Bio·based Industries Consortium

Mapping Latvia's bio-based potential

Country Report

CONTENTS

EXECUTIVE SUMMARY

Latvia offers substantial opportunities for the bio-based industry. The potential of the country for bio-based activities comes across very clearly from the information gathered from publicly available sources and not-yet published studies from national organisations (gratefully accepted by the authors of this report to expand and strengthen its basis). The information is not complete but warrants an optimistic view of the bio-based potential of the country.

Situated on the banks of the Baltic Sea, Latvia's landscape is mostly plains and undulating midlands. Roughly half of the country is covered by forests, while around a quarter of the country is agricultural land.

Agriculture, forestry and chemical industries are among the strong drivers of Latvia's economy. Also present are a healthy blue economy, food and beverages, food-processing and wood-processing industries. Despite being mostly a services economy (80% of GDP) and having a highly urbanised population (76%), agriculture and forestry still play an important role in the country's economy, accounting for 4% of GDP and 7% of employment (higher than the EU average).

These industries are a sound basis for a bio-based industry in Latvia. The presence of a well-organised innovation support infrastructure contributes to a significant list of ingredients for a sustainable bio-based sector. In addition, the country was the first among the Baltic states to issue a bioeconomy strategy that should be great support for local, regional and national bio-based operations.

The industrial sectors in Latvia have substantial residual streams and waste, most of which find low-value applications today. These streams are relevant feedstocks for bio-based operations in the country.

Being the largest sector, agriculture produces the most residual streams (estimated at 9 million tonnes/year), but forestry also contributes with an estimated 2.9 million cubic metres/year of logging residues. Moreover, the arable land and grasslands are considered underexploited at the moment, leaving further space for additional bio-based activities in the country. The food and beverage industries and the manufacturing of wood-based products are currently the main bio-based economic activities in the country. Residual streams from these activities are excellent feedstock for bio-based operations in Latvia. However, precise data on waste generation and management are not available across all industrial sectors: while figures exist for agriculture and forestry, they are not available for downstream processing of biomass' residual streams and the organic fraction of Municipal Solid Waste.

Latvia has an infrastructure of universities, research centres and industries, and an active association for bioeconomy research. There is a strong support towards high-tech university spinoffs and start-ups. Among the 15 technology clusters recognised and supported by the government, 6 share an interest in bioeconomy. Knowledge-intensive bio-economy is one of the branches of the national smart specialisation strategy (RIS3).

This document is part of the 'strategic outreach programme' of the Bio-based Industries Consortium (BIC). The objective of the programme is to identify opportunities for bio-based industrial activities in European countries where these activities are relatively low. Bio-based activities heavily depend on innovation, and hence are relatively low in 'moderate/modest innovator' countries. This may be the result of insufficient knowledge of the potential for the bio-based industry in these countries, by actors in bio-based activities in these countries as well as by BIC. Additionally, actors in these countries may not be fully aware of the opportunities offered by BIC and the Bio-based Industries Initiative.

Several EU-funded research projects using biomass feedstock and biotechnologies have been running in Latvia in the last few years (including some under the Bio-based Industries Joint Undertaking programme). This demonstrates the interest and commitment for bio-based activities by the scientific and industrial communities in the country.

This report does not pretend to be complete. Nor may it be based on the most recent statistical data. The report is a first draft that has been prepared by collecting and analysing available data by BIC. The report is mainly feedstock-driven, in an effort to use relevant available feedstock for higher values than currently is the case. The Latvian representative in the States Representatives Group of the BBI JU has provided significant assistance in collecting and reviewing data used in this report.

BIC will now share this document with local actors and seek to assist in setting up action plans with local industry and governmental institutions for expanding the bio-based activities in Latvia.

The following chapters describe the current economic basis of Latvia, the potential for bio-based industrial operations and some examples of achieving high-value applications from comparable feedstocks elsewhere in Europe. The appendix contains additional tables and graphics related to the aforementioned chapters.

1. CURRENT BASIS OF ECONOMIC ACTIVITIES

Latvia's economy shows a strong bio-based primary sector, with notable contributions from the agri-food and forest-based value chains. Roughly half of the country's surface is covered by woods and forests, while just over a quarter of the area is cultivable.

The total agricultural land area in 2016 was 2.33 million hectares (ha), including unmanaged and overgrown areas.[1] According to the Central Statistics Bureau database, the utilised agricultural area is 1.93 million ha: this yields 256 thousand ha of unused agricultural land. Additionally, only 45% of the grown green mass from the 711 thousand ha agricultural grasslands is used for production.[2]

Despite the smaller area dedicated to farming, agriculture is the leading bio-based primary sector in terms of Gross Value Added (GVA), closely followed by forestry. The balance inverts when it comes to manufacturing, with wood-based products surpassing the food and beverage sector.

For sectors such as textiles and leather, chemicals, pharmaceutical and furniture it is not possible to distinguish between the bio-based and non-bio-based contributions. They are therefore shown in Figure 3 as 'partially bio-based'.

Figure 1. Gross Value Added of bio-based primary sector (M€,[3] Eurostat, 2017)

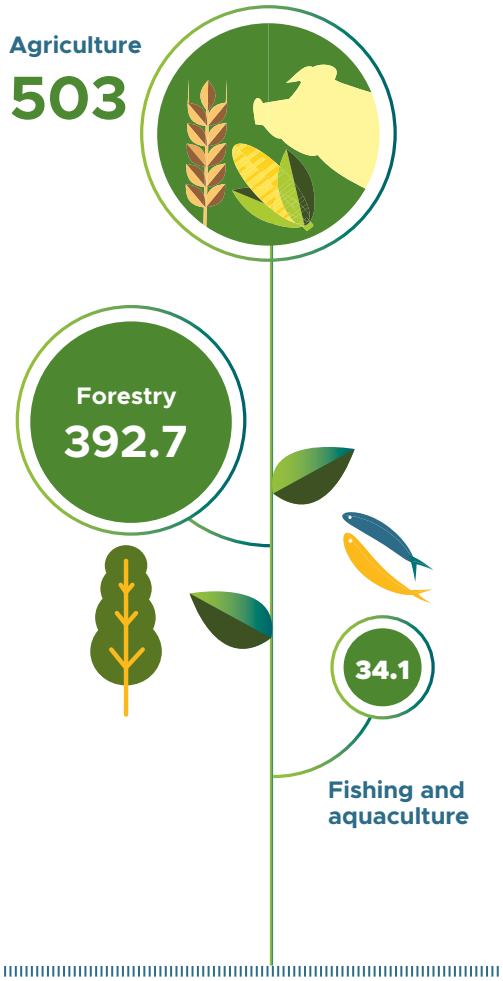
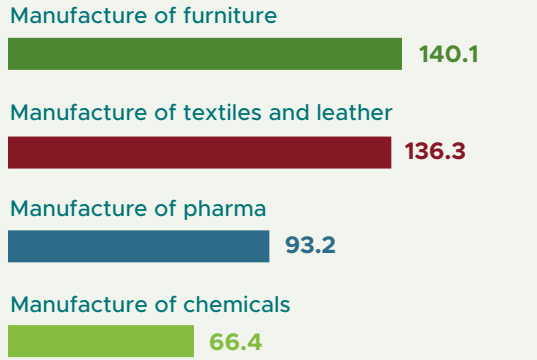


Figure 2. Gross Value Added of bio-based manufacturing sector (M€, Eurostat, 2017)

Figure 3. Gross Value Added of partially bio-based manufacturing sector (M€, Eurostat, 2017)

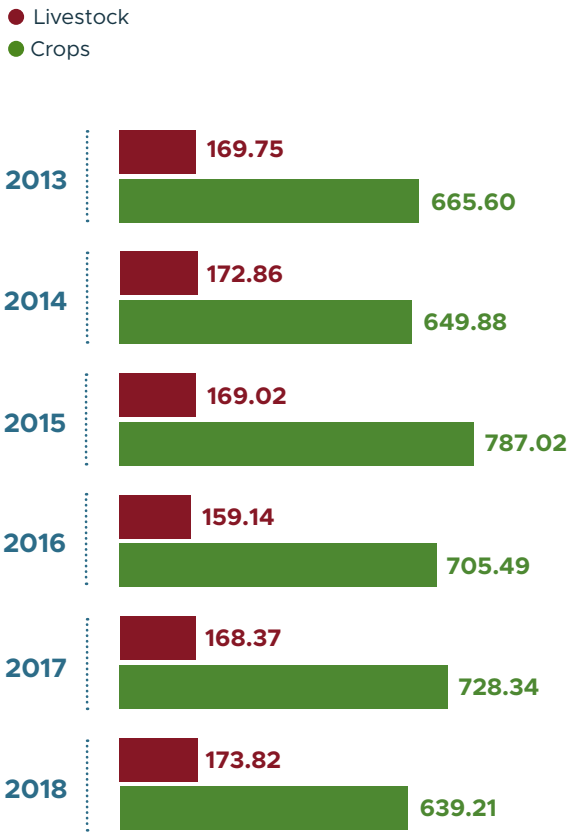


[1,2] Unpublished evaluation by Latvian University of Life Sciences and Technologies, by kind concession of the authors
[3] million

1.1. Agriculture

Latvia's agriculture is dominated by cereals and dairy production. Rapeseed and potatoes also make relevant contributions to the overall value of the sector. In the meat industry, pork is the largest contributor.

Figure 4. Agricultural production trends (M€, Eurostat)



1.1.1. Crop production

Cereals

Cereals are by far the main crop product. Their production volume amounted to over 2.5 million tonnes in 2017.

In 2017, wheat constituted 86.1% of the total volume of grain purchased (83.7% in 2016), 67.3% of which met the food quality requirements and 32.7% were fodder wheat.

Dry pulses

Production of dried pulse grains (2016/2017)

125.4 Kt*

Potatoes

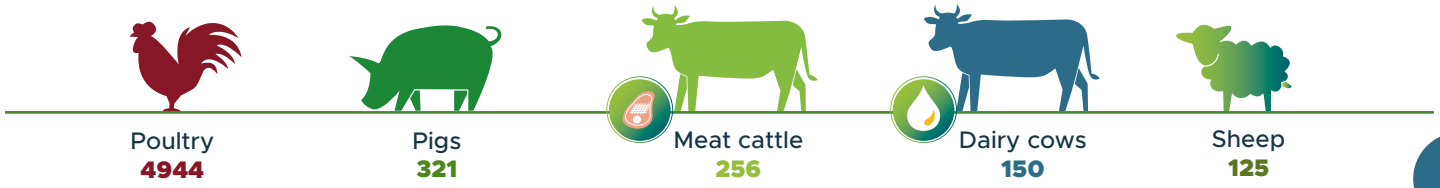
Production of potatoes (2016/2017)

491.6 Kt*

1.1.2. Livestock

The breakdown of the livestock in Latvia at the end of 2017 is shown in Figure 5.

Figure 5. Animal headcount (K*, 2017)



1.2. Forest

According to the latest data of Forest Resource Monitoring, performed in 2014, the total forest area in Latvia is 3260 thousand ha (over half of the country surface), of which 1510 thousand ha (46.3%) is state owned and 1750 thousand ha (53.7%) is privately owned.[1]

The total forest stock is estimated at 668 million cubic metres, of which state-owned amounts to 355 million cubic metres and privately-owned amounts to 313 million cubic metres. An interesting fact is that the growth rate of the forest stock is higher than the felling rate; this means that the forest stock is steadily expanding.

