BERRY+ scoping note

Part 3.- The BERRY+ regions

3.5 Friuli Venezia Giulia

3.5.1 Overview

Friuli Venezia Giulia (FVG) is one of the five Italian autonomous regions with a special statute and it is Italy's most North-Eastern region. Friuli Venezia Giulia covers an area of 7,932 km^2 (2.6% of the total area of Italy), it is the fourth smallest region of the country and has about 1.2 million inhabitants (2% of the total for Italy)[1]. Therefore, compared to other regions in the same area, Friuli Venezia Giulia is a land with not a huge arable area and energy resources but, at the same time, it is sparsely populated and largely non-anthropized.

Friuli Venezia Giulia borders with Austria to the North and Slovenia to the East. To the South, it faces the Adriatic Sea and to the West its internal border with the Veneto region. The Capital of the region is Trieste, where the activities such as the Regional Government, large banking and insurance companies are concentrated. With its commercial Free Port, Trieste also plays an essential role in the trade sector: special custom regulations ensure exclusive financial conditions to operators. The Port of Trieste is today the most important centre worldwide for the trade of coffee and plays a strategic key role in trade with northern and eastern Europe.

The region spans a wide variety of climates and landscapes, contributing to make Friuli Venezia Giulia one of the territory with the highest level of biodiversity in Italy. The total area is subdivided into a 43.0% mountainous-alpine terrain in the north, 19.2% is hilly, mostly to the south-east, while the remaining 37.8% comprises the central and coastal plains. This regional structure is adequately covered by water courses and since ancient times has offered the possibility of exploiting forest resources for both food, construction and energy purposes. In FVG there are about 93 km of coastline (nearly 2 % of Italian's). This area represents a particular ecosystem with the presence of salty and shallow lagoons. The inner lowland is characterized by a widespread presence of waterways coming from particular pure fresh water springs called "risorgive". The yearly production of fisheries is about 3,700 tons in the salty lagoons (so called "valli" by old venetians) and 13,000 tons (95% of which are trout farming) in the fresh water farms (year 2018).

Friuli Venezia Giulia has a considerable wooded area which today reaches almost half of the entire area of the region. The wooded area has marked a significant expansion in recent decades that continues constantly. The forest in Friuli Venezia Giulia covers about 320,000 ha or 40% of the regional land area (2006). In 1960 the wooded area was about 165,000 ha or 21% of the total. The woodland area is divided for about 90% into the mountains and hills and the remainder into the plains; the hilly forest is the expanding one. The ownership of the woods is

[1] http://www.regione.fvg.it/rafvg/export/sites/default/RAFVG/GEN/statistica/FOGLIA67/allegati/Regione_in_cifre_2020.pdf

public for 40% of the surface while it is private for 60%; the timber and energy related activity involves today almost of 50% of the forest. The expansion of the wooded area mainly affected already agricultural private areas[2].

Friuli Venezia Giulia joined BERRY+ because of similarities of the natural resource base with some of the other regions and research & knowledge base complementarities. The partnership focuses on the regional RIS3 priorities[3], relating to the evolution of the research system by bringing universities closer to the real needs of local supply chains. The Region FVG and Berry+ share the goal of setting up local or inter-regional clusters of companies involved in the supply chains capable of developing process and product innovation.

In particular, Friuli Venezia Giulia is a rural region, with primary productions mainly linked to grains and wine. These sectors have developed into valuable food activities, however their sustainability is now under discussion. The recovery of competitiveness can therefore be achieved through the development of innovative value chains regarding new products, the use of side streams to increase production value or the improvement of the sustainability performances in current value chains.

This transition path inevitably involves the development of value chains capable of:

- addressing new markets;
- incorporating innovative technologies and processes, even acquired from other developers;
- improving the global sustainability performance of existing supply chains, both by innovation and shared knowledge.

To achieve that, it is now possible to exploit, thanks to the RIS3 prioritization, the support coming from the European policies of the Green Deal, the European Bioeconomy Strategy, the EU strategy for Rural Revival and all the other related instruments such as the I3 tool. The establishment of horizontal and vertical partnerships can strengthen and accelerate the transition of the existing production system, through to the development of shared innovation or the rapid creation of value that reduces the Time to Market by increasing the TRL.

From this point of view, the Friuli Venezia Giulia Region entrepreneurial ecosystem is interested in the development of rural activities related to the production of vegetable proteins and their enhancement in human nutrition, the production and marketing of nutraceuticals and plant-based cosmetics, as well as the improvement of dairy proteins production performances, by increasing the circularity and sustainability of these operations. At the same time, Friuli Venezia Giulia considers of great interest the areas regarding:

- the development of bioeconomic activities in wooded and inner areas based on the recovery of by-products of timber wood (43% of the regional surface is a wooded alpine area);
- the circular and sustainable production of bio-energies;
- the extraction of essences and innovative production of chemical building blocks;

[2] https://www.regione.fvg.it/rafvg/cms/RAFVG/economia-imprese/agricoltura-foreste/foreste/FOGLIA19/

[3] https://www.regione.fvg.it/rafvg/export/sites/default/RAFVG/fondi-europei-fvg-internazionale/Strategia-specializzazione-intelligente/allegati/16072020_Allegato_1_delibera_2200-2019.pdf

- the evolution of business models in conventional activities (primary, manufacture or trade), as well as in "unconventional" ones, mainly related to ecosystem services, tourism or wellness (costal wetlands and alpine area);

- the development of bioeconomy in grape/wine value chains utilizing side streams and vineries by-products (in FVG there are 27,000 hectares of vineyards and almost 7,000 vineries).

