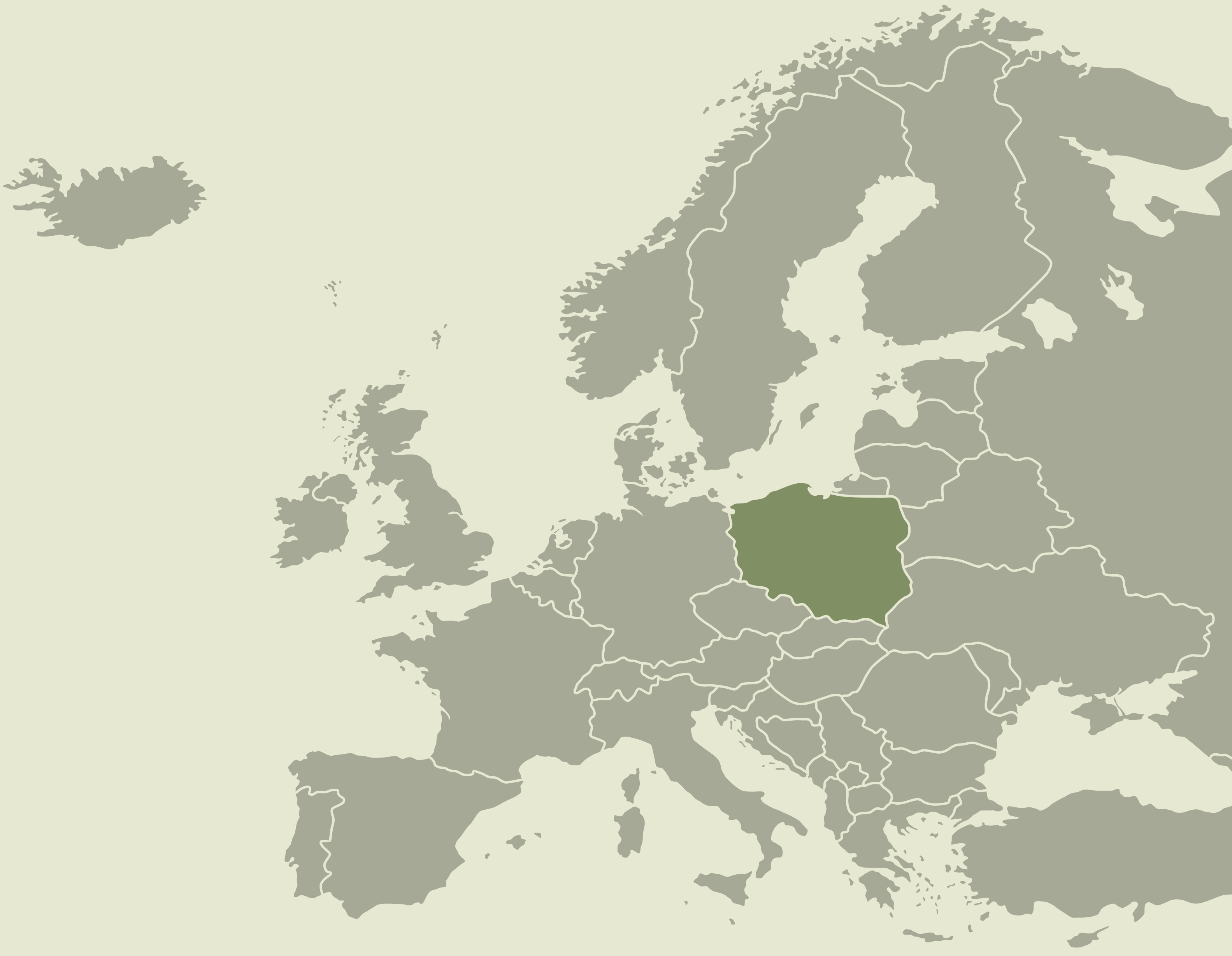
Bio-based Industries Consortium

PL

MAPPING THE POTENTIAL OF POLAND FOR THE BIO-BASED INDUSTRY



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00 | EXECUTIVE SUMMARY

Executive summary

This document is part of a series of publications by the Bio-based industries consortium (BIC) to identify the opportunities for expanding the bio-based industry across Europe. The incentive for looking into these opportunities is the fact that the level of activities of BIC is not balanced throughout Europe. Bio-based activities heavily depend on innovation, and hence are relatively low in 'moderate/modest innovator' countries[1]. 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.

The document highlights the results of the mapping exercise of local biomass sources that could be used as sustainable feedstock for the bio-based industry, and the major actors in the relevant sectors.

Poland's bioeconomy is centred on the traditional sectors of agriculture, forestry and food processing. It is an important sector in the nation's economy, accounting for almost 20% of employment and 10% of the total production volume. The agri-food sector is dominated by large groups (both national and foreign), increasingly focusing on export. Forestry is largely State-owned, and feeds pulp and paper, and furniture industries. Poland is the 4th largest world exporter of furniture. Chemical and pharmaceutical industries have a sizeable role in the country's economy, with the latter witnessing a growth of more than 60 % in the last ten years.

Although there is not yet a published bioeconomy strategy, bio-based industry elements feature prominently in Poland's Smart Specialisation Strategy. Furthermore, Polish authorities have been active in promoting synergies and actions related to bioeconomy, as testified by the letter of intent signed by BIC and BBI JU with 8 Polish regions.

BIC will now share this document with the local actors, and jointly set up an action plan, in particular with the industry and governmental institutions, to provide assistance in expanding the local bio-based industry.

1 See European Innovation Scoreboard 2017: http://ec.europa.eu/growth/industry/innovation/facts-figures/scoreboards_en

01 INTRODUCTION

1. Introduction

The bioeconomy sector in Poland has mainly a traditional structure based on agriculture, food processing and forestry. It is quite important in the overall economy. Global production volume in the Polish bioeconomy in 2014 amounted to 82 billion €, representing 10 % of the total production volume of the Polish economy. Its share in generating gross value-added was about 6.5 %, it employed almost 3 million persons (19 % of total workforce) and its contribution in foreign trade amounts to 15 % in export and 10 % in import (2014 data).[2 3]

However, the importance of the sector in the years 2000-2014 decreased by about 2 % on an annual basis. This is the result of a dwindling focus on agriculture while the focus on food processing has been increasing. Consequently, the food processing's GVA surpassed that of agriculture for the first time in 2014 and became the largest component of the Polish bioeconomy.

The structure of bio-economy is dominated by traditional sectors: agriculture, food processing industry and forestry.

1.1 Geographic Note

The geographic unit chosen for this publication is Poland's NUTS2 subdivision, corresponding to Voivodship (województwo), the regional administrative unit of Poland. The distribution of the 16 current voivodships is shown in Figure 1.1.