The felled volume in 2016 was 10.6 million cubic metres, of which 48% in state-owned and 52% in privately-owned forests.[2] This amount represents around 63% of the theoretical sustainable wood intake per year. This means that an additional 7 million cubic metres of wood are theoretically available for the bioeconomy.

The most relevant tree species in Latvia are birch, pine and fir.

Figure 6. Trend of the Gross Value Added of forestry (M€, Eurostat)

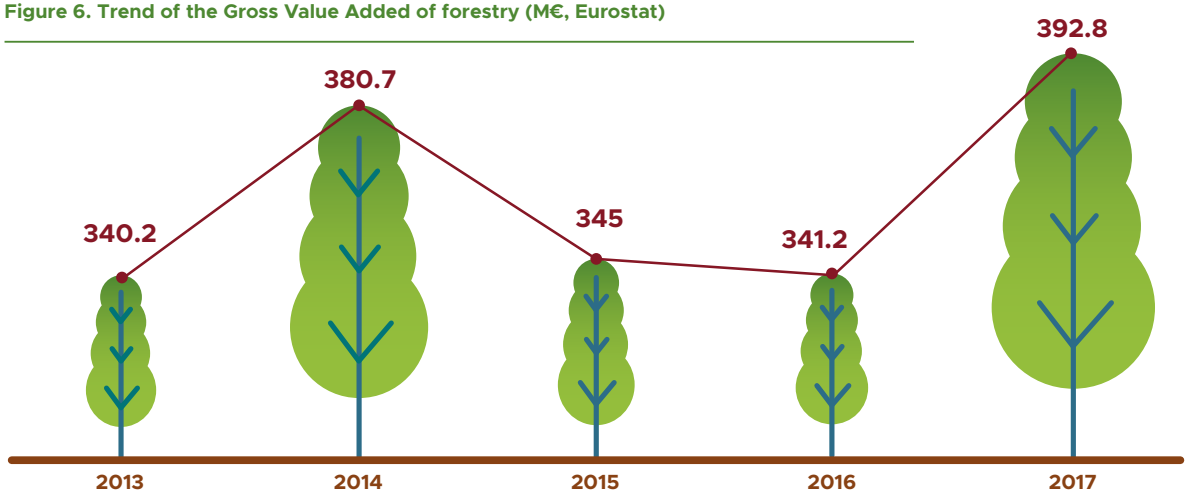
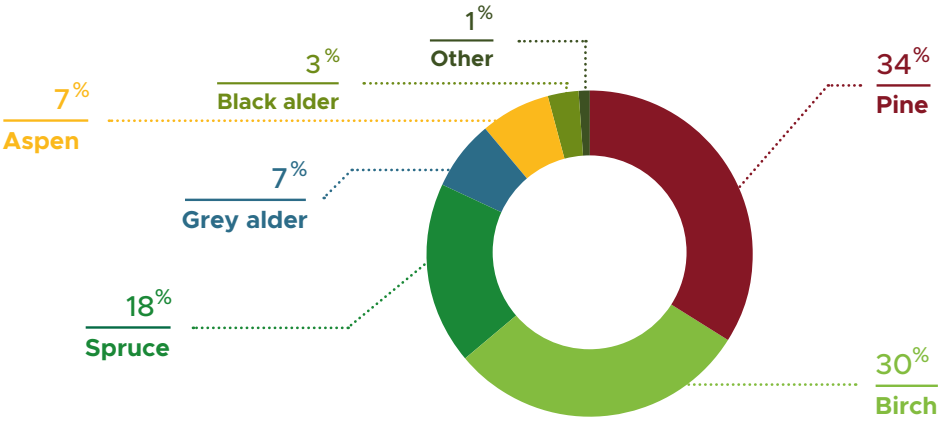


Figure 7. Distribution of tree species in Latvian forests (2018)



[1] CSB, Forestry Yearbook 2017 (Latvian only)
[2] CSB, Environmental Indicators in Latvia 2016

1.3. Fisheries, aquaculture and the blue economy

1.3.1. Fisheries

Fish catch in 2016, a 38% increased from 2015

114.2 Kt

Fishery activities in Latvia are mainly concentrated in the Baltic Sea and the Gulf of Riga.The catches of various fish species have been declining during the recent years.[1] The most caught fishes are herring, sprat and cod.

1.3.2. Aquaculture

The overall production (2014)

573 T[2]

In 2014 (last available data) there were 160 aquaculture farms in the country, most of them being small scale. This is reflected by the production, amounting to just 573 tonnes of fish per year.

1.3.3. Algae

No notable activity is observed in this field.

1.4. Food and beverages

The food and beverage industries are the second largest industrial sector in Latvia, producing around 22% of the value added in manufacturing and employing around 20% of the workforce in manufacturing (2016).

In 2016 the sector counted

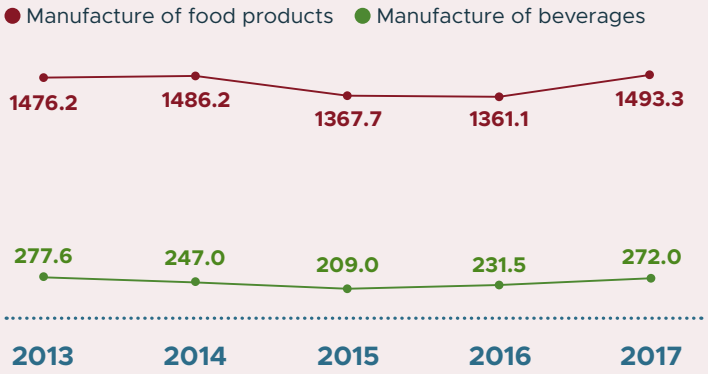
+100 companies

Turnover (Eurostat)

€1.4 B[3]

Meat and dairy are the two most important sectors by turnover and production value.

Figure 8. Trend of production value of food, beverages and tobacco production (M€, Eurostat)



[1] CSB, Central Statistical Bureau of Latvia
[2] tonnes
[3] billion

1.4.1. Meat

91.2 Kt

of meat were produced in Latvia in 2017. This represents a 4.6% increase compared with the previous year.

Main players

- **Putnu Fabrika Ķekava** is the leading poultry producer in Latvia, under the Ķekava and Top Choice Poultry brands.
- **Kurzemes Gaļsaimnieks LTD** is a B2B and B2C producer of meat, butchering co-products, manufactured meat and meat products.
- **Lielzeltiņi LTD** is the second largest poultry producer in Latvia. It is owned by the Lithuanian group Linas Agro.
- **Rēzeknes Gaļas Kombināts LTD** is a meat producer.
- **HKScan Latvia JSC** is the local branch of the Finnish group HKScan, dealing with beef and pork meat products.
- **Forevers LTD** is a beef and pork meat processing company.

The most significant increase was observed in output of

Poultry

34 Kt

↑11.3% compared with previous year

Pork

38 Kt

↑4.7% compared with previous year

Beef and veal

18.5 Kt

↓5.2% compared with previous year

Production of mutton and goat meat fell by

↓2.3% compared with previous year

1.4.2. Fish and aquaculture products

Processing of fish, molluscs and crustaceans has an overall production value of (Eurostat, 2016)

€148.8 M

Main players

- **Karavela SAS** is the leading canned fish producer, with an annual capacity of over 40 million cans of fish.
- **Salas Zivis LTD** is a fish processing company producing frozen fish products. It mainly works using imported feedstock.
- **GAMMA-A LTD** is a producer of smoked fish (mainly sprat). It operates its own fleet of fishing vessels.

1.4.3. Beverages

Soft drinks are the most important subsector among those with recently available data. The beer subsector has data marked as 'confidential' on Eurostat from 2014 onwards. The last available data, of 2013, are reported in red in Figure 9.

Main players

- **Latvijas Balzams JSC** is one of the leading producers of alcoholic beverages in the Baltic area, notably vodka (Stolichnaya and Moskovskaya brands). It is part of the Luxembourg-based Amber Beverage Group.
- **Cido Grupa LTD** (owned by Danish group Royal Unibrew) is a large producer of beer, juices and soft drinks.
- **Cēsu Alus** (owned by Finnish group Olvi Oyj) is a large producer of beer, energy drinks, mixed cocktails and soft drinks.
- **Aldaris JSC** (owned by Danish group Carlsberg) is a producer of beer and soft drinks.
- **Berlat Grupa LTD** is a producer of vodka and other spirits.

Figure 9. Soft drinks sectors (Eurostat, 2016)

	No of entreprises	Turnover of gross premiums written (€M)	Production value (€M)
Distilling, rectifying and blending of spirits	16		
Manufacture of wine from grape	10	0.1	0.1
Manufacture of cider and other fruit wines	24	0.6	0.6
Manufacture of other non-distilled fermented beverages	9	0.1	0.1
Manufacture of beer	37	103.1*	95.3*
Manufacture of malt	0	0	0
Manufacture of soft drinks; production of mineral waters and other bottled waters	30	89.4	54.2

* 2013 data

1.4.4. Dairy products

The dairy sector is dominated by the production of fresh and processed milk and cheese.

Turnover (Eurostat)

€360.2 M

911 Kt **of milk (incl. goat milk) were produced (Eurostat, 2017)**

Main players

- **Food Union** is the largest dairy company in Latvia, as well as the leading ice cream producer in the Baltic States.
- **Preiļu Siers JSC** is a dairy company mostly focused on cheese and dry milk products.
- **Tukuma Piens JSC**, operating under brand Baltais, is a producer of milk, yogurt and cheese.
- **Latvijas Piens LTD** is a producer of milk and cheese.
- **Cesvaines Piens JSC** and **Smiltenes Piens JSC** are cheese producers.

1.4.5. Cereal-based foods, bakery, sweets

The sector of bakery products consists mainly of small players: it is the first by number of enterprises but the third by turnover. (Source: Eurostat)

Main players

The largest dairy companies by turnover, as listed in the database of the **Investment and Development Agency of Latvia** are:

- **Dobeles Dzirnavnieks JSC** is a producer of pasta, cereal flakes, flour, rice and animal feed.
- **Orkla Confectionery & Snacks Latvija LTD** is the local branch of the Norwegian food group Orkla.
- **Food Union**, besides dairy products, is also active in snacks and biscuits.
- **Rīgas Dzirnavnieks JSC** produces flour, flakes and breakfast cereals.
- **Hanzas Maiznīcas JSC** is a large bread producer.

1.4.6. Other food products

In 2016, the number of eggs produced was

800.7 M

↑6.7% compared with previous year

The average egg production per laying hen (2016) constituted

303 eggs

↑6.3% compared with previous year

1.5. Wood products

The forestry and timber industries are among Latvia's export leaders. The sector is worth €117 million annual production value.

Export of wood and its products was the most significant export sector in 2016, representing

17% **of the total export value**

74% **of forestry-sector output is exported.**

The sector of wood-based products is worth over **€2B**

According to Eurostat data,

109

companies are active in the pulp and paper sector; however, only 5 of them are producers of pulp or paper, while the others manufacture products made from paper and cardboard.

Figure 10. Wood-based sectors (Eurostat, 2016)

Sectors	No of entreprises	Turnover of gross premiums written (€M)	Production value (€M)
Sawmilling and planing of wood	898	1037.8	1030.8
Manufacture of products of wood, cork, straw and plaiting materials	1164	1093.7	1036.0
Manufacture of furniture	793	245.4	244.3

Main players

- **AKZ Ltd.** is one of the largest softwood sawmills in Latvia with an annual production of about 225000 cubic metres of sawn goods.
- **BYKO-LAT** and **Vika Woods** (belonging to the Swedish group Bergs Timber) are large woodworking company producing planed timber, windows, doors, fences and prefabricated houses.
- **Kronospan Riga LTD** is the local branch of Austria-based multinational Kronospan, leading producer of wood-based panels.
- **LATVIJAS FINIERIS JSC** is a forest and woodworking company whose main product is birch plywood
- **BSW Latvia LTD** is the local branch of British company BSW Timber Group.
- **Gaujas Koks LTD** is a producer of construction wood.
- **Rettenmeier Baltic Timber LTD** is the local branch of the German sawmill Rettenmeier.
- **Stora Enso** and **Smurfit Kappa** have paper and cardboard plants in the Country.

