Agri-food clusters
in Poland

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MULTI-ANNUAL PROGRAMME
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COMPETITIVENESS OF THE POLISH FOOD
ECONOMY UNDER THE CONDITIONS OF
GLOBALIZATION AND EUROPEAN INTEGRATION

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INSTITUTE OF AGRICULTURAL
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Contents

Introduction

The topic of business clusters is debated in various dimensions both in scientific literature and in the sphere of policy making. Such a broad interest in development of business clusters has been inspired quite recently by a strong belief promoted prominently by M.E. Porter that not the companies themselves but strong clusters are the key engines of competitive and innovative economies. According to Porter clusters have a positive impact on job creation, innovativeness, wages, and consequently by boosting emergence of new companies, or even new branches, they help increase economic welfare. This view has been acknowledged for example in some strategic documents formulated by the European Commission[1,2] and consequently becomes an intellectual rationale of some public policies meant to support cluster development in the EU countries. The issue of competitiveness is also a part of the ongoing debate on desired character of the Common Agricultural Policy (CAP). It is stressed very clearly that tools of this policy, especially related to its second pillar, are supposed to be oriented towards strengthening competitiveness and stimulating innovativeness of the agri-food sectors in the EU countries. Therefore, development of strong agri-food business clusters should be an obvious objective of the CAP. Following this conjecture the current state and potential development of agri-food clusters in Poland is discussed in this monograph.

In the period of 1995-2013 the Polish agri-food sector enjoyed a very dynamic growth in foreign trade, especially visible on the export side. Value of that export increased from around 2 to around 18 billion euros. The economic crisis caused a slight decrease in the agri-food industry export and import in 2009, but in subsequent years the rates of both export and import growths recovered to the levels prior to 2008, which was even almost 40% a year. In the period of 1995-2013 agri-food products constituted 8-13% of the total Polish export. Thus, the agri-food sector plays an important role in Poland's exports and development of strong traded clusters related to this sector seems to be a natural policy direction.

The concept of business clusters has a fairly long history, which goes back to the end of the 19th century when Alfred Marshall laid the foundations of the theory of clusters in his Principles of Economics (ed. I – 1890) referring to *thickly peopled industrial districts*. Presently, the most widely accepted

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[1] *A strategy for smart, sustainable and inclusive growth*, COM (2010) 2020 final, 3 March, 2010, Brussels.
[2] *Towards world-class clusters in the European Union: Implementing the broad-based innovation strategy*, COM (2008) 652, 17 October, 2008, Brussels.

approach to study business clusters in various countries stems from conceptual and methodological works by Porter and his team at Harvard Business School. The main utilitarian objective of these research studies is to validate assumptions of economic development policies formulated and implemented at various decision levels (i.e. country, state, region, etc.). Especially, so-called cluster policies could serve as a specific example in this regard. However, the problem is that implementations of cluster development policies are usually based on superficial interpretation of the cluster notion and suffer from a lack of analytical rigour necessary to appropriately determine directions of the public support.

The monograph, intended to address key aspects of emergence and potential development of agri-food clusters in Poland, consists of five chapters focused mainly on several research questions in the context of policy implications. The first part is devoted to clarification of terminology and proper understanding of the business cluster concept and its usefulness in shaping economic development. The second part presents results of an analysis of factors determining emergence and development potential of the agri-food clusters in Poland. In this part main attention is paid to economic and institutional determinants of agri--food clusters emergence in Poland and their development potential related to employment and number of entities.

The third part includes analytical results of cluster mapping carried out with regard to the Polish agri-food sector, as well as to the other EU member countries, using Porter's notion of business cluster and derived from it methodology applied by the European Cluster Observatory (ECO). In the fourth part of the monograph the results of cluster mapping are confronted with the results of an empirical study on regional distribution, organizational structures and economic profiles of cluster initiatives associated with various branches of the Polish agri-food sector. This comparison gives an insight into compatibility of occurrence of cluster initiatives with cluster development potential and provides some guidelines for policy recommendations.

Finally, in the fifth part of the monograph the impact of clusters on competiveness of the agri-food sectors in Poland and the EU member countries is examined. It begins with a brief discussion of theoretical premises of a potential impact and then, after presenting some empirical evidence of actual impact, it ends with a reflection on the role of cluster policies in the European setting and general recommendations which are worthy of consideration when designing and implementing these policies.

It should be mentioned that this monograph consolidates and reconsiders the results of research carried out in the Institute of Agricultural and Food Economics – National Research Institute in Warsaw under government funded Multi-Annual

Research Programme 2011-2014. Elaborating its content the Authors to the extent possible have taken into account valuable comments and suggestions made by participants of three seminars held at the Institute in 2011, 2012, and 2013. Being aware of research limitations related to the subject and some unavoidable analytical shortcomings the Authors hope that the coverage of the problem of clusters development from the perspective of Polish agri-food sector presented in this monograph may also be of interest for readers from other countries.

1. Selected aspects of the business cluster concept

1.1. Origin and essence of the cluster concept

Clusters are *geographic concentrations of interconnected companies, specialized suppliers and service providers, firms in related industries, and associated institutions (for example universities, standards agencies, and trade associations), in particular fields that compete but also cooperate* [Porter 1998a].

A feature of each national economy is the spatial diversity of production effects occurring within its borders. One of the trends in economic geography is to understand and explain the processes that determine the occurrence of spatial diversity and the degree of its intensity. Over the last two decades, there has been a significant increase of interest in the phenomenon of spatial concentration of economic activity and its effects. Those studies are part of a trend in the so-called new economic geography (NEG).

Initially, the achievements in economics ignored the spatial dimension of the phenomena that take place in the economy and, consequently, economy was considered in such terms that it took a single-point character. It was only due to the work of economists who dealt with land rent and international trade that location became a subject of study for a wider group of scientists. These particularly include, among others, Alfred Weber with his location theory (the theory of industrial location) and Johann Heinrich von Thünen (rings of agricultural activity). The canon of spatial economics also includes works by Alfred Marshall, who in his *Principles of Economics* (1890) laid the foundations of the theory of clusters.

Marshall analysed the situation of manufacturers in the textile (Manchester) and metal industry (Birmingham), and manufacturers of knives (Sheffield) [Gorynia and Jankowska 2007]. The result of his work was a statement that the geographical proximity of enterprises in a given industry, as well as of those from related industries, determines the occurrence of positive effects that all entities within those industries can benefit from. He formulated the concept of the industrial district, defined as a group of companies that specialise in different phases of the production process, which was associated with the acquisition, development and strengthening of skills and competencies, with a simultaneous occurrence of economies of scale [Gorynia and Jankowska 2008]. He argued that the economies of scale can affect a sufficiently large group of companies, which through their manufacturing operations are located in different phases of the production process [Becattini 1991]. Marshall identified three types of externalities,

the existence of which is associated with the operation of industrial districts (Figure 1.1).

Figure 1.1. The Marshall's triad
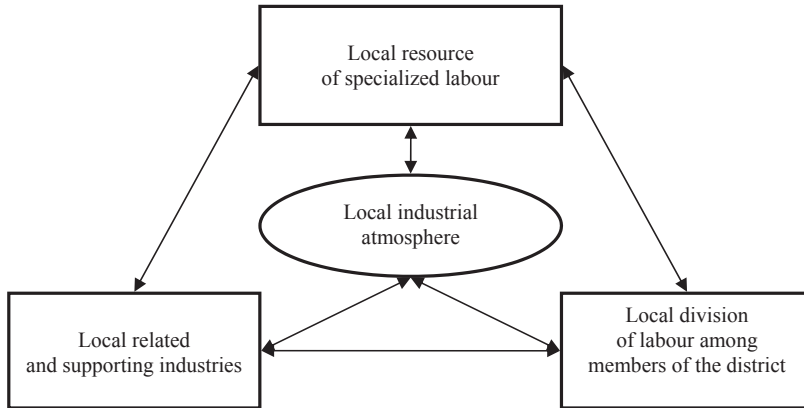
According to some researchers, Marshall presented not three, but four types of externalities in his theory [Lindqvist 2009]:
− transfer of skills and inventions;
− development of related and supporting industries that supply the core of the district with specialized inputs and services;
− economies of scale in the case of shared use of specialized equipment;
− development of a local market of qualified staff.

Marshall's concept remained outside the mainstream research until its revival thanks to the works of an Italian economist Becattini, who referred to Marshall's industrial districts. Becattini's research focused on the phenomenon of *Terza Italia* (Third Italy), which was explained by, among others, the support given to small and medium-sized enterprises and the development of cooperation between them. Becattini defined the industrial district (*distretti industriali*) as a social environment that takes the form of a strong and dynamic organization where physical proximity and cultural ties allow for the use of the advantage of proximity in order to achieve the benefits of agglomeration, which gives small enterprises a chance to share certain costs and experience mutual positive reinforcement [Figuła 2008].

The phenomenon of agglomeration is associated with the occurrence of different types of accompanying effects (economies of agglomeration). Economies of agglomeration are included in the group of external economies of scale.

They are related to the benefits for companies or urban centres, which occur due to the spatial proximity [Healey and Ilbery 1990]. Economies of agglomeration may be related to a close – in terms of location – operation of companies with the same business profile (location economies) or all entities (urbanization economies) [Hoover 1936]. The first group of economies refers to the concentration that occurs between firms that take up identical, technologically similar, or complementary activities, which results in the emergence of structures of industrial districts in an urban or regional environment. In the case of the urbanization economies, which are a consequence of operating within a structure characterized by spatial concentration, regardless of the business profile, metropolitan regions or industrial regions come into being [Ketels et al. 2008].

The benefits achieved through agglomeration were studied by Swedish economist Ohlin. He identified their sources as the following [Skawińska and Zalewski 2009]:
−   internal economies of scale that are associated with production techniques;
−   the benefits of location, as a manifestation of the impact of the industry on a single entity;
−   the benefits of urbanization, which are a manifestation of the functioning of the economy as a whole and have an external nature with respect to companies and industries;
−   links between the industries.

The distinction of four types of agglomerations, namely cities, industrial districts, creative regions and clusters, as shown in Table 1.1, is based on the delimitation carried out along two dimensions. The first one concerns the degree of technological connection between operations (diversification of operations within the analysed agglomeration, in comparison with agglomeration of operations linked in terms of technology). The second dimension relates to the separation of agglomerations characterized by economies in terms of performance (largely the economies of scale) and agglomerations with innovative benefits [Sölvell 2009].

The first type of agglomeration – a city – is associated with the occurrence of benefits available to all companies and industries that stem, *inter alia,* from lower transport costs. Under favourable circumstances, urbanization economies can lead to the development of metropolitan areas or functional regions, characterized by an increased intensity of industrial activity[3]. Industrial districts, which are the second type of agglomerations that experience urbanization economies, include companies concentrated around a similar profile of activity or

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[3] An example of the region with an industrial profile is the American Rust Belt.

related activities. Those agglomerations are characterized by flexible productive systems. In both cases, there is an improved performance and operational flexibility [Sölvell 2009].

Table 1.1. Four types of agglomeration

Effects of operations	Characteristics of business	
	Diversification of activities	Activities linked in terms of technology
Performance and flexibility	cities	industrial districts
Innovations	creative regions	clusters

Source: Malmberg et al. 1996.

Creative regions and clusters are examples of agglomerations with knowledge creation and innovative processes. In the case of clusters, a very important role in their functioning is played by processes related to the exchange of information and the flow of know-how. Creative regions are also an example of agglomerations where these processes play a key role. In their case, however, there is no limitation only to the analysis of technologically related activities, because the emphasis is on analysis in general, not in selective terms [Sölvell 2009].

Attempts to define what a cluster is have been and are still made by many authors. Due to its interdisciplinary nature, the theory of clusters as a specific form of agglomeration is gaining importance due to the interest on the part of scientists from different fields. For this reason, one can find in the literature a number of terms that are identical or similar to the concept of the cluster. Their summary is shown in Table 1.2.

Table 1.2. Concepts related to clusters

Authorship	Concept
Perroux (1988)	growth pole
OECD (1996)	network
Drejer, Kristensen, Laursen (1997)	industrial complex
Fridh (2000)	competence blocks
Whalley, den Hertog (2000)	regional cluster
Dahmen (1988)	development blocks

Source: Own elaboration based on Brodzicki and Szultka 2002.

Apart from Porter's – who is one of the most cited authors in this field – cluster definition quoted at the beginning of this chapter, there are many other definitions in the literature, similar to a greater or lesser extent to his proposal. Some of them are shown in Table 1.3.

Table 1.3. Summary of selected cluster definitions

Authors [year]	Definition
Anderson [1994]	A group of companies which actively builds its business on relationships that arise between them, established in order to achieve efficiency and competitiveness.
Rosenfeld [1997]	A geographic concentration of companies in related industries that operate in the local market, which cooperate, or are connected in another dimension, provide complementary services, and use common infrastructure and specialized suppliers.
Cooke [2002]	A geographic concentration of companies, between which there are links of a horizontal and vertical nature, which at the same time cooperate and compete with each other within specific market segments, using common local infrastructure and sharing the same vision for the development of the region and the industry in which they operate.
The World Bank [2002], in Bojar [2007]	Production networks composed of independent companies and their specialized retailers, centres of knowledge (e.g. universities, R&D institutes), supporting organizations (consultants, intermediaries) and their clients.
Gorynia, Jankowska [2008]	A group of companies and other entities (associations, chambers of commerce and industry, research institutions, etc.) which operate in geographic proximity and are characterized by above-average intensity of different relations, and those relations largely go beyond typical market relationships (confrontational, competitive).

Source: Own elaboration based on the work of the cited authors.

Clusters can be properly identified in space when their attributes are defined. Ketels [2004] proposes the following list of cluster attributes:

- geographical proximity (the distance between entities that belong to a cluster must allow for positive spillover effects);
- connections (focus on a common goal);
- interactions (that occur between entities);
- number (interactions between players located in geographical proximity must affect such a number of players that guarantees the achievement of the so-called critical mass).

Identification of cluster structures consists in separating relationships from a series of market relations that relate to the functioning of the value chain in the vertical and horizontal dimension. Established relationships connect entities that represent different links in the chain. Therefore, the following groups of entities can operate within clusters [Sölvell 2009]:

- companies (competitors, suppliers, service providers, buyers and companies in related sectors);
- representatives of the public sector (central and regional level, and local communities);
- representatives of the academic community (universities, research institutes, technology parks, technology transfer centres, etc.);
- organizations that promote cooperation (chambers of commerce, cluster organizations, etc.);
- financial institutions (finance facilities);
- media (creators of the brand of the cluster and the region).

The concept of clusters as proposed by Porter does not include companies only. A very important element of theoretical considerations on the role and importance of clusters in the economy is the expansion of the theoretical model to include the relationships that arise between companies, R&D and supporting institutions (business environment institutions). In addition, a cluster is not a system that brings together only one type of activity or representatives of one industry. Great emphasis is placed on the relationships that connect the so-called core of the cluster with companies that represent related, complementary or supporting activities. The diversified character of entities involved in a cluster can be illustrated using the Venn diagram, where the overlapping area of all three elements reflects the structure of a cluster (Figure 1.2).

Figure 1.2. Triple helix
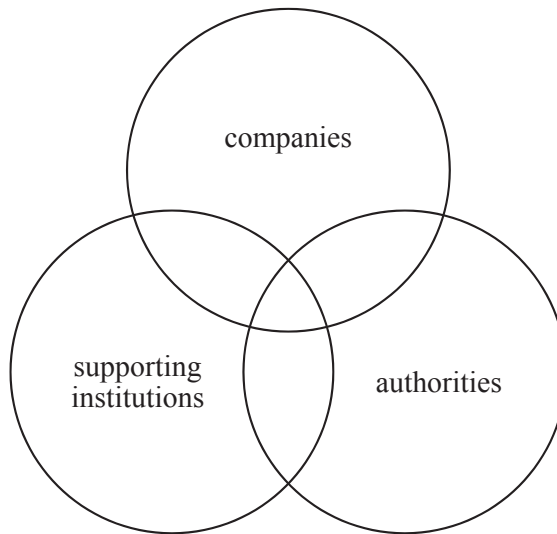
Determining whether a cluster is present in a given space is not always indisputable. The difficulty lies in the fact that in the literature there are many cluster definitions and their interpretations. Van Dijk and Sverrisson, on the basis of the study of literature, formulate a list of cluster features that can be observed directly. These are [van Dijk and Sverrisson 2003]:

- relative proximity of enterprises;
- high density of economic activity;
- presence of a number of companies engaged in the same, similar or complementary type of activity.

In addition to the features of clusters that are fundamental and universal in nature, they also include:

- linkages between companies that result from subcontracting and vertical dependence;
- linkages between companies which take specific forms of cooperation (horizontal dependence);
- a certain degree of specialisation.

Clusters are present in virtually all types of business structures, from towns and cities, through regions, countries, but they also operate across the borders of these divisions. Cluster theory puts special emphasis on the importance of location in business activity. Competitive advantage is not developed only within a company, but also depends on the degree to which an enterprise takes advantage of the opportunities provided by the environment.

Human activity has always been characterized by concentrated spatial distribution, to some extent related to the presence of obstacles in the natural environment. In many cases this concentration resulted, through specialization that occurred within its limits, in increased innovation and competitiveness. According to Porter, one of the reasons for the market success of cluster structures is the networking between related and complementary industries and the group of entities that affect the competitive climate of the location [Porter 1998b]. Thus, cluster boundaries are defined through the span of those connections.

According to Gordon and McCann, spatial clusters of companies, along with related phenomena and effects, can take three basic forms: pure agglomeration, industrial-complex model, and social-network model [Gordon and McCann 2000]. Each has a different set of properties that are listed in Table 1.4.

Table 1.4. Three forms of business clusters

Feature	Model of Pure Agglomeration	Industrial-Complex Model	Social-Network Model
Size of companies	Small enterprises, without any market power	Some large enterprises	Different enterprises
Nature of relationship	Not visible, cannot be identified	Visible, can be identified	Based on trust
Membership	Open	Closed	Partly open
Access	Location at a specific place required	Investments at the level of companies, location at a specific place required	History and experience
Spatial character	Urban environment	Local environment, but outside urban areas	Local environment, but outside urban areas
Analytical approach	Pure agglomeration economies model [Marshall 1932], [Krugman 1991], [Fujita et al. 1999]	Theory of input-output [Weber 1909], [Moses 1958], [Isard, Kuenne 1953]	Network theory [Granovetter 1973]

Source: Gordon and McCann 2000, in Gorynia and Jankowska 2008.

Cluster, as an example of an economic mesosystem, is subject to transformation processes. In this regard, Enright [1999] distinguishes [Gorynia and Jankowska 2008]:

− operating clusters, in which their members, by virtue of conscious activity in the cluster, are able to fully exploit its potential;
− latent clusters, where the entities that constitute them do not gain benefits yet;

–   potential clusters, possible to be developed in space, but only if certain conditions are met.

According to another view on the process of development of cluster structures, we can identify three stages [Wojnicka 2002]:

–   learning, which consists in learning to cooperate between large and small companies;
–   maturity, which includes the development of cooperative activities with an increase in production;
–   globalization.

Throughout the life cycle of clusters their structure and size undergo many changes. Their analysis allows us to outline several stages of development which depend on the specific circumstances. The life-cycle phases include [Skawińska and Zalewski 2009]:

–   embryonic phase,
–   growth phase,
–   maturity phase,
–   decline phase.

Sölvell proposes his cluster life cycle in a similar manner. His analysis introduces one additional stage – the renaissance [Sölvell 2009]. Changes in clusters over time are illustrated in Figure 1.3. The emergence of a cluster (its birth), according to Sölvell, may occur in either of two ways. The first involves the presence of specified advantages in a given location with respect to the set of resources available. The other concerns a situation in which the initiation of the formation of a cluster should be assigned to historical circumstances and the merits of a particular business person who started the process of concentration within a particular industry (referred to as "the hero").

In the next stage, the intensity of competition and cooperation increases [Sölvell 2009]. The environment plays an important role in this process. Porter's diamond model illustrates the conditions whose occurrence and interactions affect the development of clusters[4]. Its vertices, i.e. the demand conditions, factor conditions, the context for business strategy and rivalry, and related and supporting industries, if they create a well-functioning system, determine – as location factors – the role and power of clusters in space.

The length and course of the cluster life cycle depend on many factors (Figure 1.3).

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[4] More information about Porter's diamond model – see [Porter 1998c].

Figure 1.3. Cluster life cycle
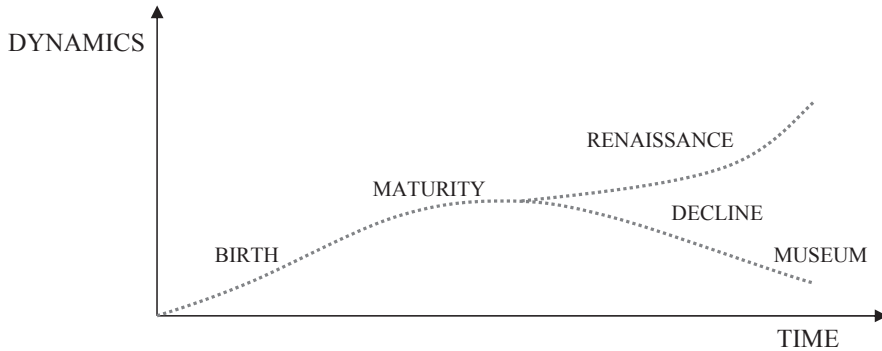
Source: Sölvell 2009.

Some clusters enter the stage of maturity relatively quickly, while for others, the stage of the greatest productivity, during which the economies of scale are achieved, can even last centuries. Over time, the processes that take place in cluster structures may lead to their decline. On the one hand, the final result of such a process can be referred to as a *museum*. On the other, also a rebirth (renaissance) of a cluster may occur, for example through the entry of new companies, or the introduction of technological or institutional changes [Sölvell 2009].

Cluster structures can take many forms. In one of the most widely cited typologies of clusters, they are divided into:
−   network clusters (which correspond to Marshall's industrial districts);
−   concentric clusters (hub-and-spoke);
−   satellite clusters;
−   institutional clusters (anchored around institutions).

This classification is based on the work by Markusen [1996], in which the author indicates attributes of the so-called new industrial districts. They differ, *inter alia*, in the characteristics of companies that operate within them and in the interdependence between their elements. Table 1.5 presents a summary of their selected attributes.

In a knowledge-based economy, enterprise networks have become a regular feature of the business landscape. The importance of relations between economic actors increases, as proper management can lead to increased efficiency and effectiveness of activities, thus enhancing competitiveness. In theory and practice, special emphasis is placed on the flexibility of relationships that arise between the representatives of the different levels of the supply chain.

Table 1.5. Attributes of districts according to Markusen

Form of district	Attributes
Marshall's district	– dominance of small and medium-sized enterprises owned by local entrepreneurs; – some economies of scale; – long-term contracts concluded between local buyers and suppliers; – weak links and cooperation with companies functioning outside the district; – flexible labour market; – evolution of a unique local cultural identity.
Italian districts	– as above, plus: – important role of local authorities in regulating and promoting key industries; – high degree of cooperation between competitors to share risk, stabilize the market and share innovation.
Concentric districts (hub-and-spoke)	– business structure dominated by one or a few large horizontally integrated companies; – significant economies of scale; – extensive links with companies outside the district (suppliers and competitors); – a less flexible labour market.
Satellite districts	– business structure dominated by large enterprises with headquarters outside the district; – lack of long-term cooperation with local suppliers.
Districts anchored around institutions	– business structure dominated by one or several large institutions, mostly government (e.g. large universities, military bases).

Source: Own elaboration based on Markusen 1996.

Networks, whose goal is to establish cooperation, may be defined in many ways. The common denominator of most definitions of enterprise networks is to emphasise the importance of cooperative relations, which are usually informal [Skawińska and Zalewski 2009].

Jewtuchowicz [2001] sees the network as a set of relations with selected partners that are part of market relations between enterprises. These relations include relationships of cooperative and competitive nature. Thus it seems necessary to outline a theoretical boundary between the concepts of network and cluster. An analysis of the features that differentiate the two concepts was conducted, *inter alia,* by Rosenfeld [1997]. The list of the differences established by him is shown in Table 1.6. This table could be expanded to include at least one

more dimension, which refers to the condition of the spatial concentration of economic activity. In the case of network structures, that condition does not need to be met, while the fundamental characteristic of a cluster is the geographical proximity between its entities.

Table 1.6. Differences between networks and clusters

Network	Cluster
allows companies to access specialized services at lower cost	attracts specialized service providers to the region
characterized by restrictions on membership	membership open to every entity
the basis for the existence are contracts and agreements	based on social values, trust and reciprocity
facilitates engaging in economic activity for a greater number of companies	generates demand for the presence of a larger number of enterprises with similar and related skills
based on cooperation	based on cooperation and competition
there are common business goals	cluster participants have a common vision

Source: Rosenfeld 1997.

Development of clusters in economic space is associated with the presence of competition and cooperation processes. From the point of view of economic entities, as well as the economy of a given region, clusters affect the economic balance, both in terms of the benefits they bring, as well as costs. Martin and Sunley [2003] compiled a list of advantages and disadvantages of clusters, which is presented in Table 1.7.

Table 1.7. Advantages and disadvantages of operating within clusters

Advantages	Disadvantages
1. Greater innovation	1. Technological isomorphism
2. Higher growth rate	2. Increase in labour costs
3. Higher productivity	3. Increase in the cost of land and buildings
4. Increased profitability	4. Increase in revenue diversification
5. Increased competitiveness	5. Excessively narrow specialization
6. Increase in the number of new enterprises	6. Pressure from the environment
7. Increase in the number of jobs	

Source: Own elaboration based on Martin and Sunley 2003.

Enright [1999] lists a number of dimensions, on the basis of which one can identify clusters. The list should be used to standardize various classifications and to allow comparisons at the stage of identification and analysis of clusters and their potential. A list is shown in Table 1.8[5].

Table 1.8. Dimensions of clusters according to Enright

Dimension	Type	Example
Geographical coverage	- concentrated - dispersed	- Sassuolo – ceramic tiles - Japan – synthetic fabrics
Density	- dense - scattered	- New York – financial - New Hampshire – medical tools
Width	- wide - narrow	- Osaka – electronics - Dalton – carpets
Depth	- deep - shallow	- Denmark – agricultural cluster - Ireland – pharmaceutical cluster
Activity (technological advancement)	- high - low	- the Silicon Valley - Chihuahua – *maquila* activity
Growth potential (competitive position)	- growing (competitive) - growing (non-competitive) - stabilization (competitive) - stabilization (non-competitive) - shrinking (competitive) - shrinking (non-competitive)	- Los Angeles – multimedia cluster - Quebec – transport equipment cluster - Boston – cluster of mini-computers
Innovative capacity	- high - low	- Boston – bio-technology cluster - Singapore – electronics
Industrial organization	- core-ring structure with coordinating company - core-ring structure with leader company - structure without a coordinator or leader (all ring-no core and all core-no ring)	- Veneto – clothing cluster, Toulouse – aviation cluster - Capri – cluster of knitting companies
Coordinating mechanisms	- spot markets - short-term coalitions - long-term relationships - hierarchy	- Prato – textiles - Hollywood – film industry - Turin – automatics - Detroit – automotive

Source: Enright 1999.

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[5] *Width* means the degree to which there is a link between sectors in a horizontal dimension, while depth means the number of stages of the production chain included in the cluster [Gorynia and Jankowska 2008].

Due to the diversity of relationships that occur in clusters in various countries around the world, a few examples of typical cluster structures in certain locations can be highlighted. Italian, Dutch and Danish clusters are particularly noteworthy. The characteristics of Italian business clusters include their lack of formal structure, considerable importance of family enterprises that determine the manner of establishing cooperation between companies, the importance of tradition in business, and a lack of coordination structures. In the case of Dutch structures, special attention should be paid to the fact that entities that fulfil an important role in these clusters include research centres, which by cooperation with network brokers establish contacts with companies that make up the cluster. Danish clusters in turn are characterized by an active role of institutions which facilitate establishing and upholding the contacts between companies (so-called network brokers) [Gorynia and Jankowska 2008].

The emergence and development of clusters depend on many factors. These conditions can be distinguished within a framework of four groups [Mikołajczyk et al. 2009]:
– historical (in most cases associated with a strong tradition in the industry);
– geographic (location in space, natural factors, resources);
– economic (demand conditions, knowledge, experience and skills, the degree of development of financial markets, expanded R&D activity);
– political (activities aimed at promoting regional specialization).

1.2. Competition and cooperation within cluster structures

Competition is an integral element in the functioning of enterprises. Attempts at describing its nature are reflected in a series of definitions that represent different approaches to the concept. Marshall saw competition as rivalry based on competing and bidding when buying and selling. Tkaczyk defines competition as a process in which market participants, in the pursuit of their interests, try to make offers that are better than those of their competitors (the benefit can refer to different types of characteristics, such as price, quality, terms of service, etc.) [Przybyciński 2005].

The issues of competition can be found in the works of representatives of different schools and streams of economic thought. Authors of classical economics promoted the view in which competition was considered to be an essential element in optimizing the use and distribution of resources and, consequently, in maximizing social welfare. Competition that takes place in the open market required refraining from intervention in the economy by state authorities. In neo-classical terms, competition was characterized as a certain

condition that occurs in the market. Thus, the static approach developed under that trend refers to a situation in which there is a high degree of atomisation on the supply side of the market, which gives rise to a structure which is the opposite of the monopoly [Gorynia and Łaźniewska 2009].

Rivalry (competition) is also a component of game theory, which analyses the most optimal effects of a conflict of interest. Game theory describes various forms of games that can be used to map behaviour of market players. Among them we can distinguish zero-sum games (the win of one player means the loss of another), non-zero sum games (players achieve profits or losses, and the optimum for each player is above the optimum of the whole system) and games with a dominant strategy (the best strategy of a single player is not dependent on the strategy of another player) [Gorynia and Łaźniewska 2009].

Competing is a process whose implementation and progress determine the achievement of competitiveness understood as a state, attribute, but also as a process. The issue of competitiveness has recently become a major area of research in economics. Its importance stems largely from the relationship, perceived and emphasised in many studies, with the economic development of countries or other geographically separate areas, translated into an increase in overall economic welfare.

Competitiveness is a derivative of the concept of competition. Competition is in fact a precondition for the discussion on competitiveness to take place at all [Gorynia and Łaźniewska 2009]. Finally, the issue of competition is widely analysed and commented on due to the confrontation and rivalry among the actors in economic life. The forms of competition and attitudes towards it have changed along with the transforming perception of the market.

The discussion on competitiveness can take place on many levels. The most commonly used criterion for delimiting competitiveness is the criterion of the hierarchy of economic systems. According to it, generally speaking, competition can be considered at the following levels:
–   macroeconomic (national economies, regions of the world),
–   mesoeconomic (industries, branches, sectors, etc.),
–   microeconomic (enterprises, institutions, etc.).

As a component of economies, clusters affect the prevailing climate of competition [Kuberska 2008]. They influence competition and competitiveness in several dimensions. Firstly, enterprises that operate in cluster structures are able to increase their productivity. Secondly, an attractive business environment and the prospect of development for the industry promote the formation of new enterprises and supporting institutions. In addition, a number of analytical studies also prove

that there is a relationship between the greater level of innovation in companies and industries and the greater spatial concentration of enterprises [Porter 1998b].

Competition is considered to be the driving force of economic activity. But the ties that are established between economic actors do not only take the form of competition. Competition is just one example of the relationships that arise between them. Another type of relationship, singled out from among the dependencies on the market, is cooperation.

The benefits of working together have been experienced throughout the history of mankind. Cooperation is chosen for a variety of reasons and can take different forms depending on the context to which it relates. Romanow [1999] saw cooperation (cooperativeness) as a special form of association for directly economic purposes. Figure 1.4 shows the types of associative institutions.

Figure 1.4. Classification of associative institutions
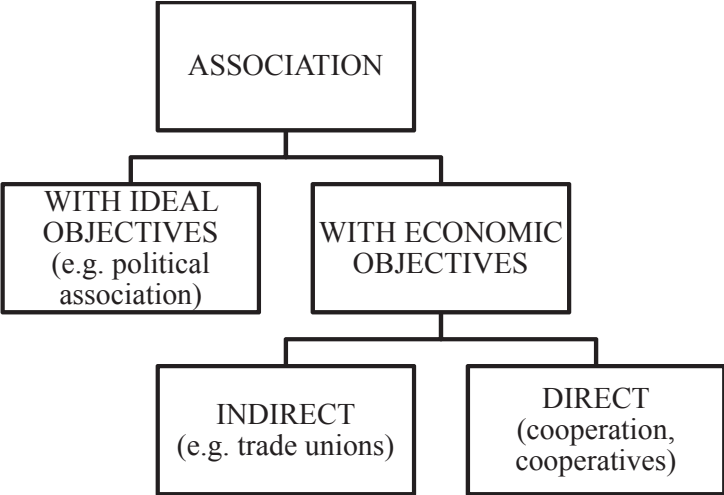
Source: Own elaboration based on Romanow 1999.

In recent years, more and more attention in the economic literature is devoted to the importance of cooperation between economic actors. The interest in this regard relates to its sources, causes, course and results achieved through it. The concept of clusters is one of the manifestations of that interest, because cooperation is one of the elements that characterize these market structures. In the case of clusters, cooperation does not only occur between the representatives of different groups of actors (companies – R&D – authorities); its fundamental importance is also emphasised within the framework of value creation.

The occurrence of competition and cooperation is a determinant for another relationship to arise between market participants, namely coopetition[6]. The term is derived from two English words: competition and cooperation. There is no clear position as to who the author of the concept is. Some authors, such as Dowling et al. [1996], Bagshaw and Bagshaw [2001] and Dagnino and Padula [2002] attribute its authorship to Raymond Noorda, founder and CEO of Novell Corporation [Walley 2007].

Coopetition is considered to be one of the types of relations between market players in horizontal terms. Enterprises, acting in accordance with an established strategy, engage in relationships with other entities, the nature of which can be varied. It is acceptable to uphold all the types of relationships as shown in Table 1.9 at the same time.

Table 1.9. Horizontal market relations

Type of relation	Properties
Coexistence	- lack of economic relations - lack of interactions
Competition	- activity based on action-reaction - observation and following the competitors
Cooperation	- relationships between competitors may concern business and social areas or exchange of information - all kinds of relationships are established
Coopetition	- exchange in economic and non-economic terms - clear guidelines of coopetition exist, often based on formal arrangements

Source: Own elaboration based on Bengtsson and Kock 1999.

Coopetition, which is a juxtaposition of two elements considered mutually exclusive up to a certain point, can be defined as a situation in which competitors cooperate and compete with each other at the same time [Bengtsson and Kock 2000]. According to many authors, coopetitive relations which a company can successfully establish should be considered on the basis of the so-called value net (Figure 1.5)[7].

Coopetitive actions that take place between parties are not identical, each of them has its own individual characteristics. Their classification according to the criteria of weights assigned to competition and cooperation, proposed by Bengtsson and Kock, allows for identifying [Bengtsson and Kock 2000]:

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[6] Alternatively, the concept of coopertition is used.
[7] Complementators are companies that offer goods on the market that complement the offer of other producers.

- relationships dominated by cooperation – with greater emphasis on cooperation;
- balanced relationships – the same proportion of cooperation and competition;
- relationships dominated by competition – competition dominates over cooperation.

Figure 1.5. Value net
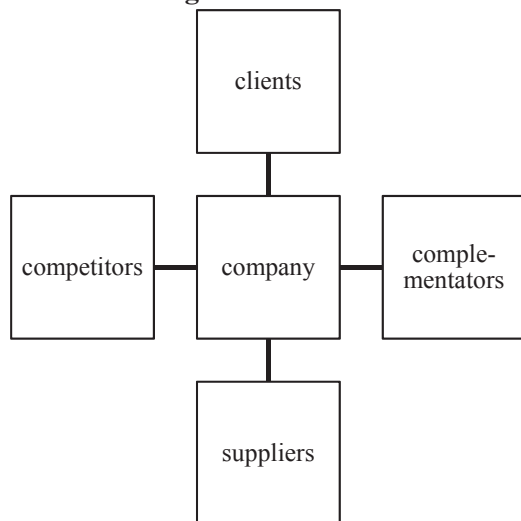
Branderburger and Nalebuff, in their work that belongs to the canon of literature in the field of coopetition[8], recognized it as a non-zero-sum game. It should be noted that coopetition does not consist in eliminating other entities or restricting their access to the game, as is the case with competition, and its purpose is for the entities that engage in it to obtain greater benefits [Jankowska 2009]. Skawińska and Zalewski [2009] distinguished six dimensions that differentiate the relationships between actors in the market, which take the form of competition, cooperation and coopetition [Skawińska and Zalewski 2009]. These are shown in Table 1.10.

The existence of coopetition should not benefit just companies but also other market participants, in particular customers [Walley 2007]. Despite the gains that can be derived from the simultaneous cooperation and competition,

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[8] More on coopetition see: Nalebuff B.J., Brandenburger A.M., 1996: *Co-opetition*. Harper Collins, London.

there are a number of reasons for terminating coopetition between the parties. These include inadequate benefits for one of the parties, leakage of confidential information, lack of confidence or a tendency to recognize competition as a superior type of activity [Walley 2007]. For coopetition to prove an effective strategic position, one should set common goals for those that use it. It can be assumed that above all the convergence of goals should pertain to the long-term horizon [Jankowska 2009].

Table 1.10. Types of relationships between competitors

Feature	Type of relationship		
	Competition	Cooperation	Coopetition
Frequency	high	high	high
Strength of links	weak	significant	significant
Form of relation-ships	informal	formal/ informal	formal/ informal
Level of confi-dence	low	high	average
Resources owned	sufficient	insufficient	insufficient
Market position	strong	weak	strong

Source: Own elaboration based on Skawińska and Zalewski 2009.

The phenomenon of coopetition applies in particular to structures that operate in economic mesosystems, such as clusters, industries, sectors. According to Jankowska [2009], coopetition, as a special case of behaviour adjustment, should have the effect of introducing order in the economic processes that take place within their boundaries. The idea of clusters connects activities that are competitive and cooperative in nature. The reality of the market entails that without intense competition clusters do not have development opportunities. Cooperation that occurs within a cluster focuses mainly on vertical relationships. It takes place between enterprises that constitute the core of the cluster and represent its main activity, and local institutions and companies that operate in related sectors. Thus, competition and cooperation are not mutually exclusive, as they mainly occur between different players and in different dimensions [Porter 1998b].

1.3. Clusters and cluster initiatives

In recent years the issue of clusters has been of interest for various policy makers. This is reflected in strengthening competitiveness of economies through the formulation and implementation of measures for the development of clusters in policies related to the functioning of regions, industries or companies. One of

the most noticeable signs of interest in clusters is the establishment of cluster initiatives. *Cluster initiatives* refer to organized actions aimed at promoting the development and strengthening competitiveness of clusters, which include companies that belong to a cluster in the region, entities that represent the government and/or representatives of research institutions [Sölvell et al. 2003]. The varied composition of cluster initiatives as presented in the definition above corresponds to the classical definition of cluster by Porter, where also multifaceted components were identified. According to Skawińska and Zalewski [2009], a cluster initiative is *the collective activity of groups of enterprises, public sector entities and other related institutions in order to improve competitiveness of economic actors in the region*.

Supporting cluster initiatives has become one of the leading elements of economic policy, guided by development, innovation and competitiveness. Established cluster initiatives can take different forms in different locations, depending on regional circumstances. In practice, several types of structures can be distinguished, by means of which actions for phenomena corresponding or similar to clusters are institutionalized. Cluster initiatives are one of them. In other cases, historically conditioned naming of this kind of organization is often used. This is particularly true in those areas where the socio-cultural factors have a strong influence on the functioning of the corporate sector. Italian industrial districts (*distretti industriali*) may serve as an example of a unique global approach in this respect [Becattini 1991].

The formation of cluster initiatives is independent of the degree of economic development. Both in developed economies and in economies of a lower level of development, there is a noticeable growth trend in the presence of cluster issues and initiatives accompanying them. In addition, cluster initiatives may operate regardless of the industry profile of the cluster that they support.

The objectives of cluster initiatives may relate to different dimensions of the functioning of enterprises and the region they pertain to. The most common include:

− cluster development, achieved through efforts to increase the level of investment attractiveness of the area, and as a result − to the formation of new enterprises in the region, whose activity corresponds to the profile of the cluster, or to encourage already existing enterprises to start their operations in the region;
− support for innovative activities;
− bringing out and supporting cooperative activities;
− support for staff development processes.

Cluster initiatives and the accompanying policies, regardless of the location that determines their unique features, can be described by a set of universal attributes. These include [Sölvell et al. 2003]:
- increased focus on the microeconomic business environment instead of traditional approaches focused on macroeconomic issues;
- a long-term programme aimed at improving competitiveness of clusters rather than individual companies or sectors;
- emphasis on local and regional areas;
- improvement of contacts between companies in a cluster, building confidence and improving dialogue that will contribute to the creation of externalities;
- provision of seed capital instead of large grants;
- balanced contribution from the government and the industry;
- selection of clusters using the criterion of competition, which implies a moderate form of selecting the winner;
- combination of competition and cooperation as essential factors for learning and innovation;
- participation of SMEs and large enterprises;
- partnership within the triple helix, including not only companies from the cluster and the authorities, but also the academic community;
- learning and innovation based on the whole system rather than on the example of individual companies.

Establishing cluster initiatives may but does not have to accompany the independent processes of competition and cooperation within the framework of existing clusters. Depending on the degree of development of clusters, we can distinguish three alternative scenarios for the relationship between the occurrence of clusters and taking up cluster initiatives (Table 1.11).

The variety of the alternatives presented is associated with a variety of purposes for which initiatives are established. Some of them are created to support the efforts of local, regional or central authorities to start or strengthen the already initiated processes for the emergence of clusters of companies with the same profile of activity (scenario 2). In other cases, agreements on cluster initiatives aimed to support the existing cluster structures are established (scenario 3). It should be noted, however, that the operation of cluster initiatives is not a prerequisite for the operation of clusters in the economic space (scenario 1). The most accurate example of a cluster with no parallel cluster initiative is the Silicon Valley [Sölvell et al. 2003].

Table 1.11. Alternative scenarios for the occurrence of clusters and cluster initiatives

Scenario	Cluster	Cluster initiative	Context
1.	+	-	Processes of competition and cooperation are present, but no organization is established to support the cluster.
2.	-	+	The cluster initiative is formed at a time when spatial specialization processes are not in place or are at initial stages.
3.	+	+	Temporal and spatial convergence in the functioning of the cluster and the supporting cluster initiative.

Source: Own elaboration.

Cluster initiatives may be formed in line with one of two approaches: top--down and bottom-up. The criterion of that distinction applies to the type of entities whose activities form the core of the cluster initiative. Thus, companies (the bottom-up approach) or the representatives of the public sector (the top-down approach) may be the force that initiates the process of institutionalization, and consequently directs the operations of the initiative. The dichotomy between these alternatives determines the manner of organizing initiatives and management processes [Fromhold-Eisebith and Eisebith 2005].

Animators of cluster initiatives, i.e. those responsible for their management, are usually enterprises, representatives of government organizations, founders (international agencies of donors or international consultants) or other entities. Sölvell et al. [2006] conducted a survey among 1,400 cluster initiatives, which outlines the variety of solutions in cluster initiatives in economies at different levels of development, managed by different groups of actors [Sölvell et al. 2006].

Organizations whose activities may affect the functioning of clusters may also be ranked according to the criterion of the degree of clarity of their policies. Fromhold-Eisebith and Eisebith [2005] propose distinguishing between two groups of actions to promote clusters: the explicit and the implicit approach. The first one includes those organizations which are established under the aegis of clusters, based on the theoretical framework developed by Porter. The other one includes those activities whose goals are consistent with the goals of cluster based policy, and the activities carried out by them are not officially, and sometimes consciously, connected with the concept of clusters [Fromhold-Eisebith

and Eisebith 2005]. Table 1.12 summarizes alternative categories of actions for the promotion of clusters.

Group 1 (explicit top-down) includes activities that are knowingly made in support of cluster structures. In addition, the main actors are representatives of the private sector. Another group – implicit top-down – revolves around the actions of entrepreneurs, as in the previous case. The difference between them lies in the purposes for which they were created.

For the implicit top-down category, actions are not necessarily taken directly with regard to their impact on clusters, while the explicit top-down category includes those activities that are undertaken in order to support the development of clusters. The next two alternatives to promote clusters have a common denominator with regard to the criterion of the entity.

The third and fourth groups include activities promoted by representatives of the public sector, e.g. of the local government. The difference between them results therefore from the second of the adopted criteria, i.e. from the degree of clarity of the policy pursued in terms of the theory of clusters. The explicit bottom-up approach refers to initiatives whose objectives pertain directly to clusters, while the goals adopted within the implicit bottom-up approach usually only indirectly affect the functioning of clusters in the economic space.

Table 1.12. Categories of activities for cluster promotion

Actors	Clarity	
	Explicit	Implicit
Top-down	*explicit top-down* (1)	*implicit top-down* (2)
Bottom-up	*explicit bottom-up* (3)	*implicit bottom-up* (4)

Source: Own elaboration based on Fromhold-Eisebith and Eisebith 2005.