Figure 1.1: Voivodships of Poland

2 Wozniak E., T. Twardowski, 2018, The bioeconomy in Poland within the context of the European Union, New Biotechnology 40 (2018) 96–102

3 Wicki L., A. Wicka, 2016, Bio-economy sector in Poland and its importance in the economy, Proceedings of the 2016 International Conference "ECONOMIC SCIENCE FOR RURAL DEVELOPMENT" No 41 Jelgava, LLU ESAF, 21-22 April 2016, pp. 219-219

1.2 Sources

- Polish Central Statistical Office (GUS)
- Polish Ministry of Agriculture and Rural Development
- Polish General Directorate of the State Forests
- Polish Investment and Trade Agency (PAIH)
- United States Department of Agriculture (USDA).

1.3 Disclaimer

This report was prepared by RINA Consulting on behalf of the Bio-based industries consortium.

The information and views set out in this report are those of the author(s) and do not necessarily reflect the official opinion of the Bio-based industries consortium. Neither the Bio-based industries consortium nor any person acting on its behalf may be held responsible for the use which may be made of the information contained therein.

02 POLICY FRAMEWORK

2. Policy framework

2.1 Domestic Policies

As of January 2018, Poland has not published a strategy on bioeconomy yet. However, items related to its individual sectors feature prominently in the country's Smart Specialisation Strategy[4], which is built along five axes:

- healthy society,
- agro-food, forestry-timber and environmental bioeconomy,
- sustainable energy,
- natural resources and waste management,
- innovative technologies and industrial processes (in a horizontal approach).

All of them address bioeconomy aspects.

The Strategy for Development of the country 2020[5], published in 2012, touches the following bio-based related themes:

- Strategic area II. Competitive economy
  - Goal II.2. Increase in the efficiency of the economy
    - II.2.3. Increased competitiveness and modernization of the sector agri-food
  - Goal II.6. Energy security and the environment
    - II.6.3. Increased diversification of fuel and energy supplies
    - II.6.5. Adaptation to climate change
- Strategic area III. Social and territorial cohesion
  - Goal III.3. Strengthening the mechanisms of territorial development balancing and spatial integration for the development and full utilization of regional potentials
    - III.3.3. Creating conditions for the development of regional, sub-regional and regional centres and strengthening the potential of rural areas

Other strategies related to bioeconomy are: the Strategy for Innovation and Efficiency of the Economy, the Strategy of Energy Safety and Environment and the Strategy for Sustainable Development of Agriculture, Rural Areas and Fisheries. Another relevant document is the National Programme for the Development of a Low-Emission Economy, published in 2015.

There is currently no specific legislation regulating innovative biotechnologies, prompting a very cautious application of such technologies.

2.2 International Cooperation in Central Eastern Europe

Poland is among the founders of the Visegrad group (V4), together with Czech Republic, Slovakia and Hungary. The group was recently enlarged to include Bulgaria, Romania, Croatia, Slovenia and Estonia (V4+).

Ministers of Agriculture of the V4+ have agreed in 2016 on setting up a common initiative, named Central-Eastern European Initiative for Knowledge-based Agriculture, Aquaculture and Forestry in the Bioeconomy (acronym: BIOEAST), aiming at establishing a common strategy on bioeconomy and at strengthening the links between the involved sectors across the borders.

4 http://s3platform.jrc.ec.europa.eu/documents/20182/223684/PL_RIS3_2014_Final.pdf/0abc3c93-7868-45f8-b27f-fbdfb28bb437 (in Polish)

5 http://www.iczmp.edu.pl/wp-content/uploads/2014/05/Strategia_Rozwoju_Kraju_2020.pdf (in Polish)

In particular, BIOEAST identifies two linked gaps in the Central Eastern Europe macro-region: unlocking of excellence in low-performing research, development and innovation regions, and bringing specific research topics relevant to the CEE macro-region in Horizon 2020 work programmes. These factors in turn hinder the promotion of synergies with the European Agricultural Fund for Rural Development (EAFRD), the European Maritime and Fisheries Fund (EMFF) and the European Structural and Investment Funds (ESIF).

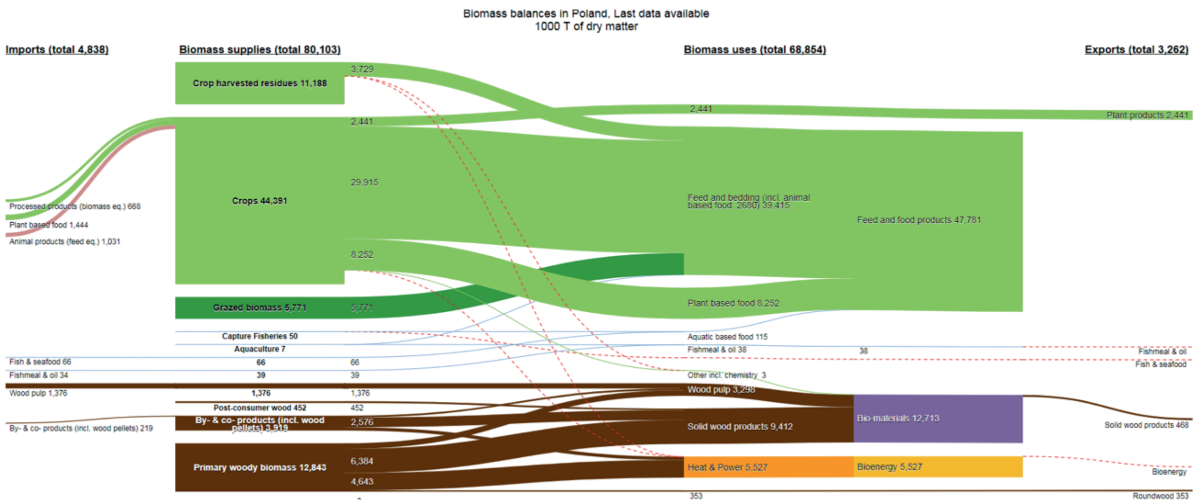
03 | BIOMASS PRODUCTION

3. Biomass production

Agriculture is by far the main biomass source. According to JRC Data M[6], it accounts for 76 % of the overall biomass input to economy (61 M tons per year over a total of 80 M tons per year), with agricultural residues amounting to 11 M tons per year. The main destination for agricultural residues is heat and power, while about 30 % goes to animal feed.

Forestry makes up for most of the remaining 24 % (19 M tons per year), with negligible contributions from fisheries and aquaculture.

Figure 3.1: Biomass flow in Poland (data from last available year, JRC Data M)



3.1 Agriculture

Polish agriculture represents the seventh in EU-28 by value, behind France, Germany, Italy, Spain, Great Britain, and the Netherlands. Polish agriculture is characterized by fragmentation: a little over half of the holdings (51 %) have a size lower than 5 ha, while only 5.2 % occupy an area of more than 30 ha; notwithstanding that, the latter account for 41.3 % of the total agricultural area.[7]

Plant cultivation is responsible for 40 % of the total agricultural production (by value), while livestock accounts for approximately 55 %.

Cereals dominate crop cultivation (73 % of cultivated area). Other crops include rapeseed, maize, sugar beets and potatoes. The size of the plantations varies greatly across the regions: the regions having most large-surface farms are Wielkopolskie (13,9%), Mazowieckie (11,2%) and Lubelskie (10%). One-third of the total volume of grain production comes from these three voivodships.[8]

The largest livestock populations are in Mazowieckie and Wielkopolskie voivodships. The leading regions for swine production are Wielkopolskie, Kujawsko-Pomorskie and Lódzkie, while the leading ones for cattle are Wielkopolskie, Mazowieckie and Podlaskie.