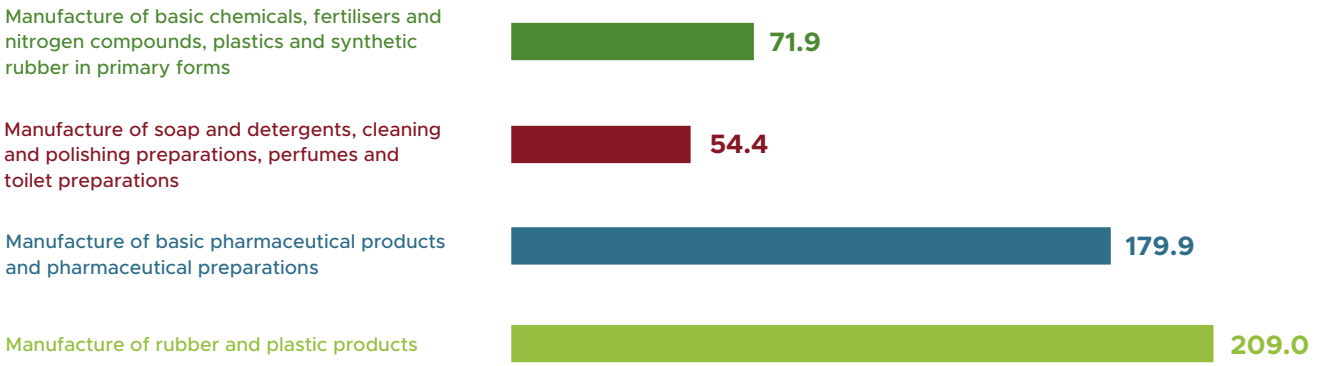
1.6. Chemical and pharmaceutical industry

The chemical and pharmaceutical sectors rank 5th on turnover among manufacturing industries (7.5% in 2016), 5th among other industries by number of employees (7.0% in 2016), and 5th by share of export in sector sales (79.3% in 2016). The Central Statistical Bureau data show that the sector included 500 companies in 2018.

Main players

- **Bio-Venta** is a producer of rapeseed biodiesel, rapeseed oil, glycerol and potassium sulphate.
- **Olaines Ķīmiskā Rūpnīca "Biolar" LTD** is a chemical company specialising in resins, paints, varnishes, plasticisers and organic synthesis products.
- **Diana Sveces LTS** is a large producer of candles.
- **NPK Expert LTD** is a producer of NPK fertilisers.

Figure 11. Production value of the chemical sector (M€, Eurostat, 2017)



1.7. Biotech industry

Latvia was the main location for the manufacturing of fine chemicals and pharmaceuticals sectors in the former Soviet Union, with 25% of all new Soviet drug technology designed in Latvia. One out of four medical preparations manufactured in the former USSR and intended for the USSR market was manufactured in Latvia.

R&D activities in Latvia show a wide range of research sectors, such as: microbiological synthesis, wood chemistry, virology, synthesis of physiologically active substances, bioorganic chemistry, molecular biology, genetics, biotechnology, biomechanics, magneto-biology.

Manufacturing and design of biotechnological equipment is also relevant. Furthermore, Latvia is becoming internationally recognised for its CRO (Contract Research Organisation) activities.

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Companies active in the pharmaceutical sector (Eurostat)

Turnover

€188M

Annual Production Value

€179.9M

Main players

- **Grindeks JSC** is a pharmaceutical company active in research, development, manufacturing and sales of original products, generics and active pharmaceutical ingredients. Grindeks specialises in heart and cardiovascular, CNS and anti-cancer medication.
- **Olainfarm JSC** is a producer of finished dosage forms, active pharmaceutical ingredients, intermediates and chemicals.
- **BRIZ LTD** is company developing and supporting the sales on the market of different products, ranging from pharmaceuticals, cosmetics, food supplements, medical products.
- **PharmIdea** is the only company in Latvia able to provide sterile and freeze-dried drugs manufacturing at large scale. Its product portfolio contains self-developed generic hospital, women health and anti-cancer drugs.

1.8. Clusters & organisations

Of the 15 clusters officially recognised by the Latvian government, 6 share bioeconomy interests:

- Latvian high added value and healthy food cluster, grouping 13 entities from the food and beverage industry as well as academia;
- Life Science Cluster of Latvia, grouping over 50 industries and research centres from the chemical, pharmaceutical and biotechnology sectors;
- Latvian wood construction cluster, grouping over 20 manufacturers of wooden products, educational and research institutes;
- Food products quality cluster, including over 50 food producers;
- Clean Technology Cluster, grouping 44 entities (large industries, SMEs and research centres) involved in environmentally friendly technologies and biotech;
- Green-Tech Cluster, with 52 members with different expertise including engineering, ICT, space, energy efficiency in buildings, energy efficient production processes and biomaterials.

Of the 8 competence centres established under the government measure 'Support between Competences Centers for the Development of New Products and Technologies', 2 are operating in the bioeconomy field:

- Food competence centre of Latvia is related to the introduction of innovations in agriculture and food sector for the development of new products and technologies. From 2019 till 2021 it will receive EU support (ERAF) of EUR 4,7 million for the development new products and technologies, which includes support for cross-sectoral cooperation. **From 2016 till 2019 it already supported 54 research projects and 49 entrepreneurs.**
- Forest Sector Competence Centre of Latvia realises industrial research projects, promotes new product and technologies development, promoting forestry and related industries growth. F**rom 2016 till 2019 it already supported 30 research projects and 24 entrepreneurs.**

The Strategic Association for Bioeconomy Research brings together 9 institutions active in R&D in the various fields of bioeconomy:

- Latvia University of Life Sciences and Technologies (LLU)
- Institute of Horticulture
- Institute of Agricultural Resources and Economics
- Latvian Plant Protection Research Centre
- Institute of Food Safety, Animal Health and Environment (BIOR)
- Latvian State Forest Institute 'Silava'
- Latvian State Institute of Wood Chemistry
- Forest and Wood Products Research and Development Institute (MeKA)
- Institute of Horticulture, Institute of Agricultural Resources and Economics and Latvian Plant Protection Research Centre are affiliated bodies of Latvia University of Life Sciences and Technologies (LLU).

1.9. Academia and research centres

Latvia Technology Park operates in Riga since 1996. Its founders include Riga Technical University, University of Latvia, Ministry of Economy of the Republic of Latvia, Riga City Council, Chamber of Commerce and Industry of Latvia. Latvian Technological Centre, also located in Riga and dating back to 1993, has among its founders Riga Municipality, Latvian Academy of Sciences, Institute of Physical Energetics and Latvian National Quality Association.

1.10. Research projects

ReInvent - Novel Products for Construction and Automotive Industries Based on Bio Materials and Natural Fibres

Project duration 2018 - 2022

BBI JU Demo focusing on development and testing of bio-based materials and fibres for replacing the petroleum-based polyurethane insulation products used in buildings and soft foams for vehicles interior products. SIA Ritols is a partner of the project.

US4GREENCHEM - Combined ultrasonic and enzyme treatment of lignocellulosic feedstock as substrate for sugar based biotechnological applications

Project duration 2015 - 2019

US4GREENCHEM was a BBI project combining ultrasonic and enzyme treatment of lignocellulosic biomass to obtain high quality sugars and lignin. Latvian State Institute of Wood Chemistry was a partner of the project.

BioMonitor - Monitoring the bioeconomy

Project duration 2018 - 2022

The overall objective of the project is to establish a sustainable data and modelling framework for quantification of the bioeconomy and its economic, environmental and social impacts in the EU and its Member States. Latvia University of Life Sciences and Technologies is a partner in the project.

LIVERUR - Living lab research concept in rural areas

Project duration 2018 - 2021

LIVERUR aims at transferring the Living Lab concept as innovative business model to rural areas. In doing so, it will identify those that are already developing in rural areas, and it will undertake socio-economic analysis to identify, describe and benchmark differences between the new Living Lab approach and more traditional entrepreneurial approaches. Zemnieku Saeima is a partner of the project .

LIVESEED - Improve performance of organic agriculture by boosting organic seed and plant breeding efforts across europe

Project duration 2017 - 2021

LIVESEED aims to improve the performance and competitiveness of the organic sector by acting on improved cultivar testing systems, novel breeding concepts, building new breeding networks, identifying bottlenecks in organic breeding governance and business models. Institute of Agricultural Resources and Economics is a partner in the project.

SUFISA - Sustainable finance for sustainable agriculture and fisheries

Project duration 2015 - 2019

The SUFISA project set out to identify sustainable practices and policies in the agricultural, fish and food sectors that support the sustainability of primary producers in a context of multi-dimensional policy requirements, market uncertainties and globalisation. Baltic Studies Centre (BSC) was a partner in the project

AgriLink - Agricultural knowledge: linking farmers, advisors and researchers to boost innovation

Project duration 2017 - 2021

The project focuses on analysing the role and improving the effectiveness of farm advice and advisors in farm decision-making. Baltic Studies Centre (BSC) is a partner in the project.

ROBUST - Rural-urban outlooks: unlocking synergies

Project duration 2017 - 2021

ROBUST aims to establish mutually beneficial synergies between urban and rural areas, acting in particularly on governance models. Baltic Studies Centre (BSC) and Tukuma Novada Dome are partners in the project.

SALSA - Small farms, small food businesses and sustainable food security

Project duration 2016 - 2020

SALSA is assessing the role of small farms and small food businesses in delivering a sustainable and secure supply of affordable, nutritious and culturally adequate food. Its aim is in particular to strengthen the role of small enterprises across the food value chain. Baltic Studies Centre (BSC) is a partner in the project.

FATIMA - Farming tools for external nutrient inputs and water management

Project duration 2015 - 2018

FATIMA addressed monitoring and management of agricultural resources to achieve optimum crop yield and quality in a sustainable environment. It entailed precision farming and the perspective of a sustainable agriculture in the context of integrated agri-environment management. Baltic Open Solutions Centre was a partner in the project.

EMPHASIS - Effective management of pests and harmful alien species - integrated solutions

Project duration 2015 - 2019

EMPHASIS was a research project addressing native and alien pests' threats (insect pests, pathogens, weeds) for a range of both natural ecosystems and farming systems: field crops, protected crops, forestry, orchards and amenity plants. Integretas Audzesanas Skola LTD was a partner in project.

4D4F – Data driven dairy decisions for farmers

Project duration 2016 - 2019

The project focused on the role of animal and environmental sensors in collecting real time information to help make more informed decisions in dairy farming. Latvian Academy of Sciences was a partner of the project.

ERIFORE - Research Infrastructure for Circular Forest Bioeconomy

Project duration 2016 - 2018

ERIFORE aimed at strengthening cooperation among European forest research infrastructures and to establish new business models, novel products and services enabling sustainable growth. Latvian State Institute of Wood Chemistry was a partner of the project.

