industry and tourism. The abovementioned agenda entails proximity with the business sector and local authorities, in order to assure Institute's intensive knowledge application and enable its inclusion in regional and national economic flows, with the aim of developing a timely response to the challenges of sustainable economic and social development as well as environmental protection. The evidence

consists in numerous signed contracts and agreements with various economic entities and local government bodies. The Institute's collaboration with the business and public sector is manifested primarily through the development of new technologies and products, creation of development studies, business plans, economic and investment programmes, and specifications for protected labels of indigenous products, as well as participation in creating and implementing public expert policies, and more. All of the abovementioned initiatives contribute to the realisation of the vision of establishing the Institute as a scientific and professional authority recognisable in national and international frameworks that contributes to the development of agriculture and tourism and creates new scientific, economic and social values.

3.5. Sources of Finances

Funding for the Institute's operations is provided from the budget of the Republic of Croatia and from other revenues that comprise dedicated and own funds. Among other revenue types, the most common were those from projects obtained in national and international competitive tenders, as well as revenues earned on the open market (mostly through service activities). In the structure of total revenues in 2022, the Republic of Croatia budget provided 42.7%, while other revenues (dedicated and own) composed 57.3% of the budget. Revenues granted on public tenders compose 70.0% of other (non-budgetary) incomes, accounting for 40.1% of the total revenues; revenues from open market compose 12.5% of other revenues, accounting for 7.2% of total revenues; and revenue from seized EU projects compose 9.0% of other revenues, accounting for 5.2% of the total Institute revenue.

Total Institute revenues in 2022 were 24.2% higher than in 2021, including the 9.7% increase of funds from the Republic of Croatia's state budget and the 37.7% increase of other revenues. For comparison, the Institute revenues in 2022 were 57.4% higher than in 2018, including the 25.4% increase of the Republic of Croatia's state budget and the striking 94.3% increase of other revenues.

3.6. Human Resources

On 31 December 2022, the Institute was employing 70 employees in total, 46 women and 24 men, a 25% increase of total employees in comparison to 1 January 2019. Forty-one (41) employees were employed with the revenues from the Republic of Croatia state budget, while 29 employees were employed with the revenues from competitive projects. Among the employees on 31 December 2022, there were 25 doctors of science, of whom 19 occupied scientific positions, three occupied professional positions, and three worked as higher assistants. In the recent four-year period (2019–2022), seven employees had habilitated their PhD. On 31 December 2022, 19 scientist were employed in systematised scientific workplaces, an increase of 11.8% from 1 January 2019. On 31 December 2022, of its 19 scientists, the Institute employed 3 scientific associates, 7 higher scientific associates, 4 scientific advisors and 5 scientific advisors with tenure. On 31 December 2022, the number of employees working as associates (assistants and higher assistants) was 22, 83.3% higher than the number of associates employed on 1 January 2019.

Considering the organisational structure of the Institute, on 31 December 2022, the management and expert services accounted 13 employees, Department of Agriculture and Nutrition had 44 employees, Department of Economics and Rural Development three, Department of Tourism five, and the Experimental Agricultural Estate was five.

3.7. The Scientific Infrastructure

The Institute's basic infrastructure consists of the main building and other spaces in other separate buildings, all on the campus of the Institute. Within the main building there are office spaces, particular laboratories (Wine Laboratory, Food Technology and Biotechnology Laboratory, Genetics Laboratory, Plant Protection Laboratory), sensory analysis hall, library, meeting hall and other auxiliary spaces. A separate building within a newly renovated space houses the Plant Protection Laboratory and Phenotyping Laboratory. The Wine Laboratory and Food Technology and Biotechnology Laboratory are accredited laboratories approved by the norm HRN EN ISO/IEC 17025. The Wine Laboratory is authorised by the Ministry of Agriculture for the performance of official tasks of physical-chemical wine analysis and related products for the purposes of placing the aforementioned products on the market, while the Food Technology and Biotechnology Laboratory is authorised by the Ministry of Agriculture to perform analyses of olive oil with the purpose of official controls. The equipment of the laboratories is in a very good or excellent state, providing necessary analytical support for excellent scientific research pursued at the Institute through projects, and also by laboratory services for the open market. In the scope of the laboratories, the Institute has active panels for sensory analysis of wine and olive oil, procuring their activities according to the accredited norm HRN EN ISO/IEC 17025. The Panel for Sensory Analysis of Extra Virgin Olive Oils is listed on the list of official panels of the Ministry of Agriculture and the EU, and is acknowledged by the *International Olive Council* (Madrid, Spain).

The Institute owns 31.30 hectares (ha) of land, of which 16.89 ha are under experimental plots, according to the following structure: vineyards 3.83 ha, olive groves 1.22 ha, fig plots 0.26 ha, arable plots 11.25 ha, protected covered space 0.10 ha, pastures 0.14 ha, meadows 0.09 ha, moreover forest land 2.89 ha, and other (e.g. yard, roads, parking) 11.52 ha. In the assembly of the Experimental Agricultural Estate (which also contains the Institute's wine collection plantation), indigenous varieties of olives, figs, garlic, shallot, Kozjak onion, and diverse aromatic herbs are grown. There are also other plantations used for scientific research and professional work and are participating in the *National Programme of Preservice and Sustainable use of Plant Genetical Resources for Food and agriculture in the Republic of Croatia for the period from 2011 to 2027*. Beside the open spaces, the Experimental Agricultural Estate has organised its work in several protected greenhouse spaces of different sizes. The Experimental Agricultural Estate also has advantageous agricultural machinery that enables excellent-quality research that must be executed in open fields. Of the other capacities for carrying out research and professional work, it is important to highlight the modern wine cellar and olive mill among the Institute's semi-industrial operations.

The Institute was previously granted within the competitive tender of the programme KK.01.1.1.09 – *Preparation of IRI infrastructure projects* for the project KK.01.1.1.09.0030 – *Scientific platform for research and development of innovations in sustainable agriculture and tourism - Reconstruction, extension and equipping of the Institute for Agriculture and Tourism,* which was fully conducted and completed, resulting with planned building documentation including all required permits. The Institute is currently expecting appropriate opportunities and possibilities of financial support (application in tenders, direct support or other sources) for the purpose of expanding and equipping itself to continue the aforementioned project, with the intention of fully modernising and harmonising the research infrastructure, amidst the Institute's other potentials, in order to achieve a significant and comprehensive step forward in positioning the Institute prominently within the EU and the global research space.

3.8. Scientific and Professional Activities

The Institute's scientific activities in the current period are assessed on the basis of participation in the implementation of domestic and international competitive projects, as well as on the basis of the number and quality of scientific papers published in journals indexed in the database of *Web of Science* (*WoS*). During the past four years (2019–2022), the Institute was approved as leader or partner institution for financing 35 scientific and IRI projects on competitive tenders, comprising 7 international projects (1 Horizon 2020, 1 PRIMA, 2 Interreg MED, 1 ECPGR, 2 Erasmus+), 10 projects financed from EU funds, 16 projects of the Croatian Science Fund (of which 11 projects were for young researchers' career development) and 2 projects of Adris Fund. Formalised collaboration with foreign partner institutions or associates was accomplished within the frame of ten projects. Of the projects approved for financing in the period 2019–2022, 21 projects were characterised as interdisciplinary, based on the co-working of researchers and associates from at least two scientific disciplines, while 23 projects were involved with applied research. Moreover, a larger number of such projects (approved for financing before that period) were implemented at that time (2019–2022).

Regarding the mobility of personnel, in the past period (2019–2022) one scientist and five assistants from the Institute spent at least one month at another institution, while one scientist and four younger researchers (assistants – doctorates, higher assistants – post doc, students) from other institutions spent at least one month at the Institute.

In the last four-year period (2019–2022), scientists at the Institute published 157 scientific papers in journals and collections of papers indexed in the *WoS* databases – an increase of 89.2% from the 83 papers published in the prior four-year period (2015–2018). Of the papers published in the period 2019–2022, 38.2% were published in the journals of first quartile (Q1) according to the *Journal Citation Report* (Clarivate Analytics, USA, 2022). The international co-authorships in the last four-year period yielded 62 published papers. Scientific papers of the Institute's scientists with co-authorships were cited 949 times in the past period (2019–2022) with an *h*-index of 16.

Through the last four-year period (2019–2022), Institute scientists presented their results on numerous international scientific conferences. In the same period, Institute scientists published 12 non-periodical publications.

A significant share of the Institute's employees' activities in the past period (2019–2022) involved work for the open market, business stakeholders on the market and formalised collaborations with public bodies. We have accomplished 12 formalised collaborations with market and education stakeholders (i.e. contracts, agreements), 90 contracted projects providing services to business and other public stakeholders, and 27 formalised collaborations with state administration bodies and other public-sector bodies at national and international levels. Pre-existing collaboration was continued with business stakeholders, public sector stakeholders and physical persons through service activities.

The Institute's employees were engaged also in education at the BSc, MSc, and PhD levels, as well as polytechnic studies, teaching classes and mentoring students.

3.9. *SWOT* Analysis

In order to realistically elaborate the Institute's strategic goals and specific objectives in the forthcoming period, we considered the estimations of the influence of current and future strengths and weaknesses (i.e. opportunities and threats) arising from internal circumstances at the Institute, as well as from the local, national and wider international scientific environments. For that purpose, we have developed this *SWOT* analysis (i.e. *Strengths*, *Weaknesses*, *Opportunities*, *Threats*):

Strengths:

- Long tradition of scientific research and professional activities in the field of agriculture
- Active role in agriculture and tourism development in local and international frameworks
- Conducted infrastructure project KK.01.1.1.09.0030 – *Scientific platform for research and development of innovations in sustainable agriculture and tourism - Reconstruction, extension and equipping of the Institute for Agriculture and Tourism* - obtained valid construction permit
- Adequate level of equipment for particular activities (laboratories, Experimental Agricultural Estate, wine cellar)
- Accredited and authorised laboratories and panels for psychical-chemical and sensory wine and olive oil analysis
- Valuable collection plantations with indigenous species and varieties (vine grapes, olives, figs, vegetables, aromatic and medicinal herbs)
- Age structure (average employees age structure below 50 years)
- Unique interdisciplinary teams (agriculture, food technology, biotechnology, STEM/biotechnical sciences, economics/tourism) within the Institute
- Experience in carrying out internationally competitive projects, project financed with EU funds and internationally evaluated projects
- Experience in national and international collaboration (participation in international projects, publications, expert groups, etc.)
- Growing trend of scientific publications and scientific papers in Q1 journals
- Experience in collaboration with business stakeholders, public, national, regional, and local authorities