6 https://datam.jrc.ec.europa.eu/datam/public/pages/index.xhtml

7 Ministry of Agriculture and Rural Development, 2016, Agriculture and Food Economy in Poland

8 Competence Centre Agriculture, 2014, "The report: 2 years of Polish agriculture", http://www.ckpulawy.com/files/The%20Report_25%20years%20of%20Polish%20agriculture.pdf

Figure 3.2: Agricultural production in Poland, 2004 – 2014 (from[7])

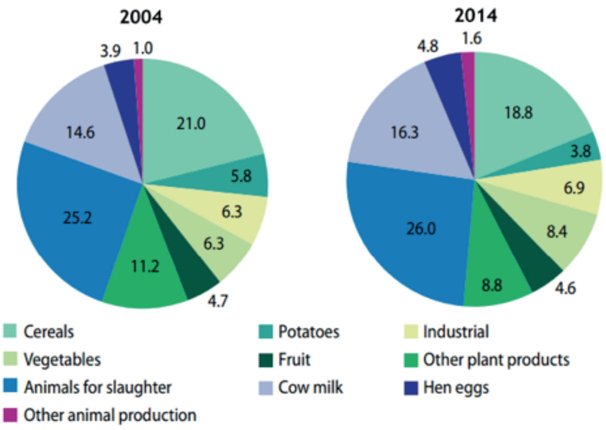


Table 3.1: Agricultural land in Poland[9]

Voivodship	Agricultural land (ha)
Dolnośląskie........................	909515
Kujawsko-pomorskie	1064011
Lubelskie..............................	1443958
Lubuskie..............................	391225
Łódzkie................................	972327
Małopolskie.........................	537466
Mazowieckie.......................	1931190
Opolskie..............................	496620
Podkarpackie.......................	574233
Podlaskie..............................	1058258
Pomorskie............................	759909
Śląskie..................................	356706
Świętokrzyskie....................	481270
Warmińsko-mazurskie..........	994569
Wielkopolskie......................	1736869
Zachodniopomorskie............	837144

9 Statistical Yearbook of Agriculture 2016, Central Statistical Office (GUS)

Table 3.2: Agricultural output in voivodships (percentage, from [9])

	Total		cereals	industrial crops	potatoes	vegetables	fruit	Other		beef for slaughter	pork for slaughter	cows' milk	hen eggs	Other
POLAND	**100**	**41.5**	**13.5**	**6.3**	**3.1**	**9.4**	**6.2**	**3**	**58.5**	**5.8**	**14.7**	**18.3**	**5.4**	**14.3**
Dolnośląskie	100	73.5	43.6	17.6	3.3	6.3	1.7	1	26.5	2.5	2.5	6.2	6.2	9.1
Kujawsko-pomorskie	100	40.5	14.8	10.8	2.3	10	1.8	0.8	59.5	5.8	24.5	17	2.6	9.6
Lubelskie	100	62.1	12.2	8.8	1.9	14.5	20.7	4	37.9	3.5	12.1	12.9	1.8	7.6
Lubuskie	100	49.5	20.9	6.6	1.7	9.6	3.8	6.9	50.5	2.2	9.2	7.1	5.9	26.1
Łódzkie	100	38.8	5.9	1.8	7.9	13.4	9.1	0.7	61.2	7.3	18.8	17.6	5.3	12.2
Małopolskie	100	52.9	8.3	2.2	6.4	23.5	9.6	2.9	47.1	6.8	11	13.7	7.8	7.8
Mazowieckie	100	39.2	6.1	1.8	3.9	12	10.7	4.7	60.8	5.8	8.3	21.8	4.8	20.1
Opolskie	100	60.7	31.8	21.6	2	4.3	0.6	0.4	39.3	2.4	14.1	12.9	1.8	8.1
Podkarpackie	100	45.8	15.1	8	1.2	13.4	6.8	1.3	54.2	3.4	14.4	18	6.2	12.2
Podlaskie	100	9.2	4.5	0.5	1.1	2	0.8	0.3	90.8	12.3	9	58.1	1.3	10.1
Pomorskie	100	36.7	17.3	8.2	5.2	2.8	1.2	2	63.3	4.9	28.2	12.1	3.3	14.8
Śląskie	100	40.3	13.6	4	3.6	8.9	1.7	8.5	59.7	6	13.7	13.3	7.2	19.5
Świętokrzyskie	100	56.7	8.7	3.2	2.7	18.3	20.4	3.4	43.3	8.2	11.6	10.7	2.4	10.4
Warmińsko-mazurskie	100	29	16.5	5.4	1.2	2.8	1.4	1.7	71	4.5	13.1	28.1	2.2	23.1
Wielkopolskie	100	30.7	10.6	5	1.7	7.6	1.5	4.3	69.3	7	21.2	14.8	12.4	13.9
Zachodniopomorskie	100	56.9	31.4	14	2.8	2.4	3.4	2.9	43.1	1.8	8.6	6.8	3.3	22.6

3.1.1 Crop production

Polish agriculture is characterised by a high specialisation of agricultural production by region. Cereal cultivation is concentrated in the following provinces: Dolnośląskie, Kujawsko-Pomorskie, Lubelskie, Łódzkie, Mazowieckie, Podlaskie, and Wielkopolskie. Rapeseed cultivations are concentrated in six provinces (Dolnośląskie, Kujawsko-Pomorskie, Opolskie, Pomorskie, Wielkopolskie and Zachodniopomorskie), while sugar beet is mainly grown in five provinces (Dolnośląskie, Kujawsko-Pomorskie, Lubelskie, Opolskie and Wielkopolskie). Potato production is concentrated in Lubelskie, Łódzkie, Małopolskie, Mazowieckie, Podkarpackie and Wielkopolskie[10].