Cluster initiatives go through several stages of development in their life cycle. The starting point is the so-called *existing condition*. This period consists of all kinds of activities and their institutionalizations, which have a significant impact on future cluster initiatives. At the next stage a cluster initiative is generated, usually initiated by representatives of one of the three groups of

stakeholders: entrepreneurs, government or researchers. In some cases, after some time cluster initiatives evolve into formal structures [Sölvell et al. 2003].

Research into cluster initiatives is largely based on the model of their performance proposed by Sölvell et al. [2003]. The model includes elements that play a major role in the formation, operation, and in some cases extinction of cluster initiatives (Table 1.13).

Table 1.13. Model of cluster initiatives

Environment:	Process:	Objectives:
• Business environment • Policy • Cluster strength	• Initiation and planning • Management and funding • Scope of membership • Resources and promoters • Framework and agreement • Momentum	• Research and networking • Activities in the field of policy • Trade cooperation • Education and training • Innovation and technology • Expansion
RESULTS: competitiveness growth achievement of objectives		

Source: Own elaboration based on Sölvell et al. 2003.

The model consists of four elements where the leading three determine the fourth one, i.e. the results. The results achieved are determined by the environment (the context for the operation of cluster initiatives), processes (which explain how initiatives are formed and developed) and objectives (which guide the actions undertaken).

The last two decades are a period in which cluster initiatives have become an important element of economic policy in many countries, which is recognised from a cross-sectional perspective, e.g. within industrial, regional policies, concerning the sector of small and medium entrepreneurs, foreign direct investments, as well as policy for research and innovations. However, the activities of cluster initiatives supported by public funds require evaluation regarding adopted solutions and effectiveness of the instruments used.

In 2010, the Polish Agency for Enterprise Development (PAED) conducted the first benchmarking of Polish cluster initiatives. Its recurrence in 2012 made it possible to monitor the process of the dynamics with regard to the observed development of initiatives [Hołub-Iwan et al. 2012]. 35 initiatives took part in the second benchmarking study, 20 of which participated in the first study. The examined initiatives differed from one another owing to their:

–   initiators,
–   organisational and legal forms,
–   number and structure of the entities that form them,
–   types and models of development,
–   development phases,
–   objectives of operations.

Most of the 35 examined initiatives were created between 2006 and 2009, especially in 2007 and 2008, which is associated with the PAED pilot programme being implemented in 2007 titled *Support for the development of clusters*, from which it was possible to obtain financial support under the Integrated Operational Programme for Regional Development, Activity 2.6. Regional Innovative Strategies and Knowledge Transfer as well as with the availability of structural funds OP Innovative Economy, Activity 5.1. Although only six of the 35 initiatives were created within the timeframe of 2010-2012, they are characterised by extraordinary elements in many operational activities, especially when it comes to joint orders, delivery channels or submission of common offers.

The research implies that the initiators are most often private sector entities, which confirms their growing interest in this form of cooperation. In the subsequent places there were: the science together with the R&D sectors and widely understood public institutions. The examined initiatives were created mostly as bottom-up initiatives, namely by companies or natural persons. Only six have been established as a result of top-down efforts, namely by *non-profit* institutions or the public sector. 30% of the examined initiatives were of a mixed nature. Among the six youngest initiatives there were three bottom-up, and two mixed initiatives. The largest number of initiatives operated in the form of an association, few as limited companies and the fewest number as limited liability partnerships, although the popularity of these forms is constantly growing along with growing awareness of constraints related to the activity in the form of an association. The major restriction of this type has been indicated, in particular as the lack of opportunities for obtaining funds for operations from sources other than membership fees due to the lack of gainful activity [Hołub-Iwan et al. 2012].

With regard to the number and structure of the entities in the examined initiatives, the members were mainly companies (74%), local government units and natural persons (10%), entities of the R&D sector (9%) and supporting institutions (7%), while apart from a few exceptions, representatives of each of these groups participated in each of these initiatives. On average, the initiatives consisted of 44 entities, including 32 enterprises. The initiatives were rather diverse owing to the entities creating them and the ones with the fewest number included several, and the most numerous included more than 100 entities. On average, other mem-

bers of these initiatives were 1-3 supporting institutions, 1-4 R&D units and one entity of a different type as a local government unit or natural person.

Among the enterprises, 71% of them constituted microenterprises employing up to 10 people and small enterprises (10-49 employees). Medium enterprises (50-249 employees) and large enterprises constituted 21% and 8%, respectively. Although in almost all of the initiatives enterprises of each type could be found, the least numerous were large enterprises. It proves that in the Polish conditions mainly small enterprises, searching for benefits from cooperation in one line of business, are interested in member participation. However, their clear domination in creating initiatives makes it difficult for these initiatives to compete on the market.

With regard to the type, the initiatives, being the object of the study, represented an industrial district type. They consisted of a network of small enterprises with a similar kind of production. The initiatives have the possibility to adapt rapidly to the changing market and diverse requirements through cooperation and use of new technologies. They do not have one central point around which the initiatives could gather. Interestingly enough, the industrial district type most often consists of the youngest initiatives created by a diverse base of companies. On the other hand, among the examined initiatives, there were much fewer initiatives of a satellite type, namely those within which cooperation and exchange takes place extremely rarely. There are external relations with a large enterprise which prevail in them that results in a high level of migration for work towards the initiative and from its area. At the same time, the satellite enterprises can start cooperating with one another regardless of the large company. The least numerous were initiatives operating as *hub and spoke* initiatives, characterised by the occurrence of large companies, around which a supplier network within delivery chains is gathered. Large enterprises dominate and attract smaller entities, however, the innovation sharing is not present here and the financial and business services are rather adjusted to the needs of the dominant companies and the labour market is not as flexible. An important hazard stems from the fact that the dependence on large companies may restrict the possibility of adjusting the region to the changes which take place [Hołub-Iwan et al. 2012].

Considering the development model, the initiatives participating in the study represented, first of all, a Danish model which enhances the role of a coordinator stimulating the cooperation. It is also the most popular among the youngest initiatives. Next place belongs to the Dutch model which is a modification of the Danish model. In this model, the key role is played by the coordinator who is additionally focused on the cooperation with the science and R&D sectors. Finally, in 70% of the examined initiatives, the role of a coordinator prove

to be extremely important. In addition, the initiatives that are developed accord-ing to the Italian model have also been identified, which involve specialised small and medium-sized enterprises, unrelated with regard to their capital, with-out a separated management structure, whose cooperation is based on family relationships, craft traditions and trust, as well as in accordance with the Ameri-can model, which is based on close cooperation of large companies with a dom-inant position, with hierarchically small and medium-sized enterprises companies related with them [Hołub-Iwan et al. 2012].

On the other hand, when it comes to the phase of the life cycle of the sepa-rated initiatives, more than 80% of them were qualified for the phase of growth or maturity, also some of the youngest ones focused on benefits from affiliation to new structures. Whereas, the initiatives that qualified for the embryonic or incuba-tion stage also included some older initiatives established between 2006-2007 in which appropriate activity in order to proceed to a subsequent phase of develop-ment was missing.

Most of the Polish cluster initiatives, which were examined (ca. 89%), generally had a formalised development strategy. However, these strategies contain errors. First of all, they do not include information concerning the envi-ronment. The main reason for the errors in, or lack of, strategy consist in a dynamic creation of initiatives, with which a rather laborious process of estab-lishing cooperation and agreement of common objectives cannot keep abreast. The period of operations is not a factor conditioning the possession of a devel-opment strategy because there are also both some young and some old initiatives among those without strategies. It turned out that the objectives that are deter-mined most often are those focused on the provision of development opportuni-ties by acquiring funds for a joint activity and expanding possibilities related to skills of creating innovative solutions and technologies within the cluster struc-tures. Actions improving the market position are also important, both towards institutional partners and the initiatives from outside the companies. Whereas soft goals such as information flow or development of competences are listed in second place [Hołub-Iwan et al. 2012].

To summarise, the comparative analysis of results from both editions of benchmarking of Polish cluster initiatives allowed us to draw the following con-clusions [Hołub-Iwan et al. 2012]:

− the most favourable period to create initiatives in Poland was 2007-2008 so these are relatively young structures;

− the initiators for creating initiatives are still most often private sector entities;

–   the newly established initiatives are more frequently of a bottom-up nature, at the expense of a top-down approach;
–   in spite of the fact that the association prevails, the interest of new and older initiatives in other organisational and legal forms of operational activities is growing;
–   the participation of companies in the initiatives remains on a steady and high level (ca. 73%), also the participation of other groups is rather constant in time;
–   interest of microenterprises in the participation in the initiatives grows whilst that of the large companies falls;
–   the greatest and growing participation of the micro and small enterprises affects changes of initiatives' operations – they are more interested in active operations on the market but, on the other hand, their dominance limits the possibilities for effective competition and improvement of the market position of an initiative as such;
–   the percentage of initiatives in the phase of growth or maturity grows decisively, which is not only related to the operation period of initiatives, but also to the fact that in this phase the youngest initiatives can also be found;
–   there is an increasing percentage of initiatives operating with a strategy and only few of them do not have it in any form;
–   the percentage of the youngest initiatives operating with a strategy increases, created more frequently by very active and motivated enterprises cooperating with one another also before formalising this cooperation in the form of an initiative.

Unfortunately, in Poland, no comprehensive study showing existing clusters, defined as significant aggregations of companies, has been carried out so far [Dzierżanowski et al. 2012]. The results of benchmarking Polish cluster initiatives can only be compared with the results of the European Cluster Observatory (ECO). In Poland, it has indicated the existence of approximately 246 clusters defined as statistically significant aggregations of different potential. On the other hand, the report of benchmarking indicated that between 1997-2008, in Poland, approximately 178 cluster initiatives were created, of which only a part remains active. It turns out that more than a half of initiatives were created separately from the largest companies' aggregations. Cluster initiatives appeared in just 27% of cases of these significant aggregations. Although the situation is quite dynamic – in connection with the great interest in contests within various programmes aiming at supporting clusters, new cluster initiatives are constantly arising – it is said that active cluster initiatives are of rather low economic

importance in Poland. It can be proved by the total employment of those who took part in the first edition of benchmarking. It amounts to ca. 250,000 employees which makes only 1.6% of all the employed people in Poland (ca. 15.8 million in 2009 according to Eurostat), whereas this share with regard to clusters identified in Poland amounts to as many as 15.5% (20.7% for the EU).

On the basis of the results of benchmarking, many reasons for the weaknesses of Polish cluster initiatives have been identified [Dzierżanowski et al. 2012]. Firstly, it turned out that initiatives do not have sufficient financial resources adequate for implementation of their activities (44% of them between 2008-2010 did not have any public funds, and more than 70% did not collect any membership fees). And if it was the case, from several up to a few hundred thousand PLN have been collected. As a result, they take actions on a large-scale less frequently (e.g. construction of a common technological line or laboratory), focusing rather on activities to a lesser extent (e.g. information and knowledge exchange, networking, stimulating cooperation activities) while the coordinators only occasionally devote their time solely to the implementation of the tasks related to the initiative actions.

Secondly, the actions undertaken by initiatives do not usually lead to improvement of innovation and competitive position of their members. Instead of a common offer, distribution or one product, benefits from the cooperation are presented more often as cooperation and development of human resources. Although one third of initiatives operate in highly innovative areas, the funds meant for the R&D are very limited. Only 5% of the initiatives' employees deal with research, and no activities for legal protection of the innovation, introduced by the members, are being undertaken. Despite the presence of R&D units, the active cooperation between these units and companies rarely takes place. The possibilities to access laboratory infrastructure are not used because the ideas and knowledge, needed for initiating appropriate cooperation with R&D units, are missing.

Thirdly, the Polish initiatives use the potential to cooperate with foreign institutions and clusters to a small extent. In this area the authors of the benchmarking study indicate the lack of appropriate instruments of support encouraging internationalisation.

The last element of the critical evaluation is the objective itself for which the entities create initiatives. It is mainly the possibility to use the EU funds. Within the programmes, quick effects are expected and it is also possible to reach them without the involvement of one's own financial resources. There is lack of awareness and especially knowledge regarding what can be achieved

thanks to the initiatives and how the participation in them can be transferred into profits [Dzierżanowski et al. 2012].

It is worth emphasising that although in Poland it is the Ministry of Economy, along with the PAED subordinated to it, that contributes in a top-down manner to the creation of cluster initiatives, the development of clusters and supporting cluster initiatives also increasingly takes place at the regional level. Undoubtedly, the interest in the subject of cluster initiatives at the level of government authorities, self-government and local administration results from the availability of the EU funds meant for the development of clusters. Thus, the EU funds should be classified as the main factors for the creation of Polish cluster initiatives. To express it in more detail, it may be concluded that the occurrence of cluster initiatives in Poland is the effect of the specified EU, national, as well as regional cluster policy, both existing and planned (effect of the anticipation).

2. Determinants of emergence and development potential of agri-food clusters in Poland

2.1. Economic determinants

Economic determinants of the formation and development of clusters may be seen as sources of competitive advantage that lead to the emergence and development of clusters and their achievement of competitive advantages [Porter 1998a, 1998b]. They include interacting factors which – with reference to the analytical convention of Porter [1998a, 1998b] – may be divided into supply, demand and structural factors. Supply-side factors include:
–   the quality and cost of natural, capital and human resources;
–   the quality and cost of material and non-material infrastructure to facilitate access to resources and support activities of enterprises (administrative, legal, information, scientific and research infrastructure, social factors related to the quality of life of the sector community such as security, order, or leisure opportunities);
–   regulations on international trade and foreign investment;
–   resources that come from outside the sector together with foreign investment;
–   formalized social relations;
–   informal social relations (an atmosphere favourable to business activity and work, and unspecified, informal relationships associated with vertical trade contacts between enterprises).

Demand factors include:
–   demanding and sophisticated local customers that force companies to improve continuously;
–   existing and future customer needs, satisfied by segments outside the cluster;
–   local demand, which reveals market sectors where companies can differentiate (specialize), with the quality of local demand more important than the actual size of the market;
–   barriers related to entry in foreign markets, and export regulations;
–   unforeseen events in the global market, which may increase the demand for the products of the sector;
–   external markets;
–   social factors related to formal social relations.

Also structural factors, which shape the context for the strategy and rivalry of enterprises and the strategies of related and supporting industries, may be an important source of competitive advantages. Factors that affect the context for strategy and rivalry include legal standards and regulations, as well as incentives and standards that determine the type and intensity of competition between local companies in a given sector, in particular:

- the local context that encourages appropriate forms of investment and supports modernization;
- strong competition between local rivals;
- the structure of the tax system;
- business management systems;
- labour market policies;
- provisions on intellectual property rights;
- local policy on anti-trust and anti-corruption activities.

In general, poor competition in a given sector or industry entails a low efficiency of enterprises, a lack of innovation and, in addition to imitation, a minimum level of investment focused only on material resources. An important role in this respect is also played by related and supporting industries, which include local suppliers and enterprises from related industries which provide complementary services to the activities of enterprises from a given industry. It is worth noting that factors related to formal social relations are also important.

Analysing the sources of competitive advantage allows evaluating competitiveness of a sector in terms of its strategy and in terms of strategies of individual enterprises. Examination of the properties of the forms of organization in the sector provides an explanation of the mechanism of how enterprises gain and maintain competitive advantage. In turn, the existence of interconnections within and between the sources of competitive advantage can compensate for the deficiencies in the potential of the sector and allow for a better utilisation of those that distinguish it.

The study of the sources of competitive advantages of a sector is often referred to as the structural analysis of the sector. Importantly, although in each sector the development of competitive advantages is influenced by different forces, some of them are essential. In the agri-food sector, probably the most important of those include the bargaining power of buyers and potential entering entities (also from sectors from other countries). Practically speaking, in relation to particular industries of the sector, competitors are the major force in the sector, e.g. for a particular producer of pork these will not only include other pork producers, but also producers of poultry meat.

By examining the structure of the sector, the focus should also be put on the analysis of the severity of various competitive forces rather than only on the analysis of the factors that may temporarily affect competition and profitability. Such factors include, for example: fluctuations in economic conditions in the economic cycle, shortages of raw materials, strikes, periodic sudden increase in demand. It is more about the basic economic and technological features of a given sector rather than identifying factors that have a short-term impact on the profitability of all sectors, since structural analysis is used for strategic rather than tactical decisions, and its purpose is to understand the structure of the sector.

In this context, the aim of this chapter is not to make the structural analysis of each of the branches of the domestic agri-food sector, but to assess the conditions for the formation and development of agri-food clusters in Poland. Thus, the analysis presented in this section concerns supply, demand and structural conditions for the entire agri-food sector. The individual industries of this sector will only be invoked as examples, with no separate discussion.

The key supply-side factors determining growth of agri-food clusters include land and other natural resources, labour resources, the availability of capital and direct foreign investments, information and R&D infrastructure and opportunities in the field of international trade. Poland ranks ninth in Europe in terms of area and eighth in terms of population. Located centrally in Europe, it has a rich history of agriculture. With a population of 38.5 million (34th most populous country in the world and 6th most populous member of the EU), the 15.5 million hectares of agricultural area should be considered relatively big. Arable land area per capita is 30% greater than in the EU, which allows it to be used less intensely. Land prices are moderate, ranging from about PLN 10 thousand per ha (low meadows) to about PLN 21 thousand per ha (good wheat-beet soils). The opportunities for using agricultural land are multidirectional [Jabłońska-Urbaniak 2010]. According to the agricultural census of 2010, 68% of the total area of agricultural land was under sowing, 2.3% were orchards, and 21% pastures [GUS 2011]. The quality of land is greatly diversified, but in general it can be concluded that arable land is of relatively good quality. The best wheat-beet soils are in Żuławy, Kujawy, Lublin Upland, Roztocze, in the Sandomierz Basin and in Silesian Lowland. In central Poland, on the other hand, there are predominantly weaker rye-potato soils. Vegetable and fruit crops are mainly located in the vicinity of large cities (e.g. Warsaw, Gdańsk, Szczecin, Katowice, Kraków, Bielsko--Biała, Wrocław, Wałbrzych). The poorest soils with crops of barley, oats and fodder are mainly in the southern part of North-Eastern Poland and in Pomerania. Also, the terrain is characterized by a high degree of diversification, taking the form of lowlands, highlands, mountain and foothill areas and deltas. The growing

season is more than 200 days, and majority of arable land is located in areas with adequate rainfall. Unfortunately, where precipitation is insufficient or excessive, there is a problem of the negligence of irrigation systems. This is especially important now, as more and more floods and droughts occur in the spring, and excessive rainfall and hails in the summer.

In Poland, there are favourable conditions for both crop and livestock production. Regional differences in the nature of agricultural production are mainly due to the different natural conditions, in particular to soil quality. There are a number of different crops and types of farming. Poland also has a rich tradition, now often recreated, in food processing. Our country almost avoided the very negative consequences of animal diseases such as the BSE or avian and swine flu. The natural environment is little polluted. There are even places practically completely free of industry, such as Roztocze or Bieszczady. Principles of cross-compliance apply to most agricultural land, and monocultures are practically non-existent. The level of biodiversity is also relatively high.

Polish food products are considered to be of very good quality (e.g. meat products and cold meats). With small doses of fertilizers per hectare, Polish raw materials for food production are relatively good and cheap. There are also increasing areas under the organic farming system. In 2010, it was 518.5 thousand ha. The organic production method was used in almost 21 thousand farms. The average annual growth of agricultural land under organic production in 2003-2008 was 40% [Więcek 2011]. When compared with Europe, the position of Poland in organic farming is getting better.

Labour resources in Polish agriculture are relatively large. It employs about 2 million people (about 12 persons per 100 ha), representing 14.7% of total employment, compared to 5.8% in the EU [Sawicki 2011]. Over the past 20 years, the Polish countryside depopulated mostly as a result of domestic and international economic migration. Currently, half of land owners receive income from employment outside agriculture. More and more rural residents and farmers take up business activity. Non-agricultural economic activities are pursued by 7.5% of the rural population and about 4.5% of farmers. In rural areas there are 892.5 thousand enterprises engaged in non-agricultural activities, including 115.2 thousand enterprises on farms [Więcek 2011].

The number of farms in Poland is steadily declining (within 40 years it was reduced by 1/3), while their area is increasing. Recently, the dynamics of these changes has been weakened. Poland ranks second in Europe in terms of the number of farms, which in 2010 was 2.28 million. Of that number, 1.89 million engaged in agricultural activities. The structure in terms of area is dominated by very small farms of up to 1 ha (31.4%) and small farms of 1-5 ha (37.9%)

[GUS 2011]. The high competitiveness and a strong export position of Polish agricultural production are mostly due to many thousands of large farms. Farms of over 15 ha hold ca. 50% of all agricultural land. In the period 2002--2010, the average farm size increased by 13%, while the number of small farms (with an area of less than 5 ha) decreased by 23% [Sawicki 2011]. Agricultural land goes not only to the largest farms, but increasingly often it is taken over by professionals and managers. At the same time, many farmers remain on unprofitable farms and the labour market does not absorb hidden rural unemployment. In Poland, there are still resources of relatively cheap workforce engaged in labour-intensive crops (e.g. fruits, vegetables), but they are shrinking rapidly. It should also be noted that the income of farms of over 10 hectares and small farmers who depend on off-farm employment is growing.

The capital equipment of Polish farms is highly varied depending on their size. Favourable changes that have taken place in this area in recent years are mainly related to Poland's accession to the EU. Under the CAP, farmers receive direct payments (per ha) and are eligible for funding under many programmes of the second pillar (Rural Development Programme), although the application process is rather complicated. The RDP distributes funds for improving competitiveness of the agricultural and forestry sector, improving the environment and the countryside, improving the quality of life in rural areas and diversifying rural economy, creating local action groups, and for technical assistance. In 2004-2013, the budget to be used within the programme amounted to approximately EUR 31 million [Jabłońska-Urbaniak 2010].

In recent years, significant progress has been made in the technical infrastructure of farms, in quantitative and qualitative terms. However, there have been few initiatives for joint investments, e.g. within producer groups, so that equipment could be used more effectively and economies of scale achieved. When it comes to enterprises in the agri-food sector, they can obtain structural funds for [PriceWaterhouseCoopers 2008]:
–   grants for investments using innovative technology, R&D and implementation of their results, large investment projects in the manufacturing sector (over EUR 40 million);
–   grants for general and specialist training, open or closed, for the management and employees of enterprises, co-financing for postgraduate studies within the Human Capital Operational Programme;
–   grants for investments to adapt enterprises to environmental requirements (including environmental management systems, waste management, implementation of best available techniques, water and sewage management,

air protection), investments in renewable energy sources under the Operational Programme Infrastructure and Environment;

−   grants for investments and other development projects of EUR 2 million for various purposes depending on the needs of the voivodeship under Regional OPs (investments were also co-financed by pre-accession grants under the SAPARD programme).

It is possible to obtain the technology loans as well. They can be granted by the Bank Gospodarstwa Krajowego (BGK) under conditions similar to market conditions, but with the possibility of partial redemption. Its maximum value is EUR 2 million. It can be designated for implementing one's own technology or buying it if it has not been used in the world for more than five years, and for launching production of new or improved products based on that technology, or the provision of new or improved services. The exemption from property taxes is provided by communities as part of regional aid, which aims to encourage new investment and create new jobs associated with new investment. The level of assistance depends on the area where the investment will be carried out, in accordance with the current regional aid map. The amount of aid is calculated for investors individually, based on investment costs and salary costs. To obtain it, one must meet specific conditions, e.g. create new jobs within three years from the completion of the investment and maintain them for five (large firms) or three years (SMEs) [PriceWaterhouseCoopers 2008].

Mainly due to the accession to the EU, the Polish food sector in recent years has been greatly improved. It is better promoted, and with flexibility, awareness of the risks and opportunities, the pro-export attitude and finding gaps in the range of goods, it competes with global giants. In many industries, the technological level is not inferior to world standards. However, there are cases of overinvestment, which results in the installed capacity significantly exceeding sales capacity. Also the growing prices of agricultural raw materials and market pressure on the part of retailers are a threat to the viability of the sector.

The agri-food sector is increasingly confronted with greenfield investments, acquisitions and privatizations involving foreign investors. Investors are interested in investing in Polish enterprises mainly due to the fact that after the accession to the EU, Poland has become a very attractive and safe place for business investment. Moreover, Poland has been effectively resisting the current crisis and as one of the few EU countries continues to exhibit a relatively high economic growth. For example, just in 2011 five investors invested 83.5 million euros in the food industry, creating 662 jobs. Often with the foreign capital come highly qualified managers and specialists. Most projects are located in special economic zones, and most of the capital flows to the food industry from

the Netherlands, UK, USA, Germany, and France. Capital is invested primarily in the production of stimulants and secondary in processing (i.e. tobacco, confectionery, beer, and non-alcoholic drinks), and the least in processing of animal and vegetable products [Ministerstwo Gospodarki 2003].

With FDI, Poland has made significant progress in terms of renewal and expansion of production assets, agricultural processing plants have been modernised, export has increased and access to international distribution networks has been facilitated. In addition, there has been an increase in the degree of processing of agricultural products, increase in productivity, and stimulation of the economic infrastructure development. FDI played a special role also prior to accession to the EU – by 2004 the Polish food sector received investments of 6,624.8 million USD (mainly due to privatization). Currently, foreign investments and resources flowing with them are seen less as a development factor and more as competition to the rapidly developing domestic enterprises (with the exception of areas with high unemployment) [Ministerstwo Gospodarki 2003].

Being a member of the EU, Poland in order to implement objectives of the Common Agricultural Policy (CAP) has to follow the common organization of markets, including the agricultural market. The common rules on competition are complied with and the policy is aimed at controlling and limiting production while ensuring an adequate level of income for farmers. The EU agriculture is one of the most regulated sectors. The EU law regulates within the co-existent types of interventions in agricultural markets [Czyżewski and Henisz--Matuszczak 2006]:

– intervention in the internal market and external protection (including the market of cereals, sugar, dairy products, beef, certain types of fruit and vegetables, table wine – together about 70% of agricultural production; the EU guarantees procurement and minimum prices; the surpluses are purchased by authorized agencies and directed to public reserves, during shortage the agencies sell products within the EU; each product has its own market organization and rules of procedure; procurement price is determined through tender; flexible rules in the pork market, table wine, some fruit and vegetables, with financial aid mainly for private storage – subsidies for the cost of storage relieve from excess surpluses and stabilize prices);

– external protection without internal intervention (rapeseed, sunflower, soy, eggs, poultry, processed fruit and vegetables, quality wines, tobacco, hops, seed, flowers – together 25% of agricultural production; protection through tariffs and levies, the safeguard clause in case of occurrence or threat of market disruption, certificates combined with the payment of deposit,

import licenses for sensitive products – one needs to specify the amount of allowable import, minimum import price and a period of implementation);
– direct payments to agricultural production or through the processing industry (products for which direct or indirect financial support to producers applies, including assistance for the processing industry, which undertakes to pay the minimum price for farmers; subsidies to industry concern products for which the EU bound its tariffs at the WTO, which prevented external protection; recently subsidies were used for olive oil, tobacco, cotton, wheat; support for processing branches which process agricultural raw materials for technical purposes and undertake to pay domestic suppliers prices higher than the prices in the international market, e.g. distillation of wine, production of starch, casein, sugar processing; subsidies for processing apply to 2.5% of production);
– direct flat aid per hectare, head, growth or volume of production (producers of flax, hemp, silkworms, hops, dried fodder; increase in the significance of this form of support; instrument of stabilization and improvement of agricultural incomes; bonuses for heifers and suckler cows).

A key element of information infrastructure in the Polish agriculture is the Agricultural Information System (AIS). It should perform the following functions: describing entities and objects, events and processes in the agricultural market; forecasting future events and market processes; supporting the creation of new solutions in the area of market products and operations; evaluating the effectiveness and efficiency of CAP measures and the quality of work in their implementation (descriptive, predictive, innovative, and controlling functions) [Rembisz and Idzik 2007]. The R&D infrastructure is created by a number of different entities. Research for the sector is carried out by thirteen R&D units subordinate to the Minister of Agriculture and Rural Development, but also nine research centres of the Polish Academy of Sciences and universities (with 47 faculties) supervised by the Minister of Science and Higher Education [Jabłońska-Urbaniak 2010]. Six of the R&D units have the status of a National Research Institute. These include: the Institute of Agricultural and Food Economics, the Institute of Soil Science and Plant Cultivation, the Institute of Animal Production in Balice near Kraków, the National Veterinary Research Institute in Puławy, the Institute of Plant Protection in Poznań and the Plant Breeding and Acclimatization Institute in Radzików. Some of the issues in agricultural sciences are also explored in other units subordinated to the ministries of economy, environment, health and labour.

The financial resources for the purposes of R&D are derived mainly from the budgetary grants, and as a result of reducing the allocation for statutory

activities the additional funds are derived from participation in the international scientific and technical cooperation programmes, tasks assigned by the business sector, and also from loans and leases [Jabłońska-Urbaniak 2010]. Some units receive funding from the Ministry of Agriculture and Rural Development for the implementation of multi-annual programmes. Currently, there are eight such programmes aimed mainly at monitoring the transformation processes in the sector and setting quality standards for the production of safe food.

Poland is a part of the common market with the freedom of movement of goods between the Member States. Moreover, the Member States do not conduct their own trade policy with third countries, but are represented by the EU institutions under the common trade policy. The agricultural sector is additionally under the CAP regime, which regulates not only agricultural production, but also trade in agricultural products. In addition, countries have the instruments available in the framework of national policies, which, however, are constantly reduced. As a result, trade within the EU and beyond its borders is controlled directly or indirectly by means of the following instruments [Czyżewski and Henisz-Matuszczak 2006]: the price intervention system, creating state reserves, direct subsidies to market prices, intervention buying and stocking system, customs (ad valorem, specific, combined, conventional, contractual, preferential), export subsidies, levies, quotas, sales tax, quality and technical standards, standardization of products, direct and indirect subsidies, preferential loans, acreage reduction, loans to finance inventories, import and export licenses. These instruments change significantly at the same time. It can be said that despite the freedom of movement of goods, in Poland, under existing EU and national regulations, there are some significant constraints regarding quality, volume of production, and consequently trade.

Considering demand factors in global or macroeconomic terms, it has to be emphasised that the demand for food is determined by the population and the level of income. Regardless of the assumptions underlying the various demographic forecasts, it is expected that by 2050 the world population will continue to grow. In the most likely scenario, according to data published by the United Nations, it will reach 9 billion (Figure 2.1).

On the other hand, when it comes to personal income in the world, which is a derivative of the productivity of individual economies, the changes in the level of GDP in large countries regarded as poor so far will be of crucial importance. In a synthetic way, one can treat them as a result of specific economic competition of G7 countries (USA, Japan, Germany, United Kingdom, France, Italy, and Canada) and the E7 group (Brazil, Russia, India, and China – countries known as the *BRIC* – and Mexico, Indonesia, and Turkey). According to

long-term forecasts of global economic growth by PriceWaterhouseCoopers, in 2050 countries from the E7 group will have their GDP 50% higher than those of the G7. It is also expected that in 2025 China's GDP will be greater than that of the USA, and in 2050 the same may be true for the GDP of India.

Figure 2.1. Occurring and forecasted changes in world population in 1950-2050 [million]
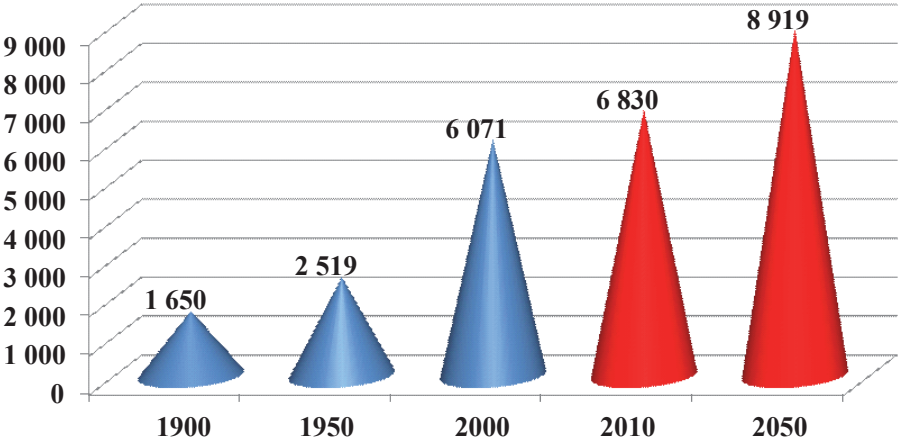
Source: Own elaboration based on data from the United Nations.

These changes will influence the level of GDP per capita, as well as the income and demand for food. It can, therefore, be assumed that both the increase in world population and the wealth of societies, particularly in big and relatively poor countries, will inevitably lead to increased global demand for food (Figure 2.2).

In Poland, expenditure on food and non-alcoholic drinks is a major item in the structure of household expenditures. In 2010, their share in the total expenditure amounted to 24.8%. However, according to many authors, we should not expect, even with an increase in the wealth of Poles, that food consumption in Poland will grow. Due to the change in food prices, its share in household expenditure may rise. It is also possible that the structure of consumption will change due to changes in fashion and consumer tastes. In the shorter term, also the events such as the financial crisis, avian or swine flu, the BSE, scandals related to the quality of organic food and others are not without significance.

As for the trends observed in the last 20 years in Poland, in general we consumed more fruit, poultry meat, vegetable fats, fish, and less animal fats, sugar, and milk. The level of total meat consumption remained relatively stable,

while the consumption of beef, sheep, and goat meat decreased, the poultry meat consumption increased, and the consumption of pork remained relatively constant. In the last decade of the 20th century, the consumption of grain products per capita in Poland was among the highest in Europe [Borowska 2002], while the domestic consumption of bread and other baked goods is steadily decreasing.

Figure 2.2. Forecasted increase in demand for major agri-food products
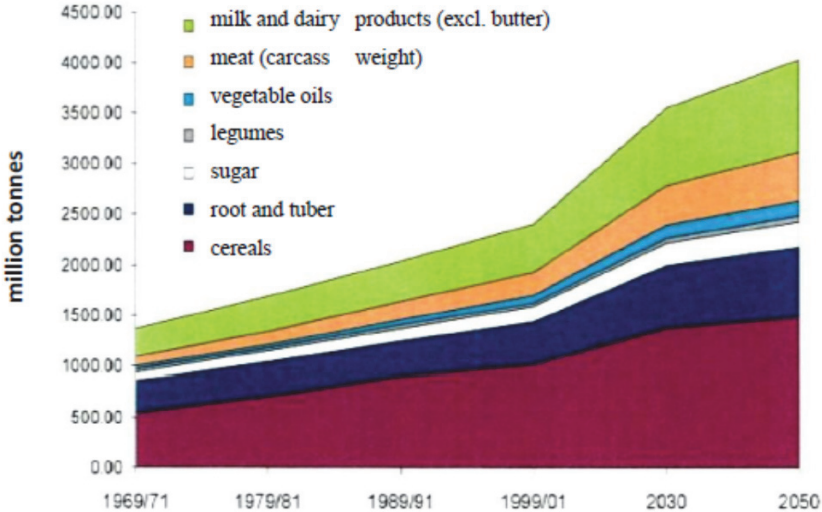
Source: Giejbowicz 2011.

The analysis of the demand conditions for the creation and development of agri-food clusters must also take into account the qualitative aspects of the demand for food, which is especially important in affluent societies. Behavioural patterns of those societies reveal specific megatrends, such as the convenience of consumption or interest in the security and health status of food. Consumers are paying increased attention to the form and quality of consumed food. There are also new groups of consumers with preferences previously unobserved or of little importance to the market. In accordance with Porter's approach [1998a, 1998b], with regard to the agri-food sector one can indicate a variety of demand sources of potential competitive advantages that determine the creation and development of agri-food clusters in Poland. In somewhat subjective terms, they can be classified as:
−   demanding and increasingly sophisticated local customers that force enterprises to continuously improve their market offer:
• enthusiasts of health and taste quality,

- vegan children,
- those disproportionately burdened,
- starving for life,
- caffeine crazies, etc.;
– existing and future customer needs met by other sectors related to the agri-food business:
- the need to deliver products directly to home, wider access to online ordering and group purchasing;
- the desire to help other people when buying a given product (farmers, group of manufacturers of a certain product, domestic producers, or others through charity actions associated with sales);
- the overall need for information on the conditions and place of production, etc., instead of advertising;
- the need to buy Polish products considered to be healthier due to the good environmental conditions;
- the need for sustainable packaging;
- the need to consume food with a higher content of vitamins and minerals;
- the need for short information on nutritional properties of products to be provided (e.g. fruits, vegetables);
- the need for greater amounts of natural additives in the production of various goods (in cosmetics, for example);
- the need to provide various recipes for the preparation of dishes for specific products;
- the need for contact with nature, as well as contact and dialogue with the food producer;
- the need for modern places to shop for original products supplied directly by Polish producers;
- the needs met by foreign products unavailable in Poland (e.g. Spanish ham, Dutch cheese with various additions, French bread, etc.);
- the needs of Polish and foreign tourists (mostly city dwellers) interested in the Polish countryside landscape, leisure and contact with people who live in harmony with nature;
– local demand that reveals different market segments, so that enterprises can specialize or integrate vertically:
- specialization in the production of low-cost products or more expensive products of higher quality, which implies different marketing strategies;
- vertical integration of enterprises, relations between small facilities that provide semi-finished products and the processing industry;

- barriers related to entry to foreign markets and export regulations:
  - capital resources needed to undertake expensive and risky investment projects;
  - prevalence of various forms of financing activities and investments (e.g. leasing, joint ventures, business angels, etc.);
  - low level of cooperation between companies that represent a given industry;
  - insufficient promotion of Polish products in foreign markets;
  - the lack of proper identification of markets outside the EU, with simultaneous focus on the EU markets;
  - high standards and quality requirements applicable to the EU markets;
- development of external markets:
  - growing interest in high quality Polish products in the EU;
  - growing demand for food in large rapidly developing countries (e.g. China);
  - popularity of Polish food in Polish communities abroad (e.g. USA, Canada, United Kingdom);
  - the positive image of Polish food as a result of export success of domestic companies operating in foreign markets;
- supply-side flexibility in responding to changes on the demand side, including changes in consumer behaviour:
  - conditions for the development of short supply chains;
  - cooperation between entities in marketing chains (e.g. market research, joint campaigns and promotional activities, etc.);
  - ability to meet the needs of consumers who look for high quality products for the lowest possible price;
  - the degree of product diversity;
- sudden, unexpected events in the global market, which have a significant impact on the demand for products of the domestic food and agriculture sector:
  - natural disasters (droughts, floods, etc.);
  - diseases, outbreaks or contamination of products in food supply chains which are difficult to control.

From the perspective of the development of clusters in the Polish agri--food sector, a more detailed discussion should be devoted to the emerging category of demanding and sophisticated consumers. Global trends reach Poland. A very interesting list of these trends was compiled by Penn and Zalesne [2009], highlighting the following microtrends: vegan children, disproportionately burdened, starving for life, caffeine crazies.

The first trend is associated with the fact that there are no longer classic dinners consisting of meat and potatoes, and meals for children are increasingly meatless. This trend is clearly visible in the USA, where about 1.5 million children aged 8-18 years old are vegetarian, and another 3 million do not eat red meat [Penn and Zalesne 2009]. The reason for the existence of that trend is an overall increase in parental permissiveness and nurturing individualism at all ages. Today, children are not reprimanded, punished, or forced to eat meat, but rather praised for independence and sensitivity to the animal welfare. Their decision to switch to vegetarianism has nothing to do with practicality, tolerant parents, but rather with teaching children the approach to the environment. Examples include the Earth Day, encouraging segregation of waste and taking care of stray animals. The voice of children in many families is one of the loudest and most unfettered. They are the ones to teach parents to segregate waste, tell them about the negative effects of smoking. Today schools teach nothing about hunting, fishing, raising chickens. What is most striking, however, is that children do not want to eat animals because in the literature animals are objects of children love. As a result, even the most nutritionally conscious parents are no longer able to convince children to eat animals. On the other hand, nutritionists themselves increasingly recognize that a vegetarian diet for children can be just as good or better. Male vegetarians are 37% less at risk of heart diseases and the risk of dementia, regardless of lifestyle among vegetarians of both sexes is reduced by 50%.

Another global trend is the increase in the average weight of women and men, called *globesity* by the World Health Organization. Currently 925 million people starve in the world, including more than 40 million of poor people who continue to experience the shortage of food (malnutrition) in Europe, while more than one billion people are overweight. The number of obese people (13 or more kg overweight) means now more than 300 million who are at risk of obesity-related heart disease, heart attack, diabetes, or hypertension [Penn and Zalesne 2009]. In connection with this paradoxical phenomenon, some industries even thrive. This primarily applies to fast-food restaurants, but also to the weight loss industry. Many governments and organizations have announced action plans to reverse this negative trend. Labels include mandatory calories information, restaurants provide information on the principles of proper nutrition. At the same time, obesity medications continue to improve, and in some countries surgery to reduce weight will probably be funded from public sources.

The *starving for life* trend, in turn, determines the group of people who *disappear*, which is not due to illness, preferences or political protest, but the conscious pursuit of a longer life [Penn and Zalesne 2009]. The number of

followers of this diet is not great, but it is constantly growing. Instead of 2,500 calories, they eat an average of 1,800. They do not follow a specific diet, they just eat little, mostly fruit, vegetables, nuts and sprouts, etc. This trend seems to be attractive for two reasons. Firstly, it is something of a secret society whose members believe in the meaning of their actions, they are happy with themselves, thinking that others slowly kill themselves by eating.

Secondly, their goal is not to be thinner, but to live longer, which is a paradigm shift, and is particularly significant for people who decide to have children at around age 40 and want to get to know their grandchildren. This trend may be important and change the attitude to food consumption. In the face of this, restaurants will have to provide information about the number of calories, there will be an increase in the demand for functional food, enriched with additional vitamins and minerals. People who starve themselves in the name of a longer life will not want to pay for overweight people with, in their opinion, too carefree attitude to life. It is also worth mentioning here that, historically speaking, different cultures alternately favoured stout or slim silhouettes. What remains unchanged is the more and more intense desire to prolong life. If calories reduction actually contributes to that, it could mean drastic changes in the market for food production.

The last of the rarely identified trends which is worth noting is the group of caffeine crazies [Penn and Zalesne 2009]. In addition to the huge and growing consumption of bottled water, which has become the prevailing fashion, there are plenty of additional products offered. Water is enriched with the so-called functional additives, i.e. vitamins, minerals, flavours, etc., because a product with such additives sells faster. At the same time, there is an increasing interest in coffee. The income of Starbucks or Costa Coffee has been steadily increasing over the past few years. Their youngest customers are 10 years old. In addition, carbonated soft drinks and juices are becoming more and more popular; they are ahead of white bread as the main source of calories in the diet. The sales of tea are increasing. However, the fastest-growing segment of beverages is energy drinks. For example, in the USA in 2006 alone, about 200 such beverages went on the shelves, contributing to the growth of the industry by 50%. Red Bull beats sales records and the trend continues. Beverages with more and more caffeine content are promoted. There is the belief that with caffeine athletes are fitter, drivers can get to their destination, and the risk of Alzheimer's disease, diabetes, gallstones, Parkinson's disease, or colon cancer is reduced. It is also believed that caffeine supports the effects of medication, improves memory and learning ability.

An established, fairly strong trend in the welthy EU that is becoming increasingly stronger in Poland is the growing interest in healthy food produced

organically. In general, the demand for high quality food is increasing. Quality can be understood in two ways [Giejbowicz 2011]. Firstly, it is the health quality, which means:

–   control and monitoring of the growing-farming-processing-transport-retail chain;
–   traceability of the origin of foods and food ingredients, and monitoring their movements in the supply chain;
–   certification of organic products.

Secondly, it is the quality of flavour. As a result of devoting more attention to the quality, there is a growing interest in products that have quality certificates, certificates of regional or traditional food, as well as original, little-processed products purchased directly from the farmer. The group of organic product lovers – where chemicals are not used – is also expanding. However, these are more expensive products for a relatively small percentage of affluent consumers.

Considering the demand-side determinants of the development of the agri--food clusters, one cannot ignore the issues related to the production and the way of buying food. Firstly, more conscious consumers are interested not only in the price but also in quality, care more about animal welfare, good agriculture and the conservation of biodiversity. Secondly, although much of the food is bought in supermarkets and hypermarkets, consumers more often visit fairs organized in city centres or in closed streets, buy food online, order services of steady supply of fruit and vegetables, or purchase directly on farms or at farmer's stores. They increasingly prefer fresh and less processed products, small portions and dishes ready for consumption. Appropriate packaging and appropriate processing of the product becomes more and more important.

A notable phenomenon which affects the demand for agricultural products is the growing importance of renewable energy and biofuels. This trend is related to the EU decision of 2007 on the 20-20-20 objective. The European Council announced a 20% decrease in greenhouse gas emissions by 2020, as compared to emissions in 1990, a 20% increase in the share of renewable energy in final energy consumption, a 20% improvement in energy efficiency (decrease in the use of primary energy), and a 10% share of biofuels in transport fuel consumption to be reached in 2020. Each of the Member States has adopted different objectives, taking different circumstances into account. Plans under the Polish energy policy until 2030 include improving energy efficiency, increasing energy security, developing renewable energy sources, including biofuels, developing competitive fuel and energy markets, reducing the impact of energy on the environment [Jabłońska-Urbaniak 2010].

Structural factors determining development of clusters can be viewed from a perspective proposed by Porter [2010] who singled out the following structural determinants of the intensity of competition: competition between local rivals, the threat of new entries, the pressures associated with substitutable products, the presence and strategies of local vendors from competitive, related industries.