It is clear that the constitution of an interregional quadruple helix cluster including companies as well as research institutions engaged in the various value chains would allow to improve the performances of technology transfer, reducing the Time to Market and therefore generating new added value to the whole interregional eco-system.

We believe that, only in this shared way, small regions such as Friuli Venezia Giulia would be able to promote and develop joint-activities able to face financial and knowledge-related issues connected to innovation. Mutual learning, shared investment in new skills and the concrete participation in pilots or excellence innovative platforms (such as the ones launched in the framework of interregional networks e.g. Vanguard Initiative, ERRIN, etc.) represent effective empowering tools.

3.5.2 Statistical evidence-base and insights

According to the 2019 European Regional Innovation Scoreboard[4], Friuli Venezia Giulia (ITH4) is playing the role of **Strong Innovator** in Italy, while all other regions are Moderate Innovators. The Regional Innovation Index (RII in 2019 is 96,99) increased, in the period 2011-19, by 7.7 points, allowing Friuli Venezia Giulia to be one of the best performing regions in the country; RII, performing 80% higher than the lowest performing regions of Italy. If compared to the Italian average, Friuli Venezia Giulia stays always ahead in all the 17 indicators that are composing the RII[5]. Among the strong aspects of the region, it emerges a peculiar high production of patents accompanied by a remarkable scientific production at international level. However, if compared to the European average, the region shows weaknesses regarding Tertiary education (44% below EU average) and R&D expenditures business sector (22% below EU average). On the contrary, the region shows strengths in the field of International scientific co-publications (36% above EU average) and Design applications (43% above the Italian average, 62% above EU average)[6].

Considering the national hierarchical level, Italy is a Moderate Innovator and, over time, performance has increased. Innovators, Intellectual assets and Attractive research systems are the strongest innovation dimensions. Italy scores high on SMEs innovating in-house, Design applications, SMEs with product or process innovations, and SMEs with marketing or organizational innovations. Human resources, Finance and support, and Linkages are the weakest innovation dimensions. Low-scoring indicators include Population with tertiary education, Venture capital expenditures, Innovative SMEs collaborating with others, and Broadband penetration (**Table 1**)[7].

In 2019, in Friuli Venezia Giulia the **employment** rate was higher (66.6%) than the national value (59.2%), although still below the European average (69.2%). The unemployment rate decreased considerably in the recent

[4] https://ec.europa.eu/growth/sites/default/files/ris2019.pdf

[5] https://ec.europa.eu/growth/industry/policy/innovation/regional_en

[6] https://ec.europa.eu/growth/tools-databases/regional-innovation-monitor/base-profile/friuli-venezia-giulia

[7] https://ec.europa.eu/docsroom/documents/41880

years, from 8% in 2015 to 6.1% in 2019, though below the National (from 11.9% to 10.0%) and also below the European trends in 2019 (6.3%). From 2015 the youth unemployment rate decreased by -8.5%, as well as the Italian trend (-11.1%)[8].

Table 1. Italian innovation performance (source: European Innovation Scoreboard 2020).

Italy		Relative to EU 2019 in	Performance relative to EU 2012 in	
		2019	2012	2019
	SUMMARY INNOVATION INDEX	**82.8**	**78.3**	**90.1**
1	**Human resources**	**53.4**	**47.3**	**61.5**
1.1	New doctorate graduates	66.2	82.4	72.9
1.2	Population with tertiary education	25.3	3.3	32.2
1.3	Lifelong learning	74.2	53.3	80.0
2	**Attractive research systems**	**97.3**	**84.4**	**111.1**
2.1	International scientific co-publications	82.5	76.4	121.2
2.2	Most cited publications	114.1	99.7	114.2
2.3	Foreign doctorate students	83.2	59.2	95.9
3	**Innovation-friendly environment**	**69.7**	**83.7**	**121.2**
3.1	Broadband penetration	56.5	50.0	130.0
3.2	Opportunity-driven entrepreneurship	84.6	106.3	115.2
4	**Finance and support**	**56.5**	**60.9**	**65.2**
4.1	R&D expenditure in the public sector	60.8	57.8	59.7
4.2	Venture capital expenditures	51.5	66.1	74.5
5	**Firm investments**	**73.1**	**70.8**	**94.9**
5.1	R&D expenditure in the business sector	58.3	64.4	66.8
5.2	Non-R&D innovation expenditures	83.3	102.9	116.7
5.3	Enterprises providing ICT training	77.8	46.2	107.7
6	**Innovators**	**130.7**	**112.1**	**116.9**
6.1	SMEs product/process innovations	126.0	113.1	125.6
6.2	SMEs marketing/organizational innovations	116.3	109.7	95.5
6.3	SMEs innovating in-house	150.1	113.6	130.7
7	**Linkages**	**67.1**	**46.6**	**69.0**
7.1	Innovative SMEs collaborating with others	56.0	39.3	55.6
7.2	Public-private co-publications	80.5	68.5	91.0
7.3	Private co-funding of public R&D exp.	67.0	41.7	67.6
8	**Intellectual assets**	**103.0**	**90.8**	**96.2**
8.1	PCT patent applications	76.9	70.8	71.4
8.2	Trademark applications	104.7	88.0	111.4
8.3	Design applications	141.1	120.7	118.3
9	**Employment impacts**	**80.6**	**72.0**	**87.0**
9.1	Employment in knowledge-intensive activities	103.8	105.4	112.2
9.2	Employment fast-growing enterprises	62.0	45.0	66.7
10	**Sales impacts**	**80.8**	**87.3**	**80.4**
10.1	Medium and high-tech product exports	84.9	87.8	94.1
10.2	Knowledge-intensive services exports	62.2	70.2	64.2
10.3	Sales of new-to-market/firm innovations	98.8	104.5	82.6