Weaknesses:

- Inadequate number of scientific and professional jobs/workplaces
- Inadequate number of employees in administration (preparation and implementation of EU projects, collaboration with business stakeholders, professional services)
- Lack of workspaces and inadequate scientific infrastructure (e.g. offices, spaces for laboratories and equipment)
- Sub-optimal number of international collaborations in the frame of projects with highest validity and level of scientific excellence (e.g. Horizon, ERC)

- Sub-optimal number of outgoing and incoming personnel interchange of scientists and associates
- Sub-optimal ability to attract recognised scientists from the country and abroad (due to, e.g., inadequate infrastructure, international reputation and influence)
- Uneven scientific productivity of researchers
- Sub-optimal representation of scientists in particular research fields
- Sub-optimal average and total citations
- Sub-optimal number of formalised collaborative projects in collaboration with the business stakeholders, technology transfers to the pivate sector and service projects for the business stakeholders
- Sub-optimal number of participations in activities of national importance through formalised collaboration with state administration and public-sector bodies
- Sub-optimal level of digital business and building energy efficiency

Opportunities:

- Conducted infrastructure project KK.01.1.1.09.0030 – *Scientific platform for research and development of innovations in sustainable agriculture and tourism - Reconstruction, extension and equipping of the Institute for Agriculture and Tourism* – obtained valid construction permit – possibility of immediate application to the forthcoming tenders or direct allocation funds
- Possibility for stronger development and increased financing through programme contracts with the Ministry of Science and Education
- Compatibility with strategic documents and strategic development aims on national and international levels
- Agriculture and tourism are economy sectors of strategic interest and importance for regional and Croatian development
- Acting in the prospective area of biotechnical sciences that are part of the STEM field – globally recognised and included in the strategies of science, education and economy development
- Availability of projects financed by EU funds
- Additional development and better strategic positioning by entering the EU research schemes
- Country borderline vicinity and possibilities of cross-border projects applications
- Particularity in national and international frames considering the possibilities of executing unique interdisciplinary and multidisciplinary research and professional work (STEM/biotechnical sciences + social sciences/tourism)
- The Republic of Croatia has large potential for developing agricultural and food products with added value and for their placement through tourism
- Development and protection of autochthonous and original agricultural products and processes with the possibilities of their quality market preparation and their placement through tourism and catering

- Connections with the economy and opportunities for strengthened participation in knowledge transfer into the economy
- Connections with the units of local and regional authorities and opportunities for stronger participation in overcoming challenges and demands
- Possibilities of involvement in educational processes within the framework of existing and new academic programmes and lifelong education

Threats:

- Banned hiring in public services and difficulties in opening new employment posts
- Outflow of employees after employment contract expiration (continuation of employment is not possible)
- Inadequate, low salaries of technical and administrative personnel and motivation difficulties due to increased work volume
- Restructuring of public institutes, without an elaborated model that would not include or emphasise the determination of current research capacities and research missions of each institution
- Joining incompatible and unrelated institutions as part of the possible restructuring of public scientific institutes, loss of legal personality, or autonomy reduction in financial means and property management and independence in organising scientific work and performing other tasks
- Unresolved property ownership relations or court disputes with owners of neighbouring plots and co-owners of real estate
- Continuous pressure by construction lobbies on land owned by the Institute
- Problems with pre-financing or co-financing of certain projects (e.g. significant accumulated own funds of the Institute are required, while the return of pre-financed or co-financed funds usually significantly exceeds the scheduled deadlines, long-term public procurement, non-compliance with contractual deadlines, slow evaluation of projects and reports)
- High costs of equipping and maintaining laboratories (due to, e.g., inflation, economic crisis)
- Insufficiently consolidated local and national agricultural and food production, which would significantly financially support applied research and development of innovations at the Institute
- Mistrust of the part of the public about scientific activities in general

4. CHALLENGES AND DEVELOPMENT DEMANDS

4.1. Scientific Productivity and Quality of Scientific Research Work

The Institute faces challenges of scientific productivity and quality, and regarding excellency in scientific research work.

In the previous four-year period (2019–2022), 7 international projects were granted by competitive tenders; 10 projects were financed with EU funds, and 18 projects with national funds (Croatian Fund for Science and similar). During the same period, the Institute scientists published a total of 157 scientific papers (*WoS*), of which 60 (38.2%) were published in the first quartile (Q1; according to *JCR* reports). The total number of citations for published papers in the period 2019–2023 was 949 with *h*-index 16 (*WoS*), measured in October 2023. With a significant number of granted projects with more than two published papers per employed scientist each year (*WoS*), the Institute was one of the most successful public institutes in the Republic of Croatia and comparable to similar institutions abroad. However, in terms of the citation numbers and *h*-index, in international relations there remain possibilities for significant progress. Based upon the abovementioned data, there still exists a necessity for enhancing scientific productivity, especially for the quality of the Institute's scientific work, as a basic indicator of its fundamental task and basis for respectability and impact in the national and international scientific communities as well as the general public.

As one of the priorities in the forthcoming period, the Institute will extend its scientific productivity, especially the quality of scientific and professional work that will manifest through an increased number of successful project applications to competitive tenders, increased number of scientific papers (Q1) in journals cited in *WoS* and *SCOPUS* citation bases, as well as in A1 journals and internationally reviewed collections of papers for scientists from the social sciences field and enhanced number of citations and *h*-index. In addition to directing and encouraging scientists and young researchers in the Institute to carry out such activities through various internal measures, as well as revising the relevance and actuality of certain research disciplines with an emphasis on their internationalisation and increasing interdisciplinarity through international collaboration (on the basis of this document), further financial investments are necessary through activities that contribute to improvements of scientific productivity and the excellence of the Institute's scientific and professional work.

4.2. International Collaboration and Scientific Activities

The Institute is challenged with issues of international collaboration and international scientific activities.

In the previous four-year period (2019–2022), the Institute was profiled as one of the most successful Institutes in Republic of Croatia, considering the number of competitive scientific research projects financed from national resources, and published scientific papers in scientific journals indexed in referent *WoS* database in regards to the number of employed scientists. During the previous four-year period the Institute scientists had published in total 157 scientific papers (*WoS*), 62 (39.5%) of them in collaboration with international co-workers. In collaboration with foreign partners/co-workers, 10 projects were contracted, accounting for 31.4% of the total number of granted competitive scientific projects. Of these, 7 projects were financed from international sources. The number of incoming personnel mobility longer than one month (scientists and associates) was 5, whilst 6 were outgoing. The Institute participated in numerous international conferences, and the Institute itself was the main organiser of two international conferences with numerous participations in co-organisation and in organisation and scientific committees of other conferences.

Considering the implementation capacities in terms of human potentials and infrastructure, as well the experience in conducting other projects, is was estimated that the Institute's international collaboration and engagement in internationally funded projects has not reached its full potentials.

As one of the priorities in the forthcoming period, the Institute intends to upscale its international collaboration and international scientific activities on an advanced level, with the aim of enhancing its relevancy, augmented importance and impact for research results created at the Institute and increase international recognition, respect and influence in both the EU and global research spaces. Besides directing and encouraging Institute scientists and young researchers to perform such activities with various internal measures, with revision of relevancy and actualisation of certain research disciplines with emphasis on their internationalisation and increase of interdisciplinarity through international collaboration (based upon this document), the increase of co-financing is necessary, especially for activities that contribute to the increased level of international collaborations.

4.3. Human Potentials Development

The Institute is challenged by issues connected to development of human potentials, primarily employment possibilities, advancements, work quality and results.

In the previous 10 years, and particularly in the previous four years, the Institute has noted a significant enhancement of human potentials. On 31 December 2018, the Institute employed a total of 56 employees; by 31 December 2022 that number was 70, but during that span, the figure had reached as high as 80 employees. At the end of 2022, the Institute was employing a total of 19 scientists at its scientific workplaces, compared to 17 scientists at the end of 2018; on 1 January 2019, there were 12 associates (assistants and higher assistants), whereas on 31 December 2022 that number had almost doubled to 22. Beside the two scientific workplaces that were fulfilled based on the redistribution of existing development coefficients, the established increase of the total number of employees and employed on associate workplaces was secured exclusively using resources obtained from competitive projects. The number of employees financed by the state budget remained almost equal to the established one, when the Institute had a significantly lower budget; therefore the need for employment exists at all levels.

Considering the current and planned development, the Institute aspires to simultaneously develop infrastructure capacities, primarily linked to the continuation of the project KK.01.1.1.09.0030 – *Scientific platform for research and development of innovations in sustainable agriculture and tourism - Reconstruction, extension and equipping of the Institute for Agriculture and Tourism* while increasing all indicators of scientific work excellence, ensuring the rise of personnel employed:

- on scientific workplaces,
- on associate workplaces (assistants and higher assistants), and
- other Institute services – professional and administrative personnel (as a response to the continuous increase of workload that also suggests an increased level of business and fiscal responsibilities).

The Institute will pursue new workplaces and resources for pay rises due to enhancements of workplaces from the resources of the state budget through contracting programmes with the Ministry of Science and Education, in accordance with the criterion of excellence. The Institute has plans to enhance its project activities, and correspondingly increase the number of employed persons using funds obtained from competitive projects, focussing especially on young scientists (assistants and higher assistants), but also educated professional and administrative personnel.

Among the priorities in the forthcoming period are improvements of work quality and excellence of scientists and other employees in the Institute, namely upgrading their scientific and professional competency, concurrency and recognisability. The above mentioned plans will be achieved through continuous investments in education and support to international collaborations, personnel interchanges, participations in projects, particularly the ones that include applied and interdisciplinary research, and other forms of dissemination. Likewise, special support is needed for internationally competitive careers of young and perspective scientists, as well as for educating new doctoral candidates.

4.4. Development of Scientific Research Infrastructure

The Institute faces challenges related to scientific research infrastructure.

With its existing facilities and equipment, the Institute cannot follow the development of existing human potentials and scientific capacities, nor the rapid progress of science, in an optimal way; therefore it is necessary to take certain steps to reduce the gap between the Institute and related international scientific institutions by investing in infrastructure and equipment.

The main existing internal spaces of the Institute (building with ground and first floor, net surface area 1,192.38 m^2), were not originally intended for scientific research, namely laboratory work. Due to significant increases in personnel in the last few years, there is a general lack of space at the Institute. Because the necessary laboratory facilities cannot be installed in most spaces of the Institute, the total area and the share of laboratory spaces are limited and inadequate – and many existing laboratory spaces were adapted with improvised solutions of limited practicality. Besides the lack of laboratory space considering the number of personnel, there is a lack of space for new equipment.