Agri-food sectors in different countries and their selected industries compete with each other, using different methods, including price competition, advertising campaigns, introduction of new products, wider range of customer services, warranties, etc. Reaching for these methods is either a necessity or an opportunity to improve one's position. Industry activities from one country result in counter-activities by companies in other countries. Usually, they decide to retaliate or carry out neutralizing activities. Companies in these industries are mutually dependent. The game conducted between them can improve the situation of the industry in the country, but it often happens that the entire industry is in a worse off situation. In particular, price competition may reduce the profitability of the entire industry (e.g. the poultry industry). In turn, the advertising campaigns often contribute to an increase in demand and a greater variety of products, what can benefit all parties. An example would be the milk products industry (such as yogurt, cream cheese).

In most branches of the agri-food sector, there is a domination of given countries, or in the case of processing – international concerns. These leaders often impose discipline and play a coordinating role, for example, they are responsible for fixing prices. Competition in the agri-food sector, due to the relatively stable demand, transforms into a game to increase market share. Consequently, the situation is not as stable. In addition, the high fixed costs put pressure on the full use of production capacity in processing plants, but also on farms. The storage of products is difficult and costly, sector companies lower prices to ensure sales, which translates into a reduction in earnings across the sector.

Competitors in the Polish agri-food sector differ in strategy, origin or character. In every industry there are different goals and competition strategies. Therefore, companies that compete in the agri-food sector have difficulties in reading each other's intentions and rules of the game. Strategic choices appropriate for one competitor often turn out to be inappropriate for another. Especially foreign competitors bring a lot of variety to competition. Small enterprises often decide for a below the average rate of profit, because it is more important for them to maintain the independence of ownership of the company. This action taken by small companies reduces the profitability of larger companies, where such rate of profit is not acceptable. In many industries of the agri-food sector,

there are also companies that use dumping prices, considering the particular market as a place for disposing of surplus production, while for other companies it is the primary market. Competition in the agri-food sector is further exacerbated by companies whose strategic activities involve gaining certain markets in order to diversify the business, achieve prestige or technical credibility.

The agri-food sector is one of the sectors with a low profitability rate. Both the processing industry and agriculture cannot count on the margins comparable to the sectors of services and high technology. However, the companies, despite the low rate of profit, stay in their industries. The reasons behind leaving a given sector stem from the following problems (of economic, strategic, and even emotional nature), called the exit barriers [Porter 2010]:

− resources with a high degree of specialization, associated with specific activities or specific location, with low values at their liquidation and high costs of transfer, e.g. processing plants;
− fixed exit costs, including collective bargaining agreements with employees, production maintenance costs and provision of spare parts;
− strategic interdependencies between a given unit and other units, important in terms of prestige, shared facilities, access to capital markets;
− identification with a particular line of business, loyalty to employees, fear for one's own career, pride;
− government bans and other restrictions that result from the government policies to retain jobs or potential economic impact on the region.

Thus, high exit barriers contribute to the struggle of companies to stay on the market, often using such tactics as e.g. lowering the quality of the product.

The threat of new entries depends on the barriers of entry and the response of competitors on a given market. It is small when the barriers are large and the reaction of competitors is fierce. New players that enter the industry bring new production capacity and significant resources. They aim at gaining a market share, which results in lower prices, rising costs, and reduced profitability. Companies that diversify their activities often buy companies in other markets where, using their resources, they change the market situation.

In general, entry barriers in the case of the Polish agri-food sector are relatively low. This means that reaping the benefits of the new solutions is not free from the fear that new competitors will follow. The main entry barriers include economies of scale, product differentiation, capital needs, costs of switching suppliers, access to distribution channels, cost disadvantage (regardless of scale) and the policy of the state [Porter 2010]. Economies of scale consist in reducing the unit cost of the product, together with an increase in the volume of production per unit of time. The presence of economies of scale prevents the entrance,

forcing the entering party to undertake action on a large scale, which causes severe competitive response of existing firms or forces operations on a small scale.

Another way to increase the entry barriers is through product differentiation. This requires an established brand and regular customers. Diversification may include advertising, level of customer service, diversity of products, or the fact of being the first. The newly entering parties are forced in such a situation to incur large expenses to overcome customer loyalty, while such investments are characterized by a high level of risk. Entry barriers may be amplified by the policy of the state. This happens in the EU, which uses instruments to empower the EU agriculture. Also the Polish government, within domestic and international law adopted by Poland (mainly the EU, WTO), can limit or prevent entry into specific industries (for example, by using the safety regulations, standards of air and water pollution, etc.).

It is worth noting that entry barriers may change, e.g. patents can expire, diversity of products in some industries diminishes, or economies of scale increase due to automation. Barriers are also affected by firms' strategic decisions, e.g. the timely introduction of new products, intense advertising, distribution expansion, vertical integration. Some companies also have the resources and capabilities that lower the costs of overcoming the entry barriers. These may include, for example, developed distribution channels and the ability to share costs between greater than before number of product types.

The pressures associated with substitutable products are associated with the fact that their appearance on the market limits potential earnings and determines the price cap. The more attractive they are in terms of price and efficiency, the more they limit the gains in the sector. For example, manufacturers of sugar beet compete with producers of sugar cane or corn syrup with high fructose content. Substitution products limit profits of leaders in the market. Substitutes not only limit the possibility of raising prices even in the periods of prosperity, but also profitability, especially if it turns out that the newly opened es-tablishments have a high capacity to satisfy demand. When assessing the structural conditions of development of the agri-food sector, one must indicate substitutes for each of its branches that can play a similar role as the products of that industry. Substitution products may be from relatively remote areas of the economy.

The biggest threat are goods that can effectively replace the products of the sector because of their value for money and goods produced by sectors that achieve high returns. They contribute significantly to increases in efficiency, but also decreases in prices. Identification of such substitutes may entail a decision on strategic blockade of substitute entering the market or on adjusting the strategy, treating a particular product as an inevitable crucial force.

Very important structural conditions are the presence and strategies of local suppliers from competitive, related industries, which are the companies that perform activities complementary to the activities of enterprises of the industry (e.g. fertilizers, fuels, pesticides, agricultural machinery, etc.). The bargaining power of suppliers comes down to the fact that they can raise prices or lower the quality of goods and services. This leads to a reduction in the profitability of the sector, which is not able to cover rising costs with higher prices. It can be said that the power of buyers is a reflection of the power of suppliers.

Branches of suppliers of inputs to agriculture are usually dominated by a small number of companies, resulting in much more concentration than in the sector to which they sell their products. Suppliers can have a significant impact on prices, quality and delivery terms. The group of suppliers does not have to compete with other substitution products offered to the sector; this is because there are not too many substitutes when it comes to fertilizers, fuels and pesticides. In addition, the Polish agri-food sector is not necessarily the key customer for the group of suppliers. Producers of fertilizers, fuels, pesticides and agricultural machines can successfully sell their goods to agri-food sectors in other countries and in the case of fuel producers, also to other sectors. Suppliers are then more likely to use their bargaining power.

2.2. Institutional determinants

Institutional determinants of cluster emergence and development can be examined in relation to the institutions that participate in such processes. Clusters are associated with a number of advantages whose beneficiaries are enterprises, industries and the economy. Clusters are recognized as an innovative way to gain competitive advantage [Chrobocińska and Juchniewicz 2010]. On the other hand, Jankowska and Gorynia [2008] recognize that the dimensions in which the impact of the cluster structures on competitiveness may be considered include:
−   competitive position (i.e. the resulting competitiveness, as a result of the assessment of the offer of the company by the market);
−   competitive potential (i.e. resource competitiveness, the resources that the company has);
−   competitive strategy (i.e. functional competitiveness, which is a set of instruments to develop a competitive advantage).

Benefits from the presence of clusters can be analysed in microeconomic, mesoeconomic and macroeconomic terms [Kładź and Kowalski 2010]. In microeconomic terms, i.e. for companies, operating in a cluster allows for better

access to information and human resources development, as well as increases the flexibility. In addition, cooperative processes are associated with the development of social capital, which is considered one of the determinants for development and maintenance of collaborative processes. In mesoeconomic terms, i.e. from the point of view of the sector, the presence of cluster structures increases the intensity of economic activity, knowledge transfer and investment, and causes the emergence of a dense network of relationships between companies of the industry and the entities representing supporting and related sectors. Total benefits that make up the microeconomic and mesoeconomic dimensions are finally reflected in the positive effects on the whole economy.

One of the characteristics of clusters are increased links between groups of entities of various types, namely enterprises, government officials, scientific research units and business environment institutions. The group of institutions that support the development of clusters in Poland includes:

−   ministries (special role in this respect is played by the Ministry of Economy and the Ministry of Infrastructure and Development);
−   local authorities;
−   national and regional agencies (including e.g. the PAED and regional development agencies);
−   technology parks;
−   special economic zones;
−   business incubators;
−   universities and associated technology transfer centres, research institutes and other R&D bodies;
−   cluster initiatives;
−   unions and trade associations;
−   others, whose activities directly or indirectly affect the functioning of clusters.

Those involved in the process of clustering can be ranked according to the extent of their impact. In this way, the list of entities that affect clusters is split between central, regional and local levels (Table 2.1).

It is worth highlighting, that it can be a problematic issue to synchronize actions of individual entities, undertaken for the development of cluster structures, which would prevent duplication and blurred responsibility for its development, thus leading to the development of a coherent and transparent cluster-based policy. Institutional conditions have a significant impact on market processes, which determine competitive advantages, not only for individual companies, but also for the economy of a region or a country.

Table 2.1. Participants of cluster creation

Central level	Regional level	Local level
- regional policy - industrial policy - science policy	- regional public authorities - regional organizations	- companies - local government bodies - universities

Source: Own elaboration based on Sölvell 2009.

The measurement of competitiveness at the national level is a multi-faceted process. In one of the most popular rankings of national competitiveness, published in the form of yearbooks by the World Economic Forum, this multidimensionality manifests itself in the set of determinants of competitiveness, which consists of twelve pillars of competitiveness [World Economic Forum 2013/2014]:

- basic requirements:
  - institutions,
  - infrastructure,
  - macroeconomic environment,
  - health and primary education,
- efficiency enhancers:
  - higher education and training,
  - goods market efficiency,
  - labour market efficiency,
  - financial market development,
  - technological readiness,
  - market size,
- innovation and sophistication factors:
  - business sophistication,
  - innovation.

According to the WEF report of 2013/2014, Switzerland, Singapore and Finland are the most competitive economies in the world. Among the 148 countries classified, Poland ranks 42nd. The economies of countries belonging to the European Union are ranked from the third to ninety-first place. In comparison with the previous year, Poland's position in the ranking has deteriorated by one. On the other hand, in 2009/2010, Poland ranked 46th. According to the report, Poland's position is quite stable and uniform in all twelve pillars of competitiveness. Table 2.2 summarizes the results of the 2013/2014 assessment of selected pillars of competitiveness of the EU-28.

Table 2.2. Ranking of selected pillars of competitiveness of the EU-28

Country	Rank	Pillar 1: Institutions	Pillar 5: Higher education and training	Pillar 12: Innovation
Finland	3	1	1	1
Germany	4	15	3	4
Sweden	6	5	8	6
Netherlands	8	8	6	10
United Kingdom	10	12	17	12
Denmark	15	18	14	11
Austria	16	21	13	15
Belgium	17	24	5	14
Luxembourg	22	10	36	18
France	23	31	24	19
Ireland	28	16	18	20
Estonia	32	27	23	31
Spain	35	58	26	34
Malta	41	37	31	42
Poland	42	62	37	65
Czech Republic	46	86	39	37
Lithuania	48	61	27	44
Italy	49	102	42	38
Portugal	51	46	28	29
Latvia	52	57	40	70
Bulgaria	57	107	69	105
Cyprus	58	42	32	56
Slovenia	62	68	25	40
Hungary	63	84	44	47
Croatia	75	93	51	79
Romania	76	114	59	97
Slovak Republic	78	119	58	95
Greece	91	103	41	87

Source: Own elaboration based on data from the World Economic Forum 2013.

For Poland the distinguishing pillars include market size (20th place), higher education and training (37th place), and financial market development (38th place). On the other hand, some of the most problematic factors are the tax regulations and restrictive labour regulations. At the moment Poland is considered one of the countries aspiring to become innovative economies. Achieving this status requires increased efforts in relation to the pillars of innovation and the quality of the business environment [World Economic Forum 2013].

Clusters are examples of systems where due to increased relations between actors, access to knowledge is facilitated. This is the result of two processes. Firstly, it results from the relationships between enterprises and the flow of skilled labour. Secondly, through a network of cooperation between the private sector and the R&D a process of commercialization of research results is stimulated, where innovation centres, which include technology transfer centres, incubators, academic business incubators and technology parks, play an important role [Daszkiewicz 2008]. In addition, when schools offer the opportunity to pursue studies in the fields of activity corresponding to the profile of the cluster, there is a flow of knowledge and experience. R&D sphere, therefore, plays a key role in shaping innovation and competitiveness.

In the case of the agri-food sector in Poland, the success factors for operating and potential clusters are undoubtedly academic institutions and R&D units, which are elements of an innovative business environment. The importance of the environment increases with development of the knowledge-based economy [Kowalski 2010]. The success of efforts to develop agri-food clusters depends on the quality of services provided by these institutions. On the one hand, the issue of transfer of knowledge and strengthening the innovation in business and the economy is associated with the offer of agricultural universities in Poland. Their structure shapes future staff, which supplies human capital. In addition, the results of conducted research should be applied in the economy. On the other hand, the innovativeness of the sector is also affected by R&D units, laboratories and state research institutes, which are subject to the relevant ministries, including the Ministry of Agriculture and Rural Development. In general, cooperation between R&D and the business sector, occurring within clusters, increases the chances for the implementation of the results of R&D in enterprises, by providing better opportunities to focus on the needs of enterprises.

Discussing institutional determinants of cluster emergence and the role of cluster policy cannot be omitted. Cluster-based economic policy approach is the result of increased interest in issues of clustering in academic circles and the desire to implement these solutions in practice. It can be considered as a new kind of regional development policy, in which the starting point is the existence of agglomeration of economic processes in relation to a specific industry and its related industries. Clusters are based on the development of a competitive and cooperative relationships, and cooperative actions relate, among others, to the relationships between the sphere of enterprises and the sphere of scientific research. A lot of emphasis in the CBP is based on the occurrence of a public--private partnership.

As defined by the Gdańsk Institute for Market Economy, cluster-based policy is *a set of activities and instruments used by the authorities at various levels to improve the level of competitiveness of the economy by encouraging the development of existing or creating new cluster systems primarily at the regional level* [Brodzicki et al. 2004].

The position of the European Union on support for clusters defines them as structures that stimulate the development of enterprises. The guidelines addressed to government authorities affecting the clustering process relate to acceleration of the processes initiating or supporting the emergence of clusters and assistance for emerging relationships between entities of the cluster [Staszewska 2009].

Policy that supports the development of clusters is always accompanied by policy to promote competitiveness and innovation. According to Skawińska and Zalewski, the competition policy, with which we deal at present, is multi-faceted in nature. These authors emphasise that the authorities take an active role in the process of structural change, focusing their efforts, *inter alia,* on supporting micro-competitiveness. In addition, they can influence the flow of FDI [Skawińska and Zalewski 2009].

From the point of view of the central and regional authorities, the impact on clusters may be exercised directly or indirectly, on many levels of the created policy. Table 2.3 summarizes the areas of policy that affect the processes in relation to clusters.

Table 2.3. Implications of measures under policy focused on clusters

Policy area	Consequences
Science and innovation	Clusters whose operations are related to the results of scientific research depend on the investment in science and technological development.
Competition	Competition is a prerequisite for the occurrence of dynamic clusters.
Trade	Relationships with global markets are essential for the development of clusters.
Integration	With progressive integration, clusters have access to the resources whose flow is due to the elimination of barriers (for some clusters it is a favourable situation, for others it is not).
Regional policy	Clusters benefit from regional development programmes.
Social policy	Improving the attractiveness of clusters is done by providing access to public services of higher quality.

Source: Own elaboration based on Sölvell 2009.

The beginnings of support for efforts aimed at the development of clusters in the EU date back to the early 1990s. Research carried out in the framework of the Europe Innova project, for cluster mapping, shows that in

most European countries, cluster-based policy was initiated in 1990-1994 and 2000-2004 [Europe Innova 2008]. Regarding Poland, measures to support cluster activities became available in the financial perspective 2000-2006, and more specifically in 2004-2006.

Taking the cluster-based policy into account, which leads to an effective increase of competitiveness and innovation, formulated cluster strategies in Poland include [Wojnicka et al. 2005]:

– mapping of cluster structures;
– support for clusters;
– taking clusters into consideration during the development and implementation of regional policies;
– support for local development and the SME sector through the use of clusters;
– use of clusters in order to attract FDI.

Unfortunately, cluster-based policy has not yet been separated in Poland from a number of other types of policies. However, the instruments designed to support clusters become more and more important in the policies designed to support innovation and competitiveness. Given the short-time horizon of the presence of clusters in the Polish economic debate, one should expect to see more ways in which cluster-based policy will gain on importance.

2.3. Regional differentiation of cluster development potential related to employment and number of entities

Natural conditions for the occurrence and development of clusters in general, including the ones in the agri-food sector, are those of economic nature, and result, first of all, from the phenomenon of spatial concentration of business entities and their agglomeration. In analytical terms it is all about identifiable and measurable economic potential, indicating the possible presence of sufficiently strong clusters, connected with the leading industries and their specialisation. A natural reflection of this potential is a spatial distribution of the number of entities and their employment levels, what will be the object of analysis in this sub-section.

Clusters, whose manifestation of occurrence is spatial concentration of entities forming them and of their employment, are recognised quite commonly as a factor effecting competitiveness and innovation significantly. The benefits arising from the effective operations of cluster structures in the economy may appear at different levels of aggregation of economic activities and can be

noticed in the dimensions of the analysis related to them, starting from the microeconomic aspect, by mesoeconomic up to the macroeconomic one.

Due to the occurrence of spatial aggregations of entities the concentration of relations based on competition occurs and, at the same time, favourable conditions for cooperation arise. Thus, the benefits from the functioning of clusters can take various forms, which is related to the multi-faceted character of these structures. This multidimensional character results, among others, from a diverse nature of the entities that participate in the life of a cluster. They include representatives of private and public sectors, entities of the R&D areas and sometimes a broad range of entities supporting its functioning while relations between them constitute the vertical and the horizontal dimension of the value chain.

There is no single universal scheme of cluster construction. This statement is valid regardless of the industry profile of a given aggregation of entities. Owing to the presence of forces of local nature that shape functioning of particular industries, the result of which are the differences in the functioning of the business environment, two clusters with the same specialisation profile can be characterised by a quite different construction and role that they play from the point of view of the market processes.

Clusters, as market structures, are given the whole set of features which may be treated as determinants of their occurrence within an economy. Van Dijk and Sverisson [2003] systemised them, by distinguishing three groups of them: characteristics subject to direct observation, fundamental (universal) characteristics and characteristics built in the course of theoretical reasoning. In the opinion of these authors, a direct observation takes places with regards to: the relative proximity considered from the spatial perspective, high density of business operations and presence of many enterprises that are involved in identical, similar or subsidiary activity. The fundamental characteristics include, in turn, relations between companies as a result of subcontracting and cooperation at vertical level, connections occurring as a result of cooperation at horizontal level and some degree of specialisation. The third group of features, namely characteristics built in the course of theoretical reasoning, includes such issues as institutional environment, learning processes, trust between business partners or level of technological sophistication.

In each economy we can indicate the presence of some, typical for a given location, groups of entities with characteristics of a cluster structure. They result from the fact that economic activity very often takes the form of clusters. Most of today's operating cluster structures, which constitute an example of success on the national and international markets, have developed independently from the activities of people and institutions designing and implementing economic

and regional policy. Thus, they are a natural response to reality and market processes of the entities' operating in the market. These naturally developed clusters are the result of the activities of market forces that, uninterrupted, allowed for an effective allocation of outlays resulting in positive outcomes from the local, regional, national or of supranational perspective. Sölvell [2009] indicates the presence of the so-called organic clusters, and their counterweight, i.e. planned clusters.

The search for clusters and their separation from a wide spectrum of market linkages normally takes place through identification of clusters with a specific industry profile in a given location. The presence of companies' cluster is a prerequisite to ensure that in the economic space, market processes accompanying clusters could occur, which will generate a number of benefits for the participants of economic activities. Thus, spatial concentration is a natural condition which must be fulfilled to enable the positive effects of clustering to take place.

Employment is the basic category proving the spatial specialisation of economic activity. The presence of clusters of entities with a specific industry profile facilitates the development of clusters in a natural manner. In the case of Poland, we are dealing with an uneven distribution of employment in particular voivodeships (Figure 2.3).

Figure 2.3. Average number of employees per voivodeship in 2011
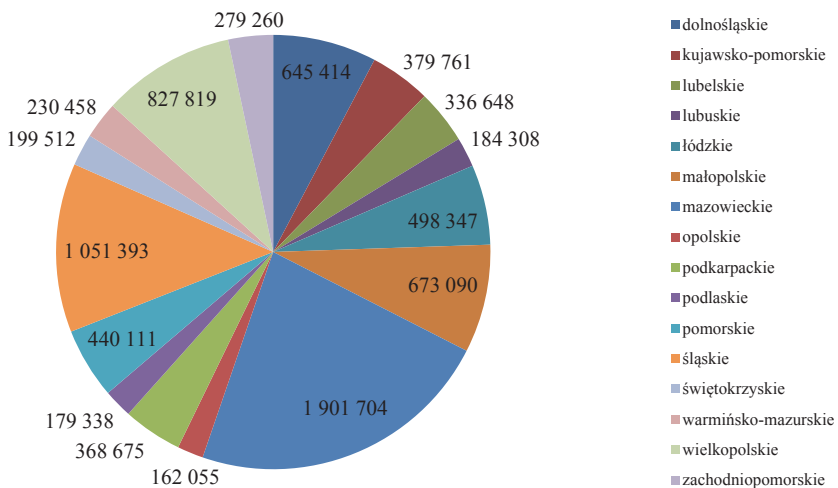
Source: Own elaboration based on data from the Central Statistical Office (GUS).

In 2011 the greatest share in the average number of employed persons was in the Mazowieckie voivodeship (22.75%), and the smallest in the Opolskie

voivodeship (1.94%). In recent years, the share of particular voivodeships in the average number of employed persons fluctuated slightly (Table 2.4). In some voivodeships, between 2005-2011, there was an increase in the share of national employment (e.g. in the Mazowieckie voivodeship by 2.05 p.p. between 2011 and 2005) and these, at the same time, were the voivodeships characterised by higher values of GDP and GDP per capita as compared to other regions.

Table 2.4. Structure of employment by voivodeship between 2005-2011 [%]

Voivodeship	Year						
	2005	2006	2007	2008	2009	2010	2011
Dolnośląskie	7.66	7.75	7.86	7.92	7.75	7.78	7.72
Kujawsko-Pomorskie	4.75	4.70	4.70	4.66	4.57	4.58	4.54
Lubelskie	4.10	4.06	4.00	3.97	3.93	4.05	4.03
Lubuskie	2.26	2.25	2.25	2.26	2.19	2.22	2.21
Łódzkie	6.02	5.98	6.00	6.02	5.89	6.01	5.96
Małopolskie	7.86	7.89	7.80	7.86	7.87	7.94	8.05
Mazowieckie	20.70	20.70	20.97	21.37	22.78	22.68	22.75
Opolskie	2.19	2.14	2.08	2.04	2.02	2.00	1.94
Podkarpackie	4.59	4.53	4.52	4.49	4.34	4.39	4.41
Podlaskie	2.33	2.30	2.28	2.23	2.17	2.14	2.15
Pomorskie	5.38	5.42	5.44	5.49	5.39	5.33	5.27
Śląskie	13.22	13.19	13.06	12.91	12.73	12.59	12.58
Świętokrzyskie	2.48	2.45	2.44	2.45	2.41	2.39	2.39
Warmińsko-Mazurskie	3.06	3.10	3.05	2.89	2.77	2.78	2.76
Wielkopolskie	9.79	9.91	10.00	9.91	9.77	9.74	9.90
Zachodniopomorskie	3.61	3.62	3.56	3.54	3.42	3.38	3.34

Source: Own elaboration based on data from the Central Statistical Office (GUS).

In most other cases the share in the average number of employed persons declined. This leads to the conclusion that in the analysed period, certain allocation of labour took place in the country, that consisted in regions with a higher level of productivity attracting workforce from regions with a lower level of productivity. It results from the fact that higher productivity makes it possible to offer higher remuneration, which is a principal driving force for migration of the employed persons.

A complementary method for determination of the development potential of clusters is an analytical approach for defining concentration which uses data regarding the number of entities functioning in the economy. In Poland, the source of such data is the REGON database which includes entities such as: corporations, organisational units without legal entity, natural persons

conducting business activity (also running individual agricultural farms) and local units of these entities.

Likewise in the case of employment, the spatial distribution of entities classified in the REGON database is quite diverse. The spatial concentration of entities is proven by the fact that a clearly higher number of entities is located only in few voivodeships (Figure 2.4). The voivodeships with the largest number of entities registered in the REGON database are: Mazowieckie, Śląskie and Wielkopolskie, in which, according to the data from the end of the 4th quarter of 2011, nearly 39% of all economic entities operating in the country were located.

Figure 2.4. Number of entities registered in the REGON database by voivodeship in 2011
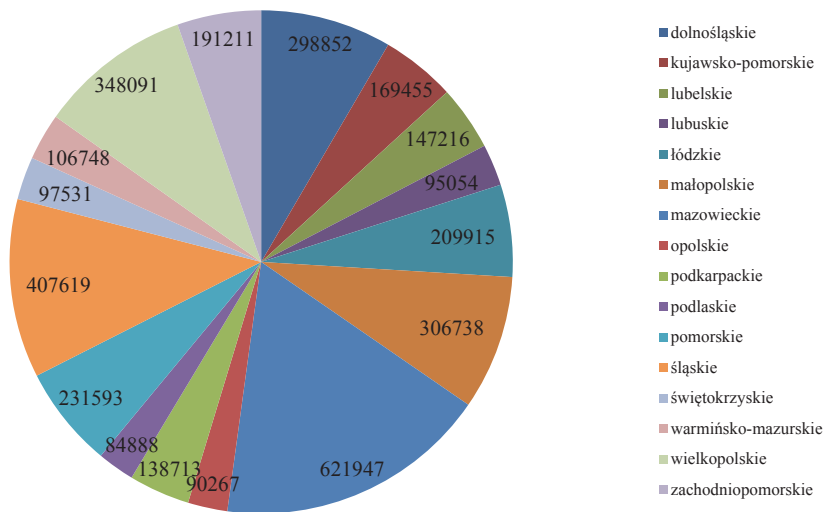
Source: Own elaboration based on data from the Central Statistical Office (GUS).

Between 2002 and 2011 the concentration of entities changed slightly. The Herfindahl-Hirshman coefficient, being one of the measures of the concentration, in 2002 was amounted to 0.0826, whereas in 2011 it was at the level of 0.088. Such change in the coefficient value indicates a growing concentration of entities, which is caused by a growth in shares of several voivodeships at the expense of others. In the analysed years, this share increased in the following voivodeships: Dolnośląskie, Małopolskie, Mazowieckie, Oposkie, Pomorskie and Wielkopolskie (Table 2.5).

Table 2.5. Distribution of the number of entities by voivodeship between 2002-2011 [%]

Voivodeship	Year									
	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011
Dolnośląskie	8.31	8.37	8.45	8.30	8.27	8.31	8.38	8.42	8.42	8.43
Kujawsko-Pomorskie	5.34	5.35	5.19	5.19	5.15	5.12	5.12	4.88	4.77	4.78
Lubelskie	4.20	4.23	4.15	4.09	4.11	4.08	4.08	4.18	4.19	4.15
Lubuskie	2.69	2.66	2.75	2.81	2.89	2.88	2.69	2.68	2.68	2.68
Łódzkie	6.66	6.71	6.89	6.94	6.67	6.56	6.47	5.89	5.92	5.92
Małopolskie	8.06	8.08	8.14	8.09	8.03	8.04	8.07	8.47	8.57	8.65
Mazowieckie	15.65	15.74	16.23	16.52	16.65	16.91	17.20	17.40	17.51	17.54
Opolskie	2.41	2.41	2.47	2.50	2.55	2.58	2.57	2.57	2.56	2.55
Podkarpackie	3.96	3.95	3.91	3.85	3.88	3.86	3.84	3.86	3.91	3.91
Podlaskie	3.15	3.10	2.56	2.47	2.46	2.42	2.41	2.42	2.37	2.39
Pomorskie	6.10	6.19	6.20	6.23	6.27	6.30	6.38	6.53	6.51	6.53
Śląskie	11.86	11.67	12.02	11.81	11.73	11.63	11.44	11.51	11.59	11.50
Świętokrzyskie	2.84	2.87	2.88	2.88	2.92	2.90	2.88	2.82	2.79	2.75
Warmińsko-Mazurskie	3.95	3.84	3.06	3.05	3.07	3.07	3.09	3.04	3.02	3.01
Wielkopolskie	9.27	9.31	9.42	9.50	9.56	9.61	9.67	9.68	9.67	9.82
Zachodniopomorskie	5.55	5.52	5.66	5.74	5.78	5.74	5.69	5.62	5.50	5.39

Source: Own elaboration based on data form the Central Statistical Office (GUS).

Altogether, the regional diversity of the development potential of agri-food clusters in Poland, determined on the basis of available data regarding the number of entities, was smaller than on the basis of available data regarding employment. The set of voivodeships where this type of potential appears to be the greatest, is also slightly different.

3. Mapping agri-food clusters in Poland

3.1. Methodological aspects of cluster mapping

Cluster mapping consists in the identification of objects and separation of their sets in a specified space. These objects are various, formally identifiable entities (companies, institutions, organisations etc.) and the space is a geographically designated area of economic activity (region of the world, country, voivodeship, etc). The analytical solutions used while mapping clusters may be of a diverse nature, though none of these solutions can be recognised as methodologically specific or unique, i.e. prepared and used only for this purpose.

Cluster mapping can be included in the class of issues of a typological or taxonomic nature from the mathematic perspective. Theoretically, the space in which mapping of clusters is carried out, may be treated as topological space, being a specified case of metric space which meets certain conditions. The term of metric space is understood as a set X with ρ *function: $X \times X \rightarrow$* R assigning each pair of elements (points) x, y $\in$ X the real number of ρ (x, y), referred to as the distance between x and y at fulfilment of the following conditions:

a) ρ (x, y) $\geq$ 0 and ρ (x, y) = 0 $\Leftrightarrow$ x = y,
b) ρ (x, y) = ρ (y, x),
c) ρ (x, z) $\leq$ 0 ρ (x, y) + ρ (x, y).

Function ρ is defined as metrics. To determine the distances between the objects differing in terms of specified measurable features, the following formula can be used:

$$\rho(x, y) = \sum_{i=1}^{n} |\bar{x}_i - \bar{y}_i|$$

where:
x, y – two objects of the selected population,
n – number of features,
$\bar{x}$, $\bar{y}$ – standardised characteristics with an *i* number, adequately of the object x and y.

On the basis of calculations it is possible, e.g. to build a taxonomic graph and then on the basis of its interpretation to classify the objects. However, such a seemingly obvious approach cannot be easily applied for cluster mapping. It results from the vague and rather blurry nature of the notion of cluster. It is difficult to group and classify unambiguously and without any doubts such highly heterogeneous entities. The reasons for these difficulties are, among others:
–   different scale and market scope of operations (from local to international) of the entities functioning in a given geographic area;

- diversity and infiltration of scopes with regards to the activities of entities (services of the same kind, e.g. bank services may be provided for many different companies operating in different fields);
- a lack of clear evaluation criteria of competitive and cooperative relations;
- a variety of roles performed by institutions and a lack of possibility to distinguish them clearly as those which are related or not related with clusters.

The implications of the definition of clusters burdened with lack of accuracy are quite numerous. The first and the main one is the freedom and conventionality in the identification of clusters, especially with regard to the delimitation of the geographic area of their operation. The second one, partially resulting from the first, is the generic diversity of identified clusters arising, which is understandable, from the nature of the economic activity in the given field (e.g. agriculture, extraction of minerals, etc.), but also from some arbitrariness in the recognition of a given entity as an element belonging to one particular cluster, which is difficult to avoid. An example can be a bank or banks providing services for numerous agri-food entities operating in a given geographic area, in which a strong financial sector is functioning. It is not obvious in which generic cluster type a bank or banks should be situated. Thirdly, it is difficult to speak not only about universal, generic types of clusters, but also about their composition, though Porter's definition, in this respect, contains clear postulates. However, they are seldom interpreted and met properly, the extreme example of which is when cluster initiatives are equated with clusters.

Generally speaking, treating clusters as sets in a metric space and specifying their topology designated by the metrics is not possible without a more clear definition of the term of a cluster. Also in this situation, the very term of mapping, having a strict meaning in mathematics (a synonym of a certain function) or the computer science (assignment of some resource systems to others), loses a lot of importance in the confrontation with a rather unclearly defined term of clusters. The ambiguity of the definition of clusters simply affects the freedom of analytical approaches to their mapping.

An additional problem in this regard is the availability of relevant data concerning entities operating in a given geographic area. Usually the source of this data is statistical databases containing information about registered business entities classified by the type of operations. Without taking into account the fact that the classification systems of economic activity may be characterised by a different degree of detail and distinctiveness of division criteria, and, as a consequence a lack of cohesion hindering comparisons, the registration of business entities reflects the location of their headquarters, and the classification of these entities is separable. Meanwhile, in the functioning of a cluster it is a company's

activity in a given geographic area that counts and it does not have to necessarily be fully consistent with the location of the registered office of the company. It applies especially to larger companies carrying out business activities in many locations. Also, the compliance with the separation condition and inclusion of some entities only in one type of a cluster, which is related to it, is a solution that raises controversies.

It should also be noted that different types of clusters mapped in different geographical areas, being a reflection of the type of economic activities carried out in that area, determined by factors of various nature, are difficult to be compared with, due to the lack of full conformity of the character of this activity, as well as due to a different degree of its technological advancement. Some clusters may be of a particular or even unique nature. As it results from some research, models of clusters also differ depending on the industry with which they are associated and the stage of the development cycle of the cluster itself [He and Fallah 2011].

From a methodological point of view, a very interesting attempt to address the theoretical gaps in the conceptual definition of clusters and difficulties that are caused by their mapping, is the algorithm for generating the set of definition of clusters suggested by Delgado et al. [2012]. These authors admit that the assignment of industries to clusters is a significant challenge because of numerous externalities, by which they are bound and difficulties with their direct measurement. While in some research, links between industries are measured, clusters are not being defined. On the other hand, defining clusters generally comes down to the use of customised measures of intersectoral links (e.g. relations of input-output or collocation of employment), which results in the fact that we can deal with information noise, mainly owing to the appearance of relations and restrictions of classification. Therefore, arbitrary expert decisions or use of idiosyncratic rules to overcome this noise are often necessary.

The proposed algorithm of generating operational definitions of clusters consists of the following steps:

- development of the matrices of links for each pair of industries on the basis of a multi-dimensional location analysis, the correlation of employment and presence of entities, coaglomeration index, the relations of input-output and correlation between professions represented by people working in the given geographic area;
- determination of parameters such as initial number of clusters, standardisation of data and admission initial values;
- formulation of the so-called cluster functions permitting to group the industries with regard to the maximisation criterion of the degree of links between the industries;

- groups' benchmarking, aimed mainly at obtaining such distribution, that will result in links between industries present in the cluster being greater than between clusters;
- assessment and characteristics of the identified clusters.

This slightly eclectic approach is essentially based on methods of cluster analysis, and the possibilities of its use in practice depend, to a large extent, on the availability of sufficiently detailed data. For this reason, in analytical practice, a number of alternative solutions and cluster mapping methods may be used.

Cluster mapping methods are characterised by the multiplicity of analytical approaches which is related to the distinctive feature of clusters, namely the incorporation of entities representing various areas of life into the groups of linkages of a cluster nature. These areas of life are of different nature and at the same time they operate using various managerial approaches, or they are focused in their action on different purposes. In the classic definition of a cluster [Porter 2001], the elements that may constitute its part, are:
- companies,
- specialised suppliers,
- service units,
- entities operating in related industries,
- institutions (e.g. research centres, universities, trade associations).

Therefore, most generally speaking, from the point of view of companies, the relations within clusters take place cross-sectionally as:
- company – company,
- company – business environment units,
- company – local government units (governmental units),
- company – R&D units.

The above mentioned separation of links, which potentially occur in a cluster, should be the evidence of complexity of the process consisting of separation of cluster structures in space. The difficulties in the identification of clusters are caused by the fact that in the literature there are many definitions of this term, which translates into complications in determining clearly, what it is. Additionally, the complexity of economic processes which takes place, should be considered as a very significant element affecting perception of the concept of clusters in the economy. These processes result in the occurrence of differences between particular locations where clusters of companies and entities related to them are being distinguished. The diversity of the environment of the companies affects these economic forms either in an economic, demographic, socio-cultural, political-legal or technological-environmental dimension. In

consequence, the characteristics of a cluster of a specific industry profile may be completely different, taking two different locations into account.

The analysis of clusters as parts of the economic system, may be conducted in relation to various levels of economic aggregation. A different point of view is accepted in the case of macroeconomic, mesoeconomic or microeconomic analyses. This results in the diversity regarding the selection of methods and research tools on particular levels of the analysis.

In the case of the research on a micro-scale, the separation of clusters from other economic entities is a multistage process. The proposal of Porter [2001] assumes that the particular stages of such process include the following activities:

− identification of companies in the cluster (depending on the form of the cluster, we can speak, for example, about clusters concentrated around one large entity or about more fragmented forms);
− analysis of the value chain, occurring both downwards and upwards;
− from the point of view of the cluster, separation of important links with the entities representing related and supporting industries;
− identification of entities which, thanks to their operations, are a source of skills, information, technology or capital and infrastructure;
− creation of bodies with normative and legal profiles that have impact on the functioning of companies in the cluster.

In the opinion of some authors [Brodzicki and Szultka 2002] three basic groups of research methods can be distinguished, which may be used in order to separate clusters from all market links, and the application of which is described and presented in literature. They include:

− expert method (monographic),
− input-output method,
− methods based on the analysis of clusters.

For some time, in economic sciences, we have been able to notice a growth in the interest in the application of a method of monographic nature, namely the case study. It is a form of research typical for social sciences and life sciences. Its application takes place within two dimensions. One of them is connected with an objective, which is the scientific research, the other one involves their use in the course of teaching (what is currently particularly popular in economic sciences, law and medicine).

Yin [2003] states that the case study should be considered as an empirical research in which:

− learning a certain contemporary phenomenon in its real context takes place;

- the boundary between this phenomenon and the context is not clearly visible;
- in the process of evidence collection diverse sources are being used.

Moreover, the selection of the case study as a form of research requires a priori decision, as to whether it is an appropriate methodological solution from the point of view of the research objective, in the context of alternative research approaches. Comparison of the case study with other forms of research may be based on the following criteria: type of the research question, the degree of control of the entity carrying out the research over the events of behavioral nature, and the degree of reference towards events of the current or historical nature (Table 3.1).

Table 3.1. Case study compared to other research strategies

Strategy	Form of research question	Requires control over behavioral events?	Focuses on contemporary events?
Experiment	how, why	yes	yes
Survey	who, what*, where, how many, how much	no	yes
Archival analysis	who, what*, where, how many, how much	no	yes/no
History	how, why	no	no
Case study	how, why	no	yes

* – what questions, if they are a part of an exploratory study, belong to all strategies
Source: Yin 2003.

The case study is subject to categorisation. Likewise, in the case of other approaches shown in Table 3.1 it may be stated that they are created bearing in mind three objectives [Yin 2003]:
- exploratory,
- descriptive,
- explanatory.

Carrying out research in the form of a case study should be based on the activity scheme taking place in the specific sequence. The purpose of such procedure is to ensure the features of the research, such as: methodological rigour, validity and credibility. One of the proposals for the implementation of the research with the use of a case study method consists of the following activities [Dooley 2002]:
- identification and definition of the research questions,
- selection of cases and techniques of data collection and their analysis,

- preparation for data collection,
- gathering data,
- evaluation and data analysis,
- preparation of the report.

Due to the possibility to use a number of sources of information along with accompanying tools (interview of a direct or indirect nature, expert method and others), the monographic method makes it possible to encompass many significant phenomena from the point of view of a cluster. Its use takes place very often within a micro dimension, therefore, the structure of a cluster can be explored in the most accurate manner, along with its development and its functioning [Brodzicki and Szultka 2002].

Nevertheless, the case study is recognised by some researchers as, in a sense, a controversial method. First of all, the objections towards it are formulated with regards to the lack of sufficient scientific rigour. It involves the fact that there is no single, commonly used method for carrying out this kind of research. It is also seen as a cost-consuming method [Chiucchi 2008]. Restrictions, which have to be taken into account in the case study, can be summarized in two points. Firstly, there is a significant risk concerning the subjectivity of the research. This subjectivity may concern the stage of research being carried out and the stage of reasoning. It is connected, among other things, with the fact that in the case study the key role belongs to the information of a qualitative nature. Secondly, due to the differences between particular aforementioned environments involving the development of clusters, the possibilities of making comparisons between clusters are limited, even when they are characterised by a similar or identical industry profile [Góra 2008a].

The input-output method, as opposed to the monographic methods, involves a greater objectivity with regard to the course of research implementation, and interpretation of the results. In essence, it comes down to the identification of links between the sectors distinguished in the research or branches of economy included in the analysed clusters. These links are of production flow nature, and in the process of research the so-called production matrices are created [Brodzicki and Szultka 2002].

The input-output method is a method close to the so-called innovative matrices, the application of which involves the separation of interactions taking place in the innovation processes. The problem with the application of this method is related mainly to the substantial costs of obtaining data, and the necessity for assessments of particular innovations [Brodzicki and Szultka 2002].

Despite the fact that as a result of the application of the input-output method it is possible to detect links between particular observations of the

studied group accurately, its application in practice for the purposes of mapping, encounters some restrictions. The largest barrier in this respect is the availability of relevant data that usually, with regard to input-output flows, is estimated and published at a high level of economic aggregation. Such an approach makes it significantly difficult to use them as means for cluster identification, as clusters are considered as structures functioning at the mesoeconomic level. Another problem results from the various classifications of economic activities that take place in the world, the comparability of which can be significantly limited.

With regard to the methods based on the analysis of clusters, the leading role in analytical literature and practice, among the determinants of the presence of clusters, belongs to the location quotient. The general formula for its calculation is as follows:

$$LQ = \frac{\frac{x_{ij}}{x_j}}{\frac{x_{in}}{x_n}}$$

where:

x_{ij} – value of the analysed variable i within the j area,
x_j – total value of the analysed variable in the j area,
x_{in} – value of the analysed variable i within the n reference area,
x_n – total value of the analysed variable within the n reference area.

In the vast majority of studies dedicated to the analysis of aggregations in the form of clusters, with the use of the location quotient, it is employment that plays the role of the variable, on the basis of which clusters are identified. In this case the formula is as follows:

$$LQ = \frac{\frac{e_{ij}}{e_j}}{\frac{e_{in}}{e_n}}$$

where:

e_{ij} – employment in the cluster i and the j region,
e_j – the total employment in the j region,
e_{in} – employment in the cluster i and in the country,
e_n – total employment in the country.

Due to the availability of statistical data necessary for the separation of clusters from the economic space, the significance of the method, namely the location quotient, turns out to be invaluable. Thanks to this method it is possible to carry out an objective comparison between clusters. In some cases, dependent on the degree of comparability of the available data sets, the LQ method may also

deliver conclusions regarding the presence of clusters within the area covering more than one region or country.

To summarise, the identification of clusters can be done by applying both quantitative and qualitative methods. Due to the deficiencies that are attributed to particular methods, it is often necessary to design such a process of identifying clusters in which both types of methods are used.

In the case of cluster identification, the attempts to pass from theoretical to methodical spheres, and, as a consequence, to prepare and effectively apply a mapping method, face a number of obstacles. The concept of clusters is present both in the economics and management sciences, what implies the diversity of research contexts in these disciplines. The diversity of typologies used with regards to clusters, lack of theorems with regards to their functioning – are only a few problems identified in the processes of analysis of this concept [Góra 2008b].

Clusters, as market structures, are characterised by the diversity of the types of business entities operating within their limits. The recognition of relations between particular links of cluster processes takes place on the basis of contractually approved systems of classification of economic activity.

The valid classification system of business activity in Poland – Polish Classification of Activities 2007 (PCA 2007) – is a system prepared with regard to the statistical classification of economic activities, NACE Rev2, which operates on the basis of the Regulation of the European Parliament and the European Council (no 1893/2006) of 20 December 2006. In Poland, the introduction of PCA in its present form took place thanks to the Regulation of the Council of Ministers of 24 December 2007. PCA 2007 retains its full consistency and comparability with NACE Rev2 within the methodological, conceptual, scope, and code dimensions. Within the classification, a hierarchically systematic division of sets, regarding the types of socio-economic activities of the business entities, is performed [stat.gov.pl/].