In 2020 the **number of employees** in FVG amounted to about 513,600, an increase of 2,100 units compared to 2019 (+0.4%), data that confirms how Friuli Venezia Giulia was the only Italian region to register a positive change in the pandemic year[9]. From the regional context, the sectors enhancing the production in terms of **size** and **export** are the following: wood-furniture sector; manufacture of metal products; manufacture of machinery and equipment; manufacture of electrical and non-electric household appliances; manufacture of other non-metallic mineral processing products; food and beverage industry; metallurgy; shipbuilding.

[8] https://ec.europa.eu/growth/tools-databases/regional-innovation-monitor/base-profile/friuli-venezia-giulia

[9] https://www.iresfvg.org/wp-content/uploads/2021/03/occupati_disoccupati_2020_Infoclick.pdf

The importance of the **manufacture** is confirmed and highlighted by the LQ of 2018 (LQ = 1.31; **Table 2**), telling us that there is a high concentration of these activities in the region. Some of the above mentioned sectors converge in supply chains and sectors with a high capacity for growth and innovation: the agri-food chain; the supply chain of the home system; metalworking; the chemical-pharmaceutical supply chain; the nautical, shipbuilding, and off-shore; the Bio sector and the cultural & creative enterprises. Aligned to that, these chains are prioritized by the 2017 Regional RIS3 (currently under review): advanced manufacturing is a field of strategic development for regional policies, as evidenced by its transversal value compared to the areas of specialization and related development trajectories identified in the Smart Specialisation Strategy (S3). Moreover, considering the Multiannual Financial Framework 2021- 2027 and the Next Generation EU, the programmes will be arranged around the main thematic spending priorities that include food supply and safety (e.g.: ensure access to safe, high quality, affordable, nutritious and diverse food) mainly, but not exclusively, atributable to headings 1 "Single market, innovation & digital", 2 "Cohesion & values" and 3 "Natural resources & environment" [10, 11].

From the LQ analysis (**Table 2**), it appears also that the distribution among sectors in FVG region is quite uniform, with all industries representing on average the 2% of the national levels. However, this great coherence cannot contribute decisevely to the development of the Region, due to the **limited critical mass** of the regional economy and territory that needs still to be fully exploited. For this reason, FVG region defined - as second pillar of its S3 strategy - the expansion of the economic base, by opening to new markets.

Table 2. Location quotient (LQ) of industries in Friuli Venezia Giulia in relation to the whole country, 2018.

	Absolute concentration of Industry in FVG in relation to the whole country	**Location quotient (LQ) of industries in FVG in relation to the whole country**
A. Agriculture, forestry and fishing	2%	0.76
B. Mining and quarrying	1%	0.42
C. Manufacturing	3%	1.31
D. Electricity, gas, steam and air conditioning supply	2%	1.03
E. Water supply; sewerage, waste management and remediation activities	2%	1.07
F. Construction	2%	0.88
G. Wholesale and retail trade; repair of motor vehicles and motorcycles	2%	0.83
H. Transportation and storage	2%	0.84
I. Accommodation and food service activities	2%	1.01
J. Information and communication	2%	0.71
K. Financial and insurance activities	2%	1.08
L. Real estate activities	2%	0.97
M. Professional, scientific and technical activities	2%	0.90
N. Administrative and support service activities	2%	0.92
O. Public administration and defence; compulsory social security	3%	1.38
P. Education	2%	0.95
Q. Human health and social work activities	2%	1.11
R. Arts, entertainment and recreation	2%	0.93
S. Other service activities	2%	0.88
T. Activities of households as employers; undifferentiated goods- and services-producing activities of households for own use	2%	0.95
U. Activities of extraterritorial organisations and bodies	-	-
Unknown	-	-

[10] https://eur-lex.europa.eu/legal-content/IT/TXT/?uri=CELEX%3A52018DC0321

[11] https://ec.europa.eu/info/sites/info/files/about_the_european_commission/eu_budget/ mff_factsheet_agreement_en_web_20.11.pdf

Even though the regional research concentration levels are aligned to the national ones (from 2018 LQ), the scientific contribution, which allows Friuli Venezia Giulia to be a Strong Innovator according to the RIS2019, have to uptake production and lead to product innovation. Aligned to that, the regional S3 aims at **improving the link of the innovation system to the real economic needs**. This improvement can be facilitated by acquiring and enhancing the work of the Technological Transfer Organisations (TTOs) in terms of transferring the idea (low TRL, from 1 to 3) to the market (TRL9).

In 2019, the regional **GDP** amounted to € 38,772 million (2.17% of the national) and, in the same year, the **GVA** was € 37,742 million[12]. For the two-year period 2020-21, due to the Covid-19 pandemic, the Prometeia Institute estimates for the GDP of FVG region a decline from 9.8% in 2020, a rebound of 6.3% in 2021 and a growth of + 2.8% in 2022. In Friuli Venezia Giulia business investment is expected to pick up sharply in 2021, with high growth rates also in 2022 (-12.1% in 2020, +11.2% in 2021 and +9.9% in 2022). According to forecasts, **exports** will recover completely from the Covid-19 effects in one year (-11.5% in 2020, + 11.7% in 2021) and in 2022 they will increase at a faster rate than GDP growth (expected + 4.3%)[13].