BE-Rural - Bio-based strategies and roadmaps for enhanced rural and regional development in the EU

Project duration 2019 - 2022

The overall goal of BE-Rural is to realise the potential of regional and local bio-based economies by supporting relevant actors in the participatory development of bioeconomy strategies and roadmaps. The project will implement a series of regional Open Innovation Platforms to kick-start the co-creation process, bringing together key stakeholders from academia, policy, business and civil society to develop ideas and capitalise on this bioeconomy potential. Latvian State Forest Research Institute 'Silava' is a partner of the project.

SmartAgriHubs - Connecting the dots to unleash the innovation potential for digital transformation of the European agri-food sector

Project duration 2018 - 2022

SmartAgriHubs is dedicated to accelerating the digital transformation of the European agri-food sector. It will consolidate, activate and extend the current ecosystem by building a network of Digital Innovation Hubs (DIHs) that will boost the uptake of digital solutions by the farming sector. The heart of the project is formed by 28 flagship innovation experiments demonstrating digital innovations in agriculture, facilitated by DIHs from 9 Regional Clusters including all European member states. Zemnieku Saeima, Baltic Open Solutions Centre, SIA Sungis are partners of the project.

MAGIC - Marginal lands for Growing Industrial Crops: Turning a burden into an opportunity

Project duration 2017 - 2021

MAGIC aims to promote the sustainable development of resource-efficient and economically profitable industrial crops grown on marginal lands. The project foresees identification of the most suitable crop varieties and agronomic practices and the development of suitable harvesting strategies and logistics to optimise the biomass supply-chains. Latvian State Forest Research Institute 'Silava' is a partner of the project.

Advancing Sustainable Circular Bioeconomy in Central and Eastern European countries: BIOEASTsUP

Project duration 2019 - 2022

The project aims at supporting the BIOEAST initative in the transition of Central and Eastern Europe towards circular bioeconomy. The project focuses on aligning national bioeconomy strategies and stimulating the creation of multi-actor value chains in a transnational framework. Latvia University of Life Sciences and Technologies (LLU) and Technical Unviersity of Riga are partners of the project.

BALTICBIOMASS4VALUE

Project duration 2019 - 2021

The project is an INTERREG project with partners from Lithuania, Latvia, Estonia, Germany, Poland, Sweden, Norway and the Russian Federation, focusing on generation of bioenergy from residual biomass from agriculture, food and feed industry, forestry, wood industry, municipal waste and sewage sludge, fishery and algae. Latvia University of Life Sciences and Technologies (LLU) is a partner of the project.

2. CURRENT OPPORTUNITIES FOR BIO-BASED ACTIVITIES

This chapter explores the opportunities to expand bio-based industrial activities in Latvia. It lists existing or potentially new feedstocks for the bio-based industry from the industrial sectors covered in chapter 1. These are mainly residual streams and waste that today find a low-value destination. By feeding these streams into bio-based operations, they could be converted into applications that have higher value than their current disposal in the country.

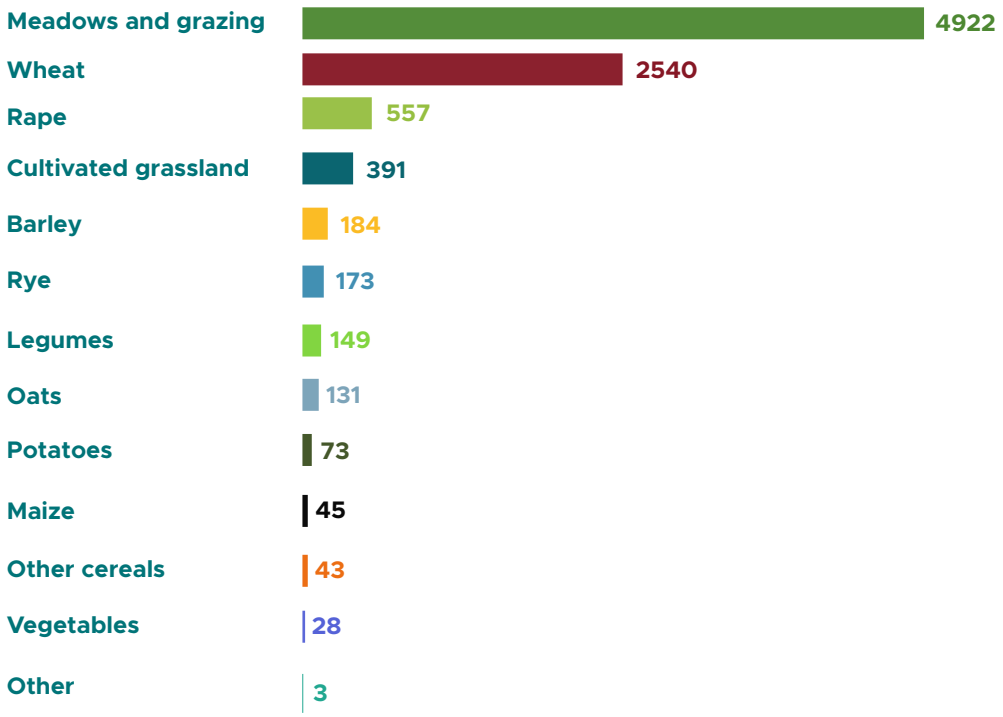
Success of these new developments also depends on regional and national strategies for bioeconomy. Latvia was the first among Baltic states to adopt a national bioeconomy strategy. Sub-chapter 2.2 lists current strategies and programmes on a national basis and international in the Baltic region.

2.1. Bio-based residue: availability and use

2.1.1. Agricultural residues

An estimation of the quantities of agricultural residues has been made by the Latvian State Forest Institute 'Silava'*. There are over 9 million tonnes of agricultural residues per year, mostly coming from meadows and grazing and from wheat cultivation.

Figure 12. Agricultural residues, including those used as animal feed or bedding (Kt, Eurostat, 2017)



* Unpublished study by the Latvian State Forest Institute 'Silava', by kind concession of the authors

2.1.2. Forestry residues

According to an unpublished evaluation by the Latvian State Forest Institute 'Silava', residues from logging amount to 2.86 million cubic metres. Roughly 30% of it is used, mainly for energy production, while 70% is left in the forest.

It is also possible to estimate the fraction of residues in weight from the removal data. JRC estimates the fraction of residues as 20% in weight of the total wood felled,[1] while other sources vary between 15% [2] and 30%.[3] The exact fraction depends of course on many factors, among these are tree species and age, climate and logging practices.

Based on the above, an estimate of the available residues can be made from the removal quantities shown in Figure 12. Since the amount of wood removed is only available as volume, a conversion to weight is necessary. For this calculation, we use an average density of 600 kg/m3 for coniferous trees, and 800 kg/m3 for deciduous ones.

Figure 13. Forest residues availability (estimation from Eurostat data for 2016)

			Residues (thousand tonnes)		
Group of species	Removal (thousand cubic metres)	Removal (thousand tonnes)	15%	20%	30%
Coniferous	8824	5294	794	1059	1588
Non-coniferous	3827	3062	459	612	919

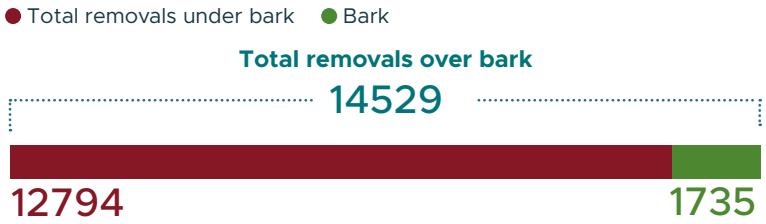
An estimation of the quantity of bark available can be extracted from the difference between the removal statistics 'over bark' and 'under bark', both available on Eurostat.

[1] Camia A. et al., 2018, Biomass production, supply, uses and flows in the European Union, JRC

[2] Meuleman, B., L. Kuiper, G. J. Nabuurs, 2005, Effect: EU forest for renewable energy to mitigate climat, Ecofys, Utrecht

[3] Smith et al., 2009, Forest resources of the United States, 2007: a technical document supporting the forest service 2010 RPA Assessment.

Figure 14. Estimation of the availability of bark (thousand cubic metres)



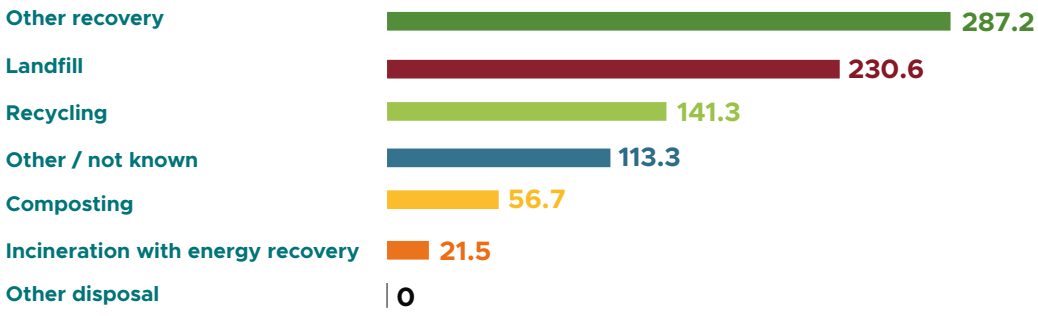
2.1.3. Residues from bio-based economic activities

No data is available.

2.1.4. Organic fraction of Municipal Solid Waste

The generated municipal solid waste amounts to little over 850 thousand tonnes/year (2017). Unfortunately, no data about the organic fraction thereof are available. OECD data, shown in figure below, describe the management of MSW as a whole.

Figure 15. Management and disposal of MSW (Kt, OECD, 2017)



2.2. Bioeconomy strategies and programmes

Latvia has developed a national smart specialisation strategy (RIS3) in 2014 to concentrate public R&D investments in programmes that create future domestic capability and interregional comparative advantage.

The strategy focuses on seven investment priorities, one of them being the knowledge base. The knowledge specialisation areas in Latvia are:

1. knowledge-intensive bio-economics;
2. biomedicine, medical technologies,
3. bio-pharmacy and biotechnologies;
4. smart materials, technologies and engineering systems; smart energetics; and
5. information and communication technologies (ICT).

Latvia was the first of the Baltic States to adopt a Bioeconomy Strategy in December 2017. The strategy, falling under the responsibility of the Ministry of Agriculture, sets the country's agenda for bioeconomy development to 2030, with three overall goals:

Advancement and retention of employment in the bioeconomy sectors to at least 128 thousand persons

Increasing the value added of bioeconomy products to at least €3.8 billion in 2030

Increasing the value of bioeconomy production exports to at least €9 billion in 2030

The Latvian strategy has a business-oriented focus aiming at promoting long-lasting investments in the country's bioeconomy, namely by creating a predictable and stable tax policy, reducing administratively regulated prices for bio-products, promoting a favourable investment environment and calling for replacement of non-renewable resources with bio-resources in public procurement. The strategy also aims at promoting SME participation in the bioeconomy and providing a level playing field for all actors.

2.2.1. International cooperation in the Baltic Sea Region

The Baltic Sea Region is a highly-connected region, hosting several international initiatives.

2.2.1.1. Interreg Baltic Sea Region Programme

The Interreg Baltic Sea Region Programme is an agreement between EU member states Denmark, Estonia, Finland, Latvia, Lithuania, Poland, Sweden and the northern parts of Germany as well as partner countries Norway, Belarus and the northwest regions of Russia.

2.2.1.2. EU Strategy for the Baltic Sea Region

Policy Area Bioeconomy in EU's Baltic Sea Region Strategy covers sustainable use of biomass, agriculture, forestry, fisheries and rural development. It is coordinated by the Nordic Council of Ministers (based in Denmark).