Polish Classification of Activities 2007 is a hierarchy, which consists of five levels. The hierarchical system makes the particular levels of the classification arranged in a clear manner, and the grouping inside the particular levels of the analysis is clearly highlighted. These levels are [*Zasady Budowy Klasyfikacji* 2007]:
- the first level (section) – marked by the use of a one letter notation, in which 21 grouping types of operations, clustering activities related to one another, have been distinguished, while taking into account a traditionally formed, general division of labour;
- the second level (division) – marked by the use of a two-digit numeric code in which 88 grouping types of operations, clustering activities by

features of primary importance, have been distinguished, while determining the degree of probability and while considering the links in the national economy;

- the third level (group) – marked by the use of a three-digit numeric code, in which 272 grouping types of operations, that can be separated from the perspective of the production process, intended use and the nature of the recipient of services, have been distinguished;
- the fourth level (class) – marked by the use of a four-digit numeric code, in which 615 grouping types of operations, that can be separated, have been distinguished, while taking into account issues regarding the specialisation of the production process or activity of a service nature;
- the fifth level (subclasses) – marked by the use of a five-digit alphanumeric code in which 654 grouping types of operations have been distinguished. In most cases, the subclasses correspond to the level of classes, and thus the additional separation of this level takes place.

The placement of an object within Polish Classification of Activities 2007 is based on the hierarchical principle and relies on a top-down method. The identification at the lower levels of classification must be compliant with its classification made at the higher levels of the PCA 2007. In the top-down method it is called for a commencement to classify operations of a given economic entity from the highest level of classification and then, going down the grouping, for the selection of a relevant grouping at the lower levels of classification [Principles for the Construction of Classification 2007].

The classification of business activities built in such a way constitutes a background for discussions concerning the identification of clusters in Poland. In the case of the agri-food sector, initial identification can be made using higher levels of the PCA 2007 which aggregate activities characteristic for it. These, first of all, are divisions 01, 10 and 11.

The methodology of separation of clusters adopted in the study is based on the approach used by scientists from the European Clusters Observatory, (ECO). They managed to transfer methods of spatial identification of clusters, worked out by the team of Professor M.E. Porter, Harvard Business School, USA, into European conditions. The method used for separation of clusters, according to the U.S. method, which is recognised as a pioneering approach in this respect, consists in arranging the types of operations according to the degree of co-location between them [Porter 2003].

In accordance to the classification of clusters established by the ECO, three types of agri-food clusters can be distinguished. The activity concentrated

in them consists of a number of classes of the classification system regarding economic activity (Table 3.2).

<p style="text-align:center">Table 3.2. The classes of PCA 2007 in agri-food clusters</p>

Type of cluster		
Agricultural Products	Processed Food	Farming and Animal Husbandry
01.61 – service activities supporting plant production	10.11 – processing and preservation of meat, excluding poultry	01.11 – cultivation of cereals, leguminous and oil plants for seeds, excluding rice
01.62 – service activities supporting breeding and farm animal husbandry	10.12 – processing and preservation of poultry	01.13 – the cultivation of vegetables, including melons, and the cultivation of root plants and tubers
01.63 – service activities following the harvest	10.13 – production of meat preserves, including products of poultry	01.24 – cultivation of trees with grain and stone fruit shrubs
01.64 – seed processing for the purposes of plant reproduction	10.31 – processing and preservation of potatoes	01.25 – cultivation of other trees, fruit shrubs and nuts
10.41 – production of oils and other liquid fats	10.32 – production of fruit and vegetable juices	01.30 – plant reproduction
10.81 – sugar production	10.39 – other processing and preservation of fruits and vegetables	01.41 – breeding and husbandry of dairy cattle
11.01 – distilling, rectification and mixing of alcohols	10.51 – milk processing and production of cheese	01.42 – breeding and husbandry of other dairy cattle and buffalos
11.02 – grape wine production	10.52 – ice cream production	01.45 – breeding and husbandry of sheep and goats
11.03 – production of cider and other wines	10.61 – manufacture of grinding cereal products	01.46 – breeding and husbandry of pigs
11.04 – production of other non-distilled fermented beverages	10.62 – production of starch and starch products	01.47 – breeding and husbandry of poultry
81.30 – service activities related to greenery management	10.71 – production of bakery products; production of fresh confectionary goods and cakes	01.49 – breeding and husbandry of other animals
	10.72 – production of crackers and biscuits; production of preserved confectionery goods and cakes	77.31 – rental and lease of agricultural machines and equipment

	10.73 – production of no-odles, dumplings, couscous and similar floury products	
	10.82 – production of cocoa, chocolate and confectionery products	
	10.83 – processing of tea and coffee	
	10.84 – spices production	
	10.85 – production of ready-made meals and dishes	
	10.86 – production of homogenised groceries and dietary food	
	10.89 – production of other groceries not classified elsewhere	
	10.91 – production of ready feed for animals	
	10.92 – production of ready feed for domestic animals	
	11.05 – production of beer	
	11.06 – malt production	
	23.13 – production of domestic glassware	
	23.19 – production and processing of remaining glass, including technical glassware	
	25.91 – production of metal containers	
	25.92 – production of packages made of metals	
	28.93 – production of machines used in food and tobacco processing and the beverage production	
	46.11 – activities of agents involved in the sale of crops, livestock, raw materials for the textile industry, and semi-finished products	
	46.21 – wholesale of cereals, unprocessed tobacco, seeds and feed for animals	
	46.23 – wholesale of livestock	

Source: Own elaboration based on the European Cluster Observatory 2012.

In Poland, the identification of the occurrence of agri-food clusters can be based on two types of data. This data is related to employment and to the number of entities within the national economy. In this study employment is analysed with regard to the period 2007-2010, whereas the number of entities is analysed within the time range including the period 2002-2011. The sources of the data employed are the Central Statistical Office and the database of the European Cluster Observatory.

Data from the REGON database obtained for purposes of mapping agri--food clusters is formulated in the given range of time in two forms. For the period between 2002-2009, the data at the level of classes and sub-classes has been made available by the Central Statistical Office (GUS) in accordance with Polish Classification of Activities 2004, whereas the data for the period between 2010-2011 was made available in accordance with PCA 2007. Therefore, the results of mapping agri-food clusters in the period 2002-2009, to some extent are burdened with the effect of a lack of full comparability, resulting from the need of transition from PCA 2004 to PCA 2007. In the case of the analysis of the presence of clusters from a dynamic perspective it is advisable, thus, to be careful while comparing these two above-mentioned intervals of time.

The inspiration for the adopted system of the assessment regarding the strength of agri-food clusters were the conditions for the occurrence of strong clusters prepared by the ECO in Stockholm. This methodology has been modified in terms of the objective of the research carried out. The strength of a cluster is assessed using the scale consisting of four grades: 0, 1, 2 and 3. The higher the grade the cluster receives, the greater its power in the economy. If the strength of a cluster is evaluated at the level of 0, it means that a given cluster has not fulfilled any of three conditions set for strong clusters. Grades of 1, 2, 3 receive clusters that fulfilled one, two or three conditions accordingly.

The first of the conditions is met in the case of agri-food clusters when their LQ ≥ 1. The verification of the second condition is carried out separately for each of the three cluster categories in question. The clusters that belong to 25% of the largest clusters in Poland of a given type are identified as the strong ones, taking their level of employment into account.

The third condition refers to the identification of those agri-food clusters that belong to the group of 25% of clusters with the largest percentage share in employment in the voivodeship, taking into account all 41 cluster categories of the European Cluster Observatory (ECO).

3.2. Regional distribution and strength of the agri-food clusters

The analysis of the presence of agri-food clusters was conducted in three dimensions. The first of them refers to the distribution of the examined feature between the analysed areas (size of a cluster), the other one determines the share of the examined feature within a given region (concentration of a cluster), and the third one refers to the relative share of the feature within a region divided by the relative share of the feature within the area of reference (location quotient).

The size of a cluster is measured by the reference of employment in a given cluster category within the voivodeship to the total employment in this category in Poland. The share calculated in this way makes it possible to classify the regions from the industry perspective. Tables 3.3-3.5 present data referring to the share of different voivodeships in employment in three types of agri-food clusters in the period 2007-2010.

Table 3.3. Distribution of employment in Agricultural Products clusters from the regional perspective in the period 2007-2010 [%]

Voivodeship	Year			
	2007	2008	2009	2010
Dolnośląskie	4.96	4.42	4.52	4.53
Kujawsko-Pomorskie	9.59	9.95	8.18	8.05
Lubelskie	4.86	5.75	5.59	4.99
Lubuskie	1.99	1.63	1.49	1.23
Łódzkie	6.42	6.30	5.47	6.70
Małopolskie	3.19	3.61	4.65	3.36
Mazowieckie	18.75	14.51	13.67	12.47
Opolskie	2.31	4.92	4.94	4.49
Podkarpackie	3.96	4.11	3.79	3.96
Podlaskie	2.53	1.82	2.14	2.14
Pomorskie	3.16	3.88	3.29	4.31
Śląskie	7.08	7.47	9.69	10.38
Świętokrzyskie	2.35	1.95	2.07	2.56
Warmińsko-Mazurskie	2.55	2.07	2.30	2.07
Wielkopolskie	22.75	23.81	23.71	25.09
Zachodniopomorskie	3.55	3.81	4.49	3.66

Source: Own elaboration based on data from the European Cluster Observatory, 2012.

Table 3.4. Distribution of employment in Processed Food clusters from the regional perspective in the period 2007-2010 [%]

Voivodeship	Year			
	2007	2008	2009	2010
Dolnośląskie	3.95	4.22	4.15	4.00
Kujawsko-Pomorskie	7.02	6.39	6.22	6.32
Lubelskie	5.01	4.93	5.14	5.17
Lubuskie	2.11	2.46	2.40	2.24
Łódzkie	6.75	6.67	6.85	6.86
Małopolskie	8.03	8.36	8.33	8.18
Mazowieckie	21.35	21.01	20.74	20.73
Opolskie	1.95	1.90	1.94	1.89
Podkarpackie	4.71	4.67	4.30	4.40
Podlaskie	3.72	3.35	3.64	3.54
Pomorskie	3.65	3.83	3.90	3.95
Śląskie	8.76	8.89	8.80	9.26
Świętokrzyskie	2.36	2.32	2.45	2.36
Warmińsko-Mazurskie	5.13	4.66	4.60	5.22
Wielkopolskie	12.78	13.39	13.59	13.01
Zachodniopomorskie	2.73	2.95	2.94	2.88

Source: Own elaboration based on data from the European Cluster Observatory, 2012.

Table 3.5. Distribution of employment in Farming and Animal Husbandry clusters from the regional perspective in the period 2007-2010 [%]

Voivodeship	Year			
	2007	2008	2009	2010
Dolnośląskie	9.24	10.66	10.53	9.82
Kujawsko-Pomorskie	12.06	13.42	13.92	12.25
Lubelskie	3.50	2.99	3.21	2.92
Lubuskie	5.38	4.47	4.38	5.51
Łódzkie	4.14	4.05	4.03	4.08
Małopolskie	5.95	5.17	4.34	4.30
Mazowieckie	4.19	3.30	3.93	4.09
Opolskie	4.14	5.21	5.37	5.16
Podkarpackie	1.71	1.46	1.87	1.77
Podlaskie	1.33	1.26	0.95	0.97
Pomorskie	6.70	6.97	3.62	4.44
Śląskie	5.53	4.01	3.47	3.61
Świętokrzyskie	0.47	0.55	0.67	0.79
Warmińsko-Mazurskie	4.56	3.65	3.89	3.21
Wielkopolskie	20.53	22.24	26.44	28.34
Zachodniopomorskie	10.57	10.58	9.39	8.76

Source: Own elaboration based on data from the European Cluster Observatory, 2012.

Agricultural Products clusters, identified at the level of voivodeships, are characterised by a large diversity of the distribution of this feature. The Wielkopolskie voivodeship has the highest percentage share (25.09% of the employment in the Agricultural Products cluster in 2010), whereas the fewest number of people in this type of cluster find a job in the Lubuskie voivodeship (1.23%). In the scale of the country, the share in employment throughout the examined period increased in the Wielkopolskie voivodeship, but in the case of the second voivodeship in the table (the Mazowieckie voivodeship) this share was reduced.

In the case of the second type of the analysed clusters, the highest share in employment was in the Mazowieckie voivodeship (20.73% in 2010). The Opolskie voivodeship is the voivodeship in which the employment in the Processed Food clusters is the lowest in the scale of the country (1.89%). Likewise, in the case of Agricultural Products and Processed Food clusters, the Farming and Animal Husbandry clusters are also characterised by a diverse distribution of the analysed feature. The highest share in employment in this cluster is in the Wielkopolskie voivodeship (28.34% in 2010, an upward tendency), whereas the lowest share applies to the Świętokrzyskie voivodeship (0.79%).

In the second aspect of cluster mapping, there is a reference of the employment in a given cluster category in a given region to the total employment in this region. In this way, the evaluation may be carried out regarding which of the clusters have the greatest share in the total employment at the regional level (Tables 3.6-3.8). Among clusters of an agri-food profile, the clusters that stand out in this dimension are Processed Food clusters, among which even more than 7% of all persons employed in the given voivodeship (the Podlaskie voivodeship) find employment.

The last of the analysed dimensions – location quotient – as a measure of effectiveness regarding the degree of industry specialisation, in essence, makes it possible to compare the share of the examined feature of a cluster in the region with the share of this feature within the area of reference (Poland). In Tables 3.9-3.11 the values of location quotients for three types of agri-food clusters have been presented, which are calculated in reference to employment ($LQ_{empl.}$) in the period 2007-2010.

Table 3.6. Share of Agricultural Products clusters in employment in Polish voivodeships in the period 2007-2010 [%]

Voivodeship	Year			
	2007	2008	2009	2010
Dolnośląskie	0.27	0.21	0.22	0.21
Kujawsko-Pomorskie	0.87	0.79	0.67	0.62
Lubelskie	0.52	0.54	0.54	0.46
Lubuskie	0.38	0.27	0.26	0.20
Łódzkie	0.46	0.39	0.36	0.41
Małopolskie	0.17	0.17	0.22	0.15
Mazowieckie	0.38	0.25	0.23	0.20
Opolskie	0.47	0.89	0.92	0.79
Podkarpackie	0.37	0.34	0.33	0.32
Podlaskie	0.47	0.30	0.37	0.35
Pomorskie	0.25	0.26	0.23	0.29
Śląskie	0.23	0.21	0.29	0.29
Świętokrzyskie	0.41	0.29	0.32	0.38
Warmińsko-Mazurskie	0.36	0.26	0.31	0.26
Wielkopolskie	0.97	0.89	0.91	0.91
Zachodniopomorskie	0.43	0.40	0.49	0.38

Source: Own elaboration based on data from the European Cluster Observatory, 2012.

Table 3.7. Share of Processed Food clusters in employment in Polish voivodeships in the period 2007-2010 [%]

Voivodeship	Year			
	2007	2008	2009	2010
Dolnośląskie	2.40	2.52	2.45	2.40
Kujawsko-Pomorskie	7.12	6.48	6.24	6.44
Lubelskie	6.04	5.93	6.06	6.26
Lubuskie	4.49	5.15	5.04	4.74
Łódzkie	5.47	5.32	5.41	5.56
Małopolskie	4.91	5.02	4.85	4.81
Mazowieckie	4.86	4.64	4.17	4.27
Opolskie	4.47	4.39	4.40	4.40
Podkarpackie	4.98	4.90	4.54	4.68
Podlaskie	7.79	7.10	7.69	7.73
Pomorskie	3.20	3.28	3.31	3.46
Śląskie	3.20	3.25	3.16	3.43
Świętokrzyskie	4.62	4.47	4.67	4.61
Warmińsko-Mazurskie	8.04	7.60	7.60	8.76
Wielkopolskie	6.10	6.38	6.37	6.24
Zachodniopomorskie	3.66	3.94	3.94	3.98

Source: Own elaboration based on data from the European Cluster Observatory, 2012.

Table 3.8. Share of Farming and Animal Husbandry clusters in employment in Polish voivodeships in the period 2007-2010 [%]

Voivodeship	Year			
	2007	2008	2009	2010
Dolnośląskie	0.33	0.33	0.34	0.33
Kujawsko-Pomorskie	0.72	0.71	0.76	0.69
Lubelskie	0.25	0.19	0.21	0.20
Lubuskie	0.68	0.49	0.50	0.65
Łódzkie	0.20	0.17	0.17	0.18
Małopolskie	0.22	0.16	0.14	0.14
Mazowieckie	0.06	0.04	0.04	0.05
Opolskie	0.56	0.63	0.66	0.67
Podkarpackie	0.11	0.08	0.11	0.10
Podlaskie	0.16	0.14	0.11	0.12
Pomorskie	0.35	0.31	0.17	0.22
Śląskie	0.12	0.08	0.07	0.07
Świętokrzyskie	0.05	0.06	0.07	0.09
Warmińsko-Mazurskie	0.42	0.31	0.35	0.30
Wielkopolskie	0.58	0.55	0.67	0.75
Zachodniopomorskie	0.84	0.74	0.68	0.67

Source: Own elaboration based on data from the European Cluster Observatory, 2012.

Table 3.9. LQ_{empl} values for Agricultural Products clusters in Polish voivodeships in the period 2007-2010

Voivodeship	Year			
	2007	2008	2009	2010
Dolnośląskie	0.62	0.56	0.57	0.58
Kujawsko-Pomorskie	1.98	2.09	1.75	1.70
Lubelskie	1.19	1.43	1.41	1.26
Lubuskie	0.87	0.72	0.68	0.55
Łódzkie	1.05	1.03	0.94	1.12
Małopolskie	0.39	0.45	0.57	0.41
Mazowieckie	0.87	0.66	0.60	0.55
Opolskie	1.07	2.36	2.40	2.17
Podkarpackie	0.84	0.90	0.86	0.88
Podlaskie	1.07	0.79	0.96	0.96
Pomorskie	0.57	0.69	0.60	0.79
Śląskie	0.52	0.56	0.76	0.79
Świętokrzyskie	0.94	0.77	0.83	1.04
Warmińsko-Mazurskie	0.82	0.69	0.81	0.71
Wielkopolskie	2.21	2.36	2.37	2.49
Zachodniopomorskie	0.98	1.06	1.28	1.04

Source: Own elaboration based on data from the European Cluster Observatory, 2012.

Table 3.10. LQ$_{empl}$ values for Processed Food clusters in Polish voivodeships in the period 2007-2010

Voivodeship	Year			
	2007	2008	2009	2010
Dolnośląskie	0.49	0.52	0.53	0.50
Kujawsko-Pomorskie	1.45	1.34	1.34	1.34
Lubelskie	1.23	1.23	1.30	1.30
Lubuskie	0.91	1.07	1.08	0.99
Łódzkie	1.11	1.10	1.16	1.16
Małopolskie	1.00	1.04	1.04	1.00
Mazowieckie	0.99	0.96	0.89	0.89
Opolskie	0.91	0.91	0.94	0.92
Podkarpackie	1.01	1.01	0.97	0.97
Podlaskie	1.58	1.47	1.65	1.61
Pomorskie	0.65	0.68	0.71	0.72
Śląskie	0.65	0.67	0.68	0.71
Świętokrzyskie	0.94	0.93	1.00	0.96
Warmińsko-Mazurskie	1.63	1.57	1.63	1.82
Wielkopolskie	1.24	1.32	1.37	1.30
Zachodniopomorskie	0.74	0.82	0.84	0.83

Source: Own elaboration based on data from the European Cluster Observatory, 2012.

Table 3.11. LQ$_{empl}$ values for Farming and Animal Husbandry clusters in Polish voivodeships in the period 2007-2010

Voivodeship	Year			
	2007	2008	2009	2010
Dolnośląskie	1.13	1.31	1.34	1.24
Kujawsko-Pomorskie	2.48	2.82	3.00	2.60
Lubelskie	0.86	0.75	0.83	0.75
Lubuskie	2.34	1.94	1.98	2.45
Łódzkie	0.69	0.67	0.67	0.68
Małopolskie	0.76	0.63	0.55	0.53
Mazowieckie	0.21	0.16	0.16	0.19
Opolskie	1.93	2.50	2.61	2.52
Podkarpackie	0.38	0.32	0.43	0.38
Podlaskie	0.55	0.56	0.43	0.45
Pomorskie	1.20	1.23	0.67	0.83
Śląskie	0.41	0.32	0.28	0.26
Świętokrzyskie	0.17	0.24	0.28	0.34
Warmińsko-Mazurskie	1.44	1.23	1.38	1.13
Wielkopolskie	1.99	2.18	2.65	2.82
Zachodniopomorskie	2.89	2.94	2.69	2.52

Source: Own elaboration based on data from the European Cluster Observatory, 2012.

In the case of voivodeships where the location quotient is at a level above 1, it may be assumed that within their areas we are dealing with a sectoral specialisation. Every value exceeding 1 means that the given voivodeship is more specialised within the specific type of a cluster than the average value in the entire country.

Considering the three criteria of evaluation (size, focus, location quotient), in Tables 3.12-3.14, the ranking of strength of agri-food clusters in Poland has been presented, with reference to employment as the main variable. The number of points assigned to clusters in voivodeships depends on the fulfilment of threshold conditions related to adopted criteria of evaluation. The first condition to consider a cluster as strong is if the value of LQ is at least 1. Verifying the fulfilment of the second condition, the largest clusters, within each from three of the analysed categories in the scale of the country, have been separated (four out of sixteen voivodeships). In the case of the Agricultural Products clusters, this condition was fulfilled in the following voivodeships: Wielkopolskie, Mazowieckie, Kujawsko-Pomorskie and Śląskie. The voivodeships meeting this condition with regards to Processed Food clusters, included: Mazowieckie, Wielkopolskie, Małopolskie and Śląskie. The Wielkopolskie, Kujawsko--Pomorskie, Dolnośląskie, Zachodniopomorskie voivodeships fulfilled the second condition with regards to Farming and Animal Husbandry clusters.

Table 3.12. Strength of Agricultural Products clusters by employment in the period 2007-2010

Voivodeship	Year			
	2007	2008	2009	2010
Dolnośląskie	0	0	0	0
Kujawsko-Pomorskie	2	2	2	2
Lubelskie	1	1	1	1
Lubuskie	0	0	0	0
Łódzkie	1	1	0	1
Małopolskie	0	0	0	0
Mazowieckie	1	1	1	1
Opolskie	1	1	1	1
Podkarpackie	0	0	0	0
Podlaskie	1	0	0	0
Pomorskie	0	0	0	0
Śląskie	1	1	1	1
Świętokrzyskie	0	0	0	1
Warmińsko-Mazurskie	0	0	0	0
Wielkopolskie	2	2	2	2
Zachodniopomorskie	0	1	1	1

Source: Own elaboration.

**Table 3.13. Strength of Processed Food clusters by employment
in the period 2007-2010**

Voivodeship	Year			
	2007	2008	2009	2010
Dolnośląskie	1	1	1	1
Kujawsko-Pomorskie	2	2	2	2
Lubelskie	2	2	2	2
Lubuskie	1	2	2	1
Łódzkie	2	2	2	2
Małopolskie	2	3	3	3
Mazowieckie	2	2	2	2
Opolskie	1	1	1	1
Podkarpackie	2	2	1	1
Podlaskie	2	2	2	2
Pomorskie	1	1	1	1
Śląskie	2	2	2	2
Świętokrzyskie	1	1	2	1
Warmińsko-Mazurskie	2	2	2	2
Wielkopolskie	3	3	3	3
Zachodniopomorskie	1	1	1	1

Source: Own elaboration.

**Table 3.14. Strength of Farming and Animal Husbandry clusters by
employment in the period 2007-2010**

Voivodeship	Year			
	2007	2008	2009	2010
Dolnośląskie	2	2	2	2
Kujawsko-Pomorskie	2	2	2	2
Lubelskie	0	0	0	0
Lubuskie	1	1	1	1
Łódzkie	0	0	0	0
Małopolskie	0	0	0	0
Mazowieckie	0	0	0	0
Opolskie	1	1	1	1
Podkarpackie	0	0	0	0
Podlaskie	0	0	0	0
Pomorskie	1	1	0	0
Śląskie	0	0	0	0
Świętokrzyskie	0	0	0	0
Warmińsko-Mazurskie	1	1	1	1
Wielkopolskie	2	2	2	2
Zachodniopomorskie	2	2	2	2

Source: Own elaboration.

Verifying the third condition it has been stated that the Processed Food cluster is the only one out of three types of clusters related to the agri-food sector, belonging to 25% of clusters with the largest share in the employment in particular voivodeships.

Generally speaking, the strongest agri-food clusters at the level of voivodeships are the Processed Food clusters. In this category each of the NUTS2 regions received at least one point within the adopted scale. In addition, in accordance with the adopted criteria, only in this type of clusters it was possible to grant the highest grade of three-points evaluation in two cases (the Małopolskie voivodeship and the Wielkopolskie voivodeship).

The second possible way to separate clusters in an area, which was used as an alternative approach in relation to the one based on employment, is the identification of the strength of clusters based upon the data relating to the number of entities of the national economy.

In Tables 3.15-3.17 the results of the calculations with regard to the location quotient between 2002-2011 are presented. In the Agricultural Products clusters, the voivodeships with the highest value of LQ_{entity} throughout the examined period were: Kujawsko-Pomorskie, Lubelskie, Łódzkie, Opolskie, Podlaskie, Warmińsko-Mazurskie and Wielkopolskie.

In the case of Processed Food clusters in the scale of the country, the following voivodeships stood out: Kujawsko-Pomorskie, Łódzkie, Opolskie, Podkarpackie, Podlaskie, Świętokrzyskie and Wielkopolskie. Whereas the location quotients calculated for the Farming and Animal Husbandry clusters were the highest in the case of the following voivodeships: Lubelskie, Lubuskie, Opolskie, Warmińsko-Mazurskie and Wielkopolskie.

Table 3.15. LQ$_{entity}$ of Polish Agricultural Products clusters in the period 2002-2011

Voivodeship	Year									
	2002*	2003*	2004*	2005*	2006*	2007*	2008*	2009*	2010	2011
Dolnośląskie	0.57	0.58	0.66	0.72	0.73	0.75	0.75	0.78	0.77	0.77
Kujawsko-Pomorskie	1.57	1.49	1.54	1.54	1.49	1.39	1.38	1.46	1.65	1.62
Lubelskie	1.84	1.87	1.82	1.72	1.77	1.74	1.66	1.51	1.60	1.64
Lubuskie	0.73	0.72	0.93	0.96	1.02	1.07	1.14	1.10	1.15	1.19
Łódzkie	1.24	1.26	1.28	1.23	1.25	1.23	1.26	1.31	1.24	1.22
Małopolskie	0.72	0.70	0.68	0.70	0.68	0.70	0.71	0.72	0.77	0.74
Mazowieckie	1.23	1.20	1.00	0.95	0.93	0.95	0.93	0.93	0.88	0.85
Opolskie	0.98	1.05	1.45	1.47	1.44	1.48	1.45	1.39	1.27	1.23
Podkarpackie	1.00	0.96	0.87	0.88	0.89	0.85	0.84	0.82	0.93	0.97
Podlaskie	1.29	1.41	1.52	1.53	1.51	1.48	1.45	1.42	1.48	1.46
Pomorskie	0.72	0.71	0.69	0.70	0.72	0.74	0.73	0.74	0.76	0.76
Śląskie	0.57	0.61	0.65	0.65	0.65	0.66	0.65	0.66	0.66	0.65
Świętokrzyskie	1.03	0.99	0.83	0.80	0.77	0.80	0.80	0.83	0.96	1.12
Warmińsko-Mazurskie	0.87	0.89	1.11	1.18	1.15	1.13	1.18	1.20	1.19	1.20
Wielkopolskie	1.23	1.27	1.34	1.34	1.37	1.33	1.37	1.36	1.27	1.28
Zachodniopomorskie	0.67	0.72	0.77	0.85	0.86	0.87	0.89	0.96	0.93	0.94

* – estimation

Source: Own elaboration based on data from the Central Statistical Office (GUS).

Table 3.16. LQ$_{entity}$ of Polish Processed Food clusters in the period 2002-2011

Voivodeship	Year									
	2002*	2003*	2004*	2005*	2006*	2007*	2008*	2009*	2010	2011
Dolnośląskie	0.71	0.72	0.72	0.71	0.71	0.70	0.69	0.69	0.72	0.75
Kujawsko-Pomorskie	1.22	1.20	1.21	1.21	1.21	1.20	1.22	1.23	1.19	1.19
Lubelskie	1.54	1.53	1.53	1.53	1.53	1.54	1.53	1.45	1.28	1.30
Lubuskie	0.90	0.91	0.93	0.92	0.90	0.89	0.89	0.93	0.91	0.90
Łódzkie	1.31	1.30	1.27	1.28	1.32	1.32	1.33	1.38	1.39	1.38
Małopolskie	0.97	0.97	0.99	0.99	0.99	0.99	0.99	0.99	1.03	1.01
Mazowieckie	0.92	0.91	0.89	0.88	0.89	0.89	0.88	0.86	0.84	0.84
Opolskie	1.09	1.09	1.10	1.12	1.11	1.09	1.10	1.13	1.17	1.18
Podkarpackie	1.22	1.22	1.18	1.18	1.18	1.16	1.16	1.17	1.12	1.11
Podlaskie	0.98	1.01	1.12	1.14	1.13	1.18	1.17	1.14	1.13	1.14
Pomorskie	0.71	0.71	0.70	0.71	0.70	0.70	0.69	0.71	0.76	0.73
Śląskie	0.78	0.79	0.79	0.80	0.81	0.81	0.82	0.85	0.92	0.93
Świętokrzyskie	1.36	1.35	1.35	1.33	1.32	1.34	1.36	1.34	1.24	1.26
Warmińsko-Mazurskie	0.72	0.73	0.89	0.92	0.90	0.89	0.89	0.90	0.93	0.91
Wielkopolskie	1.44	1.43	1.39	1.37	1.36	1.36	1.36	1.32	1.30	1.29
Zachodniopomorskie	0.65	0.65	0.65	0.65	0.66	0.67	0.68	0.72	0.74	0.76

* – estimation

Source: Own elaboration based on data from the Central Statistical Office (GUS).

Table 3.17. LQ_entity of Polish Farming and Animal Husbandry clusters in the period 2002-2011

Voivodeship	Year									
	2002*	2003*	2004*	2005*	2006*	2007*	2008*	2009*	2010	2011
Dolnośląskie	0.68	0.67	0.66	0.65	0.64	0.66	0.66	0.69	0.70	0.69
Kujawsko-Pomorskie	0.86	0.85	0.84	0.83	0.81	0.83	0.84	0.91	0.97	0.99
Lubelskie	1.28	1.25	1.16	1.11	1.12	1.15	1.14	1.10	1.08	1.10
Lubuskie	1.47	1.46	1.48	1.44	1.41	1.42	1.53	1.52	1.47	1.49
Łódzkie	0.96	0.94	1.09	1.08	1.11	1.12	1.12	1.11	1.07	1.04
Małopolskie	1.07	1.04	0.78	0.76	0.79	0.78	0.77	0.73	0.69	0.66
Mazowieckie	0.67	0.67	0.67	0.65	0.64	0.64	0.63	0.65	0.65	0.66
Opolskie	1.35	1.68	2.33	2.34	2.27	2.22	2.26	2.44	2.55	2.56
Podkarpackie	0.47	0.47	0.46	0.46	0.45	0.44	0.43	0.43	0.38	0.37
Podlaskie	1.24	1.21	0.73	0.76	0.78	0.79	0.81	0.80	0.76	0.77
Pomorskie	0.54	0.52	0.57	0.63	0.61	0.59	0.57	0.57	0.62	0.59
Śląskie	0.59	0.61	0.68	0.70	0.71	0.73	0.74	0.74	0.68	0.66
Świętokrzyskie	0.87	0.81	0.49	0.47	0.46	0.44	0.46	0.50	0.51	0.51
Warmińsko-Mazurskie	2.18	2.10	1.43	1.50	1.48	1.48	1.53	1.57	1.58	1.64
Wielkopolskie	2.19	2.22	2.61	2.59	2.60	2.56	2.52	2.42	2.45	2.45
Zachodniopomorskie	0.78	0.79	0.89	0.89	0.88	0.90	0.89	0.95	1.04	1.08

* – estimation

Source: Own elaboration based on data form the Central Statistical Office (GUS).

In Table 3.18, distribution of the number of entities assigned to particular types of agri-food clusters, in particular voivodeships, has been presented. With regard to the size of clusters, the voivodeship with the largest share in the number of entities within the Agricultural Products clusters in 2011, was the Mazowieckie voivodeship (14.9%). The smallest share of such type of entities was in the Świętokrzyskie voivodeship (3.08%). In the Processed Food clusters, the majority of entities were in the Mazowieckie voivodeship (14.77%), the fewest number of those was in the Lubuskie voivodeship (2.43%). The Farming and Animal Husbandry clusters with the largest share of this kind of entities are located in the Wielkopolskie voivodeship, whereas the Świętokrzyskie voivodeship has the fewest number of entities operating within this cluster in Poland (1.39%).

Table 3.18. Distribution of the number of entities in agri-food clusters from the regional perspective in the period 2010-2011 [%]

Voivodeship	Cluster type					
	Agricultural Products		Processed Food		Farming and Animal Husbandry	
	Year		Year		Year	
	2010	2011	2010	2011	2010	2011
Dolnośląskie	6.45	6.52	6.10	6.31	5.89	5.78
Kujawsko-Pomorskie	7.88	7.74	5.71	5.70	4.64	4.71
Lubelskie	6.70	6.82	5.35	5.38	4.53	4.58
Lubuskie	3.09	3.19	2.45	2.43	3.95	4.00
Łódzkie	7.33	7.20	8.20	8.18	6.33	6.18
Małopolskie	6.58	6.38	8.79	8.75	5.89	5.74
Mazowieckie	15.32	14.90	14.72	14.77	11.41	11.58
Opolskie	3.26	3.12	3.00	2.99	6.52	6.52
Podkarpackie	3.64	3.80	4.38	4.34	1.49	1.46
Podlaskie	3.51	3.50	2.67	2.73	1.81	1.85
Pomorskie	4.94	4.96	4.97	4.78	4.05	3.85
Śląskie	7.64	7.49	10.70	10.64	7.86	7.55
Świętokrzyskie	2.68	3.08	3.47	3.47	1.44	1.39
Warmińsko-Mazurskie	3.60	3.62	2.81	2.74	4.77	4.95
Wielkopolskie	12.25	12.59	12.59	12.67	23.73	24.03
Zachodniopomorskie	5.10	5.07	4.10	4.10	5.70	5.81

Source: Own elaboration based on data from the Central Statistical Office (GUS).

The entities operating within the agri-food clusters, in many cases, represent a small part of entities operating in particular regional economies. Table 3.19 presents a specification regarding the three analysed types of clusters divided into voivodeships.

**Table 3.19. Share of agri-food clusters in the number of entities
in particular voivodeships in the period 2010-2011 [%]**

Voivodeship	Cluster type					
	Agricultural Products		Processed Food		Farming and Animal Husbandry	
	Year		Year		Year	
	2010	2011	2010	2011	2010	2011
Dolnośląskie	0.37	0.41	0.75	0.79	0.47	0.48
Kujawsko-Pomorskie	0.79	0.86	1.24	1.26	0.66	0.69
Lubelskie	0.77	0.87	1.33	1.37	0.73	0.77
Lubuskie	0.55	0.63	0.95	0.96	1.00	1.04
Łódzkie	0.60	0.65	1.44	1.47	0.72	0.73
Małopolskie	0.37	0.39	1.07	1.07	0.47	0.46
Mazowieckie	0.42	0.45	0.88	0.89	0.44	0.46
Opolskie	0.61	0.65	1.22	1.25	1.72	1.79
Podkarpackie	0.45	0.52	1.17	1.18	0.26	0.26
Podlaskie	0.71	0.78	1.17	1.21	0.52	0.54
Pomorskie	0.37	0.40	0.79	0.78	0.42	0.41
Śląskie	0.32	0.35	0.96	0.98	0.46	0.46
Świętokrzyskie	0.46	0.60	1.29	1.34	0.35	0.35
Warmińsko-Mazurskie	0.57	0.64	0.97	0.97	1.07	1.15
Wielkopolskie	0.61	0.68	1.35	1.37	1.66	1.71
Zachodniopomorskie	0.45	0.50	0.78	0.81	0.70	0.75

Source: Own elaboration based on data from the Central Statistical Office (GUS).

Likewise, with regard to employment, the evaluation of the strength of agri-food clusters was carried out taking into account the variable of the number of entities of the national economy classified into a given category of activity. The results of this evaluation have been presented in Tables 3.20-3.22.

Generally speaking, it can be stated that in spite of some differences, especially from the regional perspective, they illustrate the strength of the analysed agri-food clusters that is quite similar to the one obtained with the use of data concerning employment. Hence, among the analysed three types of clusters, the strongest ones turned out to be those associated with food processing.

It can also be noticed that changes in the strength of the analysed clusters over the period 2002-2011 were rather minor, no matter of the type of cluster considered. In other words, there were no spectacular shifts between voivodeships and only in a few cases the clusters became stronger or weaker by one point. It means that formation of strong agri-food clusters is an evolutionary process, which requires time and does not happen the same way in every voivodeship.

Table 3.20. Strength of Agricultural Products clusters by the number of entities in the period 2002-2011

Voivodeship	Year									
	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011
Dolnośląskie	0	0	0	0	0	0	0	0	0	0
Kujawsko-Pomorskie	2	2	2	2	2	1	1	1	2	2
Lubelskie	1	1	1	1	1	2	1	1	1	2
Lubuskie	0	0	0	0	1	1	1	1	1	1
Łódzkie	2	2	2	2	2	2	2	2	1	1
Małopolskie	0	0	0	0	0	0	0	0	0	0
Mazowieckie	2	2	1	1	1	1	1	1	1	1
Opolskie	0	1	1	1	1	1	1	1	1	1
Podkarpackie	0	0	0	0	0	0	0	0	0	0
Podlaskie	1	1	1	1	1	1	1	2	2	2
Pomorskie	0	0	0	0	0	0	0	0	0	0
Śląskie	0	0	0	0	0	1	1	1	1	1
Świętokrzyskie	1	0	0	0	0	0	0	0	0	1
Warmińsko-Mazurskie	0	0	1	1	1	1	1	1	1	1
Wielkopolskie	2	2	2	2	2	2	2	2	2	2
Zachodniopomorskie	0	0	0	0	0	0	0	0	0	0

Source: Own elaboration based on data from the Central Statistical Office (GUS).

Table 3.21. Strength of Processed Food clusters by the number of entities in the period 2002-2011

Voivodeship	Year									
	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011
Dolnośląskie	1	1	1	1	1	1	1	1	1	1
Kujawsko-Pomorskie	2	2	2	2	2	2	2	2	2	2
Lubelskie	2	2	2	2	2	2	2	2	2	2
Lubuskie	1	1	1	1	1	1	1	1	1	1
Łódzkie	3	3	3	3	3	3	3	2	2	2
Małopolskie	1	1	1	1	1	1	1	2	3	3
Mazowieckie	2	2	2	2	2	2	2	2	2	2
Opolskie	2	2	2	2	2	2	2	2	2	2
Podkarpackie	2	2	2	2	2	2	2	2	2	2
Podlaskie	1	2	2	2	2	2	2	2	2	2
Pomorskie	1	1	1	1	1	1	1	1	0	0
Śląskie	2	2	2	2	2	2	2	2	2	2
Świętokrzyskie	2	2	2	2	2	2	2	2	2	2
Warmińsko-Mazurskie	1	1	1	1	1	1	1	1	1	1
Wielkopolskie	3	3	3	3	3	3	3	3	3	3
Zachodniopomorskie	1	1	1	1	1	0	1	1	1	1

Source: Own elaboration based on data from the Central Statistical Office (GUS).

Table 3.22. Strength of Farming and Animal Husbandry clusters by the number of entities in the period 2002-2011

Voivodeship	Year									
	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011
Dolnośląskie	0	0	0	0	0	0	0	0	0	0
Kujawsko-Pomorskie	0	0	0	0	0	0	0	0	0	0
Lubelskie	2	2	1	1	1	1	1	1	1	1
Lubuskie	2	2	2	2	2	2	2	2	2	2
Łódzkie	1	0	2	2	2	2	2	2	1	1
Małopolskie	3	3	0	0	0	0	0	0	0	0
Mazowieckie	1	1	1	1	1	1	1	1	1	1
Opolskie	2	2	2	2	2	2	2	2	3	3
Podkarpackie	0	0	0	0	0	0	0	0	0	0
Podlaskie	2	2	0	0	0	0	0	0	0	0
Pomorskie	0	0	0	0	0	0	0	0	0	0
Śląskie	0	0	1	1	1	1	1	1	1	1
Świętokrzyskie	1	1	0	0	0	0	0	0	0	0
Warmińsko-Mazurskie	3	3	2	2	2	2	2	2	2	2
Wielkopolskie	3	3	3	3	3	3	3	3	3	3
Zachodniopomorskie	0	0	0	0	0	0	0	0	1	1

Source: Own elaboration based on data from the Central Statistical Office (GUS).

3.3. A comparison of the Polish and the EU member countries agri-food clusters

From the point of view of international competitiveness, the assessment and comparison of the strength of clusters identified at the domestic level of data aggregation is an important factor. For Poland, a comparison with the European economic area is particularly important. The source of information on the presence of clusters within the countries and regions of the European Union as well as several other countries of the Old Continent, is the database created by the before mentioned European Cluster Observatory (ECO). In its resources one can find data concerning dozens of types of business clusters. It should also be mentioned that the reference point in analyses are all the European Union countries. As a result of mapping, the identified clusters in the agri-food sector, namely Agricultural Products, Processed Food and Farming and Animal Husbandry were analysed while taking spatial specialisation occurring in different countries into consideration.

The agri-food sector in the EU countries is characterised by a significant diversity with regard to the degree of specialisation (LQ), and, as a consequence, the strength of clusters functioning within its area (Table 3.23). In the case of the

Agricultural Products clusters, the value of the location quotient calculated with regard to the whole EU is more than 1 in: Bulgaria, Czech Republic, Estonia, Greece, Spain, the Netherlands, Germany, Malta and in Hungary. Poland, with a result of 0.68, may be classified as one of the countries with a relatively small degree of specialisation in this type of clusters.

Table 3.23. LQ and relative strength (average number of stars) of agri-food clusters in the EU-27 countries

Country	Cluster type					
	Agricultural Products		Processed Food		Farming and Animal Husbandry	
	LQ	Strength	LQ	Strength	LQ	Strength
Austria	0.62	0	1.42	1.18	0.08	0
Belgium	0.62	0	1.01	0.67	0.53	0
Bulgaria	1.49	0.64	1.61	1.12	3.13	1.58
Cyprus	0.62	0	0.98	0	2.55	1
Czech Republic	1	0	1.18	0.88	1.35	0.18
Denmark	0.79	0	0.84	0.41	1.78	0.96
Estonia	1.09	0	1.32	1	2.26	1
Finland	0.57	0	0.85	0.34	3.57	1.4
France	0.82	0.29	1.04	1.44	0.7	0.15
Greece	3.28	2.12	1.08	0.81	5.71	2.77
Spain	2.09	1.4	0.7	0.66	2.52	2.07
Netherlands	1.98	0.97	0.77	0.09	2.17	1.28
Ireland	0.53	0	1.67	2	0.11	0
Lithuania	0.59	0	2.2	3	0	0
Luxembourg	0.95	0	1.39	1	0.01	0
Latvia	0.54	0	1.01	0	1.25	0
Malta	2.19	0	2.9	2	b.d.	b.d.
Germany	1.05	0.3	0.98	0.88	0.57	0.15
Poland	0.68	0	1.88	1.79	0.45	0
Portugal	0.91	0.13	1.07	0.57	0.04	0
Romania	0.88	0	1.91	1.55	0.01	0
Slovak Republic	0.6	0	1.35	1.35	0.02	0
Slovenia	0.37	0	0.93	0	0.42	0
Sweden	0.55	0	0.81	0.24	0.97	0.3
Hungary	1.08	0.18	1.43	1.14	3.46	1.97
Great Britain	0.21	0	0.62	0.27	0.1	0
Italy	0.63	0.13	1.05	1.25	0	0

Source: Own elaboration based on data from the European Cluster Observatory, 2012.

The strength of clusters has been evaluated on the basis of the average number of the so-called stars granted to the NUTS2 regions in a given cluster

category based on three features identifying strong clusters. In this respect, Poland received grade 0 with regard to the Agricultural Products clusters. It means that none of the voivodeships stands out in terms of specialisation in this type of clusters, and also has no significant share in employment.

On the other hand, the Processed Food clusters in Poland are distinctive, compared to other European economies. This is proven by a relatively high value of the location quotient of 1.88 and the average number of stars is 1.79. It should be added that this is the only type of an agri-food cluster in Poland, in which individual voivodeships are granted grades proving the presence of strong clusters. On the other hand, the location quotient for Farming and Animal Husbandry clusters is the lowest and reaches the level of 0.45, and its grade in terms of their strength is 0.

The reflection of the size of the three agri-food clusters, separated according to the methodology of the ECO, may be the size of employment in entities belonging to them. Figure 3.1 shows the changes taking place in this respect in Poland in the period 2007-2010.