In the last few years, with construction investments, the laboratory spaces in the auxiliary building have been expanded and individual laboratory spaces were equipped in the main building of the Institute. Although significant, these investments did not bring Institute's conditions to the comprehensive functioning level required by contemporary standards of scientific excellence. One of the main causes identified was a lack of dedicated financial resources for such activities.

In the previos competitive tender of the programme KK.01.1.1.09 – *Preparation of IRI infrastructure projects* for the project KK.01.1.1.09.0030 – *Scientific platform for research and development of innovations in sustainable agriculture and tourism - Reconstruction, extension and equipping of the Institute for Agriculture and Tourism,* the Institute was granted with a project, that was fully conducted and completed, resulting with planning building documentation including all required permits. The Institute is currently expecting appropriate opportunities and possibilities of financial support (application in tenders, direct support or other sources) for the purpose of expanding and equipping itself to continue the aforementioned project, with the intention of fully modernising and harmonising the research infrastructure, amidst the Institute's other potentials, in order to achieve a significant and comprehensive step forward in positioning the Institute prominently within the EU and the global research space.

In the meantime, in the forthcoming period, investments and improvements in research infrastructure are necessary, with small-scale interventions, in order to keep pace with the development of modern science. Increased investments are needed in the co-financing of activities that contribute to the improvements of the Institute's research infrastructure, with special emphasis on digital business improvements and energy efficiency of the Institute's premises.

4.5. Collaboration with the Private sector

The Institute faces challenges connected to its collaboration with the private sector, scientific research results and professional work commercialisation.

The Institute has traditionally enjoyed relatively successful collaborations with the economy and environment, directed towards transfers of new information, knowledge and technologies. An important part of such activities is fulfilled through applied research and professional work in the frame of different projects, in addition to service activities the Institute carries out. However, one of the Institute's basic tasks should be highlighted even more brightly, namely the realisation of scientific research and professional work and application of achieved results that directly contribute, encourage and direct the development of strategic economic branches in the environment, agriculture, food industry and tourism sectors. Although the majority of projects that are carried out at the Institute are of the 'applied' type, relatively few are carried out through formalised partnerships and collaboration with the private sector. Most research activities are finished with results publications in scientific journals and dissemination via traditional channels, whereas successfully completed collaborative projects in partnerships with economic entities granted on competitive tenders that have a formalised transfer of knowledge, technologies, or different sources of intellectual property are very rare. In the previous four-year period (2019–2022), 12 formalised collaborations with economy and education entities were accomplished (contracts, agreements and similar). Likewise, despite the impressive number of contracted projects for providing services to the private and public sector (90 contracts in the period 2019–2022), it is necessary to strengthen this kind of collaboration and enlarge the number of such projects.

Beside extrinsic influences, such as the small number of business entities in local and national frameworks with enough financial capacities to co-finance participations in such projects, as well as a relatively small number of calls for collaborative projects in partnerships in the past period, the Institute has recognized own situational factors hindering these activities, such as the lack of financial resources for co-financing various activities of preparing applications and implementing collaborative projects with the private sector, insufficient motivation of scientists due to insufficiently valorised collaboration with the private sector through the system of advancement on the scientific workplace, incomplete administrative and legal framework at the Institute for commercialisation of the results of research, insufficient visibility and recognition of the Institute and its competencies, overall resulting in missed opportunities for collaboration and the transfer of knowledge, technologies or various forms of intellectual property among economic entities.

The Institute's human potentials are rich in knowledge and competencies, experienced in leading projects, adept at solving project problems/tasks, with current modern, in approaching future most modern infrastructure. This significant potential for collaboration with the economy is not being fully used at present. Therefore, in the upcoming period, one of the Institute's priorities will be to strengthen the direction towards applied and developmental research in collaboration with the economy, which will result in innovations and technology transfer, with the aim of responding to the needs and problems of the economy in the closer and wider environment, increasing its competitiveness, as well securing additional financial stability of the Institute through improved commercialisation of research results. This will involve encouraging more significant participation in projects of this nature, while the needs of the environment should be answered with a suitable and timely offer within the service activity.

4.6. Social Responsibility

The Institute faces challenges connected to collaboration with the public sector and participation in activities of public interest.

The Institute has a history of relatively successful collaboration with the public sector, namely with public authorities such as county and local community governments. The Institute's scientists and professionals are making significant contributions to solving various questions of public interest by participating in projects, work groups, commissions and other formal modes of collaboration established by the state administration and other public-sector bodies. In the previous four-year period (2019–2022), 27 formalised collaborations on non-commercialised base were achieved (e.g. contracts, agreements, projects, publications, appointments in work groups, boards, committees) with state administrations and other public-sector bodies at both national and international levels.

Considering the Institute's carrying capacities in view of human potentials, infrastructure, experience in conducting projects and other activities for the business entities, while acknowledging their actual problems, it was estimated that the Institute's collaboration with bodies of state administration and other public-sector bodies in solving various questions of public interest has not yet achieved its full potential.

As one of the priorities in the forthcoming period, the Institute intends to increase its collaboration with the public sector, with the aim of substantially contributing to public goods, generally enhancing the economy and society, impacting the managing structures by solving their challenges and needs, and in creating scientific and professional policies in the Republic of Croatia and the EU. In order to achieve these goals, the Institute will take the initiative, enhance the recognisability of its scientists and professionals, and strengthen the results and impacts of its activities results for the general public.

The Institute also faced challenges linked to the level of business digitalisation, and level of infrastructural energy efficiency, which were at a relatively low level and were not advanced in the previous period. Therefore, it is necessary to take steps forward with these matters.

Particular working processes are relatively outdated and performed in a traditional 'analog' way that decreases business accuracy, efficiency, links and data management. In the forthcoming period, the Institute intends to enlarge investments in digital business components, which will include personal digital skills development and digital infrastructure development, in order to enhance the accuracy, efficiency, safety, transparency and competitive advantage of the whole business in the scientific and professional environment and, in general terms, contribute to Croatia's digital transformation.

Furthermore, the majority of the Institute's existing inner spaces are outdated and suffer from low energy efficiency – and, therefore high energy consumption. To address these challenges, the Institute's plan for the upcoming period is to enlarge investments in processing and infrastructure energy efficiency by diminishing fossil-fuel demands and greenhouse gas emissions, in order to achieve significant impacts of low carbon emissions and environmental protection to lower climate change risks, namely by supporting the transition of climate neutrality in the Republic of Croatia's sustainable development.

The Institute also faces challenges in the form of negative perceptions among a portion of the general public.

The Institute's ability to fulfil its social role is currently hindered by scepticism among a segment of the general public about the general importance and usefulness of science. Public mistrust

diminishes the Institute's opportunities to collaborate and take on higher-quality roles in public life. Intentions for the forthcoming period are to improve the popularisation of science and raise awareness about its importance. To influence public opinion, science will be presented as an extremely socially useful activity that can facilitate development and progress in the community. The intent is to indirectly influence management structures that will ease the consensus upon solving societal important questions, from the Institute's scope of work. Furthermore, amidst the current problem of outmigration by Croatia's educated young population, it is crucial to improve the image of careers in science to present them as significant, essential elements of community development and progress, thereby encouraging younger people to choose scientific careers and remain in the Republic of Croatia.

5. STRATEGIC AND SPECIAL AIMS

5.1. Quality Improvements of Scientific Work

5.1.1. Increase Participation in Competitive Project Financing and Publication Quality

5.1.2. Strengthening International Scientific Collaboration, Visibility, Reputation and Impact

5.1.3. Strengthening Human Potentials

5.1.4. Enhancing Research Infrastructure

5.1.5. Strengthening Interdisciplinarity of Scientific Work

5.2. Strengthening Collaborations with the Economy

5.2.1. Increasing Participation in Applied Scientific Research through Collaborative Projects with Economic Entities

5.2.2. Institutional Advancements for Intellectual Property Management

5.2.3. Improvements of Provisions for Scientific, Research or Technological Services on the Open Market

5.3. Strengthening Social Responsibilities

5.3.1. Strengthening Institute and Public Sector Collaboration on Activities of National Importance

5.3.2. Enhancing the Level of Digital Business

5.3.3. Improving Energy Efficiency – Strengthening the Green Transition

5.3.4. Popularisation of Science

5.1. QUALITY IMPROVEMENTS OF SCIENTIFIC WORK

5.1.1. Increase Participation in Competitive Project Financing and Publication Quality

Measures and activities for special goal achievement:

- Establishment and full functionality of the Office for Internal Quality and Assurance Enhancement
- Strengthening the Institute's ambience encouraging participation in internationally competitive research in the framework of internationally funded and/or internationally evaluated projects
- Encouraging and supporting the Institute's scientists in planning, designing and submitting project proposals with internationally relevant research that respects national specificities, demands and priorities, and is aligned with valid strategic documents
- Facilitating and encouraging rapid adaptations to changes and new trends in research
- Encouraging and supporting scientific collaboration, personnel mobility and inclusion of Institute scientists in scientist networks (co-financing and infrastructural support of the Institute)
- Encouraging partnerships and collaborations with other scientific and public institutions as well as business entities through submission of joint projects (co-financing and infrastructural support of the Institute)
- Ensuring continuous visibility of the Institute's competencies on international portals relevant for submissions of internationally competitive projects
- Improvements of internal communications *Head of the Institute – Department Heads - Heads of institutes - (potential) Project Managers*, related to identification and timely notification of current tenders and invitations, timely notification of the Institute and Department Heads about planned project submissions by potential applicants with the purpose of optimising and rationalising institutional support (e.g. staff, premises, equipment, financial resources)
- Improving internal communication between departments and research groups, and identifying key personnel with the aim of designing and applying interdisciplinary projects involving scientists from different scientific branches and disciplines
- Encouraging and supporting scientists to publish papers in leading scientific journals with high impact factors
- Creating an annual publication plan for scientific papers in the next calendar year, and continuously monitoring its implementation
- Identification of research topics, scientists and groups with below-average success in project funding and productivity in paper publications, identifying the causes and finding solutions with the aim of increasing success or joining more successful topics/scientists/groups

- Distribution of programme contract funds based on excellence, namely success in submission and implementation of projects and publication of scientific papers in leading journals with high impact factors
- Continuation of the evaluation of successful project submission and papers published in leading journals with high impact factors, with internal acts regulating the advancements in the workplace and rewarding above-average successful scientists

Indicators of success in achieving the special goal:

- The Institute's number of successful project submissions to competitive funding sources
- The Institute's number of scientific papers in the WoS database, A1 journals and internationally peer-reviewed collections of papers for social sciences
- The Institute's number of scientific paper citations
- The Institute's *h*-index of scientific papers

5.1.2. Strengthening International Scientific Collaboration, Visibility, Reputation and Impact

Measures and activities for special goal achievement:

- Follow-up activities in the programme frame KK.01.1.1.09 – *Preparation of IRI infrastructure projects* the project KK.01.1.1.09.0030 – *Scientific platform for research and development of innovations in sustainable agriculture and tourism - Reconstruction, extension and equipping of the Institute for Agriculture and Tourism* and establishment of the most modern infrastructure for excellent scientific research and international collaboration
- Strengthening the Institute's ambience in a way that stimulates internationally competitive research in the framework of internationally funded and/or internationally evaluated projects
- Establishing and assuring continuous work of the International Scientific-Economic Council of the Institute
- Encouraging and supporting the Institute's scientists in planning, designing and submitting project proposals with internationally relevant research, aligned with valid strategic documents
- Encouraging and supporting scientific collaboration and inclusion of Institute scientists in international scientist networks
- Encouraging and supporting partnerships and collaborations with other international scientific institutions through submission of joint projects and/or formal collaboration
- Ensuring visibility of the Institute's competencies in international frameworks through strategic approaches
- Encouraging scientific teams with appropriate competencies and scientific reputation to apply and carry out research of excellent quality and international impact for each individual project (leadership by those more successful than average and finding suitable roles for those less successful, with the aim of optimising team efficiency and involving all scientists in project submissions and implementations)
- Education of scientists and appropriate administrative personnel connected with the submission of internationally competitive projects (e.g. workshops, courses)
- Planning employment of specialised and trained professional personnel for administrative leading and coordination at internationally competitive project submissions
- Encouraging and supporting outgoing personnel mobility – departure to doctoral or post-doctoral training at internationally relevant institutions (identification and timely informing about scholarships, co-financing, or financing through projects, administrative support)
- Enforcing shorter stays and longer training periods at internationally relevant institutions

- Creating better conditions to increase incoming personnel interchange – attracting internationally renowned scientists and students with experience in relevant international institutions from abroad to scientific positions, post-doctoral and doctoral training (e.g. administrative support, improvement of infrastructure and material working conditions)
- Encouraging participation in relevant international scientific conferences
- Encouraging participation in international scientific conferences, seminars, workshops and organisations
- Encouraging participation in international scientific expert bodies, networks, committees and work groups
- Modernisation of the Institute's website with improved user-friendliness and greater prominence of key activities, competencies, qualifications and results of the Institute's scientific and professional work
- Encouraging and supporting scientists' publication of papers in journals with excellent impact factors in international co-authorships
- Distribution of programme contract funds based on excellence, namely success in applying and conducting international projects and paper publication in journals with excellent impact factors in international co-authorships
- Continued validation for successful project submissions and paper publications in journals with excellent impact factors with internal acts regulating advancements in the workplace and rewarding the above-average successful scientists
- Valorisation of international work experience in advancements and employments

Indicators of success in achieving the special goal:

- Number of successful applications for internationally financed projects
- Number of project submissions in collaboration with international partners
- Number of successful collaborations with international partners (minimum 5 common publications, project, agreements)
- Number of outgoing scientific personnel interchanges (scientists and associates)
- Number of incoming scientific personnel interchanges (scientists and associates)

5.1.3. Strengthening Human Potentials

Measures and activities for special goal achievement:

- Activities undertaken according to possibilities with the aim of employing scientists assisting, professional, technical and administrative staff (creating new jobs) with funds from the budget of the Republic of Croatia (i.e. with funds within the framework of programme contracts)
- Encouraging submissions and implementations of national and international competitive scientific and other projects that enable employment of scientists, associates (assistants and higher assistants) professional, technical and administrative personnel
- Planning the employment of specialised and educated professional personnel for administrative management, coordinating applications and conducting internationally competitive projects
- Employments in harmony with objective scientific and professional criteria with potentiation of excellence
- Admission of students from all study levels with the aim of conducting final/diploma/doctoral work, practical work performance, etc., which gives insight into the quality of potential new employees
- Ensuring all necessary conditions (e.g. infrastructure, mentorships, financial means) for developing internationally competitive careers of younger researchers, particularly for educating new doctors of science
- Support to younger, perspective scientists in developing internationally competitive careers (e.g. establishing scientific groups, laboratories)
- Supporting scientists and undertaking activities according to possibilities with the aim of enabling workplace enhancements according to objective scientific and professional criteria with potentiation of excellence
- Harmonisation of the Institute's internal acts with actual legal rules that regulate scientific activities, employment and workplace enhancement
- Encouraging collaboration and outgoing personnel interchanges of scientists and associates
- Creating better opportunities for increasing incoming personnel mobility – attracting renowned scientists and students with experience and knowledge transfer towards scientists and associates at the Institute
- Continuous personnel training (e.g. conferences, courses, workshops, seminars) in harmony with demands and possibilities

Indicators of success in achieving the special goal:

- Number of scientific workplaces
- Number of completed PhDs

5.1.4. Enhancing Research Infrastructure

Measures and activities for special goal achievement:

- Follow-up activities in the programme frame *Preparation of IRI infrastructure projects* infrastructural project funded by the ERDF – *Scientific platform for research and development of innovations in sustainable agriculture and tourism – Reconstruction, extension and equipping of the Institute for Agriculture and Tourism* and preparation of other identical and/or similar IRI projects
- Co-financing infrastructure interventions and equipment purchase by means of programme contracts through internal tenders and/or other means based on excellence, namely success in submitting and conducting projects as well as publishing papers in leading journals with high impact factors
- Continuation of activities in connection with purchases in the frame of Rural Programme Development measures in the Republic of Croatia, and encouraging continued applications for similar tenders
- Encouraging submissions of scientific and other projects that enable improvements of infrastructure and equipment purchase
- Optimisation and rationalisation of analytical equipment and experimental estate equipment use, and the allocation of funds from projects and other funds for the maintenance of research infrastructure (e.g. revision of authorities and responsibilities, optimisation of the utilisation plan according to the needs of current projects and work, regular servicing, fair distribution of income)
- Establishing and operating new laboratories (and restructuring existing labs) in harmony with demands and possibilities (e.g. decisions about personnel, personnel education, purchase or conversion of equipment, assurance of material means)
- Encouraging collaboration with related national and international laboratories and other units for the purpose of sharing experience and improving work quality
- Continuous personnel training in connection with managing infrastructure and equipment (e.g. personnel mobility, training, symposiums, courses, workshops)
- Maintaining a portfolio of accredited methods, to be expanded according to demand

Indicators of success in achieving the special goal:

- Conducted project *Scientific platform for research and development of innovations in sustainable agriculture and tourism – Finished extension and equipping* of the Institute of Agriculture and Tourism
- Amount of funds spent on infrastructure
- Amount of funds spent on acquiring and upgrading research equipment

5.1.5. Strengthening the Interdisciplinarity of Scientific Work

Measures and activities for special goal achievement:

- Strengthening the Institute's ambience in a way that stimulates internationally competitive interdisciplinary research in the framework of internationally evaluated and especially internationally funded projects
- Encouraging links among different Institute organisation units and research groups, and also collaboration with scientists and professionals from other institutions in the development and elaboration of ideas, project submissions, publication of scientific papers and books, as well as collaboration with business using an interdisciplinary approach

Indicators of success in achieving the special goal:

- Number of successful project submissions for interdisciplinary scientific projects (associates from at least two different scientific fields)
- Number of scientific books published

5.2. STRENGTHENING COLLABORATION WITH THE ECONOMY

5.2.1 Increasing Participation in Applied Scientific Research through Collaborative Projects with Economic Entities

Measures and activities for special goal achievement:

- Strengthening the ambience of long-term direction on applied and developmental research and submission of such projects
- Encouraging collaboration with the economy through the joint development of ideas (e.g. products, processes, services) with the aim of submitting collaborative projects
- Encouraging and supporting scientists with suitable abilities and inclinations to submit applied and developmental research projects
- Including economic entities' representatives as team members in the application of scientific projects
- Establishing and ensuring work continuity of the Institute's International Scientific and Economic Council
- Planning and ensuring the Institute's visibility as a desirable partner among business stakeholders through an integral strategic approach
- Encouraging scientists and professional personnel to participate in economic gatherings, forums, etc., presenting the Institute's competencies and activities to targeted interest groups and raising the level of public awareness of the Institute's importance
- Encouraging the formalisation of collaborations with business stakeholders (e.g. contracts, agreements)
- Follow-up activities in the programme frame *Preparation of IRI infrastructure projects* infrastructural project funded by the ERDF – *Scientific platform for research and development of innovations in sustainable agriculture and tourism – Reconstruction, extension and equipping of the Institute for Agriculture and Tourism* – ensuring the most modern infrastructure for collaboration with the economy
- Identifying successful examples of good practice for developing innovations, commercialising research and protecting intellectual property, in collaboration with the economy as well as domestic and international scientific institutions, in addition to the transfer and application of appropriate activities at the Institute
- Valorisation of scientists' and other personnel's performance in collaboration with the economy through salary/incentives/rewards, advancements and employment by the Institute's internal acts

Indicators of success in achieving the special goal:

- Number of successful applied research project submissions
- Number of successful submissions for collaborative projects with the economy (at least one associate/partner from the economy)
- Number of formal collaborations with economic entities

5.2.2. Institutional Advancements for Intellectual Property Management

Measures and activities for special goal achievement:

- Establishment and reorganisation of the Institute Technology Development Centre (TRC) in accordance with the *National Guidelines for Technology and Knowledge Transfer* or other identical guidelines with the long-term aim of commercialising research results and the Institute's opportunities for autonomous participation in the processes of technology transfer
- Increasing the number of employees in the TRC and revision of the financing (i.e. with *overhead* means)
- Strengthening the awareness of the Institute more active role needed in economy and society development among scientists and other employees of the Institute and strengthening the ambience that encourages and evaluates applied research, technology transfer, protection of intellectual property such as patents and new varieties, and so on (i.e. commercialisation of research results)
- Education of appropriate personnel (scientists, TRC, legal services) on ways to commercialise research results
- According to demands and possibilities, establishing *spin-off* and *start-up* business at the Institute
- Valorisation of research results commercialisation through pay check / stimulations / awards, enhancement and employment by internal Institute acts

Indicators of success in achieving the special goal:

- Establishment of administrative-legal frame for commercialisation of research results and protection of intellectual property in accordance with the *National Guidelines for Technology and Knowledge Transfer* or other identical guidelines
- Number of successful participations in formalised technology transfer, patents and other forms of intellectual property protection