Bioeconomy projects in the Baltic States

Proteins - The Green Gold of Baltic Sea Region Bioeconomy

Partner(s) from Latvia: Latvian Farmers Union

Developing cross-cutting stakeholder involvement for realising the bioeconomy

Partner(s) from Estonia: Estonian Forest Industry Association, Estonia Chamber of Commerce and Industry, Stockholm Environment Institute in Tallinn

Bio-resources for innovative and sustainable non-food uses

Partner(s) from Latvia: Latvian State Institute of Wood Chemistry

Factsheet plant protein arena

Partner(s) from Lithuania: Lithuanian Research Centre for Agriculture and Forestry, UAB Eko Farm

Partner(s) from Latvia: Pure Horticultural Research

Partner(s) from Estonia: Estonian Crop Research Institute

Factsheet Integrated Blue Biotechnology Strategy for the Baltic Sea Region

Partner(s) from Lithuania: Coastal Research and Development Institute, Klaipeda Science and Technology Park

Partner(s) from Latvia: Latvian Institute of Aquatic Ecology, Latvian Biotechnology Association, Riga Planning Region

Partner(s) from Estonia: Tartu Biotechnology Park, Ida-Viru Region

Local Capital - Realising the Bioeconomy in the BSR

Partner(s) from Latvia: Dzintars Vaivods SIA "Latvijas Lauku konsultāciju un izglītības centrs"

Markets for woody biomass and wood-based energy around the Baltic Sea Region

Partner(s) from Lithuania: Vytautas Magnus University Agriculture Academy

Partner(s) from Latvia: Latvia University of Agriculture

2.2.1.3. Other initiatives

The Baltic Sea States Sub-Regional Cooperation (BSSSC) brings together regional authorities from all the countries in the Baltic Sea Region. The Conference of Peripheral Maritime Regions (CPMR) and its Baltic Sea Commission brings together the peripheral maritime regions of the Baltic Sea Region. The Union of the Baltic Cities (UBC) is a network for municipalities and cities in the Baltic Sea Region. There are many networks covering specific fields such as the Baltic Development Forum (BDF).

In 2018, Latvia joined the Central and Eastern European initiative for knowledge-based agriculture, aquaculture and forestry in the bioeconomy (BIOEAST initiative). Through the BIOEAST Initiative, the Central and Eastern European countries set the vision for 2030 to develop knowledge and cooperation based circular bioeconomies, which helps to enhance their inclusive growth and to create new value-added jobs especially in rural areas, maintaining or even strengthening environmental sustainability.

3. POTENTIAL USE/VALORISATION OF BIO-BASED STREAMS

This chapter offers some possible opportunities for converting the residual streams and waste listed in Chapter 2 into high-value sustainable products and applications. These opportunities can be derived from successfully completed or running projects using similar or comparable feedstocks as those present in Latvia.

The chapter focuses on the Bio-based Industries Joint Undertaking (BBI JU) programme, executing the strategic innovation and research agenda (SIRA) of the Bio-based Industries Consortium (BIC). The BBI JU is an industry-led PPP between BIC and the European Commission. BIC and the Commission agree on annual work programmes that will be opened as annual calls for proposals to any and all actors in the bioeconomy fields. BBI JU started under Horizon 2020 (2014-2020) and since 2014 and through the 2018 call there are 101 granted projects at different technology readiness levels. The objective of the programme is to assist an accelerated commercialisation of excellent, innovative solutions for societal challenges towards a sustainable future. The commercialisation is to materialise in the country itself, on a local, regional or national basis.

Along with offering examples of projects on comparable bases as those present in Latvia, BIC also offers its European and international network and events to assist local actors in establishing partnerships for bio-based activities, both in Latvia and in Europe.

3.1. BBI JU projects of interest

Latvia has substantial residual biomass available from crops (mainly cereals and rape), forest and OFMSW. While no statistical data on residues from the food industry is available, the relevance of several subsectors (meat, fish processing, beverages, dairy and bakery products) allows to conclude that a substantial quantity of bio-based residues should be available from those activities too. The following sub-chapters contain an outline of ongoing or completed BBI projects utilising the same or comparable biomass feedstock as the abovementioned streams, to show their potential use.

The following sub-chapters contain an outline of ongoing or completed BBI projects utilising the same or comparable biomass feedstock as the abovementioned streams, to show their potential use.

3.1.1. Crop residues

LIGNOFLAG: Converting wheat straw into bioethanol

Project description

lignoflag-project.eu

Type of action : IA - Flagship

Duration : 06/2017 - 05/2022

Overall budget : €34.9M

Pilot plant location(s) : Romania

The LIGNOFLAG project demonstrates an integrated and whole value chain-oriented approach to drive forth the bio-based production of ethanol as sustainable transport fuel or chemical building block. The project approach involves the collaboration of the relevant actors along the whole value chain – from feedstock (straw) supply and logistics via process co-products (lignin as biochar, sludge as fertiliser) utilisation and valorisation to advanced bio-ethanol production and product distribution. The core part of the project is the first-of-a-kind commercial flagship plant for lignocellulosic feedstock to ethanol conversion (60000 tonnes/year) that serves to showcase the techno-economic viability of an innovative bio-refinery concept and shall boost EU bio-ethanol production.

Coordinator : Clariant (Germany)	Biomass(es) : Wheat straw	Process(es) : Enzymatic conversion

Product(s) : Primary product: bioethanol/ Secondary product: biochar, fertilisers

OPTISOCHEM: Converting wheat straw into green chemicals

Project description

optisochem.eu

Type of action : IA – Demo

Duration : 06/2017 - 05/2021

Overall budget : €16.3M

Pilot plant location(s) : Germany

OPTISOCHEM goal is to demonstrate the performances, reliability as well as environmental and socio-economic sustainability of the entire value chains, for the transformation of excess wheat straw into bio-Isobutene (bio-IBN) derivatives. To achieve these goals a team of 6 partners, leaders in their field, originating from 4 EU-member states, will join efforts. OPTISOCHEM consists in showcasing the technical accessibility and economical sustainability of the value chains, from wheat straw to 2 different families of chemicals derived from bio-based Isobutene (IBN). These compounds, oligomers (DIB, TIB, TeIB) and polyisobutylenes (PIBs) are currently used in a wide range of applications such as lubricants, adhesives, sealants, flavours & fragrances and substituted phenols. This large market is today supplied entirely by products derived from fossil-based isobutene. Products derived from bio-based IBN, using the same process as fossil-based IBN, and with at least as good performances, would provide a renewable supply.

Coordinator : Global Bioenergies (France)	Biomass(es) : Wheat straw	Process(es) : Biocatalysis

Product(s) : Bio-Isobutene and derivatives: lubricants, adhesives, sealants, flavours and fragrances and substituted phenols

EXCORNSEED: Separation, fractionation and isolation of biologically active natural substances from corn oil and other side streams

Project description

excornseed.eu

Type of action : RIA

Duration : 06/2018 – 11/2021

Overall budget : €4.5M

Pilot plant location(s) : Italy, Slovakia

The EXCornsEED project will combine chemistry, biology, engineering and biotechnology tools and expertise to develop and validate processes for recovering a range of bioactive compounds from bioethanol and biodiesel refinery side streams, specifically corn oil/thin stillage from bioethanol and rapeseed meal.

It will valorise the potential of the side streams of these two growing sectors at a time when changes in legislation on liquid biofuels are likely to strongly increase demand for biofuels will maximise the value of biofuels production and make them increasingly competitive.

Coordinator : Università degli studi di Roma La Sapienza (Italy)	**Biomass(es) : Corn oil, rapeseed meal, bioethanol stillage**
Process(es) : Separation, fractionation and isolation	
Product(s) : Proteins, polyphenols, amino acids, fibers, lipid compounds, alkaloids and tannins	

AGRIMAX: Converting crop and food residues into several products

Project description

agrimax-project.eu

Type of action : IA - Demo

Duration : 10/2016 – 09/2020

Overall budget : €15.5M

Pilot plant location(s) : Spain, Italy

Approximately one third of all food produced globally is wasted every year throughout the whole value chain-from farmers to consumers. To extract the significant amounts of valuable compounds contained in these wastes, AgriMax will combine affordable and flexible processing technologies (ultrasound assisted and solvent extraction, filtration, thermal and enzymatic treatments) for the valorisation of side streams from the horticultural culture and food processing industry to be used in a cooperative approach by local stakeholders.

Through the selection of case-scenarios previously developed to a pilot scale by the participating RTOs and their industrial transfer in new applications as food additives, packaging and agricultural materials among others, the project will disclose the holistic potential of four new agro-value chains (residues and by products from the culture and processing of tomato, cereals, olives, potato). Any by-product generated along the production cycle will be valorised in a cascade manner to reach over 40% of high value use of the waste.

Coordinator : IRIS (Spain)	**Biomass(es) : Residues of tomato, cereals, olives, potato**
Process(es) : Ultrasound extraction, filtration and enzyme treatment	
Product(s) : Primary products: food additives, packaging and agricultural materials / Secondary products: fibres, biogas and fertilisers	

PROMINENT: Proteins from cereal side-streams

Project description

prominent-protein.eu

Type of action : RIA

Duration : 01/2015 – 10/2018

Overall budget : €3.1M

Pilot plant location(s) : Finland

There is a global need, from sustainability, food security and also health perspective, to increase dietary intake of plant protein. Side streams from wheat and rice processing offer large under-exploited raw material potential, and we will work throughout the agro-industrial value chain to valorise that. The main aim of PROMINENT is to develop techno-economically and environmentally viable protein-based ingredients and foods from cereal processing side streams. We will concentrate on novel fractionation and extraction technologies, such as bioprocessing, supercritical carbon dioxide (SC-CO_2)-extraction, thermo-mechanical technologies, wet and dry fractionation, and expanded bed adsorption as well as their combinations as novel hybrid processing technologies.

Coordinator : VTT (Finland) | **Biomass(es) : Wheat, rice** | **Process(es) : Bioprocessing, supercritical carbon dioxide extraction, thermo-mechanical technologies, wet and dry fractionation, and expanded bed adsorption**

Product(s) : Protein additives for pasta, biscuit, cake and beverage

3.1.2. Forest residues

SWEETWOODS: High purity lignin and platform chemicals from wood-based sugars

Project description

sweetwoods.eu

Type of action : IA - Flagship

Duration : 06/2018 – 05/2022

Overall budget : €43.2M

Pilot plant location(s) : Estonia

The objective of the SWEETWOODS project is to demonstrate on an industrial level successful and profitable production of high purity lignin as well as C5 and C6 carbohydrates from hardwood by establishing a biorefinery having throughput capacity 80 bone-dry tonnes/day. Unlike existing biorefinery concepts, SWEETWOODS plant utilises all the fractions of the biomass feedstock, with min. 95% of its initial carbon content utilised.

Coordinator : Graanul Biotech (Estonia) **Biomass(es) : Hardwood**

Process(es) : Fractionation, enzymatic conversion

Product(s) : From lignin: elastomer foams for tube insulation, rigid polyurethane foam panels for insulation, and polymer compounds intended for injection moulding / From C5 and C6 sugars: glucose, xylose and fructose, bio-isobutene, xylitol

EXILVA: Microfibrillated cellulose from wood

Project description

h2020-exilva.com

Type of action : IA - Flagship

Duration : 05/2016 – 04/2019

Overall budget : €44.6M

Pilot plant location(s) : Norwegian

Microfibrillated cellulose (MFC) is a revolutionary product, with potential in a huge range of applications, including personal care, cosmetics, home care, pharmaceutical excipients, adhesives and sealants, composites and resins, agricultural chemicals, oil field, fish, bait, concrete, and CO_2 capture. It also has the potential to replace many fossil-based products.