Figure 3.3: Main agricultural regions by crop (data from Ministry of Agriculture)

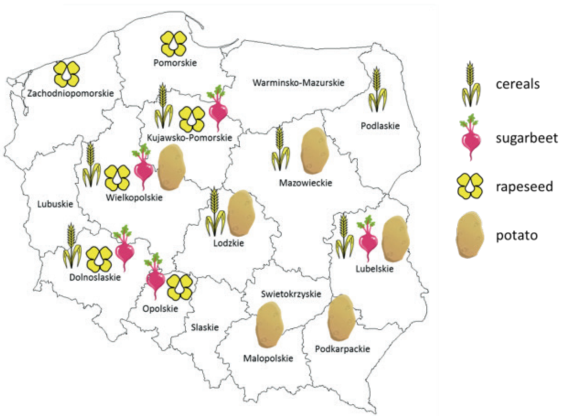


Table 3.3: Production data for main crops in Poland (2016 data, from EUROSTAT)

	Cereals	Potatoes	Industrial crops
Area (1000 ha)	7,400.26	300.74	980.10
Harvested production (1000 t)	29,849.22	8,624.05	
Production value at basic price (M€)	3,666.7572	890.0117	1,700.7928
	Plants harvested green from arable land (including forage)	**Fresh vegetables (including melons)**	**Fruits, berries and nuts**
Area (1000 ha)	1,087.01	191.50	700.58
Harvested production (1000 t)	40,486.36	5,634.31	9097.86
Production value at basic price (M€)	884.1952	2,284.9942	1,498.4682 [12]

3.1.1.1 Cereals

Poland's 2016/17 grain production is estimated at 30.0 million tons. The crop result is better than that for 2015/16 by 7.1 %, due to better yields as the total grains-planted area remained stable.[12]

Cargill Poland is the national branch of the multinational mother company and market leader in cereals. It employs 18000 persons in 23 locations in Poland.[13]

Glencore Polska is the national branch of the multinational mother company. It supplies grains, oilseed rape and related products from 10 production sites across the Country.[14]

10 Ministry of Agriculture and Rural Development, 2016, Agriculture and Food Economy in Poland

11 This value may be underestimated as it does not include berries and nuts

12 USDA, 2017, Grain and feed Annual – Poland 2017.

13 https://www.cargill.com.pl/en/about-cargill

14 http://glencorepolska.pl/en/

3.1.1.2 Sugar beet

Sugar production has been on an increasing trend in Poland in recent years (75 % increase in 2016 as compared to 2009); the trend is projected to continue after the EU sugar market reform[15]. Forecasts for the 2016/2017 season foresee the sugar beet planting area to reach a record level of 220,000 hectares. Sugar production is likely to increase to 2.2 million tons, exceeding domestic consumption by 500 thousand tons.

The main sugar producers in the Country are:

- **Krajowa Spółka Cukrowa**, operating under the brand Polski Cukier ("Polish Sugar"), is the largest sugar beet grower in Poland and the eighth in Europe. It has a domestic market share of around 40%.[16]
- **Pfeifer & Langen Polska**, operating under the brand Diamant, is the Polish branch of the German mother company with the same name. It has four production units across the country.[17]
- **Suedzucker Polska** is the local branch of Suedzucker, the largest sugar producer in Europe. It has five production units in the country.[18]
- **Nordzucker Polska** is the local branch of German mother company Nordzucker. It has two production units in Poland.[19]

The Association of Polish Sugar Producers (Związek Producentów Cukru w Polsce), groups the main actors in the sector.

3.1.1.3 Rapeseed

Poland is one of the leading producers of rapeseed in the EU, following Germany, France and UK. Rapeseed makes up 95 % of the total oil seed plantations in Poland.

Latest statistics estimate that rapeseed plantations will amount to 920,000 hectares in 2018, an 11 % increase in comparison to the previous year due to good prices for rapeseed on the domestic market and favourable weather conditions during planting season in the fall of 2016[20]. Poland's total production of rapeseed is forecast to exceed 2.5 million tons in 2018.

Kruszwica, part of the Bunge group, is Poland's largest grower and processor of oil seeds and vegetable fats. It operates two production plants.[21]

Archer Daniels Midland (ADM) operates two plants in the country.[22]

Other local oilseeds producers include **Tritech[23], BestOil[24], ZTB[25], Komagra[26], Wilmar[27], Azot[28].**

15 USDA, 2017, Sugar Annual – Poland 2017

16 https://firma.polski-cukier.pl/lang,2

17 https://www.diamant.pl/en/about-our-company

18 http://www.suedzucker.pl/en/company,142.htm

19 http://www.nordzucker.pl/services/mapa-strony

20 USDA, 2017, Poland – 2017 Annual oilseeds and products report

21 https://ztkruszwica.pl/en/what-makes-us-different/market-leader

22 https://www.adm.com/adm-worldwide/europe/poland

23 http://www.tritech.biz

24 http://www.bestoil.pl

25 http://www.ztb.pl

26 http://komagra.com.pl/

27 http://www.wilmar-oils.pl

28 www.organika-azot.p

3.1.1.4 Potatoes

In 2015 potatoes production was lower by 13 % compared to last year due to average unfavourable weather conditions. Poland's total crop is estimated at 6.7 M tons, of which ware production accounts for 3.7 M tons.[29]

Table 3.4: Potato growers and producers of potato-based products

Company	Product(s)	Location
Agrico Polska (subsidiary of Dutch company Agrico)[31]	Seed potatoes	Pomorskie
Solana (part of French group Solana)	Seed potatoes	Wielkopolskie
Farm Frites Poland[32]	Frozen French fries using potatoes from its own farms as well as from a network of around 70 farmers.	Pomorskie
Pepees[33]	Potato starch, potato flakes and proteins. Potatoes sourced from over 1000 farmers.	Podlaskie, Kujawo-Pomorskie, Lubelskie
Zetpezet[34]	Potato starch	Wielkopolskie
WPPZ[35]	Potato starch and proteins	Wielkopolskie
Solan[36]	Potato granules and flakes	Lodzkie
Trzemeszno[37]	Potato starch and proteins	Kujawo-Pomorskie and Wielkopolskie
Pol-foods[38]	Potato granules and flakes	Warminsko-Mazurskie
Nowamyl[39]	Potato starch	Zachodniopomorskie
McCain (subsidiary of the American company)[40]	French fries, snacks	Dolnoslaskie
Jantar Stolon	Potato flakes	Pomorskie

3.1.2 Livestock

Cattle and cow rearing is concentrated mostly in Podlaskie, Wielkopolskie, Mazowieckie, Kujawsko-pomorskie, Łódzkie and Warmińsko-mazurskie regions. Regions specialising in swine production are Wielkopolskie, Kujawsko-Pomorskie, Łódzkie, Mazowieckie and Pomorskie. Poultry livestock is concentrated in three provinces: Mazowieckie, Wielkopolskie and Warmińsko-Mazurskie.

Wielkopolskie alone accounts for around 35 % of swine and 17 % of bovine production.

29 USDA, 2015, Poland – Fresh potatoes and products. Annual 2015

30 https://agricopolska.pl/o-nas/o-firmie

31 http://www.farm-frites-dwa.pl/en/about-us/

32 http://pepees.pl/en/index.php?wiad=47

33 http://www.zetpezet.eu/index.php/en/

34 http://www.wppz.pl/page.php/1/show/366/

35 http://www.solan.pl/potato-products-company.html

36 http://www.ppz-trzemeszno.com.pl/en/history-of-ppz-trzemeszno

37 http://pol-foods.com/contact.html

38 http://nowamyl.com.pl/en/home-page/

39 http://www.mccain.pl/Pages/Dobrze-Robimy.html

Figure 3.4: Main livestock regions by animal (data from Ministry of Agriculture)