The export and import activity in the region is intense thanks to the **centrality** that FVG has. In fact, the Region is located in the heart of Europe, at the meeting point between the maritime routes and the European, Adriatic Baltic and Mediterranean corridors. The area is an interesting hub for land-sea trade and markets in Central and Eastern Europe: Trieste (capital of FVG) has the most important railway Port of southern Europe, with 70 km of tracks serving all the quays and 789,594 TEU of containers handled in 2019. The railway services of the Port make it easy to reach both foreign destinations (mostly Germany, Hungary, Czech Republic, Slovakia, Belgium and Luxembourg) and national destinations (Padua and Bologna). The efficiency of the roads is guaranteed by a direct connection with the renewed Italian motorway network[14].

As a matter of fact, the economy of Friuli Venezia Giulia is traditionally devoted to **exports**: in 2019 the trade balance stood at 7,272 million euros, an increase of 7.0% compared to 2018. This is due to a drop in imports of 6.8% and exports of 0.8%. Overall, the value of exports amounted to 15,388 million euros and that of imports to 8,116 million euros[15].

The **export** performance of the **food industry** was positive, growing to 810.5 million euros in 2019 (5.3% of the total regional export), an increase of 4.6% and a positive foreign balance of 453 million euros, confirming the great competitiveness of regional agrifood products on foreign markets. The food industry, together with the steel industry, instrumental mechanics and furniture production, in addition to shipbuilding, the production of computers, electronic and optical devices (in particular telecommunications equipment) represent the main regional export.

In 2018, Friuli Venezia Giulia was hosting 76,151 active businesses, number not including agricultural businesses accounting for 13,666[16]. Despite the high number of firms, the regional food production performances per se look not as important as the manufacture (added value: € 667 million of primary sector + € 496 million food and

[12] https://ec.europa.eu/eurostat/en/

[13] http://www.regione.fvg.it/rafvg/export/sites/default/RAFVG/GEN/statistica/FOGLIA67/allegati/Regione_in_cifre_2020.pdf

[14] Data provided by Autorità di Sistema Portuale del Mare Adriatico Orientale Porti di Trieste e Monfalcone

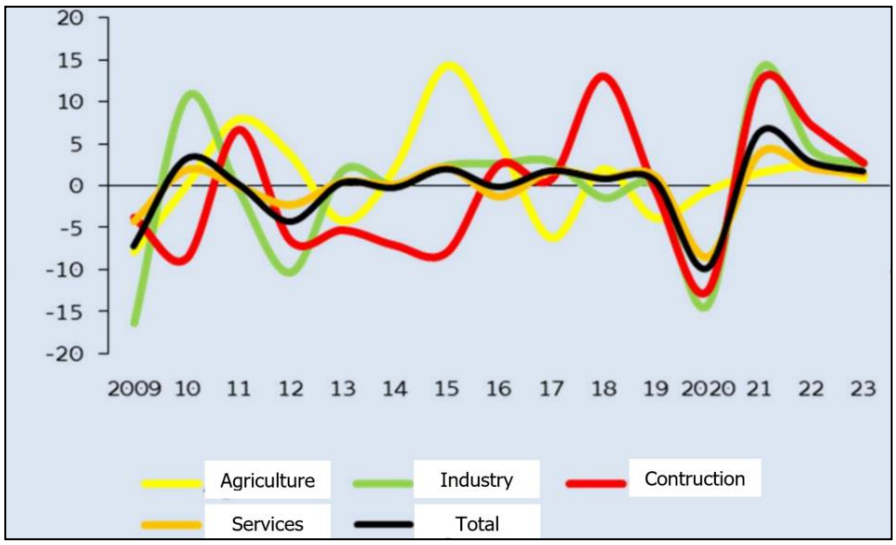
[15] http://www.regione.fvg.it/rafvg/export/sites/default/RAFVG/GEN/statistica/FOGLIA67/allegati/Regione_in_cifre_2020.pdf

[16] http://www.regione.fvg.it/rafvg/export/sites/default/RAFVG/GEN/statistica/FOGLIA67/allegati/Regione_in_cifre_2020.pdf

beverage secondary sector vs. € 6,854 of other manufacturing)[17]. This because the calculation of each sector's value is not taking into account the longer value chains, including the distribution and retail channels (currently separated and contibuting in a significant way). Whether those cros-sectoral bias would be removed, the entire food would represent better the real potential of this sector in Friuli Venezia Giulia.

Th useful agricultural area is approximately 235,700 hectares, of which approximately 169,000 are used for arable land[18]. The added value of FVG agriculture in 2019 decreased by 3.9% against a national contraction of 1.6%. The decrease is to be referred to plant and animal production, hunting and related services (-4.4%) and forestry and use of forest areas (-2.4%), while fishing and aquaculture (+3.7%) were in expansion. The main agricultural productions, measured in value at basic prices, were confirmed to be wine (181 million euros), cow milk (132 million euros) and corn (107 million euros)[19].

Figure 1. Added value for economic sector (percentage variation on linked values, reference year 2010). Years 2009-2023[20].