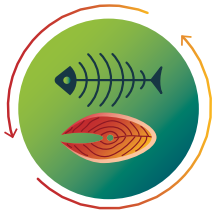
However, commercialisation of MFC has proved to be challenging, particularly making industrial quantities with sufficient running efficiency and stability. In addition, drying the MFC fibres in a cost-effective manner without losing significant performance is a major challenge.

The EXILVA project sets out to change this, by transferring technology from the existing pilot production and eventually scaling up to commercial levels.

Coordinator : Borregaard (Norway) | **Biomass(es) : Wood (Norwegian spruce)**

Product(s) : From microfibrillated cellulose: adhesives, coatings, agricultural chemicals, personal care products, home care products, construction materials

3.1.3. Fish residues



AQUABIOPRO-FIT: Proteins and bioactives from aquaculture and agriculture sidestreams

Project description

aquabioprofit.eu

Type of action : RIA

Duration : 04/2018 – 03/2022

Overall budget : €4.1M

Pilot plant location(s) : Norway

The main objective of AQUABIOPRO-FIT is to promote efficient utilisation of European aquaculture, fisheries and agriculture side streams in feeds and nutritional supplement products promoting fitness and health. The project will develop side stream biomass processing technologies to up-concentrate nutrients and bioactives maintaining product quality and minimising waste. The safety, bioactivity and acceptance of the developed ingredients and products will be documented through cell, animal, taste panel and intervention studies with humans, namely athletes and patient groups.

Coordinator : NOFIMA (Norway) | **Biomass(es) : Fish by-products**

Process(es) : Hydrolysis, extraction, separation/fractionation, stabilisation, biofiltration

Product(s) : Protein-rich and/or Omega-3 rich nutraceutical products

3.1.4. Organic Fraction of Municipal Solid Waste (OFMSW)

PERCAL: Chemical building blocks from MSW

Project description

percal-project.eu

Type of action : RIA

Duration : 07/2017 – 06/2020

Overall budget : €3.4M

Pilot plant location(s) : Spain, Germany, Greece

PERCAL will use Municipal Solid Waste (MSW) as a feedstock for developing intermediate chemical products, producing high yield with high purity, making it attractive for industry. These will be complementary to the bioethanol (existing PERSEO Bioethanol ® technology), thus creating a cascade of valorisation of the MSW components.

PERCAL aims to produce three main compounds: i) Lactic acid, which can be used to make eco-friendly ethyl lactate. This can be used in cleaning products, in ink and for hot-melt adhesives for cardboard; ii) succinic acid, as an intermediate building block for the production of polyols for the polyurethane industry and iii) biosurfactants from the remaining fraction of the MSW fermentation.

Coordinator : Industrias Mecanicas Alcudia (Spain) | **Biomass(es) : OFMSW** | **Process(es) : Enzymatic pre-treatment, fermentation, extraction via membrane electrolysis**

Product(s) : From lactic acid: solvents, inks, adhesives / From succinic acid: polyols / From proteins and lipids: biosurfactants

URBIOFIN – Conversion of MSW into chemical building blocks and biopolymers

Project description

urbiofin.eu

Type of action : IA - Demo

Duration : 06/2017 – 05/2021

Overall budget : €14.6M

Pilot plant location(s) : Spain

Today in Europe, each inhabitant generates, on average, 0.5 tonnes of MSW per year, increasing at an annual rate of 10%. Around 40-50% of it correspond to organic waste. This organic fraction contains mainly carbohydrates, proteins and lipids, which are all useful raw material that can be converted into valuable products. Its valorisation will help to solve environmental pollution but also contributes to the transition from a linear to a renewable circular economy.

Digestion and composting have contributed to the reduction of the biodegradable fraction of MSW sent to landfill. The low economical value of compost and biogas is limiting the sustainable implementation of separate sourcing systems since increasing citizen environmental (waste) taxes is then needed to tackle important logistic costs. New bio-based products can help to improve the environmental and socio-economical sustainability of waste treatment.

The aim of URBIOFIN project is to demonstrate the techno-economic and environmental viability of the conversion at semi-industrial scale (10 tonnes/d) of the organic fraction of MSW (OFMSW) into: chemical

building blocks (bioethanol, volatile fatty acids, biogas), biopolymers (polyhydroyalkanoate and biocomposites) or additives (microalgae hydrolisated for bio-fertilisers). By using the biorefinery concept applied to MSW (urban biorefinery), URBIOFIN will exploit the OFMSW as feedstock to produce different valuable marketable products for different markets: agriculture, cosmetics, etc.

Coordinator : Industrias Mecanicas Alcudia (Spain) | **Biomass(es) : OFMSW** | **Process(es) : Hydrolysis, fermentation**

Product(s) : Chemical building blocks (bioethanol, volatile fatty acids, biogas), biopolymers (polyhydroyalkanoate and biocomposites) or additives (microalgae hydrolisated for biofertilisers)

NEWFERT – Mineral fertilisers from biowaste

Project description

newfert.org

Type of action : RIA

Duration : 07/2105 – 12/2018

Overall budget : €2.4M

Pilot plant location(s) : Spain

Most fertilisers currently rely heavily on fossil mineral resources for nutrient supply. The idea behind the NEWFERT project was to build up an innovative concept for the fertiliser industry that essentially turns ashes of different origins and livestock effluent into a new generation of fertilisers.

Researchers identified and analysed more than 45 different types of biowaste from different areas of Europe and selected 10 for introduction into the fertiliser production process based on their physical and chemical properties. Ashes containing high phosphorous or potassium content and nutrient availability were used directly for fertiliser production. In the case of ashes with insoluble nutrients, NewFert partners developed new biorefining technologies with low input and energy cost to increase nutrient recovery such as phosphate.

Furthermore, to free phosphate minerals (struvite) and nitrogen from pig slurry in a more cost-effective way, the scientists developed a new process. This reduced costs by substituting the traditional reagent with the action of bacteria that grow naturally in the medium and building a more efficient electrolysis cell for nitrogen recovery.

Coordinator : Fertiberia (Spain) | **Biomass(es) : Biowaste of municipal and industrial origin**

Process(es) : Microbial electrolysis

Product(s) : Fertilisers

3.1.5. Food industry residues

GREENPROTEIN: Valorisation of vegetable processing industry residues into functional proteins

Project description

greenproteinproject.eu

Type of action : IA – Demo

Duration : 09/2016 – 02/2020

Overall budget : €5.5M

Pilot plant location(s) : The Netherlands

The economic costs of food waste are reckoned to total around €705 billion globally. There are also significant hidden environmental and social costs. RuBisCO protein is found in all green vegetables and plants and represents around 50 percent of the total protein content of green leaves.

GreenProtein is an industrial demonstration project that aims to produce high-added value, food grade proteins and other ingredients from vegetal food waste streams. The primary objective will be to extract and purify food-grade, fully functioning, RuBisCO protein isolate on an industrial scale using discards from the vegetal processing industry.

Coordinator : Royal Cosun (The Netherlands) | **Biomass(es) : Green residues from vegetable processing (mainly of sugar beet)**

Process(es) : Extraction

Product(s) : Food-grade functional RuBisCo protein and other ingredients

PULP2VALUE: Conversion of low value sugar beet pulp into chemicals and biomaterials

Project description

pulp2value.eu

Type of action : IA - Demo

Duration : 07/2015 – 06/2019

Overall budget : €11.4M

Pilot plant location(s) : The Netherlands

Europe produces around 13 million tonnes of sugar beet pulp each year. Currently, most of this pulp finds its way into low value feed, bio-fertiliser or it is used for creating green fuel gas. By using multiple extraction techniques, PULP2VALUE will extend the high value products extracted from sugar beet side streams, isolating microcellulose fibres (MCF), arabinose (Ara) and galacturonic acid (GalA). The project will demonstrate an integrated and cost-effective cascading bio-refinery system to refine sugar beet pulp and identify applications for approximately 65% of its mass in high value markets, increasing its current value by as much as 20-50 times.

Coordinator : Royal Cosun (The Netherlands) | **Biomass(es) : Sugar beet pulp**

Process(es) : Extraction

Product(s) : From microcellulose fibres: rheology modifiers for detergents, paints and coatings, composites /From arabinose: flavours and food additives / From galacturonic acid: personal care and chemical products

PRO-ENRICH: Conversion of food industry side streams into food additives and chemical products

Project description

pro-enrich.eu

Type of action : RIA

Duration : 05/2018 – 04/2021

Overall budget : €4M

Pilot plant location(s) : Denmark

Pro-Enrich will develop a flexible biorefinery approach capable of processing a range of agricultural residues (rapeseed meal, olives, tomatoes and citrus fruits) in response to the increasing global demand for alternative sources of protein and phenolic product streams, tailored to the cross-sectoral requirements of industry.

Pro-Enrich will optimise existing biomass fractionation technologies and validate novel extraction approaches beyond the current state of the art (from TRL 2 through to TRL 4/5) to isolate and purify proteins, polyphenols, dietary fibres and pigments. The products being targeted are food ingredients, pet food, cosmetics and adhesives.

Coordinator : Danish Technological Institute	**Biomass(es) : Rapeseed meal, olives, tomatoes and citrus fruits**
Process(es) : Fractionation, extraction	
Product(s) : Proteins, polyphenols, dietary fibres and pigments	

3.2. Local actors already active in BIC or BBI JU projects

LSIWC - Latvian State Institute of Wood Chemistry is a BIC Associate Member. LSIWC and SIA Ritols have been partners in BBI projects.

3.3. Link to existing/emerging bio-based activities

3.3.1. Investment plan for Europe - the 'Juncker plan'

The European Commission launched the Investment Plan for Europe (also known as the Juncker Plan) in 2015, which aims to mobilise at least €315 billion investment until 2020.

The Juncker Plan is a collective, coordinated effort at European and Member State level to encourage investment through three strategic targets:

- Boosting job creation and economic growth
- Meeting the long-term needs of the economy and increase competitiveness
- Helping strengthen Europe's productive capacity and infrastructure

In this view, the Investment Plan for Europe has operated through three main initiatives:

1. **The European Fund for Strategic Investments (EFSI)**

   - to overcome current market failures by addressing market gaps and mobilising private investment. It is jointly run by the European Investment Bank, the European Investment Fund and the European Commission. It supports strategic investments in key areas such as infrastructure, education, research and innovation, as well as risk finance for small businesses;

2. **The European Investment Advisory Hub (EIAH)**

   - to strengthen support for project development and preparation across the Union. The EIAH supports projects which may be eligible for financing by the EIB (either under EFSI or otherwise), and it is not limited to EIB-financed projects;

3. **The European Investment Project Portal (EIPP)**

   - An online marketplace where worldwide investors and EU project promoters can meet. It offers EU-based private and public project promoters a convenient way to boost the visibility of their investment projects by filling in and submitting a project form. EIPP will showcase these projects aiming at attracting investors worldwide.

The Juncker plan will find its continuation as InvestEU in the period 2021-2027. The new plan is expected to mobilise at least €650 billion in additional investment between 2021 and 2027. As of July 2019, €424 billion in investment have been triggered EU-wide.