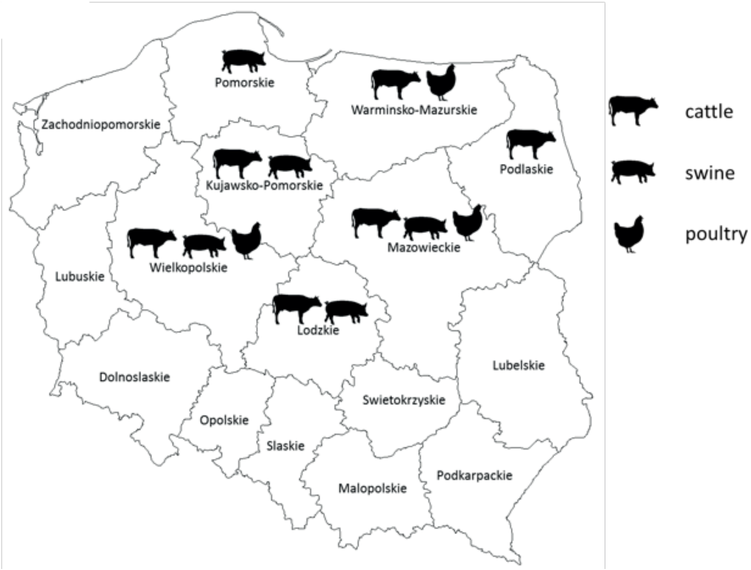


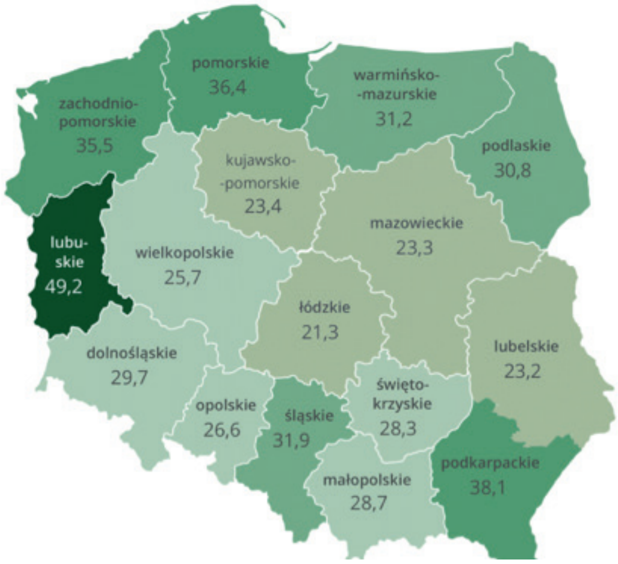
Table 3.5: Livestock in Poland (thousand heads, 2016 data from EUROSTAT)

	Live bovine animals	Live swine, domestic species
Poland	5,970.2	11,106.7
Region Centralny	1,571.7	2,054.2
Lódzkie	473.2	1,119.8
Mazowieckie	1,098.5	934.4
Region Poludniowy	300.8	412.2
Malopolskie	178.1	168.7
Slaskie	122.7	243.6
Region Wschodni	1,582.5	1,247.1
Lubelskie	371.8	550.2
Podkarpackie	84.4	166.8
Swietokrzyskie	166.5	209.5
Podlaskie	959.8	320.6
Region Pólnocno-Zachodni	1,168.7	4,395.5
Wielkopolskie	1,003.3	3,959.3
Zachodniopomorskie	92.5	283
Lubuskie	73	153.2
Region Poludniowo-Zachodni	225.4	587
Dolnoslaskie	102.5	196
Opolskie	122.9	391
Region Pólnocny	1,121	2,410.6
Kujawsko-Pomorskie	492.6	1,197.4
Warminsko-Mazurskie	419.1	466.9
Pomorskie	209.4	746.3

3.2 Forest

Poland is among the countries with the largest forest area in Europe. At a national level, around 30 % of the land is occupied by forests. This percentage varies from region to region with the Lubuskie voivodship having the highest percentage (49.2%) and Lodzkie having the lowest (21.3%)[40].

Figure 3.5: Percentage of land occupied by forest in Polish Voivodships (from [40])



Ownership of forest if mostly public: publicly owned forests amount to 80.8 % of the total area, of which 77 % is administered by the national State Forest administration (Lasy Państwowe). 19.2 % of the forests are private.

Coniferous species dominate 68.7 % of the forest area in Poland. Pine occupies 58 % of the forest area of all ownership forms.

Table 3.6: Area occupied by main tree species (data from [40])

Tree species	Area
aspen	1%
alder	5.5%
birch-tree	7.5%
hornbeam	1.5%
beech	6%
oak	7.5%
other deciduous trees	2.5%
fir	3%
spruce	6%
pine	58%
other conifers	1%

40 State of Polish forest 2016 (in Polish) http://www.lasy.gov.pl/pl/informacje/publikacje/do-poczytania/lasy-w-polsce-1/lasy-w-polsce-2016-1/lasy_w_polsce_2016.pdf

Production of solid wood products and wood boards is the main use of forest-based biomass. The country is the 10th largest world producer and the 4th largest world exporter of furniture[41].

The pulp and paper sector is also well represented with several paper and board mills.

3.3 Fisheries, Aquaculture and the Blue Economy

3.3.1 Fisheries

The total catch of the Polish fishing fleet was nearly 187 thousand tons in 2015 (last available data), the majority of which from the Baltic Sea. The main species caught by Polish fishermen in the Baltic Sea include cod, sprat, herring, salmon, sea trout, and flatfish. Polish long-distance sea vessels fish primarily for cod, saithe, redfish, halibut, mackerel, and horse mackerel. The inland fisheries production from rivers and lakes was less than 3,000 tons mainly bream, pike and roach. [42]

3.3.2 Aquaculture

Freshwater aquaculture has a long history in Poland, having been introduced in the Middle Ages. Its contribution to the overall sector is about 20 %. In 2015 the total national aquaculture production reached 38,500 tons. The main fish species produced is carp, which makes up over 50 % of total aquaculture. Carp farming is carried out in earth ponds on traditional land-based farms. The total registered area of carp farms in the country is about 70,000 hectares, the largest in Europe.[42]

3.3.3 Algae

The Culture Collection of Baltic Algae, part of the University of Gdansk, researches, grows and sells strains of algae (both marine and freshwater species).

Only one company, Svanvid, appears to be producing algae-based products commercially. It is a SME active in nutraceutical products, and was awarded 2nd place at EuropaBio's Most Innovative European Biotech SME Award in 2015.

41 USDA, 2017, The Forestry and Wood Products in Poland https://gain.fas.usda.gov/Recent%20GAIN%20Publications/The%20Forestry%20and%20Wood%20Products%20in%20Poland_Warsaw_Poland_3-23-2017.pdf

42 https://www.eurofish.dk/index.php/poland

04 | Current and potential users of biomass

4 Current and potential users of biomass

4.1 Food Industry

According to a study by PWC, the market is highly concentrated: 5 % of the largest firms account for 80 % of the sales of food products [43].