The **agriculture** of FVG represents an opportunity to generate income for about 16,400 employees (year 2019). Developing the **sustainable circular bioeconomy** of the rural sector remains a very important priority for the Region. In particular, the inner areas characterized by difficulties in accessing the major roads have always based their livelihood on the direct valorisation of locally available biomass for this reason. The high number of firms directly or indirectly involved the agrifood sector and their employees needs to be supported in terms of knowledge and skills in order to better explain their value.

[17] http://www.regione.fvg.it/rafvg/export/sites/default/RAFVG/GEN/statistica/FOGLIA67/allegati/Regione_in_cifre_2020.pdf and regional elaboration on ISTAT data;

[18] https://www.istat.it/it/files//2019/12/Tavole.xlsx

[19] http://www.regione.fvg.it/rafvg/export/sites/default/RAFVG/GEN/statistica/FOGLIA67/allegati/Regione_in_cifre_2020.pdf

[20] https://www.regione.fvg.it/rafvg/export/sites/default/RAFVG/GEN/statistica/FOGLIA51/allegati/Tendenze_macro economiche_nov_2020.pdf

3.5.3 RIS3 concept and key priorities

The Smart Specialization Strategy (S3 or RIS3) is one of the tools used by regions across the board the European Union to improve the effectiveness of public policies for research and innovation, consistent with the evolution of the European framework programming. Each Region defines its own S3 through a path of entrepreneurial discovery (cd. "Entrepreneurial Discovery Process", EDP) based on comparison and sharing with representatives of the world of business, research, associations and institutions (the "quadruple helix"). In the post-2020 perspective and in line with the provisions of the resolution of the regional council n. 883 of 30 May 2019, the FVG is working on a review and upgrade path of the regional RIS3 starting from existing ones (until the end of this updating process the current strategy remains in force which, as far as Berry + is concerned, should not undergo significant changes).

In the actual FVG-RIS3[21], the five-key regional Specialisation areas, identified by a thorough process of entrepreneurial discovery, are the following (**Figure 2**): Agribusiness; Strategic production value chains (mechanics and home furniture and automation); Maritime technologies; Smart Health; Culture and tourism. Within these Specialisation areas, were selected the most promising, challenging and significant Development traiectories.

Figure 2. FVG-RIS3 regional specialisation areas (2017).

The five areas has been recipients of financial resources through the selection of a limited number of projects assessed for quality and impacts. In this framework, the Region intends to stimulate and encourage the cross-fertilization between sectors as a key element to maximize the impact of investments.

The Strategy S3 of Friuli Venezia Giulia expects two fundamental changes:

1. the consolidation and repositioning of the industrial and production sectors in the Region towards segments that offer higher added value and are specific to the regional economic system;

[21] http://www.regione.fvg.it/rafvg/export/sites/default/RAFVG/fondi-europei-fvg-internazionale/Strategia-specializzazione-intelligente/allegati/16072020_Allegato_1_delibera_2200-2019.pdf

2. the shift of the regional economic and production systems towards new areas capable of generating new jobs, new markets and new industries, starting both with "traditional" sectors and with high-tech ones.

In both cases, the shift will be triggered by investments in innovation, promoting collaborative processes with the world of research and the contamination with Key Enabling Technologies (KETs), in order to respond to emerging social challenges.

Already in 2017, but also in the undergoing revision, the FVG lines were aligned to the national specialization areas ("SNSI") managed by the 12 national clusters (so-called "CTN") and also to the European strategies and S3 plattforms for the regional territory (**Table 3**).

Table 3. FVG-RIS3 regional specialisation areas description.

Areas of Specialisation	***Development Trajectories (2017 version, now under 2020 revision)***
AGRI FOOD INDUSTRY	1. Integration of **innovation measures on the agri-food chains** to create value for the consumer 2. Integration of the concepts of **circularity and sustainability** in the agricultural and food economy of the regional territory 3. Value development through the constant integration of information throughout the agricultural and food chain
STRATEGIC PRODUCTION CHAIN METAL – MECHANICAL SECTOR	1. Solutions and technologies for integrated design and innovation of products/intelligent machines. 2. Technologies for advanced production processes - "intelligent factory" 3. Technologies for the management and development of the organisation
STRATEGIC PRODUCTION CHAIN HOME SYSTEM	1. Technology of materials and innovative design 2. Technologies for the efficiency of buildings and production processes 3. Digitalising the "Home System"
MARITIME TECHNOLOGIES	1. Methodologies for designing new products, processes and services 2. "Green" technologies and energy efficiency 3. Safety technologies
SMART HEALTH	1. Biomedical, in vivo and in vitro diagnostics 2. Medical IT and bioinformatics 3. Innovative Therapy 4. Ambient Assisted Living (AAL)
CULTURE, CREATIVITY AND TOURISM	1. Technologies for the conservation and enhancement of goods and products 2. Geomatics and image processing 3. Social platforms and sharing

The implementation of the Strategy is achieved through the use of financial resources from different sources and with different instruments. The action plan was defined in 2015 and based on the "*policy mix*" concept, following the indications of the JRC Guide "*RIS3 Implementation and policy mixes* ". The goal was to integrate the different tools and resources within a framework consistent with the methodological priorities and expected changes. This involves 3 different types of instruments. Those providing direct support, indirect support and contextual support, summarised as follows:

- **Direct**: actions supporting directly and only the Areas of Specialisation and their development trajectories.
- **Indirect**: Actions that, while not concerning S3 Areas, deploy measures in support of Research, Innovation and Development of the regional economy.