5.2.3. Improvements of Provisions for Scientific, Research or Technological Services on the Open Market

Measures and activities for special goal achievement:

- Follow-up activities in the programme frame *Preparation of IRI infrastructure projects* funded by the European Fund for Regional Development for conducting the infrastructure project *Scientific platform for research and development of innovations in sustainable agriculture and tourism – Reconstruction, extension and equipping of the Institute for Agriculture and Tourism* – assuring most modern infrastructure for services
- Establishing and ensuring work continuity of the Institute's International Scientific and Economic Council
- Encouraging personnel with suitable abilities and inclinations to participate in developing scientific, research or technological services for the open market
- Planning and assuring visibility and raising public awareness about the Institute as a relevant partner and provider of quality services through an integrated strategic approach
- Encouraging formalised collaboration with business stakeholders (e.g. contracts, agreements) and encouraging business idea development
- Identifying successful examples of good practices as well as the transfer and application of suitable activities at the Institute
- Improvement of organisational processes and procedures with the aim of enabling prompt optimisation and redistribution of infrastructure and equipment use, in accordance with changes and new trends on the open market (e.g. allocation of personnel, revision of powers and responsibilities, coordination of use according to needs and possibilities, regular servicing, fair distribution of income)
- Elaborating collaboration opportunities that make use of the Institute's infrastructure and equipment (e.g. rental, use with professional guidance and/or supervision, external services)
- Collecting feedback from users
- Continuous training of staff (e.g. courses, workshops, training at other institutions)
- Continued valorisation of the success of scientists and other personnel in providing scientific, research or technological services on the free market through salary/incentives/rewards, promotion and employment by internal acts of the Institute

Indicators of success in achieving the special goal:

- Number of contracted projects to provide services to the economy and public bodies
- Revenues from commercial-service activities

5.3. STRENGTHENING SOCIAL RESPONSIBILITIES

5.3.1. Strengthening Institute and Public Sector Collaboration on Activities of National Importance

Measures and activities for special goal achievement:

- Strengthening awareness of the Institute's public role, encouraging and initiating the participation of scientists and other employees in projects and other forms of collaboration to the interests of the Republic of Croatia, under the jurisdiction of state or public bodies – if necessary, upon the request of the aforementioned bodies
- Encouraging and initiating the participation of the Institute's scientists and experts in the work of relevant bodies, networks, committees, working groups, etc., from the scope of the Institute's activities at the local, national, EU and global levels in the creation of scientific and professional policies, solving current challenges and needs, and other activities
- Encouraging scientific and professional work in disciplines and topics that align with current social needs and priorities, the results of which could be used as a basis for creating new legal acts and by-laws to solve current challenges and address needs and other issues from the Institute's scope of activity
- Encouraging the transfer of knowledge that came out of the Institute's scientific and professional work towards various interested groups that is relevant to the creation of scientific and professional policies
- Assuring visibility and raising public awareness about the Institute as desirable partner through an integral strategic approach
- Encouraging formalised collaboration with stakeholders from the public sector (e.g. contracts, agreements) and strengthening mutual idea developments

Indicators of success in achieving the special goal:

- Number of formalised collaborations with public bodies and public sectors (e.g. grants, contracts, publications, appointments into work groups, committees, boards)

5.3.2. Enhancing the Level of Digital Business

Measures and activities for special goal achievement:

- Encouraging the development of digital competencies of scientists and other Institute employees
- Advancement of the Institute's digital infrastructure (e.g. server with databases, protection systems, communication systems, data processing and sharing systems)
- Digitalisation of information flow and access in the Institute's businesses (e.g. enabling 'long-distance' communication whenever necessary/possible, digitalising databases and archive materials, as well as routine process and records; establishment of digital solutions for faster data processing) with the objective of diminishing harmful effects on the environment and contributing to the green transition
- Encouraging designs and applications of scientific and other projects as well as collaboration with the private and public sectors with significantly expressed digital components in conducting and planned results (e.g. digitalisation of processes and services, specialised applications, digital management of databases, access to information for business stakeholders and the general public)
- Digitalisation of knowledge and information transfer, presence and acting in public (e.g. interactive webpage, specialised platforms, publicly available repositories, social networks)

Indicators of success in achieving the special goal:

- Amount of funds spent on digital transformation interventions for the Institute's businesses

5.3.3. Improving Energy Efficiency – Strengthening the Green Transition

Measures and activities for special goal achievement:

- Increasing infrastructure energy efficiency during investments into the Institute (e.g. reconstruction, upgrading, construction, equipping)
- Encouraging the design and application of scientific and other projects as well as collaboration with the private and public sector (products, processes, services) in accordance with the principles of green transition, contributing to sustainable development, lower energy use and the transition to clean energy, using existing and new alternative energy sources, digitalisation, stimulating green and blue investments, developing circular economy and bio-economy, reducing CO_2 emissions, strengthening the Republic of Croatia's self-sufficiency in food production, preserving and renewing the ecosystem (including biodiversity), and other similar efforts in the spirit of sustainability
- Compliance with the principles of green transition in Institute operations overall

Indicators of success in achieving the special goal:

- Amount of funds spent on upgrading the Institute's energy efficiency

5.3.4. Popularisation of Science

Measures and activities for special goal achievement:

- Encouraging the transfer of knowledge created from scientific and professional work at the Institute towards various interest groups and the general public through workshops, seminars, lectures, media presentations and the like
- Assuring visibility and raising public awareness of the Institute as a major contributor to the economy and social development through an integrated strategic approach – creation of annual plans for public appearances (e.g. defining responsibility and criteria for public appearances, keeping a detailed schedule)
- Modernising the Institute's webpage with enhanced user-friendliness and greater prominence of key activities, competencies and qualifications, as well as the results of scientific and professional work at the Institute
- Digitalisation of efforts to popularise science (e.g. interactive webpage, social networks, specialised platforms, repositories open to the public)

Indicators of success in achieving the special goal:

- Number of activities in the science popularisation (e.g. workshops, seminars, round tables, media and social network appearance)

6. RESEARCH TOPICS

The Institute's mission is to conduct scientific research and apply its findings to benefit the Croatian economy, being the precursor to the development of strategic economic branches in the environment, namely agriculture, food industry, agro-economics and tourism. The significant knowledge at the Institute's disposal must be implemented into regional and national economic flows to respond promptly to challenges of sustainable economic and social development as well as environmental protection. Planned activities that will be carried out at the Institute in the 2023–2030 period span a wide spectrum of basic, applied, and developmental research on topics in the fields of biotechnical and social sciences. The topics are aligned and encompass at least one of the components that contribute to important strategic aims defined in national and international strategic development documents for the upcoming period, such as those enumerated in the *National Development Strategy (NRS 2030); Competitive and Innovative Economy; Healthy, Active and Quality life; Ecological and Energetic Transition for Climate Neutrality; Self-sufficiency in Food and Bio-economy Development; Digital Transition of the Society and Economy;* and *Strengthening Regional Competitiveness*.

6.1. AGRICULTURE AND ENVIRONMENT

6.1.1. Adjusting Agricultural Production to Climate Change

Most of the current challenges facing agricultural production are connected to climate change phenomena, such as annually rising temperatures and extreme weather events that endanger production (e.g. extreme temperatures, floods, droughts). In order to quantify the effects of climate change on agriculture, especially horticultural production, it is necessary to acknowledge its effects on physiological plant responses, namely growth, development, productivity and quality. Considering that climate change influences the agricultural production systematically, the approach to finding solutions must be systematic as well. Even a minor increase of average temperature increases plant transpiration and reduces the efficacy of photosynthesis and distribution of assimilates. However, it also significantly affects plant phenology, shortening the vegetation, speeding up fruiting, and often leading to earlier ripening and lower product quality. In addition, the problem is further complicated by its localised geographical specificity – that is to say, no global solution exists for this global problem. In accordance with the problems listed at the EU level, a European Green Plan was launched, providing guidelines for the EU's green transformation towards becoming a climate-neutral continent. All planned topics were elaborated with this determinant in mind, and all aim to contribute to developing agriculture and tourism based on the principles of the Green Plan, namely the green transition.

6.1.1.1. Innovative Technologies and Processes for Agricultural Production of High-quality and Added-value Foods

At present, technological development is in full swing, and creating innovative solutions for enhancing agricultural production may contribute to ensuring high, stable yields and competitiveness on the new technologies market. New technologies contribute to sustainable economising of natural resources such as soil and water, monitoring and control of plant diseases and pest distribution as well as the effects of climate change on agricultural cultures,

detecting variability in vegetative plant growth within the same plantation and eliminating the causes of variability, and obtaining products of higher quality and health value. The consequences of climate change are even more pronounced in horticultural production, especially fruit growing and viticulture, because these are perennial plantations that are hard to replace and have a long waiting period before the start of fruiting and full yield achievement.

The use of hyperspectral and multispectral cameras, sensors, wireless and GPS technologies, drones, spectroscopy (NIRE, EIS) and similar technologies makes it possible to gather vast amounts of information within a short timeframe. These technologies are especially important in field trial production circumstances because they enable fast problem detection – and in turn, a faster reaction. However, these are still in the development phase and are relatively expensive for wider use. Therefore, it is necessary to use a multidisciplinary approach in equipment use, and especially when interpreting collected data by using complex statistical models. Research connected with the development, testing and application of advanced technologies is planned in the fields of viticulture, fruit growing (olives) and vegetable growing, in order to adapt existing production systems to new ecological circumstances; the goal is to achieve maximal potential advantageous use of these changes and to avoid, or at least mitigate, threats to which production is exposed.

6.1.1.2. Carbon Sequestration

The modern way of life, as well the systems of modern agricultural production, generate large quantities of various organic materials on a daily basis, such as communal sludge, olive pomace, pruning residues from fruit plantations and vineyards, green residues from parks, forest biomass, and organic waste from households. Each of theseorganic materials, although treated and disposed of as waste – often at considerable cost – in fact represents a potentially valuable source of organic matter, biogenic elements and other bioactive compounds (i.e. compost or biochar). Besides the sustainable aspect of organic material valorisation for use in agricultural purposes, the other very important aspect is influence on climate change. The methods currently used to dispose of organic materials (e.g. depositing, burning) emit significant volumes of greenhouse gases; on the other side, the valorisation of these materials in the form of biochar sequesters carbon and thus helps reduce the emission of greenhouse gases that contribute to climate change. Simultaneously, with their contribution to environment protection, these areas of research could create new possibilities of additional income generation for business entities and family farms. As referenced above, optimising the disposal of organic materials by converting them into valuable commodities for use in agriculture represents a sustainable way of biomass management that forms a quality base for the circular economy.