Figure 4.1: Main food industry actors and locations (from[44])

Table 4.1: Production Value of Food Industry Subsectors (2015 data from Central Statistical Office)

Product	Production value (b €)
meat	17.9
beverages	9.9
dairy	8.0
feed and fodder	5.0
bakery products	4.5
vegetables and fruit	4.1
seafood	2.9
grain mill products	2.3
animal and vegetable fats	1.4
others	7.9

43 PWC for the Embassy of India in Poland, 2016, "Food Sector in Poland – opportunities for India"

44 Polish Investment and Trade Agency, 2016, "Poland your business Partner. Invest in Poland"

The following sections contain short profiles of some of the main players in the Polish food sector.

4.1.1 Meat

Sokolow, owned by International Danish Crown, is a large meat (cattle, swine and poultry) producer. It employs over 7000 persons in 7 production facilities, 40 warehouses and 51 shops across the Country. Its annual sales amount to 0.7 billion €. [45]

Animex Foods, owned by the multinational Smithfield Group, is a large producer of swine and poultry-based products. It has eight production plants across the country and its annual revenues are close to 1 billion €. It is the largest employer in the food sector with over 8000 employees.[46]

Indykpol is a poultry company specialised in turkey products.[47]

ZM Henryk Kania is a producer of sausages and other pig meat products.[48]

WIPASZ is a producer of poultry meat and of animal feed, both for own consumption and for sale.[49]

Drosed, part of the French group LDC, produces fresh and canned poultry products.[50]

4.1.2 Fish and aquaculture products

Morpol, part of the Marine Harvest Group, is a large fish processing industry based on the Baltic coast, in particular processing salmon meat. It does not rear its own salmons, but rather sources them from fish farms in Scotland and Norway.[51]

Lisner produces packaged fish meals as well as ready meals based on vegetables.[52]

4.1.3 Fruit and vegetables

Hortex, owned by international group Mid Europa Partners, is a large producer of frozen vegetables, fruit and fruit juices.[53]

Bonduelle has two factories in the country.[54]

Makow is a producer of frozen fruits and vegetables.[55]

45 https://sokolow.pl/en/company/did-you-know
46 http://en.animex.pl/animex/basic-data/
47 https://www.indykpol.pl/o-nas/grupa-indykpol/
48 https://henrykkania.pl/en/zm-henryk-kania-company
49 http://www.wipasz.pl/o-nas/wipasz/
50 http://drosed.com.pl/en/drosed-group/
51 http://morpol.com/about-us
52 http://www.lisner.pl/pl/lisner
53 http://www.hortex.pl/en/about-company/market-position/
54 http://bonduelle.pl/kariera/praca-w-bonduelle/
55 http://www.makow.com.pl/en/about-company/

Unifreeze is a producer of frozen food, mainly vegetables.[56]

Iglotex produces frozen food of various sorts for horeca and retail.[57]

Marwit produces packaged fruits, vegetables and ready meals.[58]

Pamapol produces processed vegetables and ready meals.[59]

4.1.4 Beverages

Kompania Piwowarska (KP), 100 % owned by the SABMiller group, is the leading producer of beer, with a domestic market share of 34 %.[60]

Maspex is a large group active primarily in the beverages sector, but also in pasta, sauces, ready meals and processed vegetables. Its headquarters are in Poland, but it is active in all Central-Eastern Europe Countries. Its 2016 turnover slightly exceeded 1 billion €.[61]

PepsiCo operates four factories, two dedicated to soft drinks and two to snacks, employing almost 3000 persons.[62]

Zywiec, part of the Heineken group, operates five breweries across the country.[63]

Victoria Cymes is a bottling company producing fruit juices, soft drinks and mineral water.[64]

CEDC International is a local producer of vodka and distributor of wines and spirits from mother company Russian Standard Corporation.[65]

ZP Glubczyce, **Sulimar** and **Browar Jablonow** are local breweries.[66] [67] [68]

PWW Polmos, **Debowa** and **Akawit** are local distilleries producing vodka.[69] [70] [71]

FoodCare produces fruit juices and energy drinks.[72]

56 http://unifreeze.com.pl/o-unifreeze/o-firmie

57 http://grupa.iglotex.pl/en/about-us

58 http://marwit.pl/en/static_15_16_Historical_background.html

59 https://www.pamapol.pl/en/

60 http://en.kp.pl/about-us/kompania-piwowarska

61 http://en.maspex.com/maspex,maspex-group,3.html

62 https://pepsicopoland.com/pl/Strona,PepsiCo_w_Polsce,6.html

63 http://en.grupazywiec.pl/

64 http://www.victoriacymes.com/

65 http://www.cedc.com/o-nas/o-roust/

66 http://glubczyce.com.pl/8/9/o-firmie.html

67 http://www.sulimar.com.pl/english/who-are-we

68 http://jablonowo.pl/

69 http://www.polmos-siedlce.com.pl/site/o-nas/historia/?lang=en

70 http://www.debowa.pl/

71 http://akwawit.eu/

72 http://www.foodcare.pl/pl/pages/display/1

4.1.5 Dairy products

Dairy producers are usually organised in the form of cooperatives.

Mlekovita is one of the largest dairy companies in Poland. It has 16 production facilities and 30 distribution centres.[73]

OSM Lowicz is a dairy cooperative with 6600 local milk suppliers and a daily output of 1.6 million litres of milk.[74]

Polmlek is the third dairy producer in Poland, employing over 3000 employees in 8 production plants.[75]

SM Mlekpol is a large dairy cooperative, operating 11 production facilities.[76]

Bakoma is a dairy company that focuses mainly on export.[77]

4.1.6 Cereal-based foods, bakery, sweets

Schulstad Bakery Solutions, part of the Lantmannen Unibake group, operates two large bakeries in the country.[78]

Mondelez has seven production sites across Poland, in addition to a research centre in Wroclaw (Dolnoslaskie).[79]

E.Wedel, part of the Lotte group, is a chocolate and snacks producer.[80]

Colian is a locally owned large producer of sweets, snacks and soft drinks.[81]

Baltyk produces chocolates and sweets in three factories in Pomorskie.[82]

Barbara Luijckx is a producer of high-end chocolates.[83]

Skawa and **Jaskolka** are producers of biscuits and sweets.[84] [85]

Lesaffre Polska, local branch of the Lesaffre group, produces yeast and bread ingredients for bakeries.[86]

73 http://www.mlekovita.com.pl/strona-glowna/rys-historyczny/

74 http://mleczarnia.lowicz.pl/en/about-company

75 http://www.polmlek.com/

76 http://www.mlekpol.com.pl/index.php?option=com_content&view=article&id=7&Itemid=22

77 http://bakoma.pl/en/export/export-products/

78 http://www.lantmannen-unibake.com/pl-PL/Lantamnenn_w_Polsce_url/

79 https://careers.mondelezinternational.com/our-world/europe/poland

80 https://wedel.pl/o-firmie/

81 http://www.colian.pl/profil_korporacyjny/en/colian-group/about-colian-group

82 http://www.zpcbaltyk.pl/?page_id=61&lang=en

83 https://www.barbara-luijckx.com/about-us.html

84 http://www.skawa.com.pl/en/company/company.html

85 http://jaskolka.net/?page_id=45

86 http://lesaffre.pl/company/lesaffre-poland

4.1.7 Other food products

Fermy Drobiu Woźniak rears egg-laying chickens. It is also active in poultry feed, mainly for own consumption.[87]

Danone is present with its own brand and with controlled company Nutricia.[88]

Heinz, Associated British Foods, Unilever, Lorenz. Mc Cain, Zeelandia, Orkla, Vandemoortele, Barry Callebaut and **Leiber** all have production sites in Poland.[89]

Mars operates in Poland with three brands (Mars Polska, Wrigley Poland and Royal Canin Polska) and seven factories dedicated to pet food, chocolate, chewing gum and candy.[90]

Nestlé has 9 plants employing over 5000 persons in Poland.[91]

4.1.8 Animal feed

Cedrob is a producer of feed mixes for poultry and swine.[92]

Most cereal and oilseed producers divert their production residues to animal feed as well.