- **Context related**: measures strengthening the competitiveness and the overall regional context, and complementing or stimulating the prospective implementation of the S3, but not directly connected to it.

Direct, indirect and context related instruments amount to about Euro 328 Million (Direct actions: € 105 Million, indirect actions: € 110 Million, context related: € 113 Million), expected values as at 2023. The policy mix involves the use of resources from both the Structural Funds (ERDF, ESF, EAFRD) and national, regional and community resources (such as cooperation or direct management programs).

The RIS3 of Friuli Venezia Giulia[22] have been identified three priorities that represent the heart of the specialization strategy: *a)* develop collaboration and synergies between enterprises and between companies and scientific structures; *b)* promote business investments in innovation and industrialization of research results; *c)* promote new innovative entrepreneurship; therefore, there are direct, indirect and contest action related to RIS3 implementation.

Collaboration possibilities based on the Friuli Venezia Giulia RIS3. The Areas of specialization "Agrifood industry" and "Strategic production chain, Home system", with their Develompment traiectories, are enablers of interregional colaborations based on biological resources and their value chains. This considering the strenghts of FVG in the intensive manufacturing and the historical rural roots and natural resources availability. The existence of a primary sector still very widespread in the territory indicates that in RAFVG the value chains linked to a traditional model of the bioeconomy, i.e. those linked to the transformation of biomass into conventional products, are already present and consolidated (e.g. from wheat to pasta, from corn to feed, etc ...). It is also reasonable that the value chains in which the rural bioeconomy is less represented today in FVG are those in which biomass is transformed to replace different existing materials.. In rural areas that are not marginal or located in geographically less favored areas of the regional territory, therefore, rural bioeconomic realities already exist that need only be identified to be then promoted and supported in their necessary growth process or evolution to connect innovative value chains. The affirmation and development of innovative and sustainable circular bioeconomic value chains, in fact, is closely linked to the opportunity to increase income that the products obtained are able to offer to operators in the sector. This is one of the goals that the Region aims to achieve in the following years, as declarated in its own regional "Positioning Document on the Bioeconomy". FVG is the first Italian region to persue such in-depht analysis of the environment in order to pursue the strategic creation of a system ready to harbor the valorization of local biomass (and its derivatives) on new streams of Green Chemistry, Energy and Food Security.

In a broad perspective, the priorities of FVG are:

- updating the regional innovation ecosystems within the Region, as well as innovation in companies, starting from the S3 territorial approach. Building stronger and win-win strategic partnerships among territories, oriented towards the future and embracing the vision of innovation;
- consolidating and repositioning the regional industrial and production system towards innovative segments of the supply chain and markets with greater added value;

[22] Strategia regionale di ricerca e innovazione per la specializzazione intelligente del Friuli Venezia Giulia. https://www.regione.fvg.it/rafvg/export/sites/default/RAFVG/fondi-europei-fvg-internazionale/Strategia-specializzazione-intelligente/allegati/16072020_Allegato_1_delibera_2200-2019.pdf

- the shift of the regional economic and production systems towards new areas capable of generating new jobs, new markets and new industries, starting both with "traditional" sectors and with high-tech ones;
- changing the regional economic production system towards identification of new VC;
- developing strategies that enhance the productive areas of regional excellence taking into account the region strategic location and consequent development perspectives in a global economic framework;
- in the field of bioeconomy, FVG region will focus on the development of new circular biobased Value Chains (VCs) towards a sustainable de-carbonated model.

Prioritised, specific value chains or value chain segments. In the Berry+ S3 partnership, the Friuli Venezia Giulia, assessed a regional first interest, identifies the following value chains and their segments as priority and strategic for the region:

- production of vegetable proteins and their enhancement in human nutrition;
- production and marketing of nutraceuticals and plant-based cosmetics;
- improvement of dairy proteins production performances, by increasing the circularity and sustainability of these operations;
- development of bioeconomic activities in wooded and inner areas based on the recovery of by-products of timber wood;
- circular and sustainable production of bio-energies;
- extraction of essences and innovative production of chemical building blocks;
- evolution of business models in conventional activities (primary, manufacture or trade), as well as in "unconventional" ones, mainly related to ecosystem services, tourism or wellness;
- development of circular bioeconomy in grape and wine VC trough recovery of by-products and carbon side streams.

3.5.4 Strengths of the economic and research base in the region

ECONOMIC BASE

As previously described, in Friuli Venezia Giulia there are very diversified economic realities due not only to historical and socio-economic peculiarities, but also to primary production capability. In **Table 4** there is a first, and certainly not exhaustive, list of firms representing the regional economic reality, grouped by Area of specialization deemed most appropriate.

Table 4. Most relevant stakeholders in Friuli Venezia Giulia and their competences.