Mobilised from EFSI in Latvia

€231M

€1.1B

Additional investment expected to be triggered as a result

18 Projects approved in the country

One of the projects is categorised under ‘bioeconomy’

Company : DASOS CAPITAL OY

Type of business : Forestry

EIF Financing : EIB loan

Financial intermediary : -

Title : DASOS TIMBERLAND FUND III

Description

Equity fund investing in sustainable forestry and biomass mainly in the EU. The fund will only invest in certified or certifiable forestry assets.

3.3.2. European Circular Bioeconomy Fund (ECBF)

The **European Circular Bioeconomy Fund (ECBF)** will provide access to finance, in the form of equity, debt or quasi-equity, to innovative circular bioeconomy companies and projects of various sizes. ECBF management will raise funds from public and private investors with a target fund volume of €250 million. Reaching the target fund volume was scheduled for a first close in Q1 2020.

3.3.3. Country-specific EIF initiatives

EIF is advising, sponsoring or managing a number of equity Funds-of-Funds and guarantee / debt funds on behalf of third-party investors, including national and regional governments as well as private strategic investors.

In Latvia, it is supporting the Baltic Innovation Fund (BIF), a Fund-of-Fund initiative launched by the EIF in close cooperation with the Governments of Lithuania, Latvia and Estonia. BIF represents a €52 million investment by EIF with each Baltic Government committing €26 million through their respective national agencies (INVEGA in Lithuania, KredEx in Estonia and Altum in Latvia).

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3.3.4. European Structural and Investment Funds (ESIF)

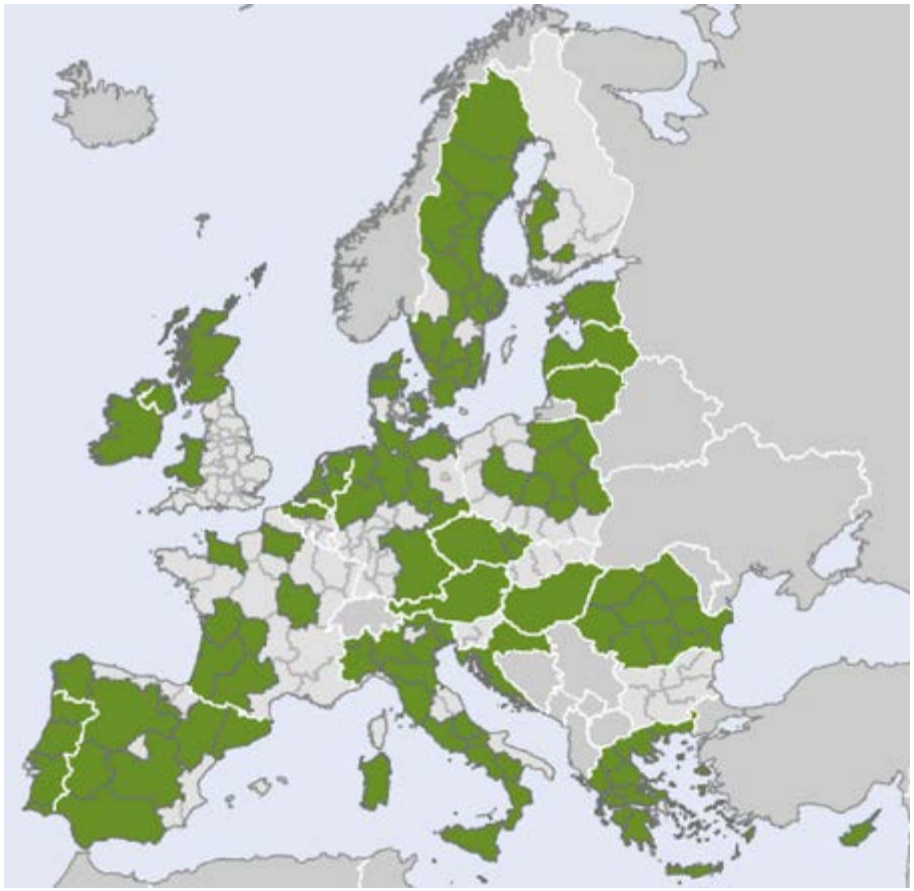
The ESIF includes five different funds, all covered by the Common Provisions Regulation – Regulation (EU) No 1303/2013 of the European Parliament and of the Council:

- The **European Regional Development Fund (ERDF)** provides financial support for developing and restructuring regional economies and aims to facilitate economic change, enhance competitiveness and boost territorial cooperation throughout the EU
- The **European Social Fund (ESF)** supports workers and companies by boosting access to employment and participation in the labour market, focusing on social inclusion of disadvantaged people, combatting discrimination and creating partnerships to manage employment reform
- The **Cohesion Fund (CF)**, aims to reduce economic and social disparities and promote sustainable development
- The **European Agricultural Fund for Rural Development (EAFRD)** aims to strengthen the EU's agriculture, forestry sector and boost rural areas
- The **European Maritime and Fisheries Fund (EMFF)**, supports the implementation of the reformed Common Fisheries Policy (CFP) and the EU Integrated Maritime Policy

Funds related to the ERDF are managed locally according to the Smart Specialisation Strategy that each region in the EU has published. In the following pictures, regions with bioeconomy research and innovation (R&I) priorities in agriculture, waste processing and biorefineries during funding period 2014-2020 are highlighted.

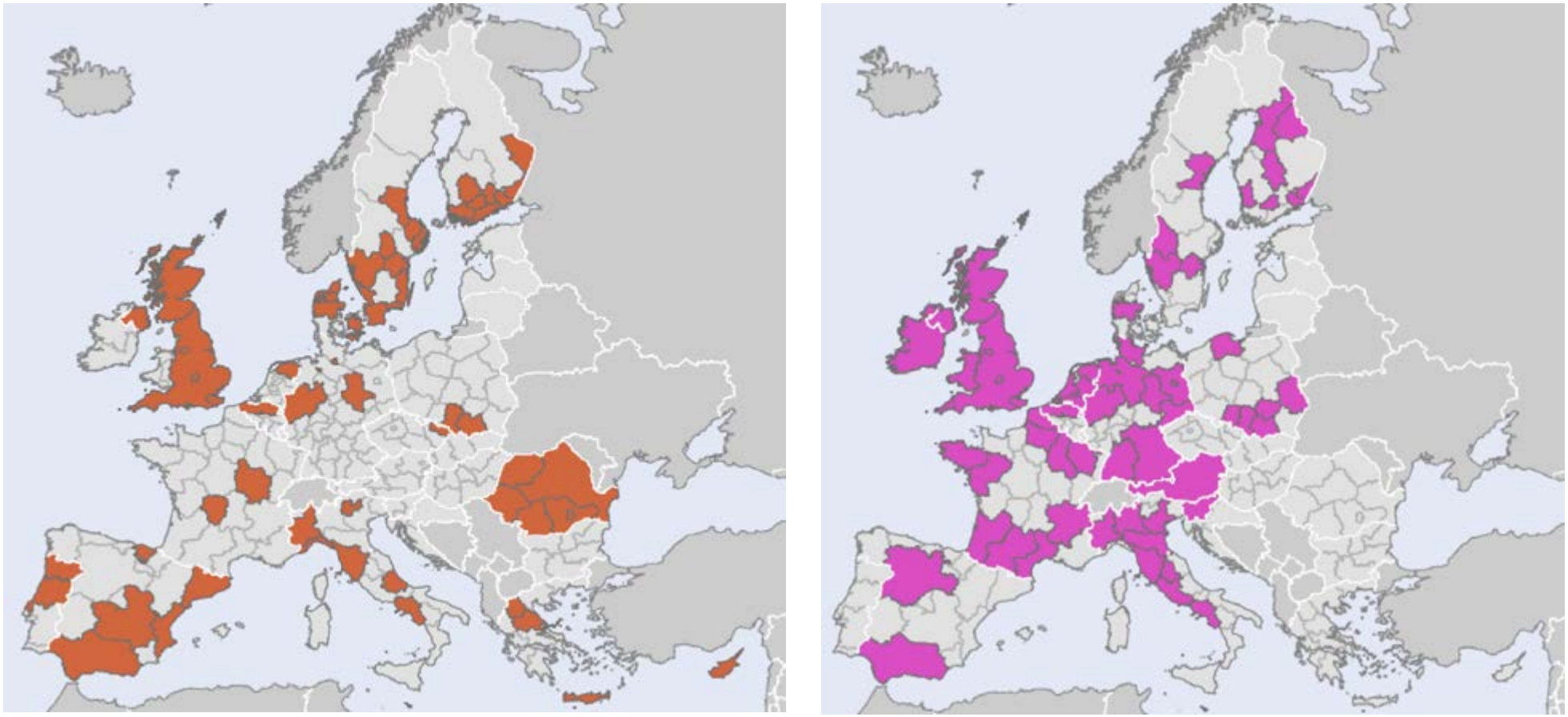
Figure 16. EU Regions with Bioeconomy R&I Priorities

● Agriculture



Latvia is eligible for projects under theme 'agriculture', while no Latvian region has set 'waste management' or 'biorefinery' as a theme in its SSS. According to the Ministry of Education and Science, they were not introduced as a separate topics in the SSS "because initially no such individual topics were explicitly addressed in the current programming period, but the LSIWC activities would be the basis for mentioning these topics in the next SSS programming period." Nonetheless, both issues can be tackled by projects within the current framework, even without an explicit mention of them*.

Figure 16. EU Regions with Bioeconomy R&I Priorities



* Communication received from the Ministry of Education and Science during the preparation of this document

3.3.5. European Bank for Reconstruction and Development (EBRD)

The European Bank for Reconstruction and Development (EBRD) is an international financial institution with a mandate to promote the transition to well-functioning market economies. The Bank finances projects and promotes policy dialogue in 37 countries from Central-Eastern Europe, Central Asia and the wider Mediterranean region.

In 2015, the Bank launched its **Green Economy Transition approach (GET)** to bolster innovative technologies by addressing market opportunities and failures related to resource use and environmental degradation.

The EBRD can offer the bioeconomy sector:

- **A broad range of financial products** such as of loans, equity, guarantees or hybrid structures which are tailored to each client.
- **Technical expertise and resources for structuring and implementation support** such as technical feasibility and market studies, project design improvement, project management and implementation support, as well as potential concessional co-financing or grants drawn from donor support
- **Rapid project scoping, approval and delivery**, moulded around a business-oriented banking structure.