Figure 3.1. Employment in Polish agri-food clusters in the period 2007-2010
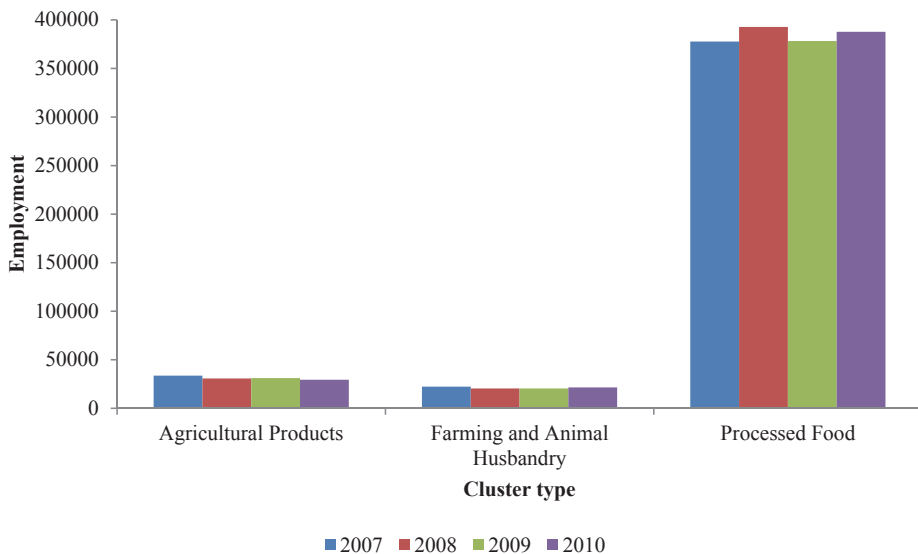
Source: Own elaboration based on data from the European Cluster Observatory, 2012.

The national employment in the Agricultural Products clusters in the analysed period decreased slightly, while in the case of the Farming and Animal Husbandry clusters it remained at a level above 20,000 persons. It is also

worth mentioning that the highest level of employment was in the Processed Food clusters. Its level in the analysed period, although showing some small fluctuations, can be considered as quite stable. Therefore, it can be concluded that the dynamics of changes in the level of employment in the agri-food clusters does not indicate significant changes of their strength assessed on the basis of the level of employment. Assuming that in the agri-food sectors the economies of scale associated with the specialisation take place, it can be presumed that from the point of view of effectiveness it was not a favorable situation, if the volume of production or generated value added in the analysed clusters did not increase in that time.

As compared to the European countries, being a point of reference for the analysis of the distribution and size of clusters in calculations applied by the ECO, the specialisation quotients of the Polish agri-food clusters have the highest values in the case of the Processed Food clusters. In each year taken into account they reached the value of more than 1. Specialisation in the case of two other cluster types is definitely less visible (Figure 3.2).

Figure 3.2. LQ of Polish agri-food clusters calculated at national level compared to the EU between 2007-2010
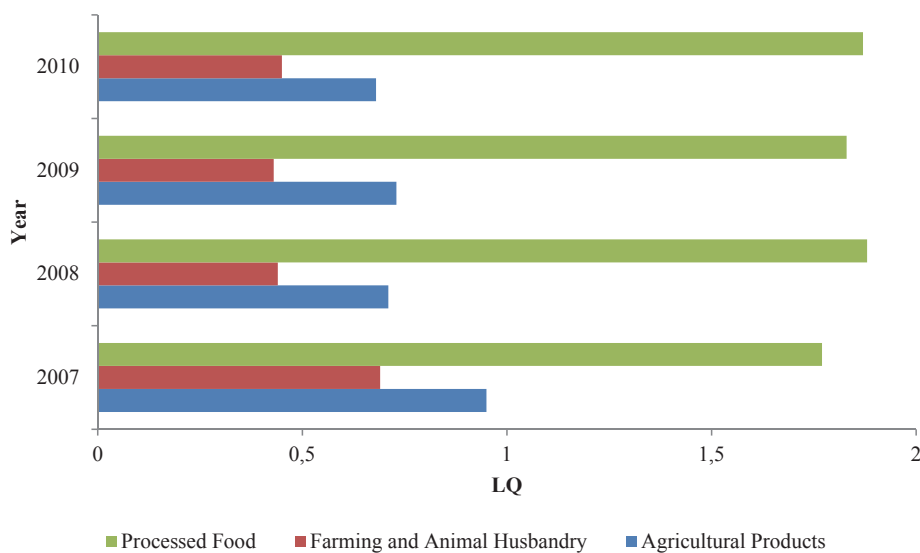
Source: Own elaboration based on data from the European Cluster Observatory, 2012.

Presented comparisons are reflecting changes taking place in the three types of agri-food clusters without regional differences, as this analysis has been

conducted at the level of national economies. Clusters are structures in which geographical proximity significantly affects the processes taking place in them, therefore, also identification of the presence and the evaluation of the strength regarding cluster structures at a spatial level of NUTS2 regions is also interesting.

The methodology prepared by the ECO makes it possible to quantify the strength of particular clusters in Europe not only from the national, but also from the regional perspective. The quantification takes place on the basis of data concerning employment based on three characteristics: specialisation (LQ over 2), size (affiliation to 10% of clusters with the largest volume of employment within a given cluster type in Europe) and focus (affiliation to 10% of clusters with the largest volume of employment in the NUTS2 region)[9].

For each of these features some universal threshold values were indicated, above which the NUTS2 region fulfils the condition of being a region with the strongest structure of a cluster. Fulfilling any of the three conditions is associated with granting clusters with the so-called *stars* (in consequence, one-, two- or three-star clusters can be distinguished). In the case of Polish agri-food clusters evaluated with regards to the EU, the strongest, again, turned out to be the Processed Food clusters (Table 3.24).

Table 3.24. Strength of Polish agri-food clusters compared to the EU clusters

Cluster	2007			2008			2009			2010		
	★★★	★★	★	★★★	★★	★	★★★	★★	★	★★★	★★	★
Agricultural Products	0	1	0	0	0	0	0	0	0	0	0	0
Farming and Animal Husbandry	0	0	0	0	0	0	0	0	0	0	0	0
Processed Food	1	8	6	1	9	5	1	8	6	1	7	7

Source: Own elaboration based on data from the European Cluster Observatory, 2012.

Among all the voivodeships only the Dolnośląskie voivodeship has not received any *stars* within the analysed period, whereas the Wielkopolskie voivodeship has met all three conditions (three *stars* granted). At the same time in none of the voivodeships there has been a strong Farming and Animal Husbandry cluster, and the only case of a relatively strong Agricultural Products cluster occurred in 2007 and concerned the Wielkopolskie voivodeship.

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[9] See: www.clusterobservatory.eu.

This confirms the results of the analysis of the data aggregation conducted at the national level, indicating the outstanding position of the Polish Processed Food clusters.

3.4. Regional specializations in the Polish agri-food sector

Particular voivodeships have a different share in the creation of gross value added in the economy. In section A of Polish Classification of Activities 2007 (agriculture, forestry, hunting and fishery), the voivodeship with the largest share in these terms, is the Mazowieckie voivodeship. In 2007 its share reached a level of 19.1%, while in the two subsequent years it was 20.6% and 19.2%, respectively. Wielkopolskie voivodeship which is the second in the rank between 2007-2009 generated within the section A: 14.1%, 13.1% and 14.1% of the value added, accordingly. The region with the smallest share in the analysed period was the Lubuskie voivodeship (accordingly: 2.4%, 2.2% and 2.5%). The gross value added in section A, generated by these entities in the period 2007-2009, per voivodeship, has been presented in Figure 3.3.

Figure 3.3. Gross value added of section A by voivodeship in the period 2007-2009
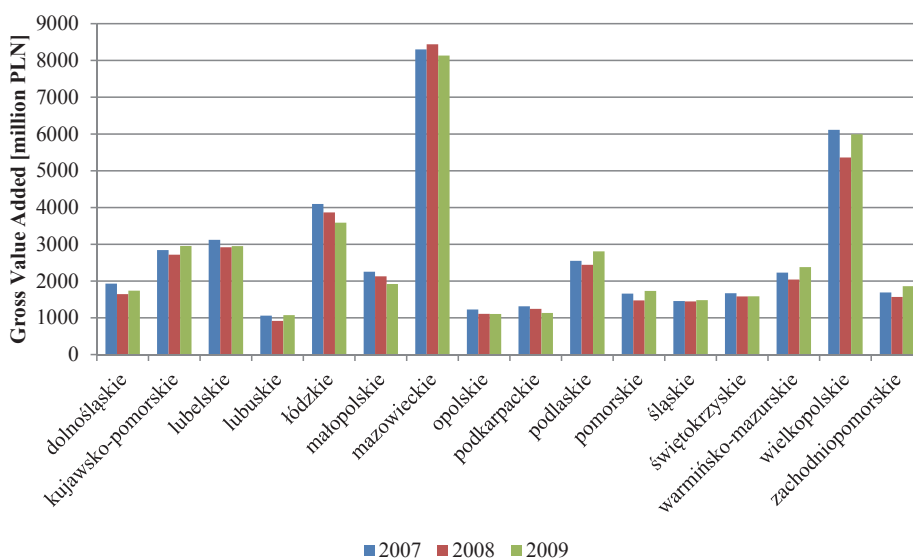
Source: Own elaboration based on data from the Central Statistical Office (GUS).

Tables 3.25-3.27 illustrate gross value added data in the period 2007-2009 in particular voivodeships with the division into sections and group sections as

presented in Polish Classification of Activities 2007. The tables show also the shares of particular voivodeships in generating this value. Additionally, Table 3.26 presents average values and standard deviations illustrating the regional diversity within this scope.

In 2007 the gross value added generated by entities in section A was 43.5 billion PLN. In the subsequent year it decreased to a level of 40.9 billion, while a year later it grew to a level of 42.4 billion PLN. Along with these changes, small fluctuations of the average gross value added by voivodeship took place, in particular in the period 2007-2009 it amounted 2.7, 2.6 and 2.7 billion PLN, respectively.

The substantial regional diversity in the creation of gross value added within the section A did not change significantly, which is proved by the value of standard deviation slightly decreasing in this period (Table 3.28).

Table 3.25. Gross value added by PCA 2007 sections in Polish voivodeships in 2007 [current prices; million PLN]

Voivodeship	GVA$_i$				GVA$_i$/GVA (%)			
	A	B,C,D, E	F	other sections	A	B,C,D ,E	F	other sections
Dolnośląskie	1931	28090	5679	48621	4.4	11.1	8.0	7.3
Kujawsko-Pomorskie	2843	12276	3547	29811	6.5	4.8	5.0	4.5
Lubelskie	3121	7719	2694	26275	7.2	3.0	3.8	4.0
Lubuskie	1059	7132	1623	14219	2.4	2.8	2.3	2.1
Łódzkie	4097	17080	4294	38494	9.4	6.7	6.1	5.8
Małopolskie	2253	18373	6312	49151	5.2	7.3	8.9	7.4
Mazowieckie	8300	33986	12703	168582	19.1	13.4	18.0	25.5
Opolskie	1227	6976	1715	13246	2.8	2.8	2.4	2.0
Podkarpackie	1315	10314	2449	24258	3.0	4.1	3.5	3.7
Podlaskie	2550	4873	1608	14869	5.9	1.9	2.3	2.2
Pomorskie	1658	14262	4310	38351	3.8	5.6	6.1	5.8
Śląskie	1457	44153	9103	79194	3.3	17.4	12.9	12.0
Świętokrzyskie	1669	7056	2225	15666	3.8	2.8	3.2	2.4
Warmińsko-Mazurskie	2230	6856	2070	17434	5.1	2.7	2.9	2.6
Wielkopolskie	6114	26230	6838	56199	14.1	10.4	9.7	8.5
Zachodniopomorskie	1688	7850	3414	27752	3.9	3.1	4.8	4.2

Source: Own elaboration based on data from the Central Statistical Office (GUS).

Table 3.26. Gross value added by PCA 2007 sections in Polish voivodeships in 2008 [current prices; million PLN]

Voivodeship	GVA$_i$				GVA$_i$/GVA (%)			
	A	B,C, D,E	F	other sections	A	B,C,D ,E	F	other sections
Dolnośląskie	1645	28663	6856	53360	4.0	10.6	8.2	7.4
Kujawsko-Pomorskie	2718	12815	4280	32379	6.6	4.7	5.1	4.5
Lubelskie	2920	8764	3295	29040	7.1	3.2	4.0	4.0
Lubuskie	916	7382	1813	15182	2.2	2.7	2.2	2.1
Łódzkie	3866	18587	4852	42020	9.5	6.9	5.8	5.8
Małopolskie	2128	19220	7813	54014	5.2	7.1	9.4	7.5
Mazowieckie	8440	35545	13958	183113	20.6	13.1	16.8	25.4
Opolskie	1107	8144	1973	14372	2.7	3.0	2.4	2.0
Podkarpackie	1245	11350	3058	26700	3.0	4.2	3.7	3.7
Podlaskie	2441	4804	1897	16285	6.0	1.8	2.3	2.3
Pomorskie	1474	14162	5087	40852	3.6	5.2	6.1	5.7
Śląskie	1447	49606	10658	85197	3.5	18.3	12.8	11.8
Świętokrzyskie	1583	8197	2754	17274	3.9	3.0	3.3	2.4
Warmińsko-Mazurskie	2041	7072	2572	19141	5.0	2.6	3.1	2.7
Wielkopolskie	5360	28426	8206	61720	13.1	10.5	9.9	8.6
Zachodniopomorskie	1569	8428	4094	30599	3.8	3.1	4.9	4.2

Source: Own elaboration based on data from the Central Statistical Office (GUS).

Table 3.27. Gross value added by PCA 2007 sections in Polish voivodeships in 2009 [current prices; million PLN]

Voivodeship	GVA$_i$				GVA$_i$/GVA (%)			
	A	B,C, D,E	F	other sections	A	B,C,D ,E	F	other sections
Dolnośląskie	1739	32037	7468	56898	4.1	10.9	8.1	7.4
Kujawsko-Pomorskie	2953	13665	4517	33710	7.0	4.6	4.9	4.4
Lubelskie	2949	8941	3514	29987	6.9	3.0	3.8	3.9
Lubuskie	1073	8137	1920	15845	2.5	2.8	2.1	2.1
Łódzkie	3589	21315	5066	42778	8.5	7.3	5.5	5.6
Małopolskie	1921	19739	8794	57968	4.5	6.7	9.5	7.6
Mazowieckie	8135	39976	16339	196771	19.2	13.6	17.6	25.7
Opolskie	1106	7637	2188	15441	2.6	2.6	2.4	2.0
Podkarpackie	1133	12006	3487	28410	2.7	4.1	3.8	3.7
Podlaskie	2808	5347	2023	17281	6.6	1.8	2.2	2.3
Pomorskie	1730	15766	6071	44181	4.1	5.4	6.6	5.8
Śląskie	1481	52383	11870	90055	3.5	17.8	12.8	11.8
Świętokrzyskie	1586	8452	2923	17915	3.7	2.9	3.2	2.3
Warmińsko-Mazurskie	2379	8128	2658	19780	5.6	2.8	2.9	2.6
Wielkopolskie	5992	31872	9433	65874	14.1	10.8	10.2	8.6
Zachodniopomorskie	1861	8578	4400	31713	4.4	2.9	4.7	4.1

Source: Own elaboration based on data from the Central Statistical Office (GUS).

Table 3.28. Average gross value added per voivodeship and its regional diversity between 2007-2009 [current prices; PCA 2007; million PLN]

Year	Average				Standard deviation			
	A	B,C,D,E	F	other sections	A	B,C,D,E	F	other sections
2007	2720	15827	4412	41383	1899	11194	2996	37306
2008	2556	16948	5198	45078	1879	12185	3365	40461
2009	2652	18374	5792	47788	1853	13347	3938	43558

Source: Own elaboration based on data from the Central Statistical Office (GUS).

Compared to other sections, some stagnation in the creation of value added by entities from section A is noticeable, resulting in decreasing economic importance of the types of economic activities carried out by them. It indicates the presence of a phenomenon typical for the developed countries where the role of the agriculture sector and sectors related to it in the creation of the national income is subject to marginalisation.

The REGON database is a valuable source of information which makes it possible to identify the level of concentration concerning particular types of economic activities from the regional perspective. In the case of agri-food markets, this type of activity is focused mainly within the following divisions of Polish Classification of Activities 2004: 01 – Agriculture, hunting, including service activities; 05 – Fishery; 15 – Production of food products and beverages. Regarding the distribution of national business entities within the division 01, the largest percentage of entities registered in the REGON database is recorded in the Mazowieckie voivodeship. In the analysed period this share grew. Fishery (division 05) is mainly concentrated in the Pomorskie and Zachodniopomorskie voivodeships, whereas the largest shares in the production of food products and beverages were in the following voivodeships: Łódzkie, Małopolskie, Mazowieckie, Śląskie and Wielkopolskie (Table 3.29).

Owing to the significant diversity of the number of national business entities within the voivodeships divided into particular subclasses of Polish Classification of Activities, the location quotients based on the data from the REGON database have been calculated. The available data in question was comparable with regards to the period 2002-2009. The subclasses of PCA 2004, which refer to activities concerning the agri-food sector (division 01, 05 and 15), have been analysed. Focusing on different divisions of PCA 2004, a point of reference, in the analysis of particular subclasses of PCA 2004, was the number of entities within the division of PCA 2004, in which the subclass is listed.

Table 3.29. Share of voivodeships in agri-food operations between 2002-2009 [%]

Year											Voivodeship					
	02	04	06	08	10	12	14	16	18	20	22	24	26	28	30	32
Division 01																
2002	3.8	6.3	3.5	1.7	3.8	6.5	11.0	1.8	2.3	14.5	2.6	3.2	1.7	25.9	8.8	2.5
2003	4.0	6.3	3.7	1.8	4.0	6.7	11.8	2.0	2.3	13.7	2.8	3.4	1.7	24.0	9.5	2.5
2004	6.3	6.2	5.0	3.4	6.6	7.6	16.2	4.2	2.5	4.0	4.4	6.1	1.4	4.8	17.1	4.2
2005	6.2	6.1	4.7	3.4	6.7	7.5	16.5	4.2	2.5	3.9	4.5	6.1	1.4	4.9	17.2	4.4
2006	6.1	5.9	4.8	3.5	6.6	7.8	16.5	4.2	2.5	3.8	4.5	6.0	1.4	4.8	17.3	4.4
2007	6.2	5.7	4.7	3.6	6.5	8.0	16.7	4.2	2.4	3.7	4.6	6.1	1.4	4.7	17.2	4.5
2008	6.1	5.7	4.6	3.7	6.5	7.9	16.9	4.1	2.3	3.7	4.6	6.0	1.4	4.7	17.3	4.4
2009	6.3	5.8	4.4	3.5	6.1	8.5	17.0	4.1	2.2	3.6	4.8	5.8	1.4	4.8	16.9	4.6
Division 05																
2002	1.5	3.1	1.3	1.5	0.7	0.9	2.1	0.6	0.9	0.9	35.4	2.0	0.4	5.9	2.7	40.1
2003	1.5	3.3	1.3	1.6	0.9	0.9	2.1	0.5	0.9	1.0	34.8	2.0	0.5	5.9	2.8	40.0
2004	1.8	3.1	1.3	1.6	1.5	1.1	2.3	0.6	0.9	1.2	34.6	2.0	0.6	5.9	2.7	38.7
2005	1.9	3.3	1.6	1.5	1.6	1.4	2.6	0.6	1.0	1.1	34.8	2.2	0.7	6.1	2.7	36.9
2006	1.6	3.3	1.8	1.8	1.3	1.3	2.6	0.5	1.0	1.2	35.1	2.3	0.8	6.0	2.8	36.5
2007	1.6	2.9	2.0	1.7	1.1	1.4	2.8	0.5	1.1	1.3	34.4	2.5	0.8	6.6	2.7	36.4
2008	1.9	3.0	2.0	1.6	1.2	1.7	3.0	0.5	1.0	1.2	34.5	2.9	0.7	6.4	2.7	35.8
2009	2.2	2.6	1.9	1.4	1.3	1.7	3.3	0.8	1.1	1.1	35.3	3.4	0.9	5.6	2.8	34.7
Division 15																
2002	6.4	6.2	4.9	2.4	9.1	8.4	13.6	2.9	4.1	2.7	5.5	11.8	3.4	2.9	11.6	4.4
2003	6.4	6.0	4.9	2.4	9.1	8.3	13.7	2.9	4.1	2.6	5.5	11.6	3.4	2.8	11.7	4.4
2004	6.4	5.9	4.9	2.5	9.2	8.6	13.9	2.9	4.0	2.5	5.3	11.7	3.4	2.7	11.7	4.5
2005	6.3	5.9	4.9	2.5	9.3	8.5	14.0	2.9	4.0	2.4	5.3	11.7	3.4	2.7	11.7	4.5
2006	6.2	5.8	4.9	2.5	9.1	8.4	14.3	3.0	4.1	2.4	5.4	11.6	3.3	2.7	11.7	4.5
2007	6.1	5.6	5.0	2.5	8.9	8.5	14.5	2.9	4.0	2.5	5.4	11.7	3.3	2.7	11.8	4.5
2008	6.1	5.7	4.9	2.3	8.9	8.5	14.6	2.9	4.0	2.5	5.4	11.7	3.3	2.7	11.8	4.6
2009	6.1	5.2	4.9	2.4	8.3	9.0	14.4	3.0	4.3	2.5	5.6	11.9	3.3	2.8	11.7	4.7

02 – Dolnośląskie, 04 – Kujawsko-Pomorskie, 06 – Lubelskie, 08 – Lubuskie, 10 – Łódzkie, 12 – Małopolskie, 14 – Mazowieckie, 16 – Opolskie, 18 – Podkarpackie, 20 – Podlaskie, 22 – Pomorskie, 24 – Śląskie, 26 – Świętokrzyskie, 28 – Warmińsko-Mazurskie, 30 – Wielkopolskie, 32 – Zachodniopomorskie (numbering after GUS)

Source: Own elaboration based on data from the Central Statistical Office (GUS).

The calculations were made with the use of the following version of the formula for the location quotient:

$$LQ = \frac{\dfrac{n_{ij}}{n_{xj}}}{\dfrac{n_i}{n_x}}$$

where:

n_{ij} – the number of entities within a subclass i in the j voivodeship,

n_{xj} – the number of entities within the x division in the j voivodeship,

n_i – the number of entities within a subclass i in Poland,

n_x – the number of entities within the x division in Poland.

We can talk about a regional specialisation with regard to analysed types of economic activities, when the value of LQ is at least 1. The results of the calculations make it possible to state which of the analysed subclasses of economic activity are characterised by a greater concentration of the number of entities within the given voivodeships as compared to other regions.

Figures 3.4-3.6 show changes which occurred in the shares of particular voivodeships in the national employment regarding activities classified into divisions 01, 10 and 11 (PCA 2007), namely representing the agri-food sector between 2005 and 2011.

Figure 3.4. Shares of voivodeships in the average employment in division 01 between 2005 and 2011 (PCA 2007)
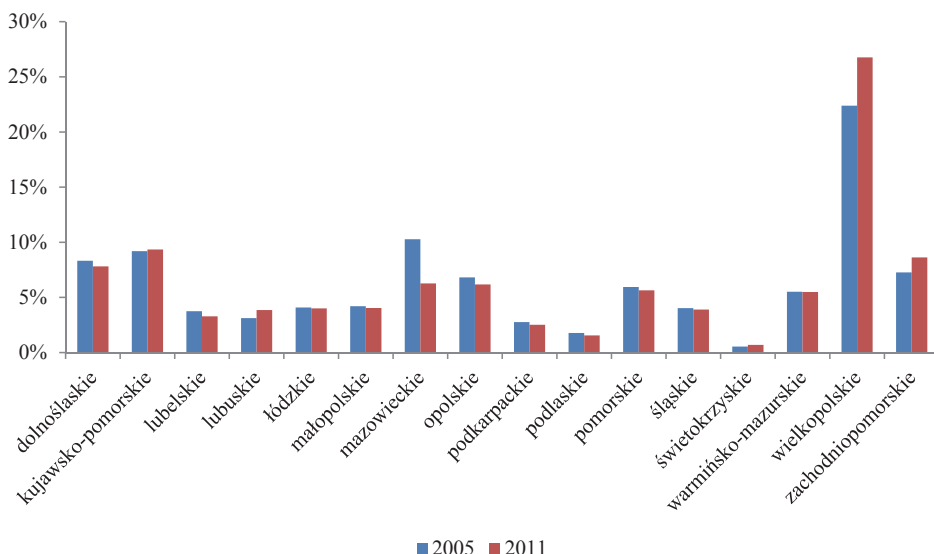
Source: Own elaboration based on data from the Central Statistical Office (GUS).

The analysis of the average employment in division 01 of Polish Classification of Activities 2007, including agricultural cultivations, breeding and animal husbandry, hunting and service activities included in this sector, allows us to state that the leading voivodeship in this matter in the period 2005-2011 was the Wielkopolskie voivodeship. The share of its employment in 2011 increased by 4.4 p.p. as compared to 2005 (Figure 3.4). The direction of changes in other voivodeships is not uniform. In some of them, in the analysed period, we could observe a growth, and in others a decrease in the share in the national employment.

In the case of the division 10 of Polish Classification Activities 2007, including the production of food products, the leading voivodeship between 2005--2011 was the Mazowieckie voivodeship which in 2011 outstripped the second in this aspect the Wielkopolskie voivodeship by 7 p.p. It is worth noting that the share of the Mazowieckie voivodeship in the average national employment in division 10 in the analysed period was growing (Figure 3.5).

Figure 3.5. Shares of voivodeships in the average employment in division 10 in 2005 and 2011 (PCA 2007)
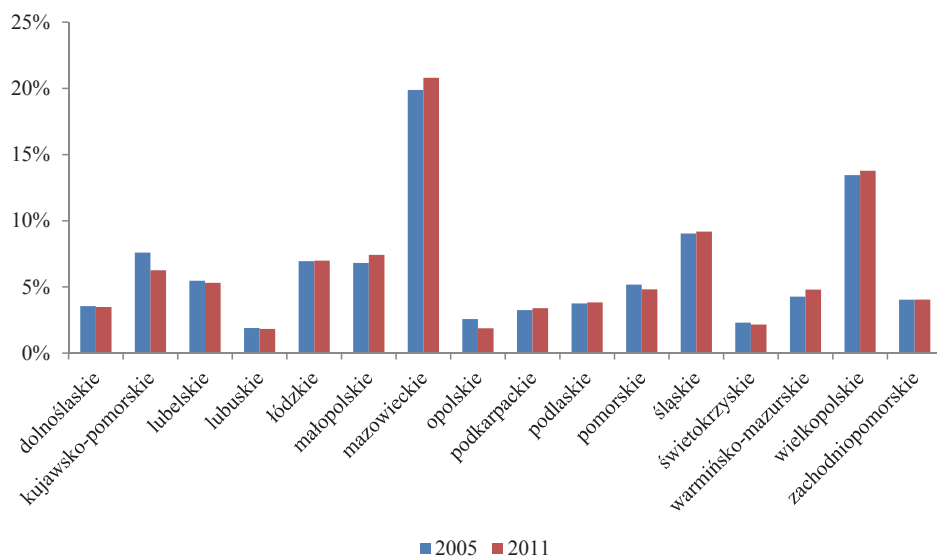
Source: Own elaboration based on data from the Central Statistical Office (GUS).

A noticeable increase in the share in employment in this division was also the case of several other voivodeships, namely: Małopolskie, Podkarpackie, Podlaskie, Śląskie and Warmińsko-Mazurskie. In other voivodeships a slight decrease or stagnation has been recorded.

Division 11, namely the production of beverages, is an explicit domination of three voivodships within the structure of average employment in the country. These are the following voivodships: Mazowieckie, Wielkopolskie and Śląskie (Figure 3.6). Also, in the case of each of these voivodeships, a clear increase in their share in the national employment in this division took place, indicating the strengthening of their position as regions with highly specialised activities of this kind.

Figure 3.6. Shares of voivodeships in the average employment in division 11 in 2005 and 2011 (PCA 2007)
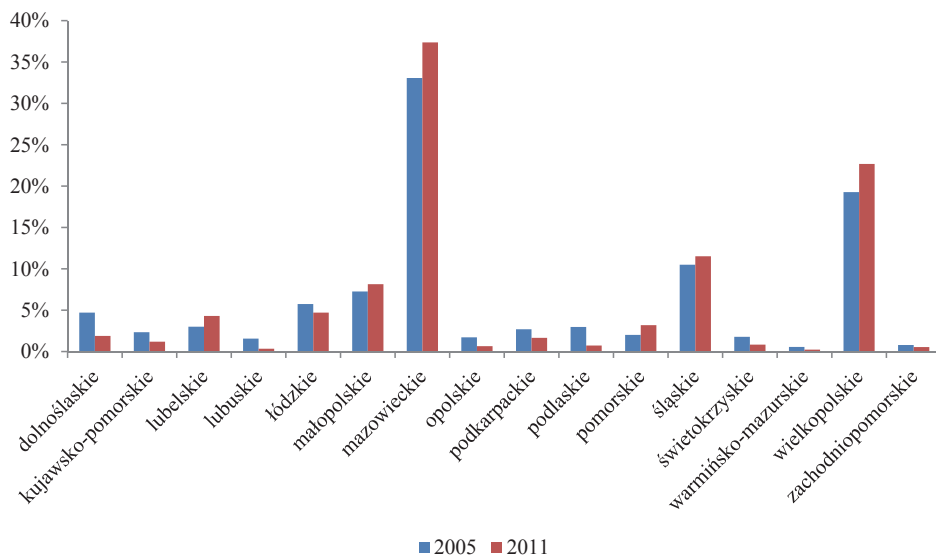
Source: Own elaboration based on data from the Central Statistical Office (GUS).

4. Polish agri-food cluster initiatives versus cluster development potential

4.1. Methodological assumptions of assessing compatibility of occurrence of cluster initiatives with cluster development potential

A key challenge of the cluster policy is to focus the public support of cluster initiatives in accordance with an actual economic cluster potential in certain industries. It is difficult not to agree with the hypothesis that the probability of development of a strong cluster depends, to a large extent, on natural premises which are often of an objective nature. In particular, this is about the spatial concentration of economic activities, being the basis for the formation of strong clusters. The initiative itself is not – although often it is believed so – equivalent to a cluster. It can only, more or less actively, contribute to the construction or development of a cluster, provided that it operates among entities being accordingly a strong aggregation and showing the potential of a cluster.

In the analysis concerning the evaluation of the compliance regarding the presence of cluster initiatives with economic cluster potential, a specially designed for this purpose, aggregated in the regional sections, Intensity & Branch Orientation Index – IBOI has been used. It was calculated according to the following formula:

$$IBOI = \sqrt{\frac{N_i(I)}{\mu(I)} \frac{N_i(+)}{\mu(+)}}$$

where:

$N_i(I)$ – number of initiatives of a given category in the voivodeship,

$\mu(I)$ – average number of initiatives of a given category for each voivodeship,

$N_i(+)$ – the number of pluses granted to a given category in the voivodeship,

$\mu(+)$ – average numbers of pluses granted to a given category for each voivodeship.

An index calculated in this manner is a standardised, aggregated measure of presence and strength of branch orientation regarding industry-led initiatives in the given area which in the case of this analysis is a voivodeship. The basis for the evaluation of compliance regarding the presence of cluster initiatives in particular voivodeships with the economic cluster potential represented by them, was the comparison of Intensity & Branch Orientation Index (IBOI) with values of the location quotient (LQ) calculated both in regards to employment and number of entities. The way of calculating the LQ is shown in subsection 3.1, while the values of the LQ for the three separated types of agri-food clusters,

(Agricultural Products, Farming and Animal Husbandry and Processed Food) have been discussed in the subsection 3.2.

In order to assess the compliance regarding the presence of the analysed cluster initiatives with cluster potential, it has been assumed that from the point of view of the effectiveness of supporting the development of clusters in the agri-food sector as part of public intervention, the most desired situation is the one in which the supported cluster initiatives meet two conditions. Firstly, their organizational structures and scopes of the activities are characterised by the greatest possible connection with subject scope of the operations classified into three types of agri-food clusters. Secondly, they operate in locations (voivodeships) with relatively strong clusters mapped on the basis of employment or number of entities. In other words, it is about ensuring that the intensification of their presence and the orientation of trade cluster initiatives, evaluated with the use of the IBOI, could be possibly the most consistent with the type, and particularly with the strength of the clusters existing in a given voivodeship, assessed with the use of the location quotient (LQ_{empl} or LQ_{entity}). Such an approach seems to be justified due to the fact that the possibility of the contribution by a specified initiative to the development of a strong cluster, and, as a consequence, the effective use of public funds obtained, is undoubtedly larger, if its functioning takes place with an appropriate, spatial concentration of economic activity.

The analysis carried out in this respect consisted in the comparison of the index value with the values of the location quotient calculated on the basis of available data regarding employment (LQ_{empl}) and number of entities (LQ_{entity}). In connection with the adopted criteria regarding the evaluation of cluster strength it can be assumed that a great degree of compliance concerning the presence of cluster initiatives with reference potential existing in the given area is when the values of IBOI exceeding one are accompanied by location quotients LQ_{empl} and LQ_{entity} greater than one.

4.2. Distribution of cluster initiatives across regions and evaluation of their profiles

In the study concerning regional distribution of cluster initiatives related to the Polish agri-food sector it was an Internet query which was used as a method of identification. This method is of universal nature and potentially gives a chance for obtaining quite full and complete data sets with the assumption that models sought after are present on the Internet. Such an assumption seems to be justified in the case of cluster initiatives which, at least due to promotional reasons, should seek for such a presence, and often they are even

obliged to create their own websites within the use of public funds granted for the implementation of cluster projects. The initiatives were searched for using keywords *cluster initiative* and *cluster* assuming that the initiative may only be a group of entities which, essentially, seeks to become a cluster. In this way any horizontal and vertical links concerning the agri-food sector were excluded as these do not meet conditions to be a cluster initiative. Thanks to the query it was possible to access the websites of particular cluster initiatives not only directly, but also indirectly, as the query made it possible to search numerous databases, containing summaries, and often characteristics of the selected initiatives.

The analysis of the subjective nature of initiatives was carried out in terms of their compliance of their declared and implemented scope of activity with the types of operations directly or indirectly related to the agri-food sector. The primary purpose of this analysis was to assign the identified initiatives, by areas of activity and the subject of activities of entities forming them, to three categories in accordance with cluster classification adopted by the ECO, namely: Agricultural Products, Farming and Animal Husbandry as well as Processed Food[10].

During the analysis of the scope of activity regarding the identified initiatives it turned out that a considerable part of them was involved in activities which cannot be clearly ascribed to one of the identified types of clusters. Often, the subjective composition and the actions undertaken by a given initiative indicated the presence of interpenetrating relations with each of three types of clusters. At the same time, the subjective and material character of the activities of some initiatives was beyond the scope of operations regarding agri-food clusters, although it was linked to the widely understood agribusiness sector or rural areas. This connection was, above all, of a resource related character, i.e. at least some of the entities belonging to these initiatives undertook activities using resources related to the agri-food sector or they used resources from the rural areas as production factors (among others, wood, human resources, bioenergy). As a result, additionally one more category of initiatives has been separated, specified as those connected with the agri-food sector or rural areas.

The Internet query made it possible to identify 132 cluster initiatives operating in various areas of activities regarding the agri-food sector or initiatives resource related to this sector or rural areas. Their number in particular voivodeships is presented in Figure 4.1.

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[10] The list of operations included in these types of clusters representing the agricultural and food sector is given in Table 3.2.

Figure 4.1. Number of cluster initiatives operating in the agri-food sector and initiatives resource related to it or to rural areas

Source: Own elaboration on the basis of the Internet query.

The number of initiatives located in one voivodeship is quite diverse, ranging from 4 to 16. The largest number of initiatives is in the Warmińsko-Mazurskie voivodeship (16), Podlaskie and Wielkopolskie (12 in each), whereas the smallest number in the Kujawsko-Pomorskie and Małopolskie (5 in each), Lubuskie and Śląskie voivodeship (4 in each).

On the basis of these numbers it is difficult to speak about a clear regional, spatial pattern of distribution of these initiatives. For example, there is an unnoticeable conventional division into Poland A and B which often appears in various territorial comparisons. On the contrary, in the voivodeships included in

the area of the so-called *Eastern Wall* the number of initiatives operating there is 62, which is almost half of all initiatives of regional range[11]. Thus, it may be assumed that the formation of sectoral initiatives does not depend, to a significant degree, on the level of economic development of the region. It seems that an important role, in this respect, is played by the availability of the EU funds meant for supporting them in connection with a conviction of the creators of these initiatives regarding a greater importance of the agri-food sector in a given region.

The identified initiatives have been analysed in terms of the type of the entities belonging to them and the nature of operations carried out by them. Then, the degree of compliance of the organizational and activity profile of a given initiative was evaluated from a qualitative perspective with the subjective scopes of four initiative categories:

−   Agricultural Products (AP);
−   Farming and Animal Husbandry (F&A);
−   Processed Food (PF);
−   Resource related to the agri-food sector or to rural areas (RC).

Each initiative was granted from 0 to 3 pluses depending on how strongly the entities, operating in such defined areas of economic activity, were represented. The authors are aware of the fact that the evaluation of initiatives, just like each qualitative assessment, is of a relative nature and is not completely free from subjectivity. Nonetheless, a relatively high number of compared objects allows us to believe that the results of assessment can be considered as reliable in the context of relations and links of identified cluster initiatives with the actual agri-food clusters.

Apart from the presentation of the evaluation results of all initiatives in particular voivodeships, this subchapter also includes short characteristics of selected initiatives, considered as the most developed and typical for a given voivodeship from the point of view of their nature and scope of their activities, as well as the relationships and links with the agri-food sector resulting from it. The selected cluster initiatives (one for each of the voivodeships) have been characterised taking Porter's diamond model [1998a, 1998b] into consideration, according to which the existence of competitive advantage is affected by the following factors:

−   development strategy, objectives and principles valid in the cluster initiative, structure, competition and cooperation;
−   the demand-based conditions (size and nature of demand);

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[11] At this point, it should be stressed that out of 132 of the identified initiatives, 5 have a national scope of operations. Numbers on the map in figure 4.1 relate to initiatives with a regional range.

- supply conditions (human resources, physical resources, knowledge, capital resources, infrastructure);
- branches connected and supportive – structural conditions (competition between local rivals, threat of new inputs, pressures associated with the substitutes, presence and strategies of local suppliers from competitive branches);
- institutional conditions (the government at the local, regional, national and international level);
- unexpected events beyond the control of the initiatives' entities creating new possibilities.

Since, in the opinion of Porter [1998a, 1998b], these factors affect one another while building space for the emergence of innovation and improvement of competitiveness, the description of each selected initiative was summarized with stating which of these factors, proving the competitive advantage, the initiative is focused on while taking actions aimed at strengthening the cluster.

The Dolnośląskie Voivodeship

In the Dolnośląskie voivodeship seven cluster initiatives have been identified, whose names and grades granted to them have been presented in Table 4.1.

Table 4.1. The results of assessment of the cluster initiatives' profiles in the Dolnośląskie voivodeship

The name of the initiative	The category of the branch orientation			
	AP	F&AH	PF	RR
1. Cluster of Innovative Manufacturing Technologies CINNOMATECH			++	
2. Nutribiomed cluster	++	+	+++	++
3. The Dolnośląskie Ecoenergy Cluster EEI – Energy, Ecology, Innovations				+
4. The Wood Side Cluster				+
5. The Dolnośląskie Cluster of Fish Farmers		+	+	+
6. The plusuj.pl Cluster				+
7. The Dolnośląskie Cluster of Renewable Energy	+	+	+	+
Total grade by categories (sum of pluses)	**3**	**3**	**7**	**7**

AP – Agricultural Products; F&AH – Farming and Animal Husbandry; PF – Processed Food; RR – resource related to the agri-food sector or rural areas.
Source: Own elaboration on the basis of the Internet query.

Their activities are mostly focused on the Processed Food type of clusters. They are also characterised by a resource related connection with the agri-food sector or rural areas. A cluster initiative that is worth a more insightful characterisation is the Cluster Nutribiomed [www.nutribiomed.pl]. The entities operating within it also come from the Śląskie, Lubuskie, Wielkopolskie, Łódzkie and Mazowieckie voivodeships representing, among others, industries such as: food processing, pharmacy, biotechnology and cosmetic one.

Cluster Nutribiomed is a consortium founded in 2007 of a superregional and scientific-industrial nature. The coordinator of the initiative is the Wrocław Technology Park S.A. The objective is to create a strong position of Poland regarding products which include dietary supplements, nutraceuticals and biomedical products based on domestic natural resources and own *know-how*. The initiative is of a supra-regional nature and includes the following voivodeships: Mazowieckie, Łódzkie, Wielkopolskie, Lubuskie, Dolnośląskie and Śląskie.

Within the initiative, interdisciplinary actions have been undertaken, aimed at the improvement of health and quality of social life in order to introduce an innovation in the area of so-called *wellbeing*. Within the initiative, apart from the creation of platforms for specialised business, technology transfers and generation of academic companies are being stimulated, as a result of which the groups of technological companies of the *spin-off* type arise. They are focused on the development of the product and are supposed to be a driving force of the consortium, creating conditions for stimulating entrepreneurship and development of competitiveness.

The area of activities includes a joint promotion and application of advanced technologies in food processing and biotechnological processes, in the production of nutraceuticals and biomedical products. In addition, the actions are focused on the pursuit of improvement of natural technology for preserving food and other products, and the preparation of modern bio-packaging systems. The entities of the initiative create a new common product brand of unique healthy properties with healthy food, functional food products, dietary supplements, cosmetics and nutraceuticals. At the same time, the majority of products are created on the basis of technologies implemented in the cluster companies or as a result of the use of innovative technological line built in the area of Wrocław Technology Park S.A. Under a common brand, new products are being introduced on the market, such as pasta or eggs enriched with omega 3 and 6 acids.

In 2012, the initiative included six universities, three business environment institutions and 29 companies representing the following industries: food, meat, cosmetic, chemical, pharmaceutical, production of additives for fodder, manufacturing fodder, egg processing, veterinary medicine, waste management

in the food industry, biotechnological and biomedical industries. 15% of the members are micro-, 55% small-, 20% medium-, 10% large-entities. The initiative also included the following universities: the Medical University in Wrocław, the Wrocław University, the Wrocław University of Environmental and Life Sciences, the Wrocław University of Economics, the Wrocław University of Technology, the Wrocław University of Environmental and Life Sciences.

Nutribiomed has also one of the globally most modern technological lines for the production of bio-supplements and nutraceuticals, which was established on the basis of patent applications of technologies developed within the cluster cooperation. The equipment and the system working on the line enable the members of the initiative to test new technologies, test scale effects, transfer technologies, or run pilot production of products that have not been on the market so far. The line meets the conditions of Good Manufacturing Practice. The quality control systems are in the process of implementation. Along with the machinery of the companies and member institutions, the line increases the capacity of production on the Polish and foreign markets. So far, five technologies developed within the initiative, based on the Polish and international patent applications, have been introduced.

All members of the Nutribiomed initiative have the right to use the line. The coordinator offers a *de minimis* aid to the all associated entities from the SME sector for supporting works carried out on a prototype technological line. As a result of this venture, the innovative technologies have greater chances of development and, as a consequence, market implementation under a common brand Nutribiomed.

It was possible to build the line thanks to the fact that the coordinator of the initiative implemented the project called *Development of the cooperative relations within the Cluster Nutribiomed aimed at commercialisation of innovative solutions* co-financed from IE OP Measure 5.1., for the performance of which it was granted distinction of the PAED.

To summarise, it can be stated that the Cluster Nutribiomed initiative aimed at the reinforcement of the represented cluster, concentrates its actions mainly on the first element of the Porter's diamond model (cooperation, creation of a common brand) as well as supply conditions which is reflected in the purchase of the technological line. Equally important are the connected and supportive branches, which is proved by the close cooperation with the science sector and institutional conditions.

The Kujawsko-Pomorskie Voivodeship

In the Kujawsko-Pomorskie voivodeship five cluster initiatives have been identified, the activities of which, omitting one of them, are characterised by rather loose connections with the agri-food sector (Table 4.2). In their branch orientation elements of being resource related to the agri-food sector or rural areas dominate.

In terms of the category of the branch orientation directly associated with agri-food clusters, the initiative called Kujawsko-Pomorski Association of Organic Food Producers EKOLAND stands out, operating in the field of ecological food [www.ekolandkujawskopomorski.pl].

In 1989, in Przysiek near Toruń, approximately 100 farmers, supported by the scientists from the agricultural universities from Warsaw and Lublin and instructors of local agricultural services, decided to create an organisation. In the same year, during the founding convention in Toruń, the project of the Association of Organic Food Producers was approved and named EKOLAND. After eight years of operations the members of the association, due to a large number of persons interested in the membership, adopted a resolution on the creation of regional branches. In 1998 a Kujawsko-Pomorski branch of the association was opened and it is based in Przykładowo.