4.2 Wood Products

The Polish wood industry accounts for a significant share of the national economy. The most important wood-based sectors include: sawmill industry, furniture manufacturing, cellulose-paper industry, and wood-based board manufacturing. Poland is the 10th largest world producer and the 4th largest world exporter of furniture (after China, Germany and Italy). Poland is the biggest EU producer of fibreboards, and the second producer of chipboards in the EU. Average wood industry sales value exceeds 18 billion € per year.[93]

IKEA employs over 3000 persons in 16 production facilities in Poland, which is its second production hub after China.[94]

Pfleiderer Group is a producer of chipboard and fibreboard.[95]

Swiss Krono has a factory in the Western part of Poland.[96]

Kronospan, multinational producer of wood-based panels, has a factory in Poland.[97]

87 http://www.fdw.pl/en/firma/odchow

88 http://pracawgrupiedanone.pl/#profesjonalisci

89 http://www.heinz.pl/pl-pl/about/ourcompany

90 http://www.mars.com/poland/en/about.aspx

91 https://www.nestle.pl/pl/aboutus/nestlepolska

92 http://cedrobpasze.pl/historia/

93 USDA, 2017, The Forestry and Wood Products in Poland https://gain.fas.usda.gov/Recent%20GAIN%20Publications/The%20Forestry%20and%20Wood%20Products%20in%20Poland_Warsaw_Poland_3-23-2017.pdf

94 http://ikeawpolsce.pl/docs/raport_IKEA_EN.pdf

95 https://www.pfleiderer.com/row/PM/Products_and_applications

96 http://swisskrono.com/en/production/poland/

97 http://pl.kronospan-express.com/pl/page/szczecinek

4.3 Pulp and Paper

Mondi operates 13 mills in Poland, producing paper, cardboard, industrial bags and flexible packaging.[98]

Arctic Paper operates a mill in Poland.[99]

International Paper has a mill and a business service centre in Poland employing over 2000 persons.[100]

Stora Enso has a paper and board production facility in Mazowieckie region.[101]

4.4 Chemical and Petrochemical Industry

PKN Orlen and Lotos are the largest petrochemical companies in Poland.[102] [103]

Grupa Azoty is a producer of chemicals and fertilisers, with 8 production plants in the country.[104]

Synhtos has three production sites in the country.[105]

4.5 Pharmaceutical Industry

Poland is one of the leading producers of pharmaceutical and cosmetic products in Central Europe. Most of the large multinational companies are present in the country; they account for the largest share of turnover, with the exception of local firm Polpharma.

Table 4.2: Largest pharmaceutical industries by domestic sales (2013, data by PAIZ)

No.	Company	Location	Voivodship
1.	Polpharma	Starogard Gdański	Pomorskie
2.	Sanofi-Aventis	Warsaw	Mazowieckie
3.	Teva Group	Krakow, Kutno	Malopolskie, Lodzkie
4.	Valeant Pharma	Rzeszów	Podkaprackie
5.	Sandoz Corp.	Warsaw	Mazowieckie
6.	GSK Pharma	Poznań	Wielkopolskie
7.	Novartis	Stryków	Lodzkie
8.	Adamed Group	Pieńków, Pabianice	Mazowieckie, Lodzkie
9.	KRKA	Warsaw	Mazowieckie
10.	Aflofarm	Pabianice	Lodzkie
11	USP Zdrowie	Wrocław	Dolnoslaskie
12.	Bayer	Warsaw	Mazowieckie

98 https://www.mondigroup.com/en/about-mondi/where-we-operate/our-locations/#6102

99 http://www.arcticpaper.com/pl/Start/Arctic-Paper/Our-Mills/Arctic-Paper-Kostrzyn/About-us/

100 http://www.internationalpaper.com/company/regions/europe-middle-east-africa/about-us/a-pioneer-investor-in-poland

101 http://renewablepackaging.storaenso.com/about-us/mills/packaging-poland

102 http://www.orlen.pl/EN/Company/Pages/default.aspx

103 http://www.lotos.pl/en/

104 http://grupaazoty.com/en/grupa/ogrupie.html

105 https://www.synthosgroup.com/en/synthos-group/groups-business-activity/

Polpharma, USP Zdrowie and Adamed are the only local companies in the list. Other local companies include Neuca, Farmacol, PGF, Bioton, Biofarm, Hasco Lek and LEK-AM. [106]

The pharmaceutical sector in Poland has realised continuous growth in recent years, reaching about €6 billion in 2013. During the period 2006–2013 the value of the Polish pharmaceutical market increased by nearly 40 % and it is estimated to grow to €7 billion in 2018.[107]

106 Polish Investment and Trade Agency, 2015, Pharmaceutical sector in Poland

107 E. Wozniak, T. Twardowski, 2018, The bioeconomy in Poland within the context of the European Union

05 | CLUSTERS AND ASSOCIATIONS

5 Clusters and Associations

Table 5.1: List of Clusters active in the bioeconomy[108]

Name	Location	Voivodship	Main members
AgroFreshPark	TBD	Lodzkie	Announced January 2018, cooperation between Dutch and Polish stakeholders
AgroBioCluster	Radom	Mazowieckie	46 members including local agrifood companies (Skowronski, TB orchard, MB orchard, Polish pepper, Ozon food, Fogiel&Fogiel, Sorter)
Food4Good	Warsaw	Mazowieckie	48 members, inlding 23 SMEs. It cooperates with two Romanian clusters: AgroTransilvania and Romalimenta.
Klaster Lifesciences Krakow	Krakow	Malopolskie	75 members
Nutribiomed Cluster	Wrocław	Dolnoslaskie	- Farmaceutyczny Zakład Naukowo-Produkcyjny „Biochefa”; - P.W. „Futurum” - Technox
West Pomeranian Chemical Cluster „Green Chemistry”	Szczecin	Zachodniopomorskie	- Polpharma - Lipopharm.pl - Blirt - A&A Biotechnology
Eco-Energetic Cluster EEI– Energy, Ecology, Innovation	Wrocław	Dolnoslaskie	- Biotransformation Department, University of Wrocław
Bioenergy for the Region	Łódź	Lodzkie	- Trimen Chemicals
Life Science	Kraków	Malopolskie	- IBSS BIOMED - Adamed - Afisen - Biopharge PharmA - Selvita S.A.
Organic Food Valley	Lublin	Lubelskie	- Owocowe Smaki - Barwy Zdrowia
Food Cluster	Kalisz	Wielkopolskie	- WPPH Elena Import-Export - Lazur Spółdzielnia Mleczarska - Ceko Sp. Z o.o
Food Cluster	Kalisz	Wielkopolskie	- WPPH Elena Import-Export - Lazur Spółdzielnia Mleczarska - Ceko Sp. Z o.o
Biotechnology Cluster BIO¬PARK	Gdańsk	Pomorskie	- Biomax - Nutri Pharmax