6.1.1.3. Plant Protection

It is assumed that climate change will affect not only the growth, development and survival of plant pathogens, but also their host sensitivity. Thus, it will be necessary to significantly modify the approach to plant protection. In the modern globalised world, plant pathogens can be easily transported across large distances and introduced to areas where they were not present before. If they encounter suitable growth and development conditions, they can multiply and spread quickly; therefore, rapid identification of such invasive species is essential to prevent epiphytotic disease. In these research topics, diagnostics will focus on the causative agent of plant diseases that currently represent threats to agricultural production, but also on other pathogens – latent or less immediately significant – with the potential to become more dangerous. Various serological, molecular or biological methods and diagnosing techniques will

be used. In addition to diagnostics that aim to prevent the spread of infection, as well as the efficacious sanitation of possible and future damages, pathogenic infection of plants will be examined, along with the pathogens' influence on the content and quality of the host, as well as its tissues and products, and the efficacy of bioactive compounds for agricultural culture protection will be tested. Such results could show their importance in the estimation of possible damages and in control of different plant diseases at present, due to the fact that the area is relatively weakly surveyed. Because climate change and globalisation are responsible for the proliferation of invasive species, the study of agricultural pests will also represent a significant research area in the forthcoming period.

6.1.1.4. Secondary Plant Metabolites in Circumstances of Abiotic and Biotic Stress

There is growing interest in products and compounds (predominantly plant phenols) applied as food supplements, nutraceutics and cosmoceutics. Also, as pre-infectious antibiotic compounds, phenols and polyphenols play an important role in host plants' chemical defences against plant pathogens. The syntheses of secondary metabolites are part of adaptive strategies that lead to plant tolerance towards different stressors. Therefore, the modulation of environmental factors (e.g. temperature, moisture, level of CO_2) related to climate change is in direct connection with the production of plants' secondary metabolites. The main aim within the frame of this topic will be the development of innovative protocols that help to increase, modulate and/or stabilise chosen bioactive compounds in different plant species. Protocols will include the use of external trial fields, green houses and vegetation chambers with the aim of simulating various abiotic and biotic factors that lead to the accumulation of desired bioactive components in selected plant species.

The implementation of the proposed concept will establish a strong and competitive research foundation in the field of plant nutrition and physiology, simultaneously connecting these with climate-change research, functional food and plant protection, while also ensuring that scientific results can be commercialised (i.e. focused research and service for business entities). Such a vision predicts the long-term development of innovative agricultural production of secondary plant metabolites, while at the same time also providing additional services for the determination of phenol profiles of different plant-based food products as well as plant-derived medical matrixes for individual producers, the food processing industry, and small and medium enterprises. Such a research concept would support the needs of Croatian and EU sectors connected to functional food, as well the sustainable agricultural development.

6.1.2. Environment and Biodiversity

The second important segment of research that is closely linked with this series of strategic documents is biodiversity and its importance in sustainable agricultural production and balanced ecosystems.

6.1.2.1. Plant Genetic Sources

The Institute has a very active programme of preserving plant genetic sources for food and agriculture, including vine grapes, as well as continental and Mediterranean fruits, vegetables, and medicinal and aromatic herbs. Through all activities, valuable plant genetic sources are collected and described in specific terms of morphology and phenotype level. Valuable genetic material is further multiplied and preserved in permanent collection plantations. Further work

in collections will include the economic valorisation of selected plant cultures' features with the aim of introducing them to commercial production. This valuable genetic material represents a potential source of variability that may be used in breeding programmes. In addition to the existing methods of genotyping, by introducing high permeable phenotyping techniques, the estimation of morphologic and economic features will be accelerated and the potential for future breeding programmes will be increased.

6.1.2.2. Plant Breeding

Plant breeding is one of the key directions of agricultural production development, both in the Republic of Croatia and worldwide. The breeding programmes for grains, soy and corn are very well developed in the Republic of Croatia, whereas for vegetables only sporadic breeding programmes exist (e.g. a paprika breeding programme in Podravka). Due to the multitude of indigenous vegetable species and traditional cultivars (e.g. cabbage, onion, garlic) that often show specific nutritive value and disease resistance, the possibility for creating new vegetable cultivars are open in accordance with special market demands (e.g. cultivars more resistant to climate change and pest impact, cultivars for ecological production, cultivars with special nutritive or sensory features). In breeding, the Marker-Assisted Selection will be used to obtain desired features (e.g. resistance to abiotic stress) and high permeable methods of phenotyping (e.g. NIR and similar platforms for phenotyping). Also planned is the development of mathematical and statistical analysis methods, as well as the interpretation of complex sets of genotypic and phenotypic data.

6.1.2.3. Ecosystem Services

Ecosystem services can be observed from the aspect of natural populations and cultivated species, but also from a wider viewpoint, as a reflection of global balance that is maintained with proper natural resource management. These services are primarily related to sustainable management of plant and animal genetic sources, respecting natural principles inside the agro-ecosystem. Such an approach ensures highly valuable ecosystem services, such as high-quality food production and other products that contribute to overall quality of life.

Because these scientific areas are relatively poorly developed in Croatia, it is necessary to establish a special research polygon on which a systematic management of mixed agricultural-forest ecosystem could be managed, and possibilities of sustainable management with autochthonous and introduced flora and fauna tested. The goal is to unite different aspects of research and follow the dynamics of natural and cultivated populations with an aim to make plans for sustainable management and environmental protection. Special attention will be paid to alternative management manners for invasive species, with emphasis on their potential development for service provision in the ecosystem in agriculture, pharmaceuticals, medicine and other fields. All mentioned can be additionally valorised through connections with research in the field of social sciences – especially tourism – as well with economic system sustainability.

Special attention will be paid to new approaches of data collection and processing, such as the application of new digital technologies (Geographic Information System - GIS) and the 'citizen science' model. In response to modern environmental crisis that includes climate change, loss of biodiversity, air pollution, appearance and spreading invasive species, measures will be undertaken to raise public awareness about the importance of education on the environment.

6.1.2.4. Genetic and Genomic Biodiversity

In times of intensive and quick environmental changes, the capacity of species to adapt to such changes is the key to ecosystem elasticity. The aim of biodiversity research is, from the starting genetic and widened genomic aspect, to obtain genetic data for detecting and tracking genetic diversity among both wild and cultivated species as well as their potential for adaptation. By collecting and analysing materials from genetic and genomic aspect data bases of polymorphism of natural and controlled populations that will become the base for evaluation of genetic biodiversity, population structure and demographic history, and thereby the base for development of targeted research activities which may result with different recommendations and directions for protection and maintenance of natural and agricultural ecosystems.

In the implementation of mentioned research, targeted species will be analysed on different levels, from genetic (using different molecular marks), up to genomic (using HTS - High-Throughput Sequencing) in collaboration with national and international institutions. A special challenge in the forthcoming period will be the application of new technologies in the area of synthetic biology (CRISPR/Cas9 and other tools for targeted genome modification) with the aim of plant breeding and finding new solutions to present-day challenges, such as demands for increased yield and quality, more robust resistance to diseases and better adjustment to environmental circumstances.

6.2. FOOD QUALITY

The Republic of Croatia, the whole Mediterranean area, and the EU are territories with great sensitivity to high quality demands of agricultural production; this is perhaps most conspicuous in the multitude of regionally specific protected products. Furthermore, there is an important space for enhancement in terms of production harmonisation and product quality, with policies for environmental protection and green transition, connected with sustainable production and promotion of so-called 'healthy living'. Modern trends in production order efficacy are increasing, in the sense of creating more products, using fewer resources spent, with reduced or zero effects on the environment. Beside this, greater competitiveness is achieved with specific and recognised products, whether it concerns products with clearly highlighted territorial connections (ZOI, Protected Origin Label; ZOZP Protected Label of Geographic Origin), other products with established and highlighted added value, and especially products that may be directly included in proper and healthy lifestyles (e.g. ecological products, functional food, nutritiously valuable and advanced products). Therefore, modern science faces new challenges, with the aim of production support for sufficient quantities of food with suitable quality and added value (biological activity, sensorial quality, nutritive value, product security) along with sustainable resource use.

The main goal of research that will be carried out in connection to food quality is the valorisation of agricultural food products through knowledge acquisition, which will contribute to production sustainability while preserving and enhancing different views of its quality. The research aim is to acquire knowledge useful for increasing both production efficacy and income (e.g. yield/randman, by-products, diminishing negative environmental effects, diminishing pollution risks), revitalisation of endangered species, advancement of existing and creating new processes and products while advancing their features in terms of biological activity, nutritional and health value, and sensory quality. Research will be oriented towards overcoming current challenges and preventing possible problems in relevant sectors, taking into consideration not only global priorities and relevance, but also national strategic interests.

Research will continue to centre on plant culture products that have been traditional research mainstays at the Institute – namely wine grapes, olives and Mediterranean vegetables, which are the most important question of traditional values preservation and importance for the economy of the Adriatic part of the Republic of Croatia and the Mediterranean region as a whole. Currently, research on agricultural and food produts are focused on topics of wine, olive oil, vegetables and these research activities will continue and create the axis of research activities. Research will also encompass other important cultures and products with high potential that have not been sufficiently valorised or researched, such as other fruits and vegetables, oilseeds, wild, aromatic and spice plants, etc.

Research results that are planned to be carried out may be used directly to increase the competitiveness of domestic producers of agricultural and food products. In practice, processes and services will arise from research prototypes of innovative or enhanced products, such as through development or selection of species and their products that demand less protective means, are more resistant to climate change and different sources of biotic and abiotic stress, showing better production parameters or having enhanced nutritive or sensory features. Research results will be useful for encouraging and directing the production system and processes towards high production quality through innovative technological solutions, diminishing negative environmental effects and lowering pollution risks; promoting typical, high quality, ecologically acceptable and 'healthy' products (through results that satisfy criteria for publication in leading journals, but are directed toward consumers in connection with features, content, production process and ties to the local area); defining new objective criteria for

proving ties with the local area and traceability and creating enforced plant breeding and finding new solutions to present-day challenges, such as demands for increased yield and quality, more robust resistance to diseases and better adjustment to environmental circumstances.