Table 4.2. The results of assessment of the cluster initiatives' profiles in the Kujawsko-Pomorskie voivodeship

The name of the initiative	The category of the branch orientation			
	AP	F&AH	PF	RR
1. Kujawsko-Pomorskie Branch of the Association of Organic Food Producers EKOLAND	+	+++	++	+
2. Bydgoszcz Industrial Cluster			+	
3. Toruń Local Tourist Organization				+
4. Inowrocław Local Tourist Organization (INLOT)				++
5. The Ciechocinek Spa Cluster				+
Total grade by categories (sum of pluses)	1	3	3	5

AP – Agricultural Products; F&AH – Farming and Animal Husbandry; PF – Processed Food; RR – resource related to the agri-food sector or rural areas.
Source: Own elaboration on the basis of the Internet query.

The EKOLAND association was created on the grounds of a very noble idea based on production without destroying the land and feeding without doing any harm to the consumers. The main objective is to organise a system concern-

ing ecological agriculture in Poland based on the programme including production criteria, inspection of farms and product attestation, which in a balanced manner is supposed to contribute to the development of ecological agricultural production. The concept of the programme has been based on the standards of the International Federation of Organic Agriculture Movements IFOAM. For this purpose the entities of the initiative undertake the following actions:

- use of various forms for popularising the idea of organic agriculture;
- inspiring and supporting any activities of the members which is consistent with the objectives of the association;
- training manufacturers, processors, distributors and consumers of the products related to organic agriculture;
- cooperating with other non-governmental organisations, public and local authorities in order to promote organic agriculture;
- organisation of fairs with ecological products;
- publishing.

The main stream of the activities of the EKOLAND association is not the attestation of farms anymore, because it is currently being conducted by specialised units. Within the association, it is mainly organic agriculture which is promoted as an alternative for the Polish rural areas under the European integration conditions, and support for farmers to successfully operate in the new conditions. This requires the establishment and signing of respective legislation, merchandising, processing, training, advisory networks and many other elements comprising the whole which can be called the development of organic agriculture. The association does not have its own product brand, however, it promotes products of the association members during the monthly fairs of organic food in the Ethnographical Museum in Toruń. The bioproducts can be bought directly from farmers at the fairs or via the Internet. Activities of the Association include also a cyclic organization of seminars and trainings on ecological agriculture, which are very popular, not only among the associated members. The international cooperation, among others with the Heinrich Boell Foundation, made it possible to promote globally well recognised brands of bioecological products which contributes to the development of organic agriculture, not only in the area of the Kujawsko-Pomorskie voivodeship, but also throughout Poland.

In 2012, the initiative included 68 enterprises. For several years, the farmers participating in the initiative have taken the lead in the national competition for the best ecological agritourist farm. However, in this initiative there is a lack of scientific and research units as well as local authorities.

To summarise, it can be stated that with its initiative, the Kujawsko--Pomorski Branch of the Association of Organic Food Producers EKOLAND

contributes primarily to the reinforcement of the regional cluster of the agricultural cultivation, breeding and animal husbandry, focusing their actions mainly on the second and third element of the model of Porter's diamond, namely on the conditions for supply and demand.

The Lubelskie Voivodeship

In the Lubelskie voivodeship nine cluster initiatives have been identified and their names, together with the grades obtained by them, are shown in Table 4.3.

Table 4.3. The results of assessment of the cluster initiatives' profiles in the Lubelskie voivodeship

The name of the initiative	The category of the branch orientation			
	AP	F&AH	PF	RR
1. Lublin Onion Roll – the regional Cluster in Lublin			+	
2. Local Tourist Organization Land of Loess Ravines			++	++
3. The Lubelskie Eco-energetic Cluster			+	+
4. The Restaurateurs and Hoteliers Cluster			+++	++
5. The Cultures Cluster of the Lublin region				+
6. The Eastern Cluster – Ecological Energy-saving House				+
7. The Association Lubelskie Wood – the regional Cluster in Lublin				++
8. Organic Food Valley Cluster	++	++	+++	
9. Association The Lublin Cluster of Food Trade		+	++	
Total grade by categories (sum of pluses)	2	3	12	9

AP – Agricultural Products; F&AH – Farming and Animal Husbandry; PF – Processed Food; RC – resource related to the agri-food sector or rural areas.
Source: Own elaboration on the basis of the Internet query.

In their branch orientation food processing is the dominant one, though, their resource related connections with the agri-food sector or rural areas are also significant. From the point of view of the branch orientation typical for agri-food sectors, the initiative Organic Food Valley Cluster is regarded as the most representative for the Lubelskie voivodeship, operating in the field of organic food [www.dolinaeko.pl].

The Organic Food Valley Cluster is an initiative of the universities which associates various entities operating for the benefit of the promotion as well as

the development of ecological food. It was founded in 2007 in Lublin and it operates in the form of an association. Its members are companies that have potential and, most importantly, broad experience in the production of ecological food. The coordinator of the initiative is the Institute of Soil Science and Plant Cultivation, the State Research Institute in Puławy. The primary purpose of the initiative is both to increase supply of ecological food (increase in the production scale and number of jobs in the ecological production sector) and to stimulate, in this respect, the regional, domestic and foreign demand.

The objective is carried out by the following actions:
−   common promotion, information database, Internet portal, participation in fairs and economic missions;
−   organisation of ecological food fairs and other ecological products;
−   organisation of training, seminars and conferences;
−   common publications;
−   endeavours to obtain European aid funds;
−   conduction of joint research together with innovative projects regarding the production, processing and marketing of ecological products.

The flagship products in this initiatives are: ecological cold-pressed linseed and rape-seed oils, Podlaski sękacz, swojska sausage, ecological ginseng with products made from it, soft fruits, fruit and vegetable preserves and ecological bakery products.

The demand and opinion-forming parties of the initiative are represented by the following potential buyers:
−   individual buyers, households – persons who want to eat healthy for well-being, appearance or fitness;
−   ecological stores with the so-called healthy food;
−   network of multi-trade retail stores;
−   little school stores, canteens, bars, restaurants and catering companies.

Among the addresees and distribution channels for the product promotion of the entities from the initiatives, the following have been distinguished:
−   web portals propagating a healthy lifestyle and diets;
−   medical environments in the outpatient clinics, hospitals and private clinics;
−   sanatoriums, wellness centres, fitness clubs;
−   schools of various levels, teaching environments;
−   media dealing with the ecological, health, agricultural and regional development topics;
−   other communities interested in leading a healthy lifestyle.

In 2012, the initiative included: four fruit and vegetable producers, two bakery products and cake producers, two meat establishments, two entities operating in the trade area, one service provider, two scientific-research units, three business environment institutions. It has been determined that the initiative will be open, which means that entities and organisations interested in the development of ecological food production from Eastern Poland can join it. The membership is open for entities from the Lubelskie, Podkarpackie and Świętokrzyskie voivodeships. For members of the initiative an information portal has been launched with the IT services system, and to bring the offer of the initiatives' entities closer, a mobile exhibition to present a common offer has been purchased. Among the partners cooperating for the purpose of the initiative there are organisations promoting ecological food, agricultural advisory centres, agricultural and business chambers, trade, social, religious and other institutions and organisations of a local nature.

In 2007, as an effect of the project called *Strategy of the Ecological Food Valley*, the Association *EkoLubelszczyzna* was founded in order to achieve the objectives of this strategy in the interest of its members. This was a pilot project of the Regional Innovation Strategy of the Lubelskie voivodeship, whose aim was to build a cooperation network concentrated around ecological agricultural production and its marketing, and indication of possibilities for the development of the region in this direction. The project was co-financed from the funds of the European Social Fund within the Integrated OP Regional Development – Measure 2.6. *The regional innovative strategies and transfer of knowledge*. Its implementation started in January 2005, and finished in August 2006. The coordinator (the so-called beneficiary) of the project was Higher School of Entrepreneurship and Administration in Lublin, and the implementation institution were the local authorities from the Lubelskie voivodeship.

In 2010, as an initiative of the Association *EkoLubelszczyzna* and with the support of the Marshal's Office of the Lubelskie voivodeship another implementation of the EU project was launched under the name of *Development of Valley of Ecological Food Cluster*. The project office in Lublin is run by the Association *EkoLubelszczyzna*, and the branch office is operated by the Alliance of Associations *Podkarpacka Chamber of Ecological Agriculture* in Świlcza near Rzeszów.

To summarise, it should be emphasised that the initiative *Organic Food Valley* Cluster concentrates its actions on all elements of the of Porter's diamond model, i.e.: demand (marketing of the ecological food) and supply conditions (soft skills), related and supporting industries (coordinator), creation of strategies, goals and principles, structure and coopetition (within the implementation

of the EU projects) as well as on the institutional conditions (effective acquisition of the EU funds).

The Lubuskie Voivodeship

In Lubuskie voivodeship only four cluster initiatives have been identified and they may be partially considered as those connected directly or indirectly with the agri-food sector (Table 4.4). On the basis of total grades by the branch orientation categories it may be concluded that, to the greatest degree, they are related to the food processing sector, as well as resource related to the agri-food sector or rural areas. Considering the nature of their operations, the most interesting in the context of the specificity of the Lubuskie voivodeship seems to be the initiative *Lubuskie Route of Wine and Mead*, the scope of which and potential impact is of an intersectoral nature.

Table 4.4. The results of assessment of the cluster initiatives' profiles in the Lubuskie voivodeship

The name of the initiative	The category of the branch orientation			
	AP	F&AH	PF	RR
1. Lubuskie Training-Consulting Cluster for the Regional Product			+	+
2. Regional Tourist Organization of Lubuskie Province LOTUR			+	+
3. Metal Cluster of Lubuskie Province			+	
4. Lubuskie Route of Wine and Mead	+++	++	+	++
Total grade by categories (sum of pluses)	3	2	4	4

AP – Agricultural Products; F&AH – Farming and Animal Husbandry; PF – Processed Food; RC – resource related to the agri-food sector or rural areas.
Source: Own elaboration on the basis of the Internet query.

The cluster initiative Lubuski Route of Wine and Mead, focusing on promoting local products and ecotourism, was established in 2006. It refers to the 800 year-old tradition of wine production in this region. The coordinator of the initiative is Zielonogórskie Winemaking Association, being an industrial, social organisation gathering companies, suppliers and manufacturers from the winemaking industry. The Lubuskie Route of Wine and Mead is a group of entities which emerged from the Zielona Góra Winemaking Association to intensify their cooperation even more.

Its objective is to improve competitiveness and the use of opportunities that are created for entrepreneurs by internationalisation. The route is a special

type of tourist product, created on the basis of the potential of the Lubuskie voivodeship (including Zielona Góra, recognised as *the Polish capital city of wine*) and related to the regional products registered on the List of Traditional Products of the Ministry of Agriculture and Rural Development, among others, with wine, mead and honey. The Route of Wine and Mead is an example of a bottom-up initiative, coming from the entrepreneurs.

Within this initiative, the following tasks are being implemented:

− conducting training and courses, organising lectures, scientific conferences;
− conducting consultations and the creation of expert studies with regard to cultivation and wine production;
− development of promotional activities via mass media;
− support for the creation of producers' groups with regard to grapevine cultivation and wine production;
− cooperation with the scientific environment and national and foreign organisations dealing with wine issues;
− cooperation with authorities, state institutions and local authorities regarding issues related to the grapevine cultivation, wine and fruit processing;
− applying to relevant bodies with regard to the legal regulations and expressing opinions on drafts of legislative acts, regulating issues related to winemaking.

Moreover, the activities of the members of the Zielona Góra Winemaking Association contributed to the creation, in 2008, of a winemaking class in the *Group of Schools and Units of Vocational Training* in Zielona Góra. The initiative integrates the tourist offer of winemakers and beekeepers located on the route. This is the so-called chain product, because it includes events, facilities and services, aimed at the promotion of regional products and interesting places of the Lubuskie Land. The guests have vineyards, apiaries, hotels and museums at their disposal which should encourage them to stay longer in the Lubuskie Land. The cooperation is an opportunity to coordinate the offer, which should contribute to the creation of an attractive and consistent tourist proposal which the tourists from the country and abroad can benefit from. A symptom of the cooperation of the initiative members is the possibility to visit all vineyards with the purchase of one ticket.

The Route has a chance to become a brand recognizable beyond the voivodeship, therefore activities are undertaken to promote this product. Two folders containing colourful presentations and descriptions of the attractions of the route, as well as a map and a calendar of events, have been issued. In 2009, thanks to the subsidy of the Marshal's Office in the Lubuskie voivodeship and

of the Municipal Office of Zielona Góra, one folder was issued in Polish, German and English language versions. A great success of the Lubuskie Route of Wine and Mead was obtaining a distinction in the competition for the *Best Tourist Product of the Zatur Fair 2008* in which approximately 100 exhibitors from the Lubuskie Land and Brandenburg took part. The members of the initiative and the Zielona Góra Winemaking Association take an active part in the organisation of cyclic events related to wine, such as *Zielona Góra Wine Harvest*, *Days of the Young Wine, Winemaker's Ball, Wine Harvest Contest of Wines, and Zielona Góra Wine Fair*. Tourists may expect many interesting events all year round.

The initiative associates winemakers, beekeepers, hotels, museum institutions and local authorities. In 2012, the initiative included 44 entities, among others, of the Lubuskie Agricultural Advisory Centre in Kalsko, three agritourist farms, six museums and open-air museums, five bee-keeping farms, 23 vineyards and one store.

The members meet in the course of the works related to the preparation of current wine events, and they communicate on a daily basis mainly by e-mail and by placing information on the website of the Zielona Góra Winemaking Association – www.winemakers.zgora.pl. As a result, they have access to the expanded forum, which is a perfect source of information and communication as well as makes it possible to become more familiar with the opinions and experiences of people from the industry.

To summarise, it can be stated that the Lubuskie Route Wines and Mead initiative, aimed at the reinforcement of a quite specific cluster, concentrates its actions mainly on the demand and supply conditions without forgetting the close cooperation regarding the development and implementation of strategies and common objectives. Bearing in mind the special character of the industry, institutional conditions are also an important element, especially concerning the creation of law fostering the development of the industry.

The Łódzkie Voivodeship

In the Łódzkie voivodeship, seven cluster initiatives have been identified whose names and results of assessment of their profiles have been presented in Table 4.5. Their activity is mostly focused on two areas, namely food processing and farming and animal husbandry.

Two initiatives deserving closer attention which, in a sense, are typical for the Łódzkie voivodeship, are as follows: the Łódzki-Mazowiecki Fruit and Vegetable Cluster and the Łódzki Fruit and Vegetable Cluster *Zjazdowa*. The entities from the first one, also active in the Mazowieckie voivodeship, are

related to the industry of fruit and vegetable production and processing, while the second is mostly related to the production and trade concerning dessert vegetables and fruits [Policy & Action Group Uniconsult 2009]. Eventually, due to a higher number of participants, the second initiative from the above-mentioned initiatives has been selected to be characterised in more detail.

The *Zjazdowa* initiative was founded in 2007 in the form of a joint stock company. Its coordinator is the management of Łódź Wholesale Market Zjazdowa S.A., having its registered office in Łódź. The initiative is local, as well as regional in scope.

Table 4.5. The results of assessment of the cluster initiatives' profiles in the Łódzkie voivodeship

The name of the initiative	The category of the branch orientation			
	AP	F&AH	PF	RR
1. Łódzki-Mazowiecki Fruit and Vegetable Cluster	+	++	+++	
2. Kutnowski Technological Cluster			++	
3. Fruit and Vegetable Cluster of Łódź *Zjazdowa*	+	+++	++	
4. Horse-Riding Tourism Cluster of Łódź		+		+
5. Tradition and Flavour Heritage Cluster			+	+
6. Bioenergy for the Region Cluster	+		+	+
7. Mechatronic Cluster			+	
Total grade by categories (sum of pluses)	3	6	10	3

AP – Agricultural Products; F&AH – Farming and Animal Husbandry; PF – Processed Food; RC – resource related to the agri-food sector or rural areas.
Source: Own elaboration on the basis of the Internet query.

Łódzki Wholesale Market began its activities in 1996. Its shareholders include the city of Łódź and local entrepreneurs, mainly wholesalers from the food industry. In 1997, the company built a complex of halls and commercial facilities in the areas contributed as endowment by the city. Particular entrepreneurs-shareholders of the company have commercial areas at their disposal correspond-ding to their shares. The company itself, as a management entity, conducts activity consisting in the management of facilities, rental of the premises, maintenance of the land, but also wholesale trade. It undertakes certain promotional activities (as the administrator of halls it periodically issues common promotional materials for a larger group of tenants), so it can be assumed that it has the function of a coordinator.

Zjazdowa is the main wholesale food market in the voivodeship and the second facility of this type in central Poland, next to the wholesale market in

Bronisze. In its area, the wholesale of all types of food products takes place: fruits, vegetables, meat, dairy etc. The functioning of the market fosters the integration of the environment of entrepreneurs operating in it. The cooperation applies, in the first place, to the common products supply of some entrepreneurs from suppliers and producers. More and more often, several companies order one transport of specified goods jointly. Less frequent is the cooperation consisting in delivery of goods to the same recipients.

The objective of the initiative is further expansion of halls and organisation of commercial areas. The following actions are planned:

− promotional activities, consisting in developing a common promotional logo and issuing common promotional materials;
− development of export by selected entities operating in the initiative;
− improvement of quality of the access road, supply of a broadband internet connection;
− *soft* activities.

According to the PAED representatives *it is the most ambiguous cluster initiative in the Łódzkie voivodeship* [Clusters in the Łódzkie Voivodeship 2012]. However, it is not possible to ignore the fact that it consists of 120 companies, one scientific-research unit, one institution from the business environment. 70% of the group's entities are of micro-type, 21% belong to the group of small enterprises, 6% to medium, and 3% to large enterprises [www.zjazdowa.com.pl]. The initiative does not rather plan to link its operations more with large companies.

Zjazdowa conducting its own commercial activities used support of a promotional nature from the EU funds. Łódzki Wholesale Market *Zjazdowa* was a beneficiary of the Łódzkie voivodeship Regional Operational Programme (ROP) for 2007-2013 and executes the project: *Initiation and animation of cooperation relations in the Łódzkie voivodeship*.

The representatives of the Łódzkie Wholesale Market expect from the public administration, first of all, the activities of infrastructural nature. On the other hand, to a smaller extent, the expectations regarding activities supporting the initiative itself are formulated, although most certainly, the creation of an effective financing system of promotional activities would be an important impulse for the development.

To summarise, it can be stated that the Łódzki Fruit and Vegetable Cluster Zjazdowa initiative, aiming potentially at the strengthening of the cluster, concentrates their actions mainly on the demand (promotion) and supply conditions (infrastructure). Also, institutional conditions and, in the last few years, obtaining the European funds related to them, are important.

The Małopolskie Voivodeship

In the Małopolskie voivodeship, five cluster initiatives have been identified, characterised mainly by (three of them exclusively) resource related connections with the agricultural and food sector or rural areas (Table 4.6).

The most interesting, from the point of view of innovation, and at the same time deserving to be characterised in more detail, is the *Life Science* Cluster initiative, operating in the area of biotechnology and biomedicine [www.lifescience.pl]. The reason for this choice is also the distinctive, as compared to other initiatives functioning in the Małopolskie voivodeship, relatively broad profile of its operations connected with the agri-food sector.

Table 4.6. The results of assessment of the cluster initiatives' profiles in the Małopolskie voivodeship

The name of the initiative	The category of the branch orientation			
	AP	F&AH	PF	RR
1. *Life Science*Cluster	+	+	++	
2. Małopolski-Podkarpacki Clean Energy Cluster				+
3. Cluster of Innovative Recycling Technologies EKO TECH				+
4. Green Economic Initiative			+	+
5. Myśleniecki Cluster				++
Total grade by categories (sum of pluses)	1	1	3	5

AP – Agricultural Products; F&AH – Farming and Animal Husbandry; PF – Processed Food; RC – resource related to the agri-food sector or rural areas.
Source: Own elaboration on the basis of the Internet query.

The *Life Science* cluster is an academic initiative founded in 2006 of a global range in the conceptual sense but, first of all, a platform of collaboration in the area of life science and a vehicle for funds acquisition, mainly in the regional system. It is coordinated by the Jagiellonian Innovation Centre seated in Cracow.

The objectives of this initiative are the following:
– using the existing potential of people, companies, universities, scientific--research units, business environment institutions as well as local and regional authorities;
– supporting entrepreneurship and innovation in the field of *life science*;
– creating conditions for effective commercialisation of the R&D findings.

Within the initiative the following programmes are being implemented:

- promotion of the idea and principles of functioning of the initiative, including, among others, internationalisation, participation in conferences and meetings;
- acquisition of new partners and development of cooperation, including organisation of regular meetings and mini conferences, workshops, training and supporting the development of scientific and business contacts;
- creation of a basic offer – elements of the innovation system, including implementation of various ventures of database and knowledge types, initiatives and ideas exchange, innovation fairs (in this programme the cooperation with institutions of Seed Capital and Business Angels type are included);
- promotion and development of competences with regard to the innovation and entrepreneurship, aimed at the systematic development of competences in the areas related to process of innovation, necessary to raise efficiency and effectiveness of the interaction between science and business;
- development of effective communication infrastructure within the initiative to ensure the access and exchange of information, including running the lifescience.pl portal and creation of other communication tools (forum, newsletter);
- integration of the life science environment – in Małopolska, as well as in the neighbouring regions, many ventures concerning the widely understood issues regarding life science are being undertaken, aimed at the integration of various actions by exchanging information, common projects, creation of a common offer etc.

So far, the following actions have been implemented:

- development of the web portal lifescience.pl run in two languages;
- development of the Internet platform, supporting the cooperation of partners of the initiative;
- appointment of the cooperation groups within the specialised activities: Innovative Hospital, Diagnostics or Team of the Scientific Innovations;
- organisation of a cyclical conference *LifeScience Open Space* in Cracow;
- establishment of international contacts and cooperation with cluster initiatives from France, Germany and the USA.

The initiative includes institutions, diverse in terms of their type, structure and size: eight hospitals, 11 manufacturers, 14 entities conducting the diagnostic tests and laboratory services, seven entities offering consulting and infobrokering services, three local government units, 11 scientific-research units, 11 business environment institutions from the areas of biotechnology, pharmacy,

medicine, food and environmental protection. Within the initiative, the entities gain access to resources of knowledge and information, specialist research resources, organisational, legal, marketing, financial, logistic and technological support and assistance in the creation of strategic alliances, excellence centres and project groups between companies and scientific centers, both at the regional and international level.

At the international level, the *Life Science* Cluster cooperates with: *Genopol Evry* from France (development projects, commercialisation of research), *Global Innovation Network* (development of the biotechnology and *life science* sectors), *European Diagnostic Cluster Alliance* (development of medical diagnostics). For instance, in 2010, the entities of the initiative were involved together in 18 projects.

To summarise, it can be stated that in the context of development, the *Life Science* Cluster concentrates its actions mainly on the supply conditions (competencies) and related and supporting industries (very diverse, including contacts from abroad).

The Mazowieckie Voivodeship

In the Mazowieckie voivodeship 10 cluster initiatives oriented mainly on food processing have been identified. To a smaller, though visible degree, they represent a category connected with farming and animal husbandry (Table 4.7).

Considering the branch orientation, in the Mazowieckie voivodeship, the initiative that is worth describing seems to be the Bioproduct Cluster initiative, operating in the field of manufacturing of ecological food [www.hurtidetal.pl   portal/article/art_id,1034-/konferencja-prasowa--klaster-bioprodukt.-ministerstwo-rolnictwa-i-rozwoju-wsi--22-listopada-2007/].

The initiative was established in 2007 by Polish manufacturers and processors of ecological food. Its development strategy for 2007-2020 includes, among others, the introduction of a biodiversity certificate into the European market and taking advantage of the Polish unpolluted agriculture, in order to make our country the leader on the European market with regard to ecological food.

Table 4.7. The results of assessment of the cluster initiatives' profiles in the Mazowieckie voivodeship

The name of the initiative	The category of the branch orientation			
	AP	F&AH	PF	RR
1. Scientific-Technological Cluster of Eco-logical Cars			+	
2. EFA – Energy from Algae	+	+		+
3. Mazowieckie Energy Alliance ALFAB		+	++	+
4. Mazowieckie Cluster of Energy Effec-tiveness and Renewable Energy Sources				+
5. Lacto-Feed Development of Food Treat-ment Technology			+	
6. The Tourism Cluster of Mazovia			+	+
7. The Bioproduct Cluster	+	+	+++	
8. Mazowieckie Cluster of Fruits		++	+	
9. Cluster of Innovation in Agribusiness		+	++	
Total grade by categories (sum of pluses)	2	6	11	4

AP – Agricultural Products; F&AH – Farming and Animal Husbandry; PF – Processed Food; RR – resource related to the agri-food sector or rural areas.
Source: Own elaboration on the basis of the Internet query.

The establishment of the initiative results from the willingness to create a common, Polish brand, which will be able to face a growing, global competition and to obtain a strong market position. Members of the initiative together manufacture more than 90 products. Some of them are: beetroot and pickled celery juice, tricoloured rice, farmer's optimistic soup, amarantus muesli, muesli bread with mixed dried fruit and nuts, spelt noodles, vegetable pate muesli with lentil, plum jam, chokeberry juice. These products have an excellent flavour and high nutritional value. The main condition to become a member is to have an up-to-date certificate of ecological agriculture. What is important, is that each of the manufacturers belonging to the initiative as well as each farm supplying the entities of the initiative in agricultural goods must have it. The main problem seems to be, at the same time, that in Poland there is an insufficient number of companies involved in the processing of ecologically produced fruits, vegetables, milk or meat, for example for jams, juices, vegetable, milk or cured meat products.

The initiative is an attempt to respond to a very quickly growing interest in niche food markets, which in Poland are still ecological products, and the large demand for those products in the wealthier old EU member states. In the opinion of the entities forming the initiative, in Poland there is an agricultural potential that may become an optimal basis for the creation of a powerful sector of ecological food. In their opinion, paradoxically, the economic delay and relatively

low degree of industrialisation of Polish agriculture helped to preserve the conditions fostering the development of this type of production. For instance, while in Western Europe, for a few decades, new artificial fertilisers and plant pesticides have been experimented with, a Polish farmer from behind the *Iron Curtain* traditionally fertilised their crops with manure and compost. Among the factors proving the size of the unused potential of the Polish ecological agriculture, the following are mentioned: soil conditions, ownership structure, knowing by farmers ecological, or similar to ecological, methods of management, clean environment and still a relatively low cost of workforce.

Despite such favourable conditions, Poland does not keep up with the specific *green revolution*, which was widespread in Western Europe over the past decades. For comparison, in Nurnberg bioproduct fairs, approximately 3,000 exhibitors present their offerings. The surface of biocrops in France expanded in the period 2001-2006 by 31%, and in Spain and Austria, only between 2005-2006, by 15 and 35%, respectively. In 2006, in Austria, the bioproduct market was worth nearly 200 million euro. Currently, in Europe, nearly 7.3 million ha is ecologically managed, which is more than 4% of used agricultural surface in the EU, when in Poland ecological cultivations take only ca. 1% of the total area of cultivations.

The Bioproduct Cluster is created by 19 entities related to ecological food, including production plants, processors, farmers, local authorities, non-governmental and scientific units. The membership of the Institute of Biotechnology, the Faculty of Food Technology of the Agricultural University, the Foundation of the Development of Agriculture, Village and Rural Areas and 14 main Polish manufacturers and food processors proves the fact that the initiative has a very high substantive and economic potential.

Also, the Ministry of Agriculture and Rural Development supports the entities forming the initiative, strengthening the industry through the following actions: promotion of Polish products on foreign fairs for instance, in Tokyo and Dubai, cooperation with the Polish embassies in order to support promotion of domestic products and development of the Council for Food Promotion – a gathering of specialists involved in the areas of sales and marketing.

To summarise, it can be assumed that *the Bioproduct Cluster* initiative, aimed at reinforcement of the cluster, concentrates its actions mainly on the first element of the Porter's diamond model, namely on the creation and implementation of a common brand, as well as on related and supporting industries, comprised mainly of the science sector. The initiative mainly emphasises the supply conditions which it has at its disposal and wishes to maintain.

The Opolskie Voivodeship

In the Opolskie voivodeship seven cluster initiatives have been identified. Results of their profile assessment included in Table 4.8 indicate that it is not possible to consider, in a clear manner, any of the analysed types of agri-food cluster as a representative one. On the other hand, to some extent, all of them are characterised by some resource related connections with the agri-food sector or rural areas.

Table 4.8. The results of assessment of the cluster initiatives' profiles in the Opolskie voivodeship

The name of the initiative	The category of the branch orientation			
	AP	F&AH	PF	RR
1. Tourist Cluster of the Opolskie Voivodeship *Land of Mead and Milk*			+	+
2. Cluster of Renewable Energy Sources *Ecoenergy of the Opole region*				+
3. Śląski Wood Cluster				+
4. Cluster of the Opawskie Mountains				+
5. Silesian Cluster of Revitalisation and Environmental Technologies				+
6. Silesian Cluster of Companies of the Basin of the Upper River Oder				+
7. Chemistry Cluster *Innovative Chemistry*				+
Total grade by categories (sum of pluses)	0	0	1	7

AP – Agricultural Products; F&AH – Farming and Animal Husbandry; PF – Processed Food; RR – resource related connected with the agri-food sector or rural areas.
Source: Own elaboration on the basis of the Internet query.

Considering the scope and directions of conducted operations, from the point of view of the analysis, the most interesting in the case of the Opolskie voivodeship seems to be the Tourist Cluster of the Opolskie voivodeship *Land of Mead and Milk* operating in the tourism and leisure industry [www.kolot.republic.pl/archive.htm].

The beginnings of the initiative date back to 2002. Kluczborska Local Tourist Organisation, which in 2004 transformed into Kluczborsko-Oleska, launched the activities aimed at the cooperation in the creation, distribution and internationalisation of tourist and leisure services and traditional local and regional products. The organization is the coordinator of the e-KOLOT initiative, performing the role of a network broker, whose task is to facilitate contacts between members of the initiative, which are the entities from the kluczborski and

oleski poviats. This area is characterised by potential enabling it to develop broadly understood rural tourism, production and consumption, as well as ecological education, creating conditions for rest, consistent with the principles of a healthy lifestyle.

The initiative is of a regional scope. Among the tasks faced by entities of the initiative, the following have been distinguished:

- profiling and expansion of tourist-leisure offers (including those related to the animation of free time) for various market segments of tourism (domestic and foreign) with the maintenance of rural, local character and ecological lifestyle (rest, consumption, care for health – prevention);
- organisational and substantive assistance in the introduction of the newly created offers (packages) and products on the market, reported by contractors and producers;
- creation and updates of the offer database of rural tourism services and producers of local and regional products (among others, administration of the website, monitoring or market bidders – identification of the development barriers and market recipients);
- creation of the brand regarding the e-KOLOT initiative promoting the Opolskie voivodeship as the *Land of Mead and Milk* through internal activities (including: certification of tourist and leisure services, implementation of procedures for maintenance and improvement of customer service quality, widening and updating competences of the initiative members through the implementation of trade and language training, applications of modern IT technologies in everyday activities) and mainly promotional, external actions with the application of diverse instruments and techniques, including: brochures, exhibitions, fairs, promotional films, tourist passports, leisure vouchers etc.;
- application for funds for the implementation of projects targeted for the creation, development and promotion of the brand of services and products of the initiative as a whole, and brands of its particular members under the common logo;
- strengthening the cooperation between service providers of the tourist and tourist-related industries, regional producers and local, traditional products from the Opolskie voivodeship, other regions of Poland and from the abroad, including the areas already cooperating and that of the presence of potential recipients of products and services offered by the members of the initiative.

The offer of the initiative members is extremely broad. It includes, among others: active leisure, club and special events, packages and educational work-

shops, regional education works, horse riding camps, therapeutic holidays, rallies, open air and cultural events, international multi-generations meetings, support for foreign tourists, transport, products of local entrepreneurs of the apiculture, dairy, confectionary industry, as well as tourist product *Mirror of the past* certified by the Polish Tourist Organisation (POT). In 2009, e-KOLOT *Land of Mead and Milk* was awarded in the second edition of the Awards of the Kluczborski Governor *Honeycomb* in the category of tourism.

The initiative consists of entrepreneurs from the industry, local authorities from the kluczborski and oleski poviats, the University of Opole and the Scientific-Technology Park of Opole. It has the form of an association based in Kluczbork. In 2012, the initiative included: 16 entities offering hotel and gastronomic services, two producers, three entities offering consulting and educational services, one offering tourist services, one offering embroidery services, four local government units, two scientific-research units, two business environment institutions. The entities cooperate closely, in particular, with the Department of Economics at the University of Opole, the Complex of Schools from Polanowice and many tourist, economic and non-governmental organisations from the area of the Opolskie voivodeship as well as within the scope of establishing, organising and implementing single promotional events, implementing the training aimed at the improvement of the quality of services and products offered by the initiative members and strengthening bonds of cooperation with partner cities and regions and with local authorities.

The greatest project among those undertaken by the initiative from the moment of its establishment was the project titled *Local and regional product in virtual tourist space of the Oder River Basin*. It was realised in 2009 within the *Financial support for the development of international cooperation of the initiative with foreign partners Programme – Innovation Express*. The tasks determined were performed in cooperation with initiative Touristische Gruppe (CLUSTER) pro-agro Verband zur Förderung des ländlichen Raumes im Land Brandenburg (Germany, Brandenburg). The project involved 41 entities (21 Polish and 20 German ones).

On the other hand, in September 2009, within the Innovation Express Programme implemented by the PAED, the members of the initiative participated in a study tour to Germany, the purpose of which was to get to know the nature of operations of the partners from Brandenburg, the solutions applied by them and the development of the cooperation framework in the scope of creation and distribution of tourist products. As a result of activities done in the communication and promotion section of the initiative, an innovative system with the use of modern information technologies was implemented.

To summarise, it can be stated that the Tourist Cluster of the Opolskie voivodeship *Land of Mead and Milk* initiative, aimed at strengthening of the cluster, concentrates its actions on all elements of the Porter's diamond model. Important are both cooperation and creation of the brand, the supply- and the demand-based conditions (multi-directional) as well as related and supporting industries (the science sector and cooperation with clusters from abroad) and institutional conditions (the EU funds and the PAED programmes).

The Podkarpackie Voivodeship

In the Podkarpackie voivodeship, seven cluster initiatives have been iden-tified and most of them, according to the results of the assessment of their pro-file presented in Table 4.9, are relatively strongly focused in their activities on firstly food processing, and secondly, on farming and animal husbandry. These categories of branch orientation are represented, to the greatest extent, by the initiative Podkarpacki Agri-food Cluster based in Rzeszów which was selected for a short description [www.farmer.pl/fakty/ polska/więcej-firm-w-klastrze-rolno-spozywczym,38943.html].

Table 4.9. The results of assessment of the cluster initiatives' profiles in the Podkarpackie voivodeship

The name of the initiative	The category of the branch orientation			
	AP	F&AH	PF	RR
1. Transboundary Tourist Cluster of Bieszczady				+
2. Renewable Energy Cluster of Pod-karpacie				+
3. Welding Cluster KLASTAL			+	
4. Cluster of Plastics Processing POLIGEN			+	
5. Agri-food Cluster of Podkarpacie based in Rzeszów	+	+++	+++	
6. The National Medicines Institute Cluster of herbal, medicinal products and dietary supplements	+	+	++	
7. Flavours of Podkarpacie		++	+++	+
Total grade by categories (sum of pluses)	2	6	10	3

AP – Agricultural Products; F&AH – Farming and Animal Husbandry; PF – Processed Food; RR – resource related to the agri-food sector or rural areas.
Source: Own elaboration on the basis of the Internet query.

The initiative is of a top-down nature and was established thanks to the efforts of the Higher School of Computer Science and Management in Rzeszów, within the implementation of the project *Support for Development of Cluster Structures in the Podkarpackie Voivodeship*. The objective of the initiative is to develop production, to create high quality food products and to develop a recognisable brand of regional food products, succeeding not only on the regional, but also on the national, European and even global market. The activities within the initiative consist in combining material resources, exchange of information, modern technologies flow and common implementation of innovative solutions in the agricultural sector, processing and production of high quality food products.

Among the planned activities, in particular, the following actions deserve attention:

−   creation of a website and brochures of the initiative;
−   preparation of the operation strategy as well as starting of associations that will manage the organisation;
−   study tours in Poland and abroad;
−   commercial missions and cross-border cooperation;
−   participation in food fairs in, among others, Ireland, Austria, Ukraine and in the Polagra Food fairs in Poznań.

The initiative consists of 40 companies and other entities from the Podkarpacie region, as well as from the south-eastern Poland, that are continuously joining it. They also include well-known, large companies like Hortino Leżajsk and PPM Taurus from Pilsen which expect that, thanks to the membership, they will be able to reduce production, distribution and promotion costs. The initiative is evolving in the direction of the Euro-regional cooperation. Also the entrepreneurs from Ukraine, Slovakia and Czech Republic want to cooperate. On the other hand, the coordinating school becomes the centre of clustering, aimed at connecting the potential of people, agricultural farms, processing and production plants, commercial companies, local authorities, universities, R&D centres, institutions from the environment business, non-governmental organisations as well as financial institutions while realizing various economic ventures. The entities of the initiative can count on financial support from the EU funds and from regional authorities. For instance, in 2012, local authorities located 500,000 PLN for the development of clustering in the Podkarpackie voivodeship.

To summarise, it can be stated that the initiative Agri-food Cluster of Podkarpacie based in Rzeszów, aimed at the reinforcement of the cluster, concentrates its actions mainly on the demand-based conditions, related and

supporting industries, seeking benefits from combining resources, strengthening the cooperation and exchanging experience with the entities from abroad.

The Podlaskie Voivodeship

In the Podlaskie voivodeship, the number of identified cluster initiatives is 12 and it belongs to one of the highest in the country. These initiatives are related mostly to food processing, which is proved by the results of a profile assessment regarding their activities, presented in Table 4.10.

Table 4.10. The results of assessment of the cluster initiatives' profiles in the Podlaskie voivodeship

The name of the initiative	The category of the branch orientation			
	AP	F&AH	PF	RR
1. North-Eastern Innovative Tourist Cluster *Crystal of Europe*			+	+
2. North-Eastern Innovative Wood Cluster				+
3. Bakery Cluster of Podlasie – Association			++	
4. Cluster of Metal Treatment of Podlasie			+++	
5. North-Eastern Machine Cluster			+	
6. Green Technologies Cluster		+	+	+
7. Podlaskie Food Cluster *Naturally from Podlasie!*		+	+++	
8. Eastern Construction Cluster				+
9. Eastern Cluster of Tourist Brands				++
10. Supraśl Health Resort Cluster			+	++
11. Podlasie Pork Cluster	+	++	+++	
12. Podlasie Food Cluster		+	+	
Total grade by categories (sum of pluses)	1	5	16	8

AP – Agricultural Products; F&AH – Farming and Animal Husbandry; PF – Processed Food; RR – resource related to the agri-food sector or rural areas.
Source: Own elaboration on the basis of the Internet query.

The initiative Podlasie Food Cluster *Naturally from Podlasie!* may be considered as the most typical for the Podlaskie voivodeship, representing, first of all, the category of branch orientation connected with food processing, and the initiative Podlasie Pork Cluster associated, to a smaller or larger extent, with all three types of agri-food clusters. The initiative selected for a more in-depth description is the first of them, which is considered to be focused better on its cluster activities [www.naturalniezpodlasia.pl].

Naturally from Podlasie! is an academic, top-down initiative established in 2007 in Białystok in the form of an association. Its main objectives, among others, are:

- dynamic growth of companies being the members of the association, and improvement of efficiency of their actions;
- increase of competitiveness of the companies on the domestic and foreign markets;
- implementation of innovative solutions;
- representation of the interests of the association members towards the local and state authorities, domestic and foreign associations and organisations;
- creation of the image and promotion of the Podlasie region in Poland and abroad;
- creation of a strong, local brand;
- creation of a marketing, legal and financial platform for the members of the association;
- popularisation of knowledge regarding nutrition, human health and protection of the natural environment.

The association contributes to the promotion of the region, being one of the ecologically cleanest in Europe, thanks to the creation of the *Naturally from Podlasie!* brand, which should be considered as a quality mark for products from Podlasie. It is protected by the Patent Office of the Republic of Poland, and it is owned by the association. Only the best products are marked with it, those which meet the highest quality and flavour-related requirements, e.g. strawberries from Korycin, broccoli from Sokółka, flour from Białystok, mayonnaise from Agrovita.

Among entities forming the initiative there are 13 companies from the agri-food sector and an advertising agency. However, among them, there are no scientific centres, local authorities and business environment institutions. The initiative includes the following sub-clusters: food, meat, dairy, cereals--bakery and fruit and vegetable. The members of the association work to its benefit for free, however, they bear the costs of a standard registration fee and an annual subscription which, in the case of private persons are token payments, whereas, in the case of companies, they are dependent on the number of the employed persons.

The initiative was established as an element of the implementation of the Regional Innovation Strategy. Its activities in the period 2007-2008 were conducted within the EU project *Innovative Cluster of Agricultural and Food*

Processing of Podlasie, the aim of which was to strengthen the economic potential of innovation.

To summarise, it should be emphasised that the initiative Podlasie Food Cluster *Naturally from Podlasie*!, aimed at the reinforcement of the cluster, concentrates its actions mainly on creating a common brand, strengthening the cooperation, and on the institutional conditions.

The Pomorskie Voivodeship

In the Pomorskie voivodeship, seven cluster initiatives have been identified which, as the results of the assessment of their activity profile presented in Table 4.11 indicate, are strongly related to food processing. Most of them are also characterised by a certain resource related connection with the agri-food sector or rural areas.

Table 4.11. The results of assessment of the cluster initiatives' profiles in the Pomorskie voivodeship

The name of the initiative	The category of the branch orientation			
	AP	F&AH	PF	RR
1. Vistula Renewable Energy Cluster	+		+	+
2. Pomorskie Horeca Cluster			+++	
3. Pomorski Biotechnological Cluster BI-OPARK			++	+
4. The Baltic Eco-Energy Cluster				+
5. Pomorskie Food Cluster (Food from Pomorze)	+	+++	+++	
6. Tourist Cluster Tuchola Forests			+	+
7. Pomorskie Maritime and Vistula Catchment Basin Cluster				+
Total grade by categories (sum of pluses)	2	3	10	5

AP – Agricultural Products; F&AH – Farming and Animal Husbandry; PF – Processed Food; RR – resource related to the agri-food sector or rural areas.
Source: Own elaboration on the basis of the Internet query.

The most noteworthy initiative, which deserves a more detailed description, is the Pomorski Food Cluster *Food from Pomorze* initiative, strongly focused in its activities on agricultural crops, animal husbandry and food processing [www.pobiarzyn.name.pl/klaster/].

Food from Pomorze is the proposed name for the Pomorski Food Cluster and at the same time the name of the initiative, which is supposed to organise the cooperation and support for development of this cluster. The initiative

adopted the formula of the association of the same name. In 2008, in Gdańsk, the Association *Food from Pomorze* was founded, whose members and founders included 19 companies from the agri-food sector. The newly-created association aims at being an animator for the development of the food cluster and undertaking operational activities stipulated in the developed strategy. In addition, the association aspires to be the office of the cluster, responsible for stimulating contacts, information flow as well as establishing cooperation between different entities in the cluster. It is a grassroots initiative, a business network of cooperation.

The prominent values of the initiative include:

− *the pomeraniaty* of products, consisting in the referral by their producers to associations related to locality, regionalism, culinary heritage of the region and experience resulting from the functioning in the Pomorskie voivodeship;

− trust in the goods based on building credibility by the reliability of the producers and distributors of food in the adherence to the principles and safety of the production process and in keeping qualitative parameters constant, but also in undertaking marketing activities of an informational and promotional nature, compliant with the ethics and principles of good practices;

− partnership and participation in benefits by creating and strengthening regional economic relations in the supply chain between producers, distributors and food consumers, as well as joint fulfilment of commitments and bearing costs and risks in the mutual action.

The main objective of the entities involved in the initiative is a maximum growth in their value resulting from the undertaken cooperation. In order to meet the objective, specific actions are taken in the following directions:

− building a promotional system of food products and beverages named *Food from Pomorze*;

− development of functional food;

− fostering development of the education system focused on the needs of the sector;

− conducting sectoral analyses and market trends;

− conducting lobby actions for the industry.

In addition, the entities of the initiatives take the following actions:

− cooperation and stimulation of competitiveness and innovation of the food sector and, as a result, stimulation of the socio-economic growth in the region;

− promotion of the food products of distinctive quality and flavour;

− promotion and creation of a positive image of the initiative members;

- dissemination of knowledge regarding the producers of local, regional and traditional food from the Pomorskie voivodeship;
- promotion of the Pomorskie voivodeship, its culture and tradition;
- cooperation and stimulation of competitiveness and innovation of the food sector from Pomorze;
- creation of a cooperation platform for the development of food companies from the region;
- intensification of the collaboration between producers, and scientific and research environment;
- representation and protection of economic interests of the initiatives and its members;
- popularisation of principles of professional ethics in the environment of people running business activities;
- cooperation with authorities, public administration bodies, and scientific-research units.

The food sector in Pomorze belongs to priority branches of the economy of the voivodeship. It produces 11% of sold industrial production of the region, employing over 20,000 people which constitutes, approximately, above 28% of persons professionally active in the voivodeship. In the Pomorze food cluster, the products are prepared by nearly 6,000 companies, of which 97% are private economic entities selling their goods for more than 4.6 billion PLN a year, and 95% are SMEs (75% – micro- and small, 20% – medium companies). The food from Pomorze has seen considerable success on the market due to its flavour and quality.