108 Locations mentioned in this table refer to the headquarters of clusters and associations. Activities of clusters and associations may extend into other and more regions than those listed in the table. These include e.g. the Opole voivodship, one of the eight co-signers of a Letter of Intent with BIC and the BBI JU to create synergies and contribute to the development of bioeconomy in October 2016; see: http://biconsortium.eu/sites/biconsortium.eu/files/documents/BBI-Regions_letter-intent.pdf andhttp://biconsortium.eu/news/enhanced-central-and-eastern-regional-cooperation-boosts-european-bioeconomy.

Lublin Medicine–Medical & Wellness Cluster	Lublin	Lubelskie	- VitaGenum
BTM (BioTechMed)	Warszawa	Mazowieckie	- Celon Pharma - TriMen Chemicals
BioNanoPark	Łódź	Lodzkie	- laboratory services
Gdański Park Naukowo-Technologiczny (GPN-T)	Gdańsk	Pomorskie	- Polpharma - Blirt
Poznan Science and Technology Park	Poznań	Wielkopolskie	- DNA Research Center - Future Synthesis - PolBiotech Laboratorium
You Nick	Suchy Las	Wielkopolskie	- Smart Pharma
Polish maritime cluster	Gdynia	Pomorskie	75 members
sEaNERGIA Baltic Cluster	Kolobrzeg	Zachodniopomorskie	259 members including 156 companies
Waste management and recycling cluster	Kielce	Świętokrzyskie	40 industrial members

06 | CAMPUS, INCUBATORS AND TECHNOLOGY PARKS

6 Campus, Incubators and Technology Parks

The Polish Business and Innovation Centres Association (PBICA, or SOOIP using the Polish initials) is the umbrella organisation grouping the vast majority of business incubators and technology parks in the country. It has around 200 members.

Examples of technology parks dealing with bioeconomy are:

- Kutno Agro-industrial Park, in the Lodzkie region;
- Wrocław Technology Park (coordinator of cluster Nutribiomed) in the Dolnoslaskie region;
- Łódzki Regionalny Park Naukowo-Technologiczny (coordinator of BioNanoPark) in the Lodzkie region.

The **International Centre for Research on Innovative Bio-based Materials**, in Lodz is a cooperation between the University of Lodz and the Max Planck Institute from Germany.

07 RESEARCH PROJECTS

7 Research Projects

According to Wicki[109], R&D work until 2016 had been characterized by the following items:

- developing processes for obtaining energy and chemicals with high value added from biomass derived from waste and vegetation using industrial biotechnology methods;
- obtaining new biomaterials and polymer composites of controllable biodegradability based on cellulose nanofibers and bio-nanocellulose;
- developing technologies for obtaining new biocatalysts and biocatalyst mimetics for the production of fuel and organic chemical compounds of substantial industrial significance (platform molecules) from biomass;
- developing biotechnological processes for producing functional foods useful in preventing and treating diet-related diseases;
- developing new ways of integrating fermentation and bioconversion processes with product separation, purification and batching;
- developing biorefinery processes based on waste and renewable resources.

While two further directions were foreseen to be tackled in the short-term:

1. strengthening innovativeness and competitiveness of food industry;
2. developing technologies for conversion of second generation biomass (residues from food industry, household and municipal wastes) into biofuels and raw industrial materials

The emphasis on food industry is well justified, given the importance of this sector in the Polish economy.

Poland has up to now mostly focused on small scale industrial projects and on university led research projects. The first notable large scale industrial project is the recently started BBI JU Demonstration action Biomotive, coordinated by SELENA.

7.1 Bioecon – New Strategies on Bioeconomy in Poland

ERA Chairs action coordinated by the Institute of Soil Science and Plant Cultivation. Its objective is to first analyse the prospects for bioeconomy in Poland and then take action to promote its development with local stakeholders. It began in 2015 and will run until 2020.

7.2 Biomotive - Advanced Biobased Polyurethanes and Fibres for the Automotive Industry with Increased Environmental Sustainability

BBI JU innovation action coordinated by Polish company SELENA. The project aims at developing, manufacturing at semi-industrial scale and testing in representative environment bio-based polyurethane foams and fibres for the automotive sector.

It started in 2017 and will run until 2021. The overall cost exceeds 15 M€.

109 Wicki L., A. Wicka, 2016, Bio-Economy Sector In Poland And Its Importance In The Economy, Proceedings of the 2016 International Conference "ECONOMIC SCIENCE FOR RURAL DEVELOPMENT" No 41 Jelgava, LLU ESAF, 21-22 April 2016, pp. 219-219

7.3 Biotrem - Processing Wheat Bran Into Packaging Products

SME Instrument Phase 1 by Polish SME BIOTREM. The project, executed in 2016, concerned the development of a business case for a process converting by-products of the milling industry (wheat bran) into biodegradable moulded packaging.

7.4 Development and Market Launch of Novel Technology for Production of Nutritionally Complete Plant Proteins Called Fidos - "Functional (Protein) Isolates Derived from Oilseeds"

SME Instrument Phase 1 by Polish SME NapiFeryn BioTech. The project, running in 2015-2016, led to commercialisation of nutritional components isolated from plant sources and in particular from legumes, cereals and oilseeds.

7.5 Pelleton – A Device for Production of Pellets from Biomass and Agricultural Waste for Energy Purposes

SME Instrument Phase 1 by Polish SME ZUK Stąporków. The project, which ran in 2016, concerned the development of a mobile machine enabling on-field production of pellets from a range of difficult-to-process biomass sources, including dense sludge.

08 MARKET ACTORS: BRAND OWNERS AND CONSUMER GROUPS

8 Market Actors: Brand Owners and Consumer Groups

8.1 Brand Owners

The main international big brands in food and beverages are all present in Poland, most of them with local production plants. Mars, Nestlé, Danone, Heinz, Associated British Foods, Unilever, Lorenz. Mc Cain and Leiber are examples.

IKEA has a strong presence in the country, which is its second production hub after China.

8.2 Consumer Groups

The main nationwide consumer associations are:

- Polish Consumer Federation (Federacja Konsumentów), the oldest consumer organisation in the country, its main focuses are education, lobbying and work in committees.
- Association of Polish Consumers (Stowarzyszenie Konsumentów Polskich), is focused on consumer defence (e.g. through promotion of class actions);
- Polish Green Network (Polska Zielona Sieć), is mostly related to consumers' health concerns and environmental issues.

Bio-based Industries Consortium

http://biconsortium.eu

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