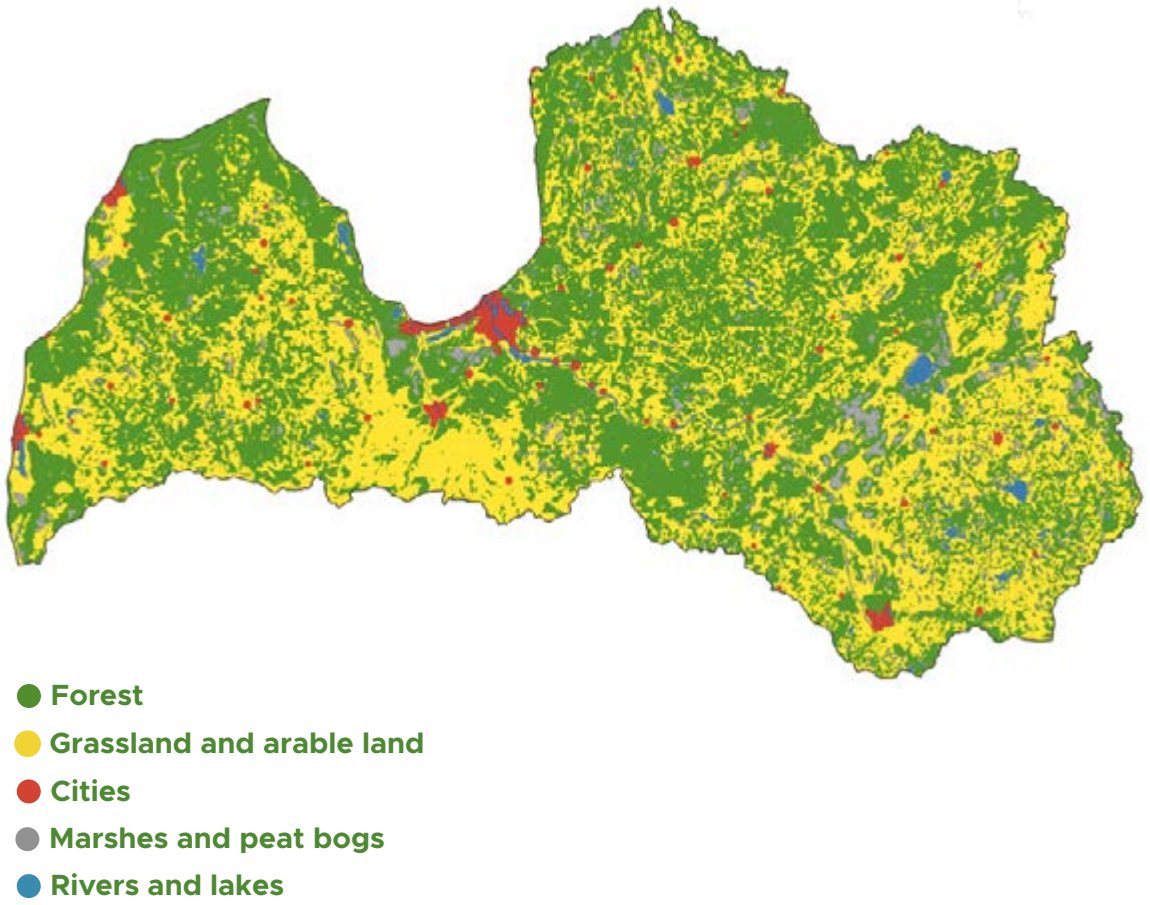
Latvia is eligible for EBRD funds.

4. APPENDIX: FIGURES

4.1. Agriculture

4.2. Waste streams

Figure 4.1. Land use in Latvia*



* Nipers A. et al (2018) "Evaluation of land use optimization opportunities in Latvia within climate policy context", Latvia University of Life Sciences and Technologies (unpublished, by kind concession of the authors)

4.1. Agriculture

Figure 4.2. Crop production (Kt)

	Area (cultivation/harvested/ production,T/ha)	Harvested production in EU standard humidity (Kt)	Yield in EU standard humidity (T/ha)
Common wheat and spelt	417.20	1431.60	3.43
Barley	118.30	306.30	2.59
Oats	86.80	188.20	2.17
Dry pulses and protein crops for the production of grain (including seed and mixtures of cereals and pulses)	51.90	104.40	
Potatoes (including seed potatoes)	9.90	19.20	19.90
Rape and turnip rape seeds	112.80	231.10	1.90
Green maize	25.50	910.17	35.75

Figure 4.3. Crop production by weight (Kt, 2016)

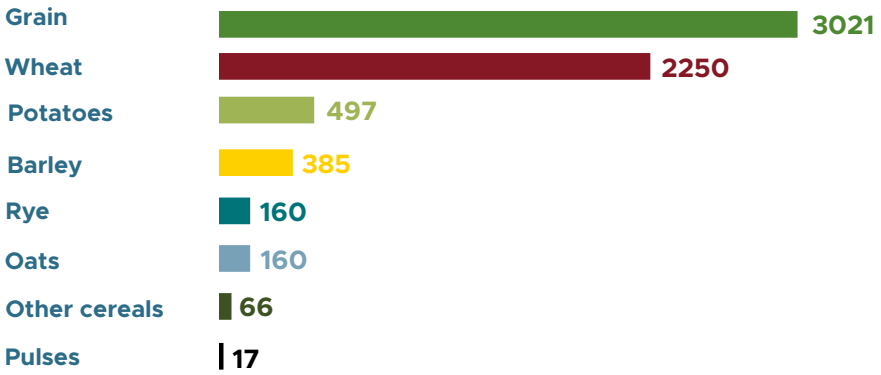


Figure 4.4. Crop production by value (2017)

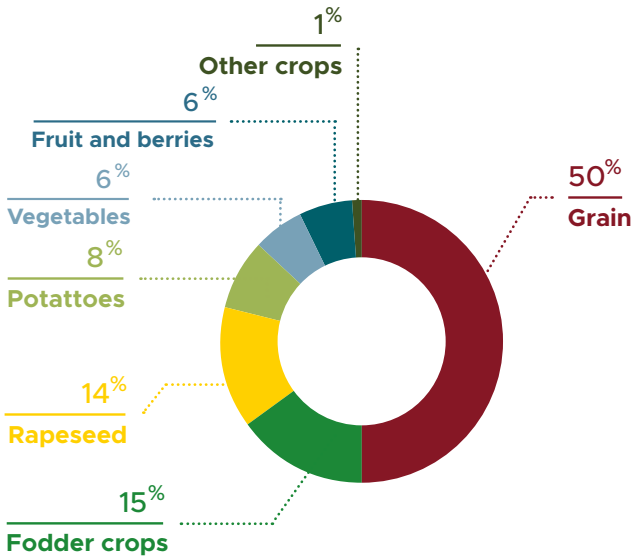


Figure 4.5. Production of cereals (Kt, 2016/2017)

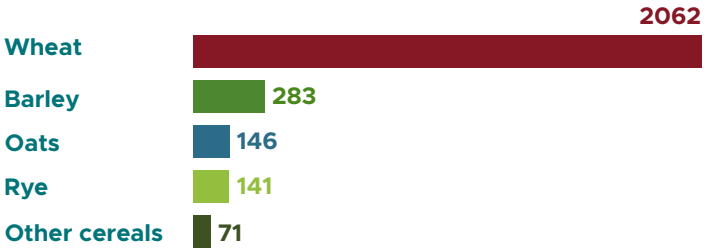


Figure 4.6. Animal production by value (2017)

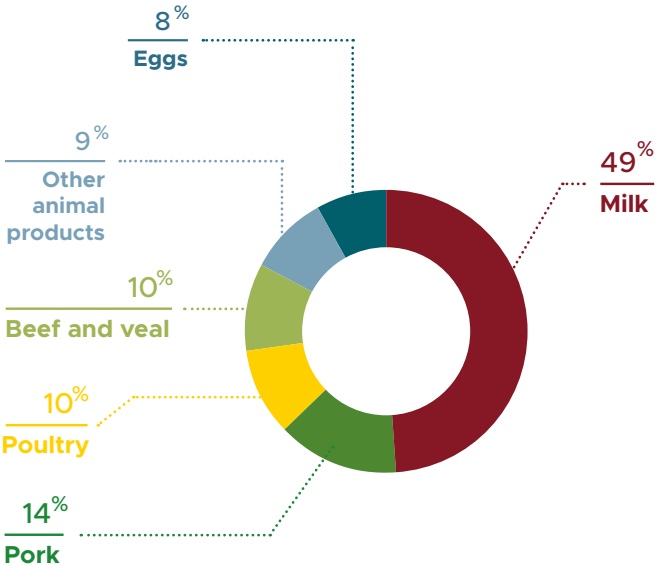


Figure 4.7. Food sector scenario (Kt)

	No of entreprises	Turnover of gross premium written (M€)	Production value (M€)
Processing and preserving of meat and production of meat products	168	343.6	338.6
Processing and preserving of fish, crustaceans and molluscs	115	153.0	148.8
Processing and preserving of fruit and vegetables	90	52.4	51.0
Manufacture of dairy products	64	360.2	333.1
Manufacture of bakery and farinaceous products	386	185.2	172.0
Manufacture of other food products	185	178.7	16.3
Manufacture of prepared animal feeds	27	39.1	38.5
Manufacture of beverages	126	270.5	231.5

Figure 4.8. Agricultural residues (Kt, 2017)

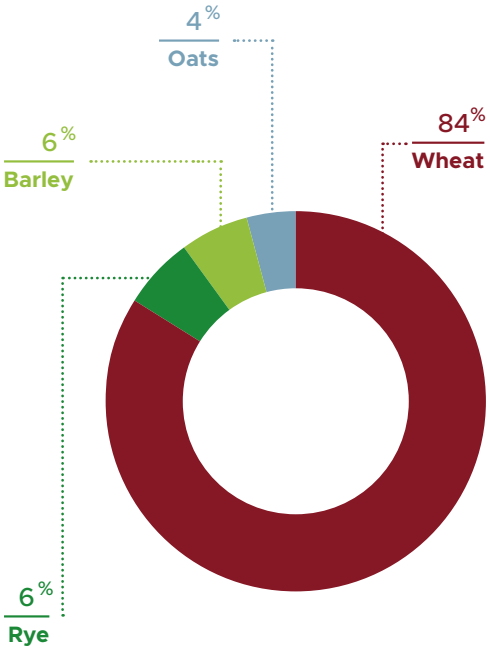
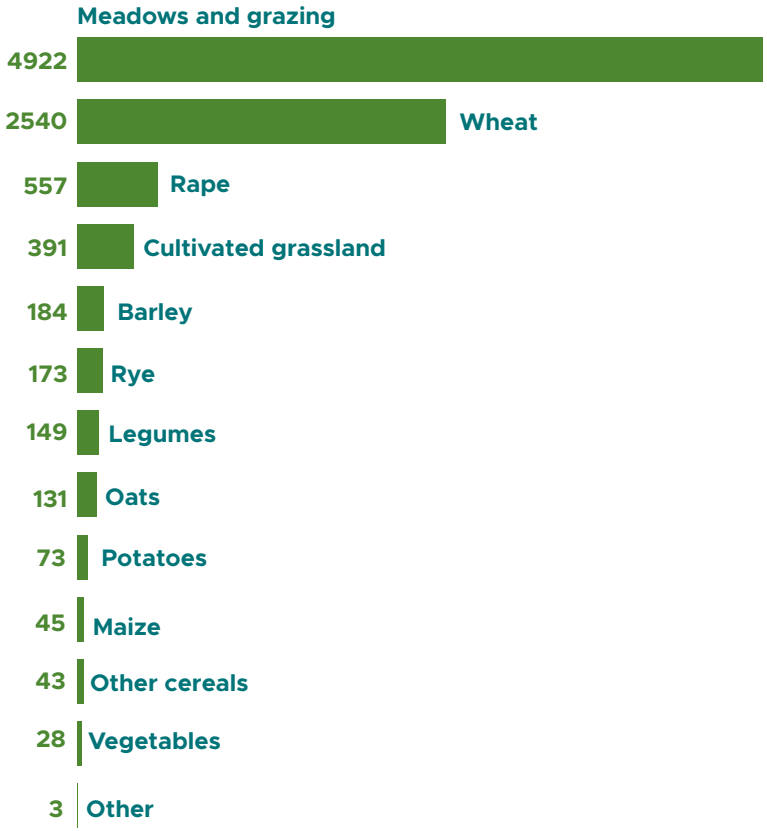


Figure 4.9. Agricultural residues, including those used as animal feed or bedding



4.2. Waste streams

Figure 4.10. Management and disposal of MSW (Kt, 2017)

Total MSW generated	850.7
Recycling	141.3
Composting	56.7
Incineration with energy recovery	21.5
Other recovery	287.2
Landfill	230
Other disposal	
Other / not known	113.3

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