The initiative has been undertaken by 16 companies from the food industry, specialising mostly in fish and meat processing. An advertising agency and scientific centres joined it, where modern personnel is trained for the industry, and rationalisation research for the food processing is being conducted. These are: the Department of Chemistry and Biology of the Gdańsk University, the Department of Chemistry of the Gdańsk Technical University, the Faculty of Commodity Science of the Sea Academy, the Department of Health and with the Branch of Nursing of the Medical University, the University of Gdańsk and the Medical University of Gdańsk with the Faculty of Biotechnology [Biuro Pomorskiego Klastra Spożywczego, 2011].

The initiative was established as a result of the project, implemented by the Gdańsk Institute for Market Economics in cooperation with the local authorities from the Pomorskie voivodeship in the period from January 2006 to July 2008, named *Stimulating the innovation of the economy in the Pomorskie Voivodeship by supporting clusters – the Concept of Policy and pilot actions*.

It was co-financed with the EU funds from the European Social Fund and the state budget under measure 2.6. of the Integrated Operational Programme of Regional Development.

To summarise, it should be noted that the initiative Pomorski Food Cluster *Food from Pomorze*, aimed at the reinforcement of the cluster, concentrates its actions mainly on the first element of the Porter's diamond model (strategy implementation) and demand conditions (promotion, increasing of awareness). In comparison with the potential of the voivodeship, the number of entities within the initiative is quite small. It should raise concern and induce a greater interest in building competitive advantage by concentrating actions also on the supply conditions.

The Śląskie Voivodeship

The number of the identified initiatives in the Śląske voivodeship is four altogether and it ranks among the lowest in the country. In addition, only one of these initiatives is characterised by a clear business profile, indicating direct relations with the agri-food sector (Table 4.12). The others show indirect, not very strong, resource related connections with the agri-food sector or rural areas.

Table 4.12. Results of assessment of the cluster initiatives' profiles in the Śląskie voivodeship

The name of the initiative	The category of the branch orientation			
	AP	F&AH	PF	RR
1. Cluster of Energy-efficient Technologies-Euro-Centre				+
2. Polish Wood Cluster				+
3. Tourism Network				+
4. Śląskie Meat Cluster			++	
Total grade by categories (sum of pluses)	0	0	2	3

AP – Agricultural Products; F&AH – Farming and Animal Husbandry; PF – Processed Food; RR – resource related to the agri-food sector or rural areas.
Source: Own elaboration on the basis of the Internet query.

The initiative selected for a short description is the initiative with a profile of activities clearly focused on the agri-food sector, in particular on the type of clusters representing food processing which is Śląski Meat Cluster, active in the meat industry [*Klastry w województwie śląskim* 2011]. This interesting initiative, which was established in Katowice in 2011, thanks to the efforts of the Silesian Guild of Craftsmen and Butchers, should constitute a platform for

cooperation of the enterprises from the meat industry, strengthening their bargaining and competitive power in the country and Europe. The coordinator of the initiative is the Silesian Guild of Craftsmen and Butchers, associating several dozens of entrepreneurs, and among the supporting institutions there are, among others, the University of Silesia and the Upper-Silesian Agency for Entrepreneurship Promotion.

The most important actions of the Silesian Meat Cluster include:

− creation of a network of connections between enterpreneurs from the meat industry and the local authorities, research units, scientists, and business environment institutions;

− implementation and dissemination of innovative technologies and solutions;

− implementation of common research, commercial, educational and promotional projects;

− supporting export activities and promotion of brands and products of the initiative members on the international, regional and national markets.

Entities belonging to the initiative assumed that the tasks will be implemented on the basis of EU funds obtained by them.

To summarise, it can be stated that the initiative, which is at the initial stage of its development, in its pursuit to strengthen the cluster, concentrates its actions mainly on the first element of the Porter's diamond model (strategy, objectives, principles, cooperation) as well as supply- and demand-based conditions.

The Świętokrzyskie Voivodeship

In the Świetokrzyskie voivodeship, eight cluster initiatives of varied profiles have been identified, often indicating the mixed branch orientation. To a similar degree, it encompasses farming and animal husbandry, as well as food processing and some resource related connections with the sector or rural areas, which is proved by the results of their profiles assessment included in Table 4.13.

The most distinctive initiative due to the unambiguity of its profile and specific nature of operations, and at the same time an initiative deserving further discussion, is the *Tomato from the Land of Sandomierz* initiative, focusing on the production of tomatoes and their provision on the market for fresh vegetables [www.wrota-swietokrzyskie.pl].

Table 4.13. Results of assessment of the cluster initiatives' profiles in the Świetokrzyskie voivodeship

The name of the initiative	The category of the branch orientation			
	AP	F&AH	PF	RR
1. The Kielce Trade Fairs			+	++
2. *Tomato from the Land of Sandomierz*		+++		
3. Świętokrzysko-Podkarpacki Energy Cluster				+
4. Cluster of the Biomass Producers – the *Świetokrzyska Biomass* Consortium				++
5. Cluster of Tourism and Regional Development *The Sun of the Region*		+	+	+
6. The Gardening and Orchard Cluster- *Ecological Food*	+	++	++	
7. Labdesign Cluster			+	
8. Świetokrzyska Biomass	+	+	+	+
Total grade by categories (sum of pluses)	2	7	6	7

AP – Agricultural Products; F&AH – Farming and Animal Husbandry; PF – Processed Food; RR – resource related to the agri-food sector or rural areas.
Source: Own elaboration on the basis of the Internet query.

This relatively new initiative was established in the form of an agreement in Sandomierz. Its coordinator is the Eko Marketing company, which has its registered office in Warsaw and cooperates with the Higher School of Humanities and Environment in Sandomierz. The objectives of the initiative include:
− suitable use of natural soil and climatic conditions;
− strengthening local initiatives of tomato producers and creation of a regional cluster of companies around Sandomierz, which will deliver fresh tomatoes on the domestic market and for export;
− improvement of effectiveness of operations on the market as a group of producers related to the Land of Sandomierz.

In the area of Sandomierz, the tradition of the production of tomatoes, both directly for consumption as well as for processing, is relatively long. The history of cultivation of this plant on the Sandomierska Upland dates back to the prewar period. It results, among others, from the fact that the area of Sandomierz is characterised by better climatic and natural conditions in comparison to other areas of Poland. The plant-growing season is longer and the soils of this area are one of the best in the country. Humus occurring in this area is a warm, permeable soil, rich with all the necessary nourishing substances (micro- and macro-elements). As a result, in these areas, gardening and vegetable cultivation is dominant, and, in particular, the cultivation of tomatoes is common.

The cultivation of tomatoes in the region of Sandomierz is based not only on using unique soil and climatic conditions, but also on using a special production technology (cultivation on a stake, crop rotation). Apart from tomatoes, the farms in the area of Sandomierz have also specialised in apple production, being in a sense of a complementary nature, which favours theirs profitability. Tomatoes are cultivated on the total area of 500 ha. In this area there are 900 farms producing them for the purpose of the market of fresh vegetables, including approximately 50 key producers operating within the 60 ha area. The surface area of farms ranges from 0.5 up to 2.5 ha, and the average crop yield is 50 tons from one ha.

To summarise, it can be stated that the initiative *Tomato from the land of Sandomierz*, aimed at the reinforcement of the developed cluster, concentrates its actions mainly on the supply conditions.

The Warmińsko-Mazurskie Voivodeship

In the Warmińsko-Mazurskie voivodeship the greatest number of initiatives in the country has been identified, namely 16 cluster initiatives, directly or indirectly related to the agri-food sector or rural areas. As it results from Table 4.14, the nature and actions of these initiatives, to the greatest extent, are focused on food processing, though as many as 14 of them also show a resource related connections with the agri-food sector or rural areas. This proves a quite far-reaching diversity of their activity profile and branch orientation.

The strongest branch orientation, directly connected with the agri-food sector, show the Diary Cluster initiative operating in the dairy industry and the Beef Cluster initiative, operating in the meat industry. They can also be considered as the most typical for the Warmińsko-Mazurskie voivodeship, taking into account directions of the agricultural production and food processing industries occurring in this voivodeship. Eventually, owing to the rare diversity and peculiar balance of the subjective composition of the participants among the Polish agri-food initiatives, the second initiative from these above-mentioned has been selected for a more in-depth description, i.e. the Beef Cluster [www.pzpbm.pl, www.klaster-wolowiny.pl].

The strongest branch orientation, directly connected with the agri-food sector, show the Dairy Cluster initiative operating in the dairy industry and the Beef Cluster initiative, operating in the meat industry. They can also be considered as the most typical for the Warmińsko-Mazurskie voivodeship, taking into account directions of the agricultural production and food processing industries occurring in this voivodeship. Eventually, owing to the rare diversity and

peculiar balance of the subjective composition of the participants among the Polish agri-food initiatives, the second initiative from these above-mentioned has been selected for a more in-depth description, i.e. the Beef Cluster [www.pzpbm.pl, www.klaster-wolowiny.pl].

Table 4.14. The results of assessment of the cluster initiatives' profiles in the Warmińsko-Mazurskie voivodeship

The name of the initiative	The category of the branch orientation			
	AP	F&AH	PF	RR
1. Kętrzyn Renewable Energy Cluster		+		+
2. Beef Cluster	++	++	++	
3. Regional Breweries Cluster			+++	
4. Dairy Cluster	+	++	+++	+
5. Fairs and Tourism of Eastern Poland				+
6. Western Masuria Tourist Cluster		+	+	+
7. Elbląg Tourist Cluster			+	+
8. *Masurian Windows* Cluster				+
9. Leather Products Cluster			+	+
10. Elbląg Furniture Cluster			+	+
11. The Baltic Eco-Energy Cluster				+
12. *Warmer Together* Cluster			+	+
13. Lubawa Furniture Cluster				+
14. Pottery Village		+	+	++
15. Rural Tourism Cluster *Heritage of Cultures and Flavours*		+	++	+
16. Wood Joinery Cluster				+
Total grade by categories (sum of pluses)	3	8	16	15

AP – Agricultural Products; F&AH – Farming and Animal Husbandry; PF – Processed Food; RR – resource related to the agri-food sector or rural areas.
Source: Own elaboration on the basis of the Internet query.

The strongest branch orientation, directly connected with the agri-food sector, show the Dairy Cluster initiative operating in the dairy industry and the Beef Cluster initiative, operating in the meat industry. They can also be considered as the most typical for the Warmińsko-Mazurskie voivodeship, taking into account directions of the agricultural production and food processing industries occurring in this voivodeship. Eventually, owing to the rare diversity and peculiar balance of the subjective composition of the participants among the Polish agri-food initiatives, the second initiative from these above-mentioned has been selected for a more in-depth description, i.e. the Beef Cluster [www.pzpbm.pl, www.klaster-wolowiny.pl].

The Beef Cluster initiative was established in 2008 in Warsaw in the form of an agreement. Its Coordinator is the Polish Association of Beef Cattle Producers, being an agricultural trade organisation representing the interests of beef cattle producers in Poland. The initiative gathers various kinds of entities, which are mainly beef producers, processors (slaughterhouses) and trade and service companies as well as, what is important from the point of view of innovation and competitiveness, the R&D units. In 2012, the initiative included: nine breeders and producers, two service providers, one local government unit, four scientific-research units and four business environment institutions.

The objectives of the initiative included:
– development of fixed frames for cooperation between entrepreneurs from the area of beef production, scientific-research and scientific institutions;
– development of a network between local entrepreneurs from the area of beef production, local authorities, research-scientific units and business support institutions;
– implementation and dissemination of innovative technologies among enterprises, and R&D institutions;
– implementation of common research, export, educational projects and education of staff for the industry;
– sales development support of high quality beef from voivodeship to the level of 6,000 tons in 2015;
– supporting the export activities, promotion of the region and regional brands and the industry on international markets;
– promotion of the idea of clustering among entrepreneurs;
– lobbying for the development of infrastructure.

The objectives are implemented, among others, by taking part in annual International Fairs of Food and Ecological Products BioFach in Nurnberg, where the representatives of the initiative present beef meat produced in the QMP quality system in the Warmińsko-Mazurskie voivodeship. In addition, the members of the initiative frequently attended the regional fairs and exhibitors.

In order to become familiar with experiences of the French partner in terms of research, technological development and innovations used, cooperation was established with the cluster initiative functioning in the meat industry *Inno-Viandes* located in the south of France in Clermont Ferrand. The representatives of the initiatives also took part in a study tour to England, the purpose of which was to become familiar with the good practices with regard to functioning of groups of beef producers. In addition, a trade database was established, which is available at www.klaster-wolowiny.pl.

The initiative was established within the project *Support for the development of the Cluster initiative within the area the Warmińsko-Mazurskie voivodeship in the beef production industry in order to increase the innovation of enterprises, exchange knowledge and technologies as well as to improve their competitiveness* co-financed from the European Social Fund and the state budget within the Integrated OP Regional Development executed in the Warmińsko-Mazurskie voivodeship by the Polish Association of Beef Cattle Producers.

To summarise, it should be emphasised that the Beef Cluster undertakes complex actions aimed at the development of the cluster pertaining practically to all elements of Porter's diamond model. They have particular significance for the development of favourable demand, supply and institutional conditions, as well as the development of cooperation, related and supporting industries.

The Wielkopolskie Voivodeship

The Wielkopolskie voivodeship is one of the national leaders in terms of the number of identified cluster initiatives. There are 12 initiatives and they constitute a set of initiatives characterised by relatively small diversity of their activity profiles. The results of branch orientation of these initiatives, included in Table 4.15, indicate that they are mainly associated with one of the distinguished types of agri-food clusters, namely food processing.

The initiatives which could be considered to the same extent as the most typical for the Wielkopolskie voivodeship, in the analysed categories of branch orientation, are the Leszczyńskie Business Centre Sp. z o.o. and The Food Cluster of the Southern Wielkopolska initiative – Association in Kalisz, both operating in the food processing industry. Owing to the embryonic development phase of the first of them, it is the second initiative which has been selected for a brief description, namely The Food Cluster of the Southern Wielkopolska – Association in Kalisz [www.klaster.kalisz.pl].

The initiative has been launched by the Regional Chamber of Economy in Kalisz and a group of entrepreneurs, and it has been affiliated to this Chamber until now. Formally, the network has been operating in the form of an association since October 2009. It is a bottom-up initiative. The basic area of activities of the association is the production of food, machines and equipment for food processing. The goal of the organization is to stimulate joint activities in order to increase competitiveness of food production companies from Kalisz, to implement new products, innovative technologies and solutions.

Table 4.15. The results of assessment of the cluster initiatives' profiles in the Wielkopolskie voivodeship

The name of the initiative	The category of the branch orientation			
	AP	F&AH	PF	RR
1. Innovation Centre and Technology of Co-Packing of Food Products – European Competency Agreement	+	+	++	
2. Leszczyńskie Business Centre Sp. z o.o.			+++	
3. Food Cluster of the Southern Wielkopolskie – Association in Kalisz			+++	
4. Renewable Energy Cluster of Wielkopolska				+
5. Wielkopolskie BIOREGION			+	+
6. Chemistry Cluster of Wielkopolska			+	
7. Green Innovation Finance and Technology				+
8. The Western Plastics Cluster PLASTOPOLIS			+	
9. Wielkopolskie Cluster of Advanced Automation Techniques ELPROTECH			+	
10. Technological Cluster Piast PLUS				+
11. Furniture Cluster of Wielkopolska				+
12. Furniture Design				+
Total grade by categories (sum of pluses)	1	1	12	6

AP – Agricultural Products; F&AH – Farming and Animal Husbandry; PF – Processed Food; RR – resource related to the agri-food sector or rural areas.
Source: Own elaboration on the basis of the Internet query.

The main tasks of the initiative include:
− undertaking activities and initiatives supporting the development and functioning of economic entities of the food industry and consolidating their cooperation;
− cooperation with the academic, R&D environment;
− improving of competitiveness of the association by reducing the costs of production and introducing common marketing actions;
− conducting research works on new production solutions and their implementation, and the introduction of new products (launching a R&D laboratory);
− improving the intellectual level, effectiveness, and efficiency management among employees and companies' personnel participating in the initiative;
− implementation of new company management systems and new IT systems;

- internationalisation of the initiatives by establishing cooperation with the developed cluster initiatives from the EU countries;
- strengthening the position of cluster companies through the economic co-operation with foreign partners.

The initiative focuses its activities on building a system of mutual trust between members of the initiative and disseminating knowledge about the necessity and possibilities for building systems of network connections and mutual technology transfer. Currently proposed ventures are aiming to raise the awareness of company owners, managers and management staff with regard to the necessity to undertake strategic activities, both short and long-term, raising competitiveness of the company, through the execution of innovative projects, implementations, or research works on modern IT and ICT technologies supporting management processes.

The association encourages the initiative members so that besides the most willingly undertaken cooperation within common promotion of products and training of the personnel, they would declare interest in joint purchases of equipment and raw materials on a regional and national scale. For this purpose, the association organises cycles of training, workshops and conferences for their participants within many thematic areas. In the final stage there is preparation of the *Strategy for Investment Development*.

The founders are 17 persons representing companies that were the first to report readiness to build a cluster initiative. The cluster initiative consists of producers of food, machines and equipment for food processing, the buyers and distributors of companies' goods, producers of spices and production additives, one local government unit, and two business environment institutions. In 2012 the initiative associated 25 ordinary members, which were private persons, and 22 supporting members, which were business entities, business environment units, scientific-research units, and local authorities. The territorial range of the initiative includes poviats (counties) from southern and eastern parts of Wielkopolska, though the greatest importance for its operations are the cities of Kalisz and Konin.

The member entities are encouraged to participate in various kinds of electronic equipment platforms and e-services between companies (business to business – B2B) that create, for entities of the SME sector, possibilities to enter the superregional and global markets. Using electronic communication enables them to achieve growth in the effectiveness of cooperation with business partners and reduction in costs of production, distribution and logistics. Moreover, very advanced are the works on the Internet platform Virtual Commodity Exchange. This platform will contribute to more effective information flow, and

will extend the possibilities of processing joint orders, auction, distribution of raw materials, products, and promotion and marketing on the Internet. The members of the initiative will have access to a wide range of applications ensuring effective cooperation, such as: e-mail accounts, instant messengers, templates of contracts and procedures. The initiative has its own website, which is systematically updated, and is an effective platform for the information exchange. It is also worth adding that in progress are works on the execution of the EU project of the WRPO project worth 840,000 PLN, within which the entities of the initiative have prepared, and have been implementing, the strategy of promotion and marketing.

To summarise, it can be stated that The Food Cluster of the Southern Wielkoposka Initiative – Association in Kalisz, contributes to the reinforcement of cluster structures, focusing their actions on the demand and supply conditions. In this case, cooperation plays a particular role, which mainly serves the development of supply.

The Zachodniopomorskie Voivodeship

In the Zachodniopomorskie voivodeship, seven cluster initiatives have been identified, and only two of them can be considered as relatively strongly connected – directly or indirectly – with the agri-food sector, particularly with food processing (Table 4.16). This applies to initiatives such as Zachodniopomorski Chemistry Cluster *Green Chemistry* and Food Industry Cluster in the Zachodniopomorskie voivodeship.

Seemingly, judging by the name, the first of these initiatives can be considered as if it did not have much to do with the agri-food sector. After closer inspection of the profile of its operations, and analysis of potential impact on this sector, particularly on processing industries, it seems that it deserves greater attention. As a result, from the identified initiatives in the Zachodniopomorskie voivodeship, this initiative was selected for a short description [http://chemia.rsi.org.pl/index.php/pl/KLASTER-CHEMICZNY-5.html, http://www.pi.gov.pl/PARP/chapter_86203.asp?soid=AD67F66FA1CA4D7587 4 F078EC102489E, Klastry w województwie zachodniopomorskim 2012]. This selection, although undoubtedly controversial, may be additionally justified by the fact that it creates the possibility to compare the scope and the activity profile of the cluster initiative, fundamentally located in a sector other than the agri--food sector, with the scopes and activity profiles of initiatives, discussed in this study, focused mainly on clusters of agri-food type.

Table 4.16. Results of assessment of the cluster initiatives' profiles in the Zachodniopomorskie voivodeship

The name of the initiative	The category of the branch orientation			
	AP	F&AH	PF	RR
1. Cross-Border Tourist Waterway Cluster Berlin-Szczecin-Baltic Sea			+	+
2. Zachodniopomorskie Chemistry Cluster *Green Chemistry*	+		+++	
3. The Association of Zachodniopomorskie Wood and Furniture				+
4. Food Industry Cluster in the Zachodniopomorskie Voivodeship			+++	
5. Pomorskie BioEcoChemical Cluster				+
6. Wood-Furniture Cluster				+
7. Fishery Cluster		+	++	
Total grade by categories (sum of pluses)	1	1	9	4

AP – Agricultural Products; F&AH – Farming and Animal Husbandry; PF – Processed Food; RR – resource related to the agri-food sector or rural areas.
Source: Own elaboration on the basis of the Internet query.

The entities forming the Zachodniopomorski Chemistry Cluster *Green Chemistry* initiative represent, first of all, the chemical industry. The initiative was established in 2007 in Szczecin in the form of an agreement, and its coordinator is the Chemistry Cluster Association *Green Chemistry*. In further stages of the development it is planned to transform into a limited liability company and then a joint stock company. The objectives of the initiative operation are as follows:

− integration of the environment of the entrepreneurs in the chemical industry from the region, and companies related and cooperating with this industry across the whole country;

− supporting the development of entrepreneurship, supporting business initiatives and raising innovation of companies, conducting personnel consulting services, as well as counteracting unemployment;

− supporting innovative construction and development of chemical industry cluster, distribution, and developing the prestige of the chemical industry in the region, Europe, and world;

− representation and protection of economic interests of the association members;

− undertaking of lobbying activities in order to establish the Zachodniopomorskie voivodeship as an attractive place for investors;

- support for mutual assistance in solving legal, organisational, economic, tax and other issues related to the conduct of business operations;
- establishment of a better cooperation between entities from the industry;
- increase of competitiveness in the market by using modern technological solutions;
- promotion of the company and its products;
- mutual exchange of experiences;
- cooperation with other companies from Poland and abroad;
- acquisition of current information and novelties from the chemical industry;
- obtaining assistance in the acquisition of funds for the development and implementation of innovative products in the companies;
- cooperation with scientists from the R&D areas and business environment institutions.

The activity of the initiative consists, above all, in matching business activities with the latest achievements in science, in order to improve the effectiveness of implementations in the companies from the Zachodniopomorski region. A great interest of Polish and foreign contractors in the results of the commercialisation works of the initiative and works related to sustainable development, contributes to a continuous development of the scientific--technological facilities. The activities carried out by the entities of the initiative also include:
- creation of legislation that enables the chemical industry to develop in the Zachodniopomorskie voivodeship;
- carrying out research within the areas of: fertilisers, plastics and rubber parts, food and petrochemical industries, medicine, pharmaceuticals and biotechnology;
- creation of markets for the products of the cluster entities;
- transfer of knowledge and technology between countries;
- manufacturing of laboratory, metallurgical, rubber and plastic products;
- production of fertilisers and paraffin emulsion;
- services in the areas of automation and industrial robotics, as well as advisory and training services.

The initiative represents a large, but fragmented chemical sector. The dominant position is held by ZCH Police. Regional R&D infrastructure is not very strong. The initiative includes the following entities: three local government units, five scientific and research units, five foreign partners, six business

environment institutions, 20 companies, nine packaging institutions and platforms, 17 supportive institutions and companies.

In the first stage of the development some local activities were conducted. The companies were encouraged to participate and the institutions to be involved, which led to the creation of foundations for appropriate structure and internal organisation. Being aware of the fact that inappropriate proportions, lack of commitment of companies or excessive institutionalisation may lead to disintegration, a special attention was paid to maintain balance between entrepreneurs and scientific agencies.

The entities of the initiative, along with their partners, arrange a cyclic event for companies in the chemical industry from the Pomorskie Euroregion titled *Chemika*, which is the only trade conference in the voivodeship connected with cooperation exchange (of B2B type) and with presentation of companies (trade fairs). The entities of the initiative arrange and carry out technological and advisory audits in companies of the chemical industry in the Zachodniopomorskie region. Along with the Centre of Bioimmobilisation and Innovative Packaging Materials, a section for plastics and packaging was created under the name of *Platform of innovative material and packaging producers*, whose task is to integrate research and implementation works concerning new materials and solutions in the packaging sector. The broad cooperation with scientists from the Faculty of Chemistry of the Zachodniopomorski University of Technology in Szczecin effected in turn in creation of a platform for science and business activities integration. Within the initiative scientists who want to start tests and implement new products may meet each other. Specialized research laboratories and services are promoted and provided by the science sector. The result covers the introduction to the market of the jointly developed products, which production lines are intensively developed.

At the present stage of development the global actions and internationalization were also considered. Study tours for the entrepreneurs are organized in Germany, Ukraine, Sweden, and Switzerland, during which companies can exchange experiences and establish good cooperation. For the longest time and most closely *Green Chemistry* cooperates with two German initiatives: The Chemical Cluster KuVBB (Ger. *Kunststoff-Verbund Brandenburg Berlin*) and the Plastics Cluster *Kunststoffnetzwerk* NORKUN. Cooperation includes both companies and scientific institutions. In the framework of this cooperation the initiative's representatives participated in the creation of the strategy of further development of KuVBB which element should be exactly the cooperation with the Chemistry Cluster *Green Chemistry*. The results are: the evolution of companies, construction of new areas of the commercial offer and long-term business relations.

The subject of this cooperation includes materials and raw materials necessary for the modern production, such as: polymer fibres, components for rubber manufacturing, glassware.

An interesting example of international cooperation of R&D nature are the joint works of scientists from the Technical University of Berlin and the Faculty of Chemistry of the Zachodniopomorski University of Technology in Szczecin. These institutions work together, among others, on two issues with high potential of innovation: nanofillers and polycarbonate fibres. In the future the entities of the initiative are planning to create along with the German partners a new product. High involvement in common enterprise shows the management of the BASF company – the largest chemical company in the world and, at the same time, the member of KuVBB. In addition, a joint participation in the *South Baltic Cross-border Cooperation Programme* is planned.

The entities of the initiative cooperate also with the Swedish Renewable Energy Cluster of Entrepreneurs as well as with the Slovak Marshal's Office in Trnava and with numerous local companies. In the East, for a long time a formalized cooperation has been conducted with the Ukrainian National Investment and Innovation Agency in Kiev, based on the cooperation agreement and exchange of experiences. As a part of this partnership the representatives of *Green Chemistry* held so far three economic missions upon the Dnieper River where two companies are building factories. One of initiative members wants to distribute its fertilizer products on the Ukrainian market. The cooperation has been established also with the Ukrainian Association of Chemists and with the Ukrainian Agriculture Agency, which facilitates the introduction of products on the local market.

The entities of the initiative have already prepared several innovative products, e.g. innovative silicone, from which breast implants are produced and nanofibres applied in artificial heart valves, or already produced photo-catalytic paint being the invention of the professor Antoni Morawski. From another group of products attention should be paid to very efficient crystalline, granulated, coated, supplied with nanofillers fertilizers that release to the soil as many mineral components as it is necessary for plants in a given period. Easy to absorb in 80% by plants, which results in higher harvest and better fertilizing efficiency. These fertilizers were created in cooperation with scientists from the Department of Engineering and Chemical Technology and the Department of Environmental Management and Agriculture of the ZUT. They are produced by Fosfan from Szczecin and are very popular e.g. in Ukraine.

Fertilizers for plants grown on a massive scale and hobby fertilizers for single decorative plants are undoubtedly the greatest asset of the *Green Chemis-*

try. In this sector a particularly vibrant activity is run by Fosfan in Szczecin and Chemical Plants in Police. The second strong point of *Green Chemistry* are substrates to cosmetics manufacturing which are produced by Kemipol in Police, among others for such international brands as Avon or Yves Rocher. Products, in spite of the fact that are produced individually by local manufacturers, are promoted under one brand of *Green Chemistry* on markets on which the entities of the initiative operate. The development of one common product identified with the region and the initiative participants is also possible. When it comes to the environmentally-friendly production, it is worth mentioning, that the environmental certificate ISO 14001 was received by Fosfan and Plants in Police, which participated in many ecological programmes.

The initiative is a top-down inspired project, that has been undertaken as part of the works on the regional Strategy of Innovation. It is the only Polish cluster initiative in the chemical industry which is focused on the international expansion. What is important, the initiative is supported by the local government authorities, in particular the Marshal's Office of the Zachodniopomorskie voivodeship which is its member too. In 2010, the entities of the initiative actively participated in the creation of the Regional Clustering Centre and helped in the organization of the Competence Centre Branch. In 2011 they took care of the animation and organization of the first in the Zachodniopomorskie Forum of Clusters clearly in this manner contributing to the development of clustering in the region. Owing to joint trainings, information and exchange of experiences between regions the entities of the initiative benefit from the available aid schemes and participate in the development for the region.

To sum up, one can assume that the initiative Zachodniopomorski Chemical Cluster *Green Chemistry*, aiming at cluster development, concentrates their actions mainly on conditions of demand (large companies, high potential) and related and supporting industries (cooperation with the science sector). What also deserves attention are its actions related to the first element of the Porter's diamond model (competition and cooperation).

Cross-regional and country-wide initiatives

In the course of works devoted to identification and assessment of the profile of cluster initiatives activity in Poland it has been stated that some of them are difficult to be attributed to a specific voivodeship. These initiatives are cross-regional or declare aspirations to play a country-wide role. An Internet research made it possible to identify five such initiatives which can be considered

as connected directly or indirectly with the agri-food sector. Results of the profile of activity assessment of these initiatives are presented in Table 4.17.

Table 4.17. Results of assessment of the cross-regional and country-wide cluster initiatives' profiles

The name of the initiative	The category of the branch orientation			
	AP	F&AH	PF	RR
1. The Agricultural Distilleries	++			
2. Polish Meat Cluster = Polish Cold Meat Cluster	+		+++	
3. Eastern Metalworking Cluster			+	
4. Innovative Health and Tourism Cluster *Resorts – Pearls of Eastern Poland*			+	++
5. Cluster of Rural Tourism Country Travel				+
Total grade by categories (sum of pluses)	3	0	5	3

AP – Agricultural Products; F&AH – Farming and Animal Husbandry; PF – Processed Food; RR – resource related to the agri-food sector or rural areas.
Source: Own elaboration on the basis of the Internet query.

Similarly, as in most of voivodeships, they are mostly focused on food processing. Special attention should be paid to the initiative representing the, in a sense classic for the Polish agri-food sector, profile of activity – the Polish Meat Cluster (Polish Cold Meat Cluster), which operates in the meat processing industry [http://www.portalspozywczy.pl/tagi/polski-klaster-miesny,9202.html].

It is a purely business initiative, which includes five meat plants: Niewieścin (the Kujawsko-Pomorskie voivodeship), Peklimar (the Mazowieckie voivodeship), Pekpol (the Mazowieckie voivodeship), MP Wierzejki (the Mazowieckie voivodeship), MP Zyguła (the Lubuskie voivodeship). The initiative started thanks to the Association of Polish Butchers and Producers of Processed Meat. The purpose of the initiative is to exploit the national marketing potential and, in the future, also foreign by the offer of companies' products being a part of the initiative which will be standardized in certain parts of the assortment. Additionally, it will be certified in the quality system *Quality and Tradition*, which is a quite difficult challenge, since requirements in this field are high.

Within the initiative's operations, works on selecting the most traditional assortments have been completed. These are well-known cold meats such as: żywiecka, jałowcowa, myśliwska, krakowska sucha or wiejska. Over 50-year old recipes are used for steamed hams, gammons etc. In Warsaw at Cynamonowa Street a new facility was opened being at the same time a butcher shop and warehouse which host is Wierzejki. New common stores are planned to be opened by partners in their regions, while meat and poultry in cluster stores will

always be supplied by the host of the facility, and the commercial space will be proportionally divided among the five of them.

In the case of some products a specialization takes place, e.g. oxtail ham raw and smoked – Zyguła, potato sausage and salami – Pekpol. The more precise production focus is planned in particular companies. Furthermore, the group is also planning to introduce a series of 25 charcuterie products under the joint brand Polonium bearing the additional certificate *Quality and Tradition* awarded by the Polish Chamber of the Regional and Local Product.

Activities were undertaken for establishing a common logistics and distribution network with the following dairy cooperatives: Spomlek Radzyń Podlaski, Łowicz, Cuiavia Inowrocław, Siedlce, Jogser Sosnowiec and Biała Podlaska. A letter of intent was signed with representatives of these plants which is the basis for establishing a working team whose task is to prepare layouts and the project of the business plan for establishing common structure of the distribution and sales system. It is assumed to undertake actions aimed at the rationalization of costs and implementation of common research projects. From the formal point of view, the entities of the initiative do not cooperate with any scientific center, using rather opinions and expert's reports of selected representatives of the world of science.

The initiative is open for participation of subsequent interested entities from the branch. The main problem is, however, that the most of companies from the meat industry still prefer to be absolutely independent even if it results in falling out from the market and taking over their property by another entity. They do not see that the common brand, standardization of production and certification in the quality system is a positive business step in conditions of a still high fragmentation of production units and growing consolidation of the trade and distribution sphere. Functioning under an organized initiative increases the possibility to compete (among belonging to it entities) and creates premises to their more effective actions and is not a form of merger or acquisition. In the opinion of some, industrial, cross-regional cluster initiatives are an introduction to fixed capital links that are becoming the necessity in the face of the growing level of competition between industry entities on the international arena.

As it has already been mentioned, the strategic purpose of the entities forming the Polish Meat Cluster initiative is to stand out on the market owing to the high quality of meat and cold meat, fully verified by independent assessment institutions. The entities plan to obtain the EU funds and support from other national sources for promotion of a common brand with the certificate *Quality and Tradition*. To sum up, it should be pointed out that the initiative Polish Meat Cluster has some features of a strategic alliance business. Its actions, examined

in the context of the cluster reinforcement, are focused mostly on the first element of the Porter's diamond model, namely on the strategy, specialization, and a common product. Furthermore, they shape the supply (common stores, infrastructure) and demand (plans regarding the joint promotion) conditions.

When making the synthetic assessment of the nature of the identified cluster initiatives it can be stated that from the comparison of their activity profiles and branch orientation it seems that the focus of operations conducted by them varies. Large part of these initiatives is relatively loosely related to the profile of mapped types of agri-food clusters, or shows only an indirect connection with the agri-food sector. The largest number of initiatives with the highest grades for their degree of branch orientation, which proves the strong focus on a given type of cluster, represents the category of food processing. As many as 19 initiatives of this kind were granted 3 pluses (18 of the voivodeship range and 1 of the national range), whereas in the agricultural products category such assessment was granted only for 1 initiative, and in the category farming and animal husbandry for 5 initiatives. Reasons for such a situation have to a large extent an institutional character. The main motive for establishing the vast majority of the analysed initiatives was a desire to use the EU funds, while in part of programmes the entities involved in basic agricultural production cannot be beneficiaries.

Out of all initiatives there two excelled and obtained 3 pluses at the same time in the categories of: farming and animal husbandry, and processed food. These are Pomorski Food Cluster and Podkarpackie Agri-Food Cluster based in Rzeszów. Two pluses in each of the three categories, which proves a balance of participants and of the supply chain integration within the cluster initiative, were obtained by the Beef Cluster initiative.

Generally, the assessed initiatives obtained the highest number of pluses in the processed food category (137). It means that the Polish agri-food initiatives are created mainly by entities involved in food processing, production of processing equipment and wholesale trade of agricultural and food products. Entities related to categories of farming and animal husbandry (55 pluses) and agricultural products (30 pluses) are definitely less active. What is quite important, a number of initiatives whose members are entities connected with the agri-food sector and with rural areas has been identified. Among all 132 identified initiatives, as much as in 85 cases the entities of the initiative represented not only industries classified into the agri-food sector, but in their operations they also used various resources connected with the agri-food sector or from rural areas. These are, e.g. agro-tourism, wood processing or the production of bioenergy. In this additionally separated category 98 pluses were granted.

When assessing the analysed initiatives from the perspective of the Porter's diamond model, it should be stated that they focus their actions mainly on the third element of this model which is supply conditions. Many efforts are directed at the development of human resources, natural resources, knowledge, capital resources and infrastructure. It is equally important to build a competitive advantage through strategy development, common determination of goals and principles valid in the initiative, development of structure, competition and cooperation, creation of one product, or a common brand. The main motivation for the development of this diamond model's element is certainly the institutional factor, and more precisely, the requirements while applying for the available funds.

A quite common trend, especially among initiatives in the initial phase of their development and among these that have not acquired additional financing, is the concentration on the demand side. Many Polish initiatives in the agri-food sector take actions designed to impact the size and character of demand. Appropriate market investigations are conducted and interesting advertising and information campaigns are implemented.

On the next place from among the elements of the Porter's diamond model are related and supporting industries. The proof of this may be the growing interest for cooperation with the science sector. The mutual trust is growing and cooperation exists not only in the sphere of declarations. Especially in the most prosperous initiatives excellent effects of such cooperation are observed.

The most problematic area seems to be the element of institutional settings. Initiatives often even excessively focus their efforts on obtaining available funds, but the final support is obtained only by the chosen ones. Moreover, the Polish system of selection and support of initiatives that preferably would help in development of new clusters is still very far from excellence. The main problem is that the entities of the initiative in order to enhance cooperation with farmers cannot achieve this with the use of the EU funds, because in regulations of some of them it is not permitted to accept agricultural producers as members. It seems that the EU subsidies should be granted reasonably in order to improve a wise strategy realisation, as well as cluster development. Meanwhile, in practice, it is most often the other way round, i.e. the strategy is adapted to possibilities of obtaining the subsidy.

Generally, functioning in a cluster initiative is perceived beneficial and prestigious, being a special market recommendation and privilege, the guarantee of modernity and cooperation. To the failure of cluster initiatives contribute:
− a groundless belief that the basic criterion of success of the initiative is obtaining external support (the EU funds);

– expecting effects in a short time, whereas the cluster initiative is by defini-
    tion a long-term project;
– reluctance to bear costs of even small contributions for at least minimum
    structure maintenance and to basic development actions of the initiative in
    the start-up period;
– lack of trust towards managers who run these projects.

4.3. Compatibility assessment of occurrence of cluster initiatives with cluster development potential

Number of initiatives identified in particular voivodeships showing the branch orientation of different intensification (from 1 to 3 pluses) in the Agricultural Products type of cluster is 22 in total. This means that only one in every six of identified voivodeship-wide initiatives has the profile related to this cluster type. This linkage is generally quite loose, which is proven by the grades distribution (number of pluses) given to this branch orientation category. The lowest grades are definitely dominant – 18 initiatives received one plus. Only three initiatives received two pluses, and only one – three pluses.

The IBOI, calculated for the Agricultural Products category, exceeds the value of 1 in eight voivodeships, and LQ values higher than 1, both LQ_{empl} and LQ_{entity}, showing the cluster potential resulting from the concentration of activities in this branch, have been recorded in five provinces (Figure 4.2). However, as it seems from comparing the IBOI values and values of the LQ_{empl} and LQ_{entity} indicators in particular voivodeships, it is difficult to speak about spatial compliance of distribution of the initiatives and the cluster potential in the Agricultural Products category. The condition of full compliance is met only in the Łódzkie voivodeship, and the Świętokrzyskie and Lubelskie voivodeships are close to its fulfilment. In the Kujawsko-Pomorskie, Opolskie and Wielkopolskie voivodeships, where the LQ_{empl} and LQ_{entity} values are higher than one, the presence of a significant cluster potential is indicated in the Agricultural Products category, however, there is a lack of initiatives with clear branch orientation of this type.

The opposite situation is in the Dolnośląskie and Podkarpackie voivodeships, where operating initiatives are quite strongly focused on the Agricultural Products cluster type, whereas the relative strength of this type of clusters is in these voivodeships weaker than expected to sufficiently meet the established criteria. On the other hand, Małopolskie and Śląskie are those voivodeships, where both the values of the IBOI and of the LQ_{empl} and LQ_{entity} indexes are lower than one.

Figure 4.2. Intensity of cluster initiatives occurrence (IBOI) and clusters strength (LQ$_{empl}$ and LQ$_{entity}$) in the Agricultural Products category in particular voivodeships
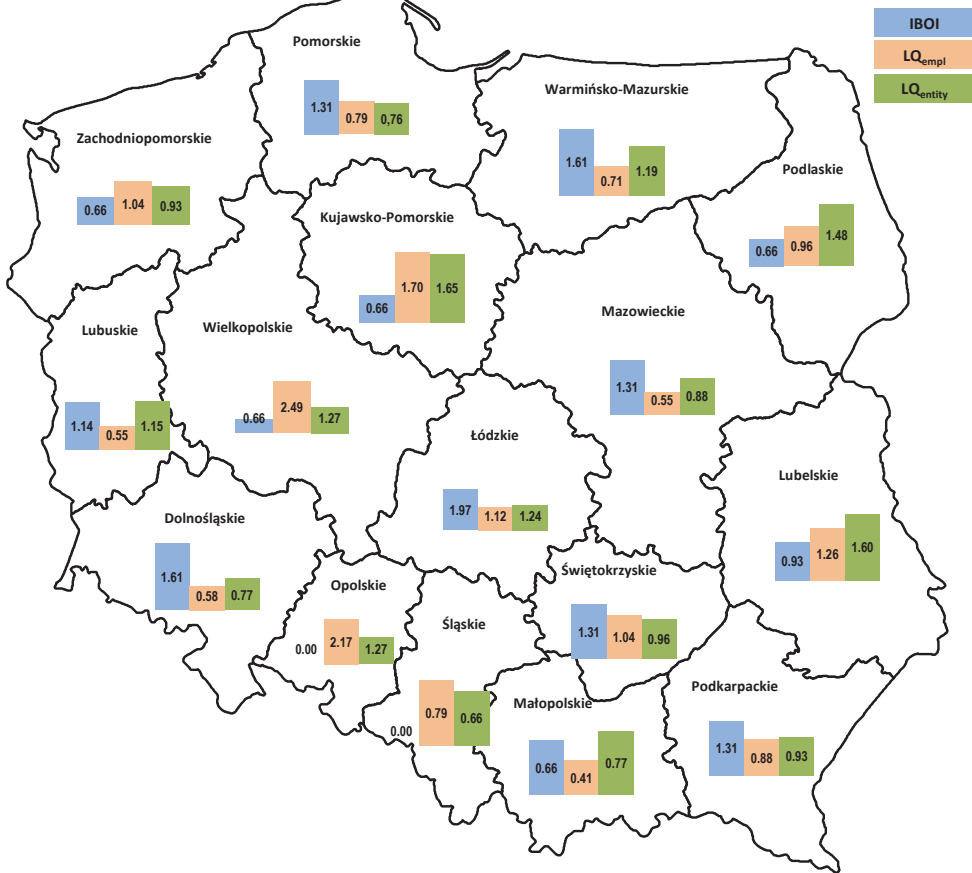
Source: Own elaboration.

Among the activity profiles of the identified cluster initiatives, Farming and Animal Husbandry ones are a much better represented branch orientation category than the Agricultural Products ones. Among all the voivodeship-wide initiatives 36 (28.3%) show signs of this type of branch orientation in their activity profile. Though in their evaluations obtained in this respect the lowest evaluations prevail, namely 1 plus, 9 initiatives have been granted 2, and 5 – 3 pluses each.

The IBOI values presented in Figure 4.3 for this branch orientation category are higher than one in seven voivodeships, while the LQ$_{empl}$ and LQ$_{entity}$ indicator values stated on the same figure are simultaneously higher than 1 in five voivodeships.

Figure 4.3. Intensity of cluster initiatives occurrence (IBOI) and clusters strength (LQ$_{empl}$ and LQ$_{entity}$) in the Farming and Animal Husbandry category in particular voivodeships
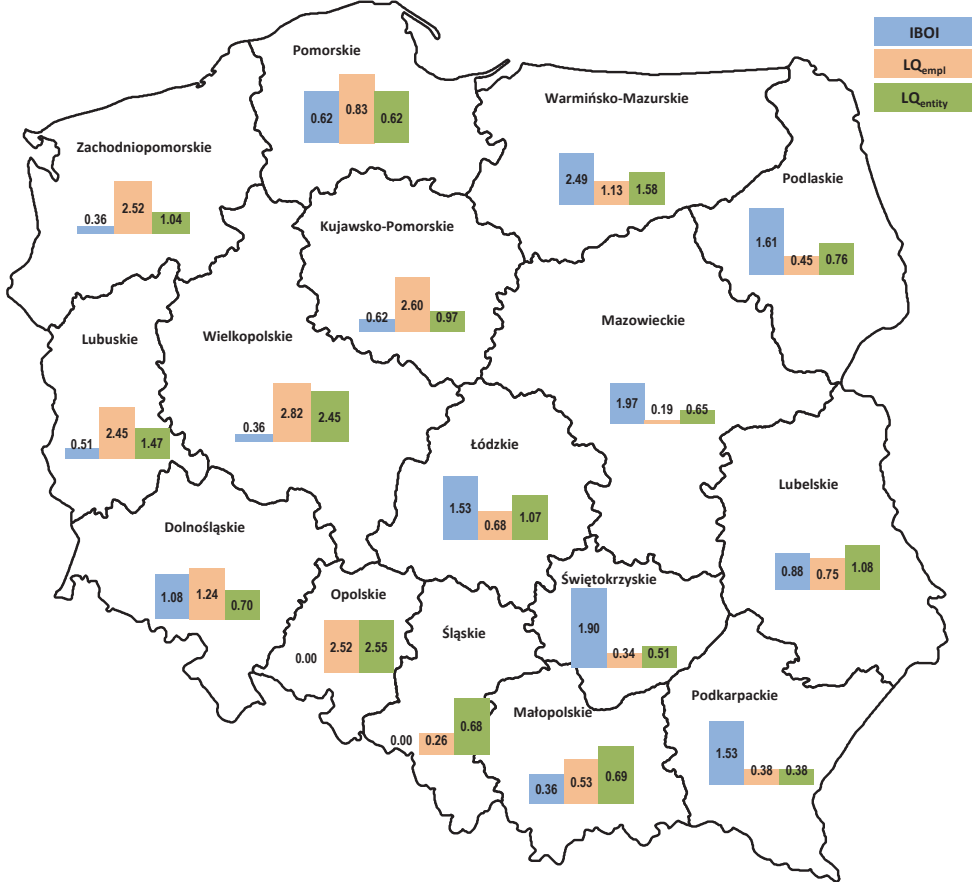
Source: Own elaboration.