Description of sub-sector/technology area/application area	Leading companies located in region
AGRIFOOD & BIOECONOMY INDUSTRY	
Coffee	ILLYCAFFE' S.P.A
Frozen Food	BOFROST ITALIA SPA

	RONCADIN SPA
Fruits	FRIULKIWI
	FRIULFRUCT
	POMIS
Cured Meat	CONSORZIO DEL PROSCIUTTO DI SAN DANIELE PDO (21 COMPANIES)
	WOLF
Milk and dairy production	CONSORZIO DEL FORMAGGIO MONTASIO PDO
	PARMALAT (LATTERIE FRIULANE)
	LATTERIA MONTANARI
	LATTE CARSO
Wine	VITICOLTORI FRIULANI LA DELIZIA
	GRUPPO VINICOLO FANTINEL SPA.-G.V.F. SPA
	PIERA MARTELLOZZO SPA P.M.
	JERMANN
	LIVIO FELLUGA
Balsamic	ASPERUM, BALSAMERIA - LINO MIDOLINI SRL
Beer	BIRRA CASTELLO SPA
Agribusiness	CONSORZIO AGRARIO DEL FRIULI VENEZIA GIULIA
	VIVAI COOPERATIVI RAUSCEDO
	VITIS RAUSCEDO
Vegetable proteins	BIOLAB
	OLEIFICIO SAN GIORGIO
Bioeconomy	GREENWAY
	BIOMAN
	SERVELMERA
STRATEGIC PRODUCTION CHAINS	
Home system (Timber industry, manufacturing of wood products, production of furniture)	FANTONI SPA
	CALLIGARIS SPA
	SNAIDERO
	BIPAN SPA
	FRIUL INTAGLI INDUSTRIES
	SAVIO MACCHINE TESSILI S.P.A.
	FLEXTRONICS MANUFACTURING S.R.L.
IoT	EUROTECH
ICT & Digital	BEANTECH
Food and beverages technologies	GRUPPO BISARO
SMART HEALTH	
BioHighTech	BIOVALLEY INVESTMENTS S.P.A.
Biomedical (BioMed)	ALTHEA
Biotechnology (BioTech)	ALIFAX R&D SRL
Bioinformatics (BiolCT)	EUROSPITAL
Area connected to regional healthcare and social policies, 3DP	LIMA CORPORATE SPA
Probiotics & Nutraceutics	BIOPHARMA
	DIPHARMA

RESEARCH BASE

Friuli Venezia Giulia is one of the most dynamic Italian regions in research and innovation. In 2017, the total R&D expenditure represented 1.57% (the fifth highest results among Italian regions) of regional GDP a result which is higher than the Italian average (1.37%), but still below the European average (2.08%), (Eurostat 2020).

The amount of regional R&D expenditure represented about 2.5% of national R&D investment: € 586 million (Eurostat 2020), of which 44% in the public sector (Government sector, Higher Education sector) and 56% in the private sector (Business enterprise sector, Private non-profit sector) (Eurostat, 2020).

The regional innovation system comprises a wide range of important organisations, both public and private. The higher-education system includes the universities of Udine and Trieste, and the International School for Advanced Studies (SISSA), which carries out research in mathematics, physics and in new cutting-edge disciplines, such as cognitive neuroscience and neurobiology. In Trieste, the Area Science Park is one of the most relevant Italian S&T Parks. It is a research-driven multi-disciplinary organization operating mainly in the following R&D areas: life sciences and bio-medicine; physics, materials and nanotechnology; electronics and ICT; environment and energy. However, there are other relevant reserch organizations acting at regional, national and international level. These resources, can increase the transversality of knowledge and skills among the various sectors as well as in circular bioeconomy

Following here the list of the main regional organisations that are involved in technology development, education and training and industrial R&D/innovation within the regional smart specialisation domains (**Table 5**).

Table 5. List of the main regional organisations that are involved in technology development, education and training and industrial R&D/innovation.

NAME OF ORGANISATION	TYPE OF ORGANISATION	WEBSITE
SCIENTIFIC AND TECHNOLOGICAL RESEARCH AREA - AREA SCIENCE PARK	Science and Technology Park, Innovation Agency (education and training and industrial R&D/innovation)	en.areasciencepark.it
SCIENTIFIC AND INNOVATION SYSTEM (SIS) FVG	Science and technology hub aimed at promoting networking among all research institutions located in the Friuli Venezia Giulia region (education and training and industrial R&D/innovation)	sisfvg.it
INDUSTRY PLATFORM FOR FVG (IP4FVG)	Digital hub of Friuli Venezia Giulia (education and training and industrial R&D/innovation)	areasciencepark.it
ARGO SYSTEM	Industrial hub (technology development, industrial R&D/innovation)	sistemaargo.it
UNIVERSITY OF TRIESTE	University (education, research and training)	units.it
UNIVERSITÀ DEGLI STUDI DI UDINE	University (education, research and training)	uniud.it
SISSA - SCUOLA INTERNAZIONALE SUPERIORE DI STUDI AVANZATI	Scientific Centre of Excellence at International level (education, research and training and industrial R&D/innovation)	sissa.it
ELETTRA - SINCROTRONE TRIESTE S.C.P.A.	International multidisciplinary research center of excellence specialised in synchrotron and free electron laser radiation and their applications in materials and life science (education, research and training and industrial R&D/innovation)	elettra.trieste.it
CNR - IOM ISTITUTO OFFICINA DEI MATERIALI	Interdisciplinary research center combining material synthesis, advanced characterisations and numerical simulations, focusing on the study and development of innovative materials and devices at the micro- and nano-scale (technology development, education and training and industrial R&D/innovation)	iom.cnr.it
ICGEB - INTERNATIONAL CENTRE FOR GENETIC ENGINEERING AND BIOTECHNOLOGY	International organisation that plays a key role in Biotechnology worldwide for excellence in Research, Training and Technology Transfer to industry - Excellence research, Advanced Training and Technology Transfer in biotechnology to promote sustainable global development (technology development, education and training and industrial R&D/innovation)	icgeb.org
INNOVA FVG CONSORTIUM	Innova FVG consortium is a non-profit economic public entity specialised in research and particularly focused on the development of mountain territory. It manages a Technology Innovation Center, conducting research and incubation activities in this area. The Center is qualified as a Scientific and Technological Park. It promotes innovation within the entrepreneurial, school and local system (technology development, education and training and industrial R&D/innovation)	innovafvg.it
FRIULI INNOVAZIONE	Friuli Innovazione is a Technological Park and a Research and Technology Transfer Organisation (TTO) (business accelerator and certified incubator) which aims at fostering collaboration between the University and the regional economic system. It is active in the sector of ICT, Additive Manufacturing, Metallurgy and Surface and Advanced Materials Technology, Energy and the Environment,	friulinnovazione.it