6.2.1. Innovative Technologies of Food Production and Processing

Regarding food quality, one of the most prominent topics in the frame of research will be the innovation of new technologies – as well as the optimisation of traditional and existing technologies – in the production of agricultural and food products, in harmony with specific ecological and socioeconomic conditions of the Mediterranean region, with a final goal of increasing product competitiveness in this area. By choice and productions technology elaboration adjusted to individual culture potentials, namely species, it is possible to majorly influence enhancement of quality and obtaining familiar local products of excellent quality from which we gain enhanced food content and positive effects on human health, clearer and more prominent connection with local production, and increased product diversification with fewer negative environmental effects. Such research will be carried out within the frame of several experimental production plans at the laboratory and semi-industrial levels, including the Experimental Agricultural Estate, wine cellar, olive mill for olive processing and olive oil production, and spaces and equipment for processing and production of other agricultural food products. Furthermore, part of the research will be directed towards youth and valorisation of neglected and underutilised products of agricultural food production, adhering to the concept of circular economy. Trials that will be conducted at the semi-industrial level with minimal changes may be implemented directly in the production sector. Research will be especially directed toward project and/or contractual collaboration with the economy and the creation of innovations by creating new products, processes and services (or enhancing existing ones) that have the potential to be transferred into the production sector, namely commercialisation and intellectual property protection.

6.2.2. Chemistry of Agricultural Food Products – New Research Methods for Relevant Bioactive, Sensorial and Nutritive Chemical Compounds

In order to objectively quantify and clarify the influence of various factors on different kinds of quality, it is necessary to acknowledge their effects on the chemical content of agricultural and food by-products. Research in the frame of this topic will be based on a strong, modern analytic platform designed to survey relevant chemical compounds in agricultural and food products, with the aim of obtaining comprehensive knowledge about the effects of different factors on their content, and of enhancing the understanding of applications on product characteristics, biological activity, sensorial quality and nutritional value. The axis of the activity will be a study of volatile aroma and phenol compounds through key groups of bioactive secondary metabolites responsible for sensory quality, in which scientists of the Institute oversee these activities and are internationally recognised as possessing the necessary expertise. The activities will also include the development and/or application of analysis methods for other relevant compound groups (e.g. carbohydrates, acids, proteins, lipids, triglycerides, vitamins, glucosinolates, aline/allicin) according to demands and priorities.

6.2.3. Sensory Quality of Agricultural Food Products

Considering the importance of information on different intrinsic and extrinsic product features in the creation of consumer preferences, sensory quality has been shown to be key to a product's sustainability and competitiveness in the market. Research in the frame of this topic will be carried out by Institute employees in the composition of specialised sensorial panels. The main aims will be researching and understanding the connection between influences of different sources of variability in agricultural food production and sensorial product quality, as well as providing developmental assistance in the creation of new products with enhanced sensorial characteristics. Trained panels will use standardised techniques (e.g. discriminative, descriptive and hedonic approach), existing self-developed protocols, and new dynamic methods (e.g. system domination, time intensity). Within the frame of this topic, all factometric analysis will be carried out, and a part of the research will follow the principles of so-called 'sensonomics'. A step forward from the current research will be achieved by organising consumer panels to test their preferences and by determining marketing demands and preferences.

6.3. AGRO-ECONOMICS

Agro-economics involves carrying out research on production, business and societal factors that influence stakeholders' business in agriculture, as well as on the development of the agricultural sector and the entire rural space. Solving problems and finding answers in such a wide spectrum of work demands an interdisciplinary research approach; for agrarian economics this involves collaborations with researchers who study technical and technological issues in agriculture and food production, as well with researchers in the social sciences.

6.3.1. Global Trends in Agricultural Sector Development

The long-term research of agricultural development should be based on sustainability principles that balance the relationships of agrarian-political, social-economic, ecological, technical-technological and energetically effective aspects of agricultural production. Among the challenges of globalisation trends it is necessary to include sustainability research in the circumstances of climate change in agriculture, especially rationally economising with basic resources such as soil, water and air; preserving biodiversity; and lowering greenhouse gas emissions. Due to business enhancements in the precedents of innovations as well as new technological solutions, it is necessary to remove or diminish risks in agriculture (natural, production, technological) that can be achieved with the research that will determine models for optimal strategic, financial and organisational business management.

The direction of future scientific research may support answering questions of organisational, financial and market aspects for stakeholders in agriculture, with the aim of providing scientifically based support to agricultural policy basis, professional participation in national and international institutions, specialised groups and research networks, providing basis and documentation for counselling, informing and public relations, and abstracting and processing all gathered agricultural data on an appropriate basis.

Because agriculture is important component in the globalised economy with multiplicative effects, it is necessary to examine interdisciplinary connections of agriculture with tourism, water supply, forestry and mariculture.

Research findings and survey data will serve as a basis for further development and research, and for the creation of strategic and development documents in the areas of agro-economics.

6.3.2. Rural Development and Diversification in Agriculture

Research in the area of rural development and diversification of rural economies will cover the widening of economic basis in agriculture through the development of other sectors such as processing and direct marketing of own products, tourism, services and crafts. Diversification refers mainly to upgrading primary agricultural production or sales by which employment, efficiency, income and business revenue are increased. Because the current structure of rural and agricultural population is an obstacle to modern development in both quantitative and qualitative terms, it is necessary to research trends of stakeholder diminishment in agriculture, diminishment of the number of active farmers, unfavourable sociodemographic structures and questionable sociodemographic reproduction that will result in questionable use of most agricultural resources. Possibilities of rural development and diversification in agriculture will be surveyed through demographic trends, family transition, and women's role in agriculture and environment. Changes within society at large and among users (consumers) of agricultural

products demand that producers make certain adjustments through investment in knowledge, using new technological solutions, creativity, networking and readiness to accept changes in the environment.

Because rural spaces are becoming highly desirable holiday destinations, many family farms are now providing tourist services, which necessarily involve direct relations between the host and their guests, social skills, knowledge of foreign languages, and the like. Research in the frame of these topics will be directed towards developing tourism on family farms in such directions as olive, wine, village or agricultural. For example, olive oil tourism is a thematic type of gastro-tourism wherein tourists interact olives and olive oil; activities include visits to oil mills, oleotheques, olive farms, fairs and demonstrations dedicated to olives and olive oil. The same applies for tourism connected with other branches of agricultural production such as viticulture, fruit growing, cheesemaking, dry meat production and truffle farming. Research connected to such forms of tourism will be directed towards identifying the motives and future intentions of tourists who visit family farms.

6.3.3. Consumers' Intentions and Preferences towards Agricultural Products

In the frame of this topic, ways of producing, distributing and consuming agricultural products will be surveyed. Consumers increasingly prefer organic products that are produced with minimal effects on the environment (e.g. climate change) and that are perceived as healthy. Given the Institute's original location on the Mediterranean, the priority area of research will be valorising natural and cultural heritage, health effects of food, consumers' healthy lifestyle trends and the so-called 'Mediterranean diet'. Especially through applied research of consumer behaviour (behaviour theories, decision styles, consumer segmentation, values/opinions/motivators for consumption of food/agricultural products), demand and the offer market – as well as typical, original, local and specialised agricultural products of the Mediterranean – will be surveyed.

The purchase of local products supports the local economy and diminishes the ecological footprint. Digital channels and e-markets enable simple and quick review of various products as well as the possibility of delivery from distant locations. Surveys will gather quantitative and qualitative data about consumers' preferences and habits regarding agricultural products, as well as consumer interest in certain products and changes in consumer intentions.

6.3.4. Consumer Panels

Consumer panels – whether composed of individuals from the general population or special groups – will serve as a support in various surveys connected to topics within the fields of tourism, agriculture and food quality. The main emphasis will be on gathering information from (potential) consumers during the development stages of optimising various production processes and agricultural food products; this information will be connected with, for example, data on intrinsic parameters of product quality or with the potential process/products for applications and sustainability on the market.

6.3.5. Food Marketing

Croatian agriculture should continuously adapt to the criteria and demands set by the European and global markets, which are saturated with products of standard, 'uniform' quality, by

orienting itself more towards original and typical products with added value protected by various labels (e.g. origin and source, quality). Protected products may encompass space specificities, cultural heritage and tradition of the area, as well as special quality features that make an important contribution to offers of specificity, recognisability and attractiveness. Surveys will be conducted in the frame of this topic to develop a model of protection and placement for such products as an enduring incentive for agriculture and enhanced sustainability of agricultural production.

6.4. TOURISM

Taking into consideration the current problems in tourism, defined Institute's vision and mission and existing experience of researchers profiles, for the next period two strategic topics of scientific research work are defined: sustainable tourism and special interest tourism.

6.4.1. Sustainable Tourism Development

As defined by the United Nations World Tourism Organisation, sustainable tourism is 'tourism that takes full account of its current and future economic, social and environmental impacts, addressing the needs of visitors, the industry, the environment and host communities'. Research in the frame of sustainable tourism will be connected with the development and methodology testing of sustainable tourism features, digitalisation and innovations in tourism, and analysis of possibilities to implement elements of circular economy in the development of sustainable tourism from the aspects of the tourist industry and consumers. In the field of social sciences, especially tourism, the Institute has conducted – or is conducting – further projects co-financed by the Interreg Mediterranean, Euro-MED and Erasmus+ programmes, which encompass research connected with the topic of sustainable tourism. In sequence of realised projects in the future observed period in the frame of this topic, sustainable tourism will rely upon research of impacts and interrelations of tourist activities, existing resources, visitors and tourists and the role of local community in the aim of sustainable tourism development. Scientific research will also seek to understand consumer behaviour and attitudes among tourist services users in coastal and rural Croatia as well as protected areas. Collaboration will be encouraged among tourism businesses, local and regional administrations/communities, as well as domestic and international scientific research centres in order to facilitate future projects and research.

6.4.2. Special Interest Tourism

Special interest tourism refers to travel undertaken with the primary motivation of interacting or enjoying a special interest. Surveys in special interest tourism sub-field seek to identify consumer preferences that choose tourist travel depending on arrival motives. Although travellers' choices and destinations are influenced by various and often intertwining motives, we can identify one prevailing motive that is common to all. We plan to research consumer preferences regarding choice of touristic travel depending on prevailing motives, such as health preservice, sampling local food and drink, hunting or cycling. Thereby it should be highlighted that such the kind of tourism represents the opposite to the term of the massive tourism that has negative consequences in the destination. In this way, the topic is connecting to the aforementioned although in this whole we start primarily from the motive of the tourist travel. Special interest tourism will be researched from the perspectives of marketing, consumer tourist and visitor behaviour. In the frame of this topic, we plan to design research that considers wine, olive oil, functional food and other regional agricultural products, as well as recreational activities. For this purpose, the Institute will encourage applications and interdisciplinary research projects between researchers in the field of economy inside the areas of social sciences with researchers in the area of biotechnical sciences.