	Biotechnologies and recently has been credited as Facility Centre for 3DP - Additive FVG -. (technology development, education and training and industrial R&D/innovation)	
TECHNOLOGICAL POLE OF PORDENONE	Scientific and technological Park (technology development, education and training and industrial R&D/innovation)	polo.pn.it
CLUSTER COMET	Metalwork cluster specialised in Advanced Manufacturing (ADMA) and mechatronic	clustercomet.it
DITEDI – INDUSTRIAL CLUSTER FOR DIGITAL TECHNOLOGIES (DISTRETTO INDUSTRIALE DELLE TECNOLOGIE DIGITALI)	Cluster specialised in ICT and digital technologies (data analytics & AI). DITEDI is a consortium aiming to promote digital culture and networking among more than 100 technological and innovating companies of the region. It promotes and disseminates digital culture among private companies, Public Administration and citizens, with the aim of increasing competitivity and cooperation among key players of the regional digital environment.	ditedi.it
SMART HEALTH CLUSTER (CBM)	Cluster specialised in smart health. It develops and exploits the potential of biomedicine, biotechnology and bioinformatic. It helps creating close links between the industrial and research systems, as well as among regional and national institutions in order to develop synergies. CMB is in charge of the smart health area in the framework of the Smart Specialisation Strategy (S3) and plays a leading role in building relationships among all actors involved in this field (entrepreneurs, researchers, clinicians, policy makers, etc.), with the ultimate goal of promoting business innovation and social and economic growth at regional level	cbm.fvg.it
CARNIA INDUSTRIAL PARK	Digital Innovation Hub Internet of Things (DIH-IoT). It includes over 180 companies located in three industrial areas of competence (Tolmezzo, Amaro and Villa Santina) for a total of approximately 3,600 workers.	carniaindustrialpark.it
FVG AGRIFOOD & BIOECONOMY CLUSTER	Cluster specialised in agri-food and bioeconomy. It assures a good coordination among all the actors operating in agri-food sector (enterprises, industry, University) as well as in bioeconomy field	agrifoodfvg.it
CLUSTER ARREDO E SISTEMA CASA	It is the cluster responsible for providing services to regional institutions and companies in the field of wood furniture. It offers services (such as group certification, production guidelines in line with sustainability principle and applied innovation, etc.) and promotes projects in favour of businesses and institutions.	clusterarredo.com
MARE FVG TECHNOLOGY CLUSTER	Cluster specialised in maritime technologies. MARE FVG is a reference point for enterprises, universities, research centers, training institutions who aim at being more competitive, together.	marefvg.it

3.5.5 Interregional, cross border and national collaboration experiences; sinergy potential

The Friuli Venezia Giulia Autonoumus Region, also within the regional research base, has a good experience in interregional, cross border and national collaboration. In **Table 6** a list of project where the acquired experience is considerate relevant for partecipation the BERRY+ RIS3 partnership.

Table 6. List of Friuli Venezia Giulia experiences.

Programme	**Project name**	***web site***
Programme 2014 - 2020 INTERREG V-A Italy - Croatia	Valorisation of SMall-scale ARTisanal FISHery of the Adriatic coasts, in a context of sustainability	*italy-croatia.eu/web/adrismartfish*
Programme 2014 - 2020 INTERREG V-A Italy - Croatia	ShARed GOvernance of Sustainable fisheries and aquaculture activities as leverage to protect marine resources in the Adriatic Sea	*italy-croatia.eu/web/argos*
Programme 2014 - 2020 INTERREG VB Alpine Space	Alpine Space Transnational Governance of Active and Healthy Ageing	*alpine-space.eu*
Programme 2014 - 2020 INTERREG V-A Italy - Slovenia	Development of ecosystems and innovation value chains: supporting cross-border innovation through Creative Industries - Strategic Theme 2 - Creative Industry	*ita-slo.eu*
Programme 2007 - 2013 Italy - Austria (IT-AT)	Tutela, valorizzazione e fruizione delle aree naturali dell'arco alpino orientale - Schutz, Valorisierung und Nutzung der Schutzgebiete in den Ostalpen	*fanalp.at*
Programme 2014 - 2020 Interreg Europe	Green Public Procurement and Sustainability Tools for Resource Efficiency Mainstreaming	*interregeurope.eu/GPP-STREAM*
Programme 2014 - 2020 INTERREG V-A Italy - Slovenia	Green infrastructures for the conservation and improvement of the condition of habitats and protected species along the rivers	*ita-slo.eu*
Programme 2014 - 2020 INTERREG V-A Italy - Austria	Malga and Alm Desired Experience	*interreg.net*
Programme 2014 - 2020 INTERREG VB Mediterranean	Mediterranean Innovation STRAtegy for transnational activity of clusters and networks of the Blue Growth	*mistral.interreg-med.eu*