7. ORGANISATIONAL DEVELOPMENT PLAN

Within the framework of the Institute's strategic development plan, with the aim to achieve planned strategic and special goals in the forthcoming period, measures and activities have been foreseen for general organisational development, which will be achieved in accordance with the legal framework and internal acts of the Institute:

- Changes in the organisational structure and organisational and work processes in harmony with the course of project conduction
- In the organisational structure and organisational work processes in harmony with the implementation of the project *Scientific platform for research and development of innovations in sustainable agriculture and tourism - Reconstruction, extension and equipping of the Institute for Agriculture and Tourism* within the programme *Preparation of IRI infrastructure projects*
- Creation and approval of new internal acts in accordance with demands
- Establishment and full functionality of the Office for Internal Security and increased quality of scientific activities
- Establishment and full functionality of the International Scientific–Business Council
- Advancement of managing, work and administrative processes
- Advancement of financial accounting business
- Informatisation and digitalisation of the Institute’s business
- Increasing the energy efficiency of Institute buildings
- Continuation of advancing systems of work safety and information system security of the Institute
- Continuation of enhancements of public and simple processes of purchases
- Resolving disputes stemming from property ownership relations with the owners of neighbouring plots and property co-owners

8. INDICATORS OF SUCCESS AND EXPECTED RESULTS

STRATEGIC GOAL 5.1. QUALITY IMPROVEMENTS OF SCIENTIFIC WORK											
Special Goal 5.1.1. Increase of Participations in Competitive Project Financing and Publications Quality											
Indicators	Description of starting value	Frequency of reports/ evaluations	Transient value	Goal value (annually)							
				2023	2024	2025	2026	2027	2028	2029	2030
Number of successful project applications on competitive sources of financing	Annual average 2019–2022 (total 35)	annually	8.75	8	9	9	10	11	12	13	14
Number of scientific papers in *SCOPUS* and *WoS*, A1 journals and internationally peer-reviewed collections of papers for social sciences	Annual average 2019–2022 (total 157)	annually	39.25	40	44	48	52	57	63	68	80
Citations of Institute papers published in the previous 4 years*	Annual average 2019–2022 (total 949)	annually	237.25	240	245	250	260	270	280	300	320
h-index of Institute papers published in the previous 4 years*	2019–2022 (total 16)	annually	16	16	16	17	17	18	18	19	19
Special Goal 5.1.2. Strengthening International Scientific Collaboration, Visibility, Reputation and Impact											
Indicators											
Number of successfully applied and internationally financed projects in the previous 4 years	Annual average 2019–2022 (total 7)	annually	1.75	2	2	3	3	4	4	5	5
Number of successfully applied projects in collaboration with foreign partners in the previous 4 years	Annual average 2019–2022 (total 10)	annually	2.50	2	2	3	3	4	4	5	5
Number of collaborations with foreign partners (projects, 5 publications) in the previous 4 years	Annual average 2019–2022 (total 16)	annually	4	4	4	5	5	6	6	7	7
Number of outgoing personnel interchanges (scientists and associates) in the previous 4 years	Annual average 2019–2022 (total 6)	annually	1.5	1	2	2	2	3	3	3	4
Number of scientific personnel interchanges (scientists and associates) in the previous 4 years	Annual average 2019–2022 (total 5)	annually	1.25	1	2	2	2	3	3	3	4

Special Goal 5.1.3. Strengthening Human Potentials											
Indicators											
Number of scientific workplaces	State on 31/12/2022 (total 19)	annually	19	19	22	24	26	30	31	32	33
Number of PhDs completed in the previous 4 years	Annual average 2019–2022 (total 7)	annually	1.75	3	3	4	4	4	5	5	5
Special Goal 5.1.4. Enhancing Research Infrastructure											
Indicators											
Conducted IRI project – finished extension and equipping of the Institute*	State on 31/12/2022 (NO)	≤ 2027	NO	NO/YES	NO/YES	NO/YES	YES	YES	YES	YES	YES
Amount spent for infrastructure enhancement	Annual average 2019–2022 (total €162,928.64)	annually	€40,732.16	€41,000.00	€8,025,866.27	€12,038,799.40	€20.000,00	€30,000.00	€40,000.00	€50,000.00	€60,000.00
Amount spent for purchase and extension of research equipment	Annual average 2019–2022 (total €1,084,811.60)	annually	€271,202.91	€280,000.00	€100,000.00	€100,000.00	€6.376.435,19	€100,000.00	€110,000.00	€120,000.00	€130,000.00
Special Goal 5.1.5. Strengthening Interdisciplinarity of Scientific Work											
Indicators											
Number of successful applications for interdisciplinary scientific projects (associates from at least 2 different scientific fields)	Annual average 2019–2022 (total 21)	annually	5.25	5	5	6	6	7	7	8	8
Number of scientific books published	Annual average 2019–2022 (total 1)	annually	0.25	0	1	1	1	2	2	3	3

STRATEGIC GOAL 5.2. STRENGTHENING COLLABORATION WITH THE ECONOMY											
Special Goal 5.2.1. Increasing Participation in Applied Scientific Research through Collaborative Projects with Economic Entities											
Indicators	Description of starting (total value 2019–2022)	Frequency of reports/ evaluations	Transient value	Goal value (annually)							
				2023	2024	2025	2026	2027	2028	2029	2030
Number of successful project submissions for applied projects	Annual average 2019–2022 (total 23)	annually	5.75	5	5	6	6	7	7	8	8
Number of successful project submissions for collaborative projects in collaboration with the economy (at least 1 associate/partner from the economy)	Annual average 2019–2022 (total 6)	annually	1.5	2	2	3	3	3	4	4	5
Number of formal collaborations with economic entities	Annual average 2019–2022 (total 12)	annually	3	3	4	4	5	5	6	6	7
Special Goal 5.2.2. Institutional Advancements for Intellectual Property Management											
Indicators											
Established administrative-legal frame for commercialisation of research results and protection of intellectual property	on 31/12/2022 (NO)	≤ 2025	NO	YES/NO	YES/NO	YES	YES	YES	YES	YES	YES
Number of successful participations in formalised technology transfer, patents and other forms of intellectual property protection	Annual average 2019–2022 (total 0)	annually	0.00	0	1	1	2	2	2	3	3
Special Goal 5.2.3. Improvements of Provisions for Scientific, Research or Technological Services on the Open Market											
Indicators											
Number of contracted projects for providing services to the economy and public bodies, including county projects	Annual average 2019–2022 (total 90)	annually	22.5	22	23	24	26	28	30	35	40
Revenue from service activities	Annual average 2019–2022 (total €748,663.88)	annually	€187,165.97	€190,000.00	€200,000.00	€220,000.00	€230,000.00	€250,000.00	€270,000.00	€290,000.00	€320,000.00

STRATEGIC GOAL 5.3. STRENGTHENING SOCIAL RESPONSIBILITIES											
Special Goal 5.3.1. Strengthening the Institute and Public Sector Collaboration on Activities of National Importance											
Indicators	Description of starting (total value 2019–2022)	Frequency of reports/ evaluations	Transient value	Goal value (annually)							
				2023	2024	2025	2026	2027	2028	2029	2030
Number of formalised collaborations with public bodies and public sectors (e.g. grants, contracts, publications, appointments into work groups, committees, boards) on non-commercial basis	Annual average 2019–2022 (total 27)	annually	6.75	7	7	8	8	9	9	10	10
Special Goal 5.3.2. Enhancing the Level of Digital Business											
Indicators											
Amount spent on the Institute business digital transformation interventions	Annual average 2019–2022 (total €16,064.32)	annually	€4,016.08	€4,000.00	€4,000.00	€4,500.00	€5,000.00	€6,500.00	€8,000.00	€9,500.00	€11,000.00
Special Goal 5.3.3. Improving Energy Efficiency – Strengthening the Green Transition											
Indicators											
Amount spent on activities with the aim of upgrading the Institute's energy efficiency	Annual average 2019–2022 (total €46,349.80)	annually	€11,587.45	€5,000.00	€12,000.00	€14,000.00	€16,000.00	€18,000.00	€22,000.00	€26,000.00	€30,000.00
Special Goal 5.3.4. Popularisation of Science											
Indicators											
Number of activities in science popularisation (e.g. workshops, seminars, round tables, media and social network appearances)	Annual average 2019–2022 (total 207)	annually	51.75	52	54	56	60	64	68	72	76

9. EXPECTED OUTCOMES

By the end of the forthcoming period (2023–2030), the Institute expects the following outcomes of the strategic development plan:

- The Institute will have significantly improved the quality of its scientific work through increased participation in competitive project financing, increased publication quality, strengthened international scientific collaboration, visibility, respect and impact, and will have enlarged the level of interdisciplinarity in its activities.
- The Institute will have significantly enhanced its human potentials with special emphasis on employment and advancement of scientists and associates according to criteria of excellence, and will have become a desirable and attractive institution for visitors and employing international research personnel, including returnees from abroad.
- By conducting the IRI project *Scientific platform for research and development of innovations in sustainable agriculture and tourism*, as well as through finishing the reconstruction, extension and equipping through the *Preparation of IRI infrastructure projects,* the Institute will have significantly modernised its scientific research infrastructure in the areas of its activities, becoming the leading institution in national frames, but also recognised on the international level.
- The Institute will have become a desirable partner and will have significantly strengthened its collaboration with economy and contributions to the *National Development Strategy (NSR 2030)* and *Strategy of Smart Specialisation for the Period up to 2029 (S3 2029)* through the development of innovation and knowledge transfer, with contributions to the development of national and regional identity and culture
- The Institute will have significantly improved the quality of its scientific work through increased participation in competitive project financing, increased publication quality, strengthen international scientific collaboration, visibility, respect and impact, and will have enlarged the level of interdisciplinarity in activities
- The Institute will have advanced and expanded its professional and service activities in accordance with the development challenges and needs of stakeholders on local, national and international levels.
- Through scientific research and professional work, as well as collaboration with business, education institutions and the public sector, the Institute will have strengthened its position and importance in the public space, becoming a relevant and indispensable factor in the co-creation of scientific and professional policies responding to the communal current and future challenges and demands.
- The Institute will have significantly enhanced its organisation and processes, strengthened its financial stability, upgraded the level of digital business and energy efficiency, and will be ready for further challenges in the conduct of excellent scientific research and professional work.
- Through its strengthened social role, the Institute will contribute to the knowledge collection and development with purpose of preserving the natural and traditional values as well as to business and rural space development in the national and EU

environment, contributing to the creation of new scientific, business and social value in the Republic of Croatia.