Unfortunately, like in the case of the Agricultural Products category, there is virtually no compatibility between the levels of the IBOI values and the LQ$_{empl}$ and LQ$_{entity}$ indicator values. Only in the Warmińsko-Mazurskie voivodeship does a very high IBOI, amounting to 2.49, prove the presence of initiatives oriented expressly at this category, that goes hand in hand with LQ$_{empl}$ and LQ$_{entity}$ indicator values exceeding one. On the other hand, Mazowieckie, Podkarpackie, Podlaskie, and Świętokrzyskie voivodeships, where calculated relatively high IBOI values are within the range of 1.53 up to 1.97, the strength of the Farming and Animal Husbandry cluster types is relatively small. On the other hand, in the Lubuskie, Opolskie, Wielkopolskie and Zachodniopomorskie voivodeships, in the case of which relatively strong clusters of this type are pre-

sent (LQ$_{empl}$ and LQ$_{entity}$ values for each of these voivodeships exceeding 1), the branch orientation of initiatives identified for this cluster type is very poor or, like in the Opolskie voivodeship, it is not present at all.

It is also worth pointing out that in three voivodeships, namely Małopolskie, Pomorskie, and Śląskie, in which the relative strength of this type of clusters is small, initiatives active there – just as expected – show relatively small focus at this category, or do not indicate it at all (the Śląskie voivodeship).

A group of initiatives, whose activity profiles show signs of industrial focus on the Processed Food cluster type, what has been signalled before in the synthetic evaluation of the nature of the identified cluster initiatives, is definitely the biggest throughout the whole analysed set of the identified initiatives in particular voivodeships. There are 78 of such initiatives (61.4% of the total number of voivodeship-wide initiatives), slightly above half of which (42) obtained in this branch orientation category one plus in the assessment, while 18 of them have received 2 pluses. Another 18 have received three pluses each, what is definitely the highest number of initiatives assessed so highly among all branch orientation categories. It is also worth noting that all voivodeships have an initiative showing in its activity profile signs of orientation on the Processed Food cluster.

The IBOI for this branch orientation category is in particular voivodeships less diverse than in other categories. It has the lowest value, amounting to 0.16, in the Opolskie voivodeship and the highest, equal to 1.99, in the Warmińsko--Mazurskie voivodeship (Figure 4.4). A value higher than one has been recorded in eight voivodeships. As in the case of two previously evaluated categories (Agricultural Products and Farming and Animal Husbandry), in particular voivodeships discrepancies exist between the initiatives occurence intensification and the degree of their branch orientation, and the strength of clusters representing the Processed Food type. These discrepancies however are clearly smaller.

In four voivodeships, namely in the Lubelskie, Łódzkie, Podlaskie and Wielkopolskie voivodeships, the condition of compatibility of the branch orientation of cluster initiatives operating there with the strength of Processed Food clusters mapped in these voivodeships, is met. This fact is proved by IBOI values and LQ$_{empl}$ and LQ$_{entity}$ values above one. Also, the Warmińsko-Mazurskie voivodeship is very close to meet this joint condition (an insignificant deviation applies only to LQ$_{entity}$ of 0.93). A situation, in which the IBOI value higher than one does not go hand in hand with location indicators exceeding one, exists only in the Mazowieckie and Pomorskie voivodeships, and the opposite situation, i.e. when relatively strong clusters are not accompanied by reasonable, highly

anticipated intensification of occurence and appropriate orientation degree of cluster initiatives, is in the Kujawsko-Pomorskie voivodeship only.

Figure 4.4. Intensity of cluster initiatives occurrence (IBOI) and clusters strength (LQ$_{empl}$ and LQ$_{entity}$) in the Processed Food category particular voivodeships
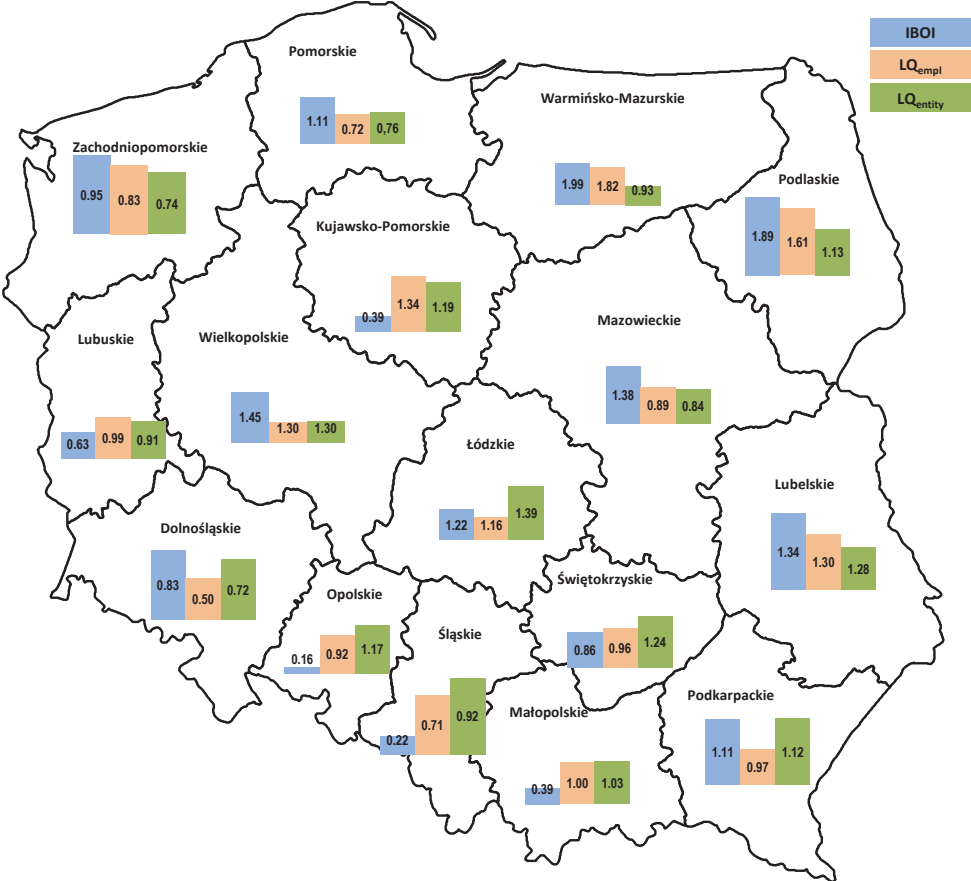
Source: Own elaboration.

4.4. Consistency of public support and economic foundations for cluster development

Since Porter [1990] recognized clusters as a source of competitive advantage of economies, the interest in their creation and development has increased. In response to growing globalization and increasing difficulties in coping with international competition, in many countries the support for clusters becomes a paradigm of contemporary policies of regional development.

A cluster policy is horizontal and includes quite wide spectrum of activities and instruments. It combines elements of the following policies: innovative, regional, industrial, scientific-technological, educational, concerning the SME sector, export promotion, or attracting foreign investments. It may be implemented on international, national, regional, or local level, and its primary goal is to boost competitiveness of the economy by stimulating cluster formation and development. Among solutions being employed, there are e.g. cooperation networks, centres for excellence, or scientific-technological parks.

Most often it is implemented as an unique mix of related activities (*policy-mix*), covering the following areas:

–   creating competitive advantage in the scope of key economy sectors or strategic added value chains;
–   increasing competitiveness of the SME sector;
–   stimulating regional development;
–   intensifying cooperation of the industry with the research sphere.

Selection of any of the aforementioned cluster policy models depends on the country, initiative's location, as well as on the initiative's stage of development [Ministerstwo Gospodarki 2011a]. A characteristic feature of the cluster policy is also the fact that it is applied in a manner coordinated for specific cluster structures, which requires process approach leading to determination of the model and the tool set optimal for given conditions, while using relatively flexible programmes and instruments of support [Ministerstwo Gospodarki 2011b].

How to identify clusters and which of them to support is a very important question that requires an answer before specific programmes and actions supporting new clusters development are chosen and accepted for implementation. In Polish conditions, and not only here, due to the lack of properly prepared criteria, the support is usually given to groups of entities forming cluster initiatives, whose main motivation is to obtain available funds. Such decisions are not necessarily wrong, provided that the initiatives operate in areas with sufficient concentration of specific business operations what is a sign of cluster potential. Actions taken by initiatives should serve, first of all, to take advantages of this potential, if the cluster policy is to be effective, and the (related) allocation of funds as efficient as possible.

Figure 4.5 presents a comparison of the assessments of the presence and the strength of the branch orientation, of all initiatives identified and analysed in this study, and therefore not only directly related to the agri-food sector, but also having indirect resource connection with it or with rural areas.

The majority of these initiatives has benefited from public support or has intensively applied for it. With some simplification, it may therefore be assumed

that the spatial displacement, their occurence intensification, as well as their branch orientation, all have been shaped to a large extent under the influence of the implemented cluster policy. In this context, it seems fully justified to confront the existing state of affairs in the sphere of cluster initiatives development with the spatial displacement of actual cluster potential.

Figure 4.5. Values of the IBOI index according to the cluster initiatives branch orientation in particular voivodeships
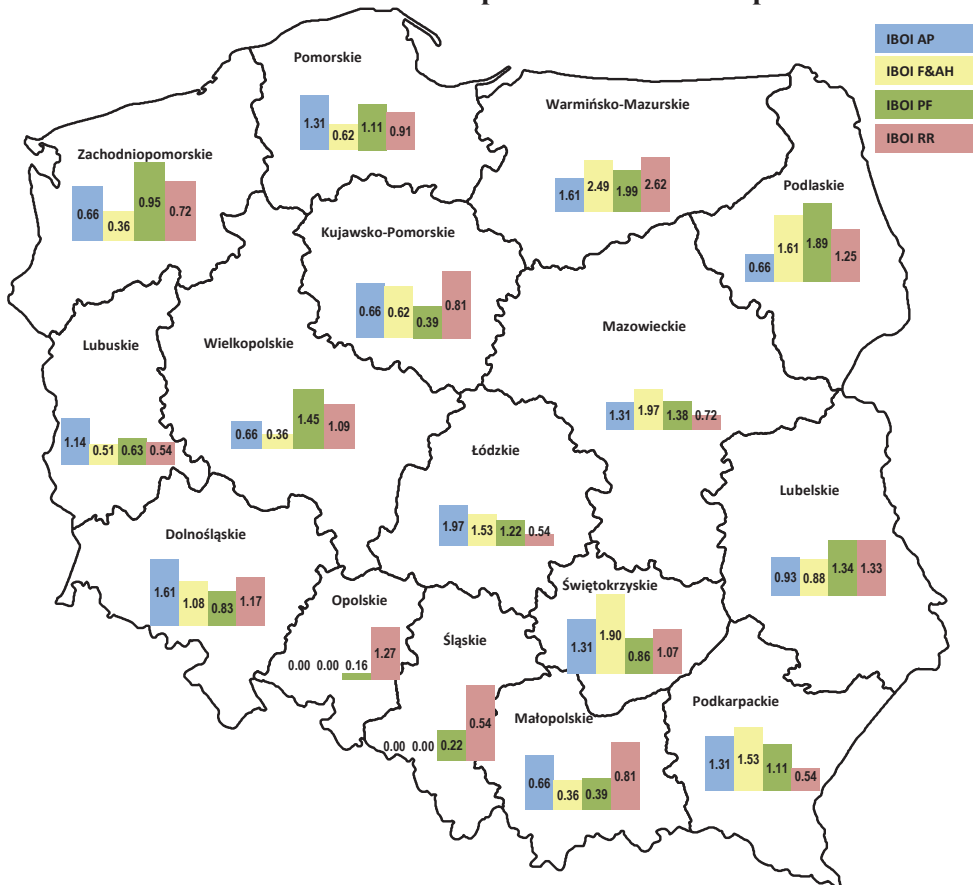
IBOI AP – The intensity and branch orientation index of the Agricultural Products initiatives
IBOI F&AH – The intensity and branch orientation index of the Farming and Animal Husbandry initiatives
IBOI PF – The intensity and branch orientation index of the Processed Food initiatives
IBOI RR – The intensity and branch orientation index of the initiatives resource related to the agri-food sector or to rural areas
Source: Own elaboration.

Summarising, the analysis of the IBOI values in particular voivodeships in the light of the results of the agri-food clusters mapping in Poland presented in

the third chapter, brings several interesting observations. Firstly, except the Opolskie and Śląskie voivodeships, in each of the remaining voivodeships in the activity profiles of the identified initiatives, their branch orientation elements related to each of the three separated agri-food clusters types are overlapping. It results from the fact that initiatives with one clear branch orientation are exceptional. Thus, one may assume that supporting cluster initiatives in the agri-food sector at the regional level is not strictly focused on one, selected cluster type directly related with this sector.

Secondly, in each voivodeship, there are initiatives, whose activity profiles indicate their indirect, resource connection with the agri-food sector or rural areas. Furthermore, the IBOI values, calculated for this branch orientation category, are relatively high in most of the voivodeships. In five voivodeships they are even higher than for branch orientation categories directly related to the agri-food sector.

Thirdly, the differences in the IBOI values between particular voivodeships is quite high in each category of the initiative branch orientation. However, it does not reflect the diversity of cluster potential connected with the business concentration distribution in the agri-food sector in particular voivodeships. This means that cluster initiatives with proper profiles do not always function in voivodeships where it is relatively easy for strong agri-food clusters to develop. Thus, it may be assumed that they have been formed spontaneously to a large extent, mainly in response to announced competitions for financing this kind of projects or due to their impelentations. It also seems that decisions on supporting initiatives within cluster policy implementation schemes have not been preceded by any analysis of actual opportunities for developing specialized, strong agri-food clusters. As a result, compatibility between intensified occurence and branch orientation of the identified cluster initiatives and the actual cluster potential in the agri-food sector in particular voivodeships is low and rather quite accidental.

5. Impact of clusters on competitiveness of agri-food sectors in Poland and in the EU member countries

5.1. Theoretical premises of the impact

Cluster is an entity, whose boundaries are defined by connections among entities forming it. At this point, it should be emphasised that these relations do not necessarily have to be of a formalized nature. Therefore, in practical terms, the problem of disappearing boundaries between two conceptual frameworks – a cluster and a cluster initiative – is noticeable. While clusters have a non-formalized nature, cluster initiatives are entities subject to considerable formalization aimed at performing activities supporting clusters and the economy. Cluster initiatives act to support clusters, the effects of their actions however would usually have a very limited scope. To a considerable extent, in the European economic circumstances, entities establishing cluster initiatives and then controlling their activities are only a small part of entities belonging to clusters. As a result, the effects of their work usually relate to a very narrow group of companies.

Companies gather in certain places, so as to use external economies of scale that can be divided into three types [Audretsch et al. 2007]:
- benefits resulting from access to common labour market and common public goods, such as infrastructure or educational institutions;
- benefits resulting from saved transport costs and transaction costs as a consequence of the proximity of companies in the region along the supply chain;
- benefits from the so-called spillover effects resulting from the fact that industry secrets are easy to identify owing to the proximity.

From the formal side, the nature of the effects of scale can be identified by analysing the shape of the long-term cost function of a company [Figiel and Kufel 2013]. When the proportion between the input level and the production level remains constant, the impact of the k-times increase in inputs on the costs can be presented as follows:

$$LRTC_0 = \sum_{i=1}^{n} x_i p_i$$

$$LRTC_k = \sum_{i=1}^{n} k\, x_i\, p_i = kLRTC_0$$

where:
x_i – a number of given input units;
p_i – a given input unit price;
$LRTC_0$, $LRTC_k$ – long-term total production cost, respectively at the initial and k-times higher input levels.

Long term average costs at new, l- times higher as compared to the initial one, production level (Y) amounting to lY are:

$$LRAC_k = \frac{kLRTC_0}{lY} = \frac{k}{l}LRAC_0.$$

Between the effects of scale and the shape of the of long-term average costs curve, there is a direct relationship according to one of the three following possibilities:

– $\frac{k}{l} > 1$ – means incresing long-term average cost and decreasing scale effects;

– $\frac{k}{l} = 1$ – means constant long-term average cost and constant scale effects;

– $\frac{k}{l} < 1$ – means decreasing long-term average cost and increasing scale effects.

Scale effects can bring internal and external benefits. They include: qualified workforce availability, development of entities to support companies in the district and development of the local labour market. In Marshall's opinion, those elements are affected by the so-called local industrial atmosphere. It enables people living in the district to learn on functioning of the industry as if it was *in the air*, namely on the basis of osmosis [Audretsch et al. 2007]. Local industrial atmosphere includes: common knowledge regarding how to act, common business practices, tacit knowledge and favourable social and institutional environment [Asheim et al. 2006]. A layout of the Marshall's external economies presented in Figure 5.1 (shared use of public goods and labour market; saving transportation and transaction costs; industry secrets lying *in the air*) is related with three kinds of agglomeration: industrial district, urban agglomeration, and industrial agglomeration.

One of the possible effects accompanying industrial districts and clusters is reducing the level of transaction costs. Transaction costs belong to the achievements of new institutional economics (NIE) along with e.g. principal--agent problem and writings on property rights. The new institutional economics has been developed based on criticism pointed by the neo-classical economists. The basic charge formulated by institutionalists in relation to representatives of the neoclassical direction was related to omitting socio-institutional conditions in their analyses of functioning and development of the market economy. Fiedor

describes this fact as an *institutional deficit* of the neoclassical economics [Fiedor 2013].

Figure 5.1. Marshall's external economies

Industrial districts: intra-industry spillover effects, small business structure, coopetition, flexible specialisation, niche market, collective action, rural areas

Industry secrets lying in the air

Urban agglomeration: inter-industry spillover effects, diversity of companies, competition, creativity, headquarters, services, openness, metropolitan areas

Industrial agglomeration: intra-industry spillover effects, large firm domination, local monopoly, specialization, production plants, cooperation in R&D, congested areas

Saving transportation and transaction costs

Shared use of public goods and labour market

Source: Own elaboration based on Audretsch et al. 2007.

Formal and informal institutions, as well as analysis of interrelations between different forms of economic activity coordination, have been to a certain moment beyond the area of interest of the neo-classical economics, which resulted in formulating, in relation to such an approach, the so-called black box assumption [Gorynia 1999]. In response to obtained criticism neoclassical economy has developed its own theory of institutions corresponding to the previous achievements of the neo-classicists.

It should be emphasised that association of new institutional economics with institutional economics is minimal and concerns considering transaction as the basic unit of analysis [Gorynia 1999]. In addition, the transaction costs theory, due to its emphasis on the importance of efficiency categories, should not be considered as a theory competitive towards neoclassical economics, but rather its supplement and development. Within NIE, several major trends can be distinguished. In narrow perspective, NIE can be reduced to two major trends concentrated around the transaction cost theory and the property rights theory. They are basic categories for analysing interdependencies between institutions and functioning of the economy. In a broader perspective, considerations concerning NIE can be supplemented with works of authors involved in the so-called public

choice theory (new political economics), or the agency theory and the external effects analysis.

The NIE is a direction, which is supposed to expand the achievements of the neo-classical thought and therefore it is also often described as neoclassical analysis, neoclassical institutions theory or theoretical institutionalism. In the new institutional economies, the company is deemed to be a contact network and transactions are subjected to the analysis [Gorynia 1999].

The British scholar Ronald Coase is recognized as the author of the foundations of the transaction costs concept. His publication of 1937 entitled *The Nature of the Firm* is considered to be the formal beginning of discussion about transaction costs. What is characteristic, in this paper the expression *transaction costs* does not appear even once. The author states that using the price mechanism results in specific costs (e.g. costs of fixing market prices, negotiating and entering into contracts) [Gorynia 1999].

The expression *transaction costs* was first used in 1969 by Arrow, who believed it should be defined as costs of the economic system [Arrow 1969]. Transaction costs have been the subject of only theoretical discussion for a long time, as their operationalization has been hindered due to definition problems associated with them. Development of the theory with regard to, among others, empirical dimension, took place in the 1970s of the 20th century [Gorynia and Mroczek 2013].

Within transaction costs, one can distinguish costs generated at the stage leading to concluding a transaction and the so-called *ex post* costs, namely resulting from the concluded transaction [Williamson 1998].

The transaction costs category includes [Fiedor 1992]:
–   costs borne at searching and processing information used to calculate market prices;
–   costs of contract negotiations (between the manufacturer and recipient of the goods and the recipient of the goods and supplier);
–   costs of controlling contract implementation.

Regulation of a transaction can proceed in different ways, two of which are of extreme nature. The first one is general regulation (concerning market and occurring when unique market transactions take place), and the second is administrative regulation (a hierarchy) [Gorynia 1999]. The scope between the market and the hierarchy includes indirect forms of transaction regulation, in the case of which cooperation takes place. Forms of transaction regulation, bearing in mind their different effectiveness in different conditions, are determined by: the transaction costs amount, the nature of resources involved in the transaction

(universal or specialized), transaction frequency as well as uncertainty degree [Kaczmarczyk 2014]. According to Gorynia [1999]:

– market regulation is recommended, when specific resources are lacking, and is particularly effective at multiple transactions;
– trilateral regulation (an arbitrator) is recommended at occasional transactions requiring entirely or partially specific resources;
– bilateral regulation is recommended in the case of an average specificity of expenses and multiple transactions;
– administrative regulation should occur in the case of a high specificity of expenses and multiple transactions, as well as in occasional transactions.

One of the authors who have substantially influenced development of the contemporary version of the transaction costs concept is Williamson. He has assumed that the object of the transaction cost theory is selection of the best method to regulate transactions and forms of its management (*governance structure*) [Williamson 1981]. Transactional cost is currently defined as the difference between the sale price and the production or purchase cost [Niehans 1987]. In the context of competitiveness, the essence of the problem is expressed by Coase [1998], who, referring to Adam Smith, states that lower transaction costs related to exchange of goods are favourable for specialisation development, and hence for growing productivity of the economy. He stresses that transaction costs depend on the quality of institutions in a given country, its jurisdiction system, political system, as well as its culture.

At present, transaction costs theory, the agency theory, and the property rights theory are considered as some of the major trends in the theory of the firm. There is, however, a certain difference between transaction costs theory and the two other theories, which refers to the main focus of the analysis (while in the agency theory and the property rights theory, the focus is directed at *ex ante* dimension in the analysed contracts, in the transaction costs theory the main object of interest is the *ex post* dimension) [Gorynia 1999].

The concept of external effects in new institutional economies often appears in deliberations concerning other categories and theories of NIE. Their separation follows the presence of inequalities between private and social costs or benefits. An external effect can be defined as side, unintended effects of actions of an entity on the state of another entity not being directly involved in this process [Kamińska 2013]. When they occur, like in the case of public goods, we are dealing with an imperfection of the market, namely not meeting the optimal state of economy as defined by the general equilibrium theory [Fiedor 1992].

An example of combining various solutions concerning different categories and theories classified as NIE was given by Coase, for which in 1991 he

received the Sveriges Riksbank Prize in Economic Sciences in Memory of Alfred Nobel. Assuming that the main condition for effective solution of the external effects problem through the market is a private resource ownership, Coase stated that in a situation of clearly assigned property rights and low transaction costs, the external effects problem can be solved by voluntary transactions, a tender between the parties those effects relate to. Those deliberations are known as the Coase Theorem.

On the other hand, when it comes to competitiveness as an economic category it developed in the last few decades. Its emergence in the scientific discourse and the practice of economic life is connected with the specific character of the 1970s. During this period several events occurred that played significant role in shaping global market environment in subsequent decades. One of them was the energy crisis which affected the performance of the world economy and the performance of particular national economies.

Another issue of crucial importance for separating the notion of competitiveness was increased competition between a number of American and Japanese industries. Competition between companies from the United States and Japan caused at some point the erosion of advantages on the part of the U.S. for the benefit of Japan. It concerned comparative as well as competitive advantages [Misala 2009]. Since the end of the World War II, Japanese companies have been gradually building their strategy in the scope of expansion into world markets, which then they have effectively implemented. They have proven to be a worthy adversary for the U.S. companies in several industries.

The next element, which was very important in shaping the economic circumstances in the 1970s and 1980s, was the implementation of active trade policy, in which a number of instruments was used to intervene in the issues of the volume, direction, and type of international flows. A particular role was played for instance by actions affecting functioning of national industries, resulting in strengthening their position on international markets by supporting their representatives or restricting access to domestic markets for foreign competitors.

To summarise, competitiveness as a concept is a result of discussion over actual economic processes [Wziątek-Kubiak 2004] and criticism towards trade theory, which would not explain a number of economic phenomena taking place in that period. Considerable role in the process of defining competitiveness was played by the President's Commission for Industry Competitiveness established in the 1980s in the United States. It contributed to today's perception of the notion of competitiveness, and in practical aspect it was supposed to assist the U.S. economy in winning back their competitive advantage in several key industries. In a summary report, the members of the Commission defined competitiveness

as a degree to which a nation can, under free and fair market conditions, produce goods and services that meet the test of international markets while at the same time maintaining or expanding the real incomes of its citizens [*Global Competition – The New Reality* 1985].

The key arrangements unanimously undertaken by the Commission regarded the three following issues [Young 1985]:

–   existence of convincing evidence that the ability of the United States to compete has decreased in the past 20 years, the effects of which have been visible on the domestic market and taking into account the sale of American goods abroad;

–   the U.S. must be able to compete, if its purpose is to rise the standard of living and national safety;

–   improvement in competitiveness must be considered a priority of programmes both in the public and private sector; no more ignoring issues of competitiveness.

In recent years, trade which is affected by a number of conditions having different economic, demographic, political-legal, socio-cultural and technological-environmental profiles, is subject to changes. Globalization continuously shapes the economic environment, and interest in the issues of competitiveness has shifted from a macroeconomic perspective to mesoeconomic and microeconomic dimensions.

Regardless of the adopted level of analysis, due to continuous market internationalisation processes, each approach to competitiveness issues must be implemented in two analytic dimensions that remain in strict association with each other: national and international. National entities compete on the domestic market with national and foreign capital. Similarly, in the case of their abroad operations, they compete with both local entities and foreign capital.

In Polish economic literature in the field of competitiveness, a number of variants of this concept are found. In one of perspectives, competitiveness *ex ante* and competitiveness *ex post* are discussed. The first one applies to a certain state which can be reached in the future, whereas the second applies to current moment and is characterized by the current competitiveness of the entity being analysed [Gorynia 2009].

Another topology of competitiveness consists in distinction of two terms of competitive potential and competitive position. This potential, understood as a set of capabilities and capacities, should be referred to resources that remain at the disposal of the entity in the course of market competition. Competitive position is in turn a certain condition that has developed through the competing process and can be attributed to that process. Therefore, elements comprising

competitive potential have impact on the competitive position. Each entity competing on the market must select proper strategies used for the conversion of possessed resources into competitive position on the market. This transformation takes place through application of a suitable competition strategy (Figure 5.2). Gorynia [2009] acknowledges that competitive potential, competitive strategy, and competitive position are three components of competitiveness.

Figure 5.2. Process of transformation of competitive potential into competitive position

Source: Own elaboration.

Taking levels of the economic analysis into account, separated on the basis of classic geographic and subjective-objective delimitation, three views of competitiveness should be considered. They include competitiveness considered at the macroeconomic level, competitiveness at the mesoeconomic level and competitiveness at the microeconomic level. Competitiveness in the macroeconomic aspect is usually related to cases in which at least two entities compete with each other economically, and these entities are national economies, or specific groups of countries. The mesoeconomic competitiveness dimension is usually discussed in two ways. The first of them applies to the geographic dimension, and thus to regions, and the second to the industry dimension. Eventually, competitiveness analysis may be also conducted with regard to individual companies.

Current approach to competitiveness in the macroeconomic dimension in the scope of its assumptions, its definition, its determinants, analysis methods and conclusions resulting from them, has been formed on the basis of several theories. In the opinion of Misala [2012], they are focused on the issues of work division, international exchange, and economic growth.

Some authors consider competitiveness issues as anchored in the theory of international trade. This opinion is not widely shared, since classic researchers would focus their interest solely on the issues of specialisation [Olczyk 2008], and not on competitiveness *per se*.

In order to clarify the reasons of specialization in trade, Smith and Ricardo have developed theories of absolute advantage (absolute differences in the

costs of manufacturing) and of comparative advantage (relative differences in the costs of manufacturing). Particularly important, still valid in the sense of explanatory power, is the comparative advantage concept. In classical terms, the essence of this concept comes down to differences in alternative costs of manufacturing of goods in two countries. With regard to utilization of the labour factor in producing two types of goods x and y, it can be expressed as follows [Figiel and Rembisz 2006]:

$$\frac{lq_x}{lq_y} \neq \frac{lq_x^z}{lq_y^z}$$

where:

lq – unit labour cost of producing goods x and y in the country;

lq^z – unit labour cost of producing goods x and y abroad.

Trade taking place on the basis of benefiting from comparative advantage enables specialization and discounting the effects of scale. This is a typical sectoral view based on assuming the lack of mobility of the production assets, in which the differences in effectiveness between companies from the sector are omitted [Figiel and Rembisz 2005].

Later, Heckscher and Ohlin approached the issues of specialization in trade, taking the volume of resources in the economy into account, and, as a consequence, differences in the abundance of resources between the economies. All the above authors looked for reasons of international exchange on the supply side. Due to discussion and polemics other theories on the reasons of trade have developed. They subject international trade, among others, to demand, location, product life cycle. In this way, these approaches to trade issues include technological theories, supply-demand theories and the theory of intra-industry trade.

The spectrum of theories, of which competitiveness is emerging from, causes that competitiveness should be considered as an ambiguous, dynamic, and relative concept [Borowski 2008]. Therefore, forming competitive potential determining the competitive position of an economy depends on many factors, like for instance [Piotrowski and Zenka 2009]:

– having certain resources used in production and their structure;
– methods of their utilization (efficiency of operation);
– economic policy;
– effect on international economic environment;
– quality of institutions;
– stability of processes in the sphere of macroeconomy.

In analysing competitiveness in the agri-food sector, apart from the issue of the national economy competitiveness, which indisputably affects competitiveness on other levels of economic disaggregation, it should be considered

which issues competitiveness is addressing in the mesoeconomic and microeconomic dimensions. Regardless which competitiveness dimension we are dealing with, it is very important to underline mutual diffusion of competitiveness issues on particular analysis levels (Figure 5.3).

Figure 5.3. Relations between dimensions of competitiveness
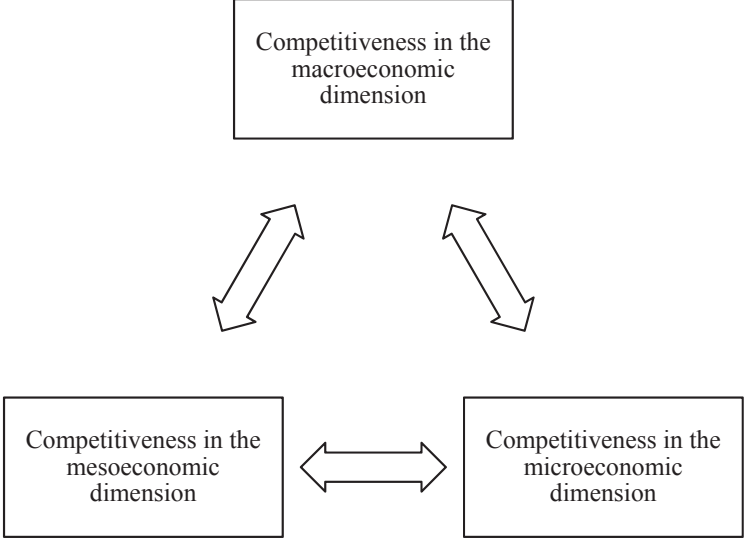
Source: Own elaboration.

Competitiveness of enterprises is the most disaggregated dimension among the analysed competitiveness levels. Since other levels are aggregation of the results obtained at this level, the mesoeconomic competitiveness and the macroeconomic competitiveness depend to some extent on competitiveness in the microeconomic dimension. Each of the presented relations has a cause-and-effect nature, and when taking into account each pair of perspectives, this nature is reflected always in both directions. Therefore, each dimension is at the same time a force affecting others and an effect of phenomena present in other dimensions.

Mesoeconomics in economic sciences was last to be separated, when compared chronologically with microeconomics and macroeconomics. For this reason, it is observed that deliberations referring to competitiveness at this level are less numerous than in other cases.

Analyses referring to the mesoeconomic level may be carried out, when it comes to competitiveness, in two dimensions. The first one is related to spatial (regional) perspective, the other one – to the industrial one. The notion of a region may be defined in many ways, depending on the context of research. Referring it to an economic area, a region may be considered an area characterized by

specific business specialisation, developed as a result of utilizing economic (internal and external) resources and the flow of growth factors (e.g. capital or technology) [Szewczuk 2011].

Analyses of regional competitiveness or of sector or industry competitiveness should gain importance paying attention to the fact that they can be a source of significant information about shaping market processes influencing both competitiveness of companies and national competitiveness. However, in analyses on the mesoeconomic level a problem of specific blurring of competitiveness problem appears. One of the reasons for such state of affairs is the possible acceptance of alternative approaches in this respect. Regional competitiveness has several definitions. Poniatowska-Jaksch [2006] proposes that this term should specifiy the capability of a territorial unit to compete (a state), and to compete and cooperate (processes) in order to achieve the expected level of socio-economic development by improving work productivity and creation of new workplaces. In turn, Meyer-Stamer (2008) acknowledges that regional competitivess is the ability of a town or a region to generate high and growing incomes and to improve the living conditions of people who live there.

On the mesoeconomic level, like on other levels on which competitiveness problem is discussed, many factors influencing competitiveness of the region can be indicated. They include, among others [Szlachta 1996]:
– access to modern production factors;
– innovation;
– existence of partner networks and commercial connections between market rivals;
– specialization and flexibility of the labour market;
– relatively homogeneous regional character;
– presence of leaders.

Competitiveness considered in the context of an industry may be defined in a different manner. Flejterski [1984] consideres mesoeconomic competitiveness as capability to design and sell goods of a given sector, industry or branch, whose prices, quality, and other attributes are more attractive than the respective features of goods offered by competitors.

In general, there is no single, accepted, comprehensive competitiveness measurement method. On the other hand, there is a number of indicators which are used to identify the degree of competitiveness of an economy, sector, or industry. Competitiveness, as a relative feature, may be measured in many ways and be referred to several dimensions. In Polish literature on this subject, there are attempts to create exhaustive lists of competitiveness measures. One of them is a proposal which divides measures of international competitiveness

into several groups: export competitiveness indicators; technological competitiveness indicators; regional competitiveness indicators; competitiveness pyramid indicators; productivity measures; multifactorial productivity (Table 5.1) [Zielińska-Głębocka 2003].

It is assumed that competitiveness may be a result of several phenomena. Thus, it is sometimes referred to variables of diverse character. In one of the approaches, data in the scope of foreign trade are considered crucial in deciding on the degree of the national or regional economy, or industry competitiveness. This analysis applies to the output dimension of competitiveness. It examines the volume of exchange resulting from competing on international markets.

In measuring competitiveness of national economy's sectors in international trade, revealed comparative advantage index (*RCA*) may be used. It was firstly formulated by Balassa [1965] and then modified by Vollrath [1991]. RCA, often known as the Balassa Index, may be defined for country *i* and product *j* as follows:

$$RCA_{ij} = RXA_{ij} = (X_{ij}/X_{ik})/(X_{nj}/X_{nk})$$

where:

X – export,

k – all goods other than j,

n – all countries other than i.

Another indicator similar in its structure to *RCA* (*RXA*), being a measure of comparative advantage, is *RMA* calculated according to the following formula [Vollrath 1991]:

$$RMA_{ij} = (M_{ij}/M_{ik})/(M_{nj}/M_{nk})$$

where:

M – import, while other symbols remain the same.

On the basis of these two indicators, one can calculate the so-called revealed competitiveness ratio (*RC*) [Latruffe 2010]. The formula for this purpose is as follows:

$$RC_{ij} = ln(RXA_{ij}) - ln(RMA_{ij})$$

Table 5.1. International competitiveness measures

Group of measures	Indicators
Export competitiveness indicators	1. Indicators concerning situation in foreign trade, i.e. balance of trade, import penetration rate, export rate, export market shares, foreign competition exposure indicator 2. Specialisation indicators, i.e. RCA index, Grubel-Lloyd index 3. Price-cost indicators, i.e. relative labour unit costs, relative export prices, relative producer prices, terms of trade, relative effective exchange rates
Technological competitiveness indicators	1. Total expenses for R&D as a percentage of GDP 2. Structure of expenses for R&D 3. Technology balance of payments 4. Internal and external patent applications 5. Country participation in patents reported by the United States 6. Number of scientific-research employees per ten employees 7. Number of scientific publications 8. R&D works intensity (expenses for R&D in enterprises as a percentage of added value) 9. Technology import (technologies included in imported goods) 10. Expenses for innovations (introduction of a new product, modernized, or new product as a percentage of total trade)
Regional competitiveness indicators	1. Relative GDP per capita 2. Relative employment rate 3. Relative unemployment rate 4. Relative productivity growth rate 5. Structure of production operations 6. Innovative activities intensity 7. Regional availability indicator (equipment in infrastructure) 8. Workforce qualifications

Competitiveness pyramid indicators (the European Commission 1996)	Living standards determined by employment rate and productivity: 1. Employment rate determined by professional activity rate, jobs creation, demography, labour markets, intangible investments, population ageing, qualifications structure 2. Productivity determined by market situation, financial situation, intangible investments, innovations, fixed capital and public infrastructure investments, R&D, organization and quality, investment funding, taxes
Productivity measures (OECD 2001)	Partial productivity of different production factors: 1. Productivity of work measured as a quotient of gross production quantitative index and of labour quantitative index 2. Productivity of work measured as a quotient of value added quantitative index and of labour quantitative index 3. Capital productivity measured as a quotient of gross production quantitative index and of a capital quantitative index 4. Capital productivity measured as a quotient of value added quantitative index and of a capital quantitative index
Multifactorial productivity	1. Total productivity of labour and capital MFP (*multi-factor productivity*) based on added value, measured as quantitative index of added value/a quantitative index of a sum of labour and capital 2. Total productivity of labour and capital MFP (*multi-factor productivity*) based on gross production, measured as an quantitative index of gross production/an quantitative index of a sum of labour and capital 3. Total production factors productivity, i.e. capital, labour, and intermediate inputs, namely energy, materials and external services, measured as a quantitative index of gross production/a quantitative index of total inputs

Source: Own elaboration based on Zielińska-Głębocka 2003.

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The issue of competitiveness is sometimes referred also to variables of factor nature. In this approach it concerns, for example, the access to production factors, among which labour, land etc. are distinguished. Some authors, including, among others, Porter, claim that a factor of considerable, and even key, importance in competitiveness is productivity. This author states that productivity is value generated by a unit of work or capital [1998a, 1998b]. In his deliberations on competitiveness and competitive advantage, Porter starts with macroeconomic dimension, crucial in his deliberations (his work of 1990 is entitled *The Competitive Advantage of Nations*). With time, Porter makes a significant change in his views and shifts the center of interest to the mesoeconomic dimension, namely industries and then clusters.

5.2. Empirical evidence of the impact

According to Porter [1998a, 1998b] clusters that are distinguished by geographic concentration of entities forming them, enable companies located there to obtain an advantage owing to the environment in which they operate. It happens under the influence of occurring external effects. Another issue significantly effecting the possibility of strengthening the competitive advantage of companies and industries is the fact that within a cluster there is a spatial concentration of expenditures. Furthermore, these expenditures often have a specialized character and lead to growth in efficiency.

Currently, one of the most popular research directions related to clusters is analysing their impact on innovation. The reasons for greater innovation of companies within a cluster may be found in transfering intangible assets, including knowledge, faciliated due to the geographic proximity. Spatial accumulation of entities leads to a denser network of relations ensuring information flow.

Kowalski [2013] distinguishes the following benefits related to locating their operations in clusters:
– facilitating the access to information and technological achievements;
– more chances to find production niches and to access export markets;
– staff qualifications development;
– increased access to resources and rare skills;
– growth in production capacity and flexibility;
– complementary nature of activities of companies in the cluster;
– faster activities;
– lower risk in business activities;
– faster integration with buyers and better access to them;
– possible common marketing actions.

The same author lists a number of features related to clusters that influence regional productivity and competitiveness. He includes here [Kowalski 2010]:

–   specialization with regard to selected industries;
–   greater availability of funds intended for innovations;
–   better transfer of knowledge and know-how;
–   local innovation and entrepreneurship culture and business activation;
–   attractive conditions for creating new entities;
–   growth in market competitiveness due to concentration of entities competing with each other, what puts a pressure on innovation (particularly when competition has a non-price character);
–   more new workplaces;
–   shaping attractive labour market for qualified staff;
–   increase in accumulation of human and financial capital;
–   concentration of resources and funds available for use in financing business operations;
–   concentration and development of means of production;
–   proximity of innovative industries related to cluster's industry profile;
–   improvement in the region's image;
–   development of services;
–   development of R&D facilities and education;
–   creation of production networks;
–   growth in export;
–   strengthening attractiveness of given location in terms of foreign direct investments.

Competitiveness, as a category which is potentially influenced by clusters, is analysed by economists from the World Economic Forum. Their annual *Global Competitiveness Report* (GCR) is used for determining how national economies satisfy the needs of their inhabitants by ensuring an adequate level of welfare. The main measure applied in the ranking is the Global Competitiveness Index (GCI) which is calculated taking into consideration a number of variables relating to different levels of economic disaggregation. Some of them have clear macroeconomic nature, whereas others are associated with the sphere of micro-economy or mesoeconomy. In the approach of the World Economic Forum it is assumed that competitiveness is a set of institutions, policies, and factors determining the level of competitiveness [Sala-i-Martín and Artadi 2004].

The structure of the Global Competitiveness Index is transparent, and it includes a number of factors called competitiveness pillars grouped among three subindices.

The result of evaluating competitiveness understood as such may be treated as a measure of competitive potential of the country, having decisive influence on the competitive position of its economy and its sectors, including the agri-food sector. In the ranking of the World Economic Forum for 2013/2014, Poland was recognized as the 42nd most competitive economy in the world (GCI value at the level of 4.46). Switzerland topped the ranking, ahead of Singapore and Finland (Figure 5.4). Considering the last eight years, the position of Poland in the ranking was gradually improving, and since the edition of 2010/2011 it is relatively stable.

Figure 5.4. Poland compared with 30 most competitive economies according to Global Competitiveness Index in 2013
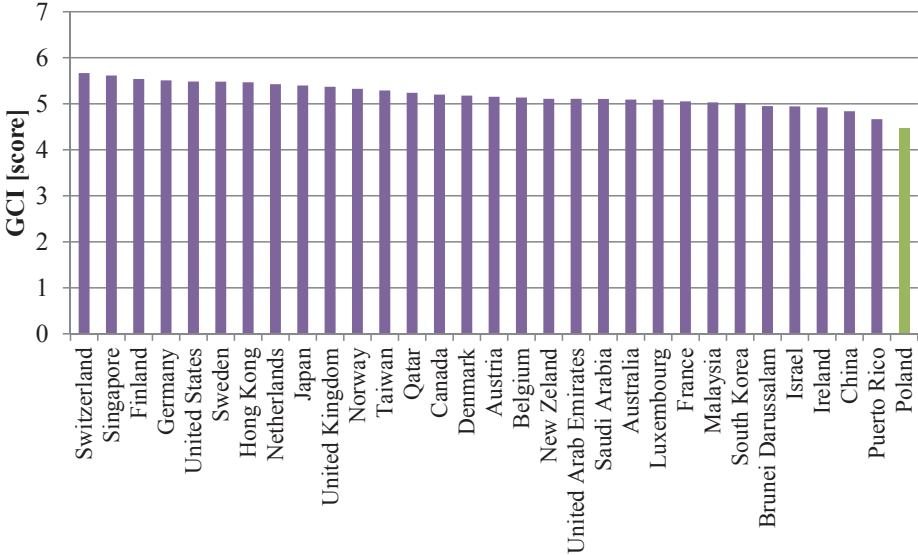
Source: Own elaboration based on World Economic Forum. Global Competitiveness Report 2013/2014.

Poland in the World Economic Forum's ranking is considered to be an economy in the phase of transition. Figure 5.5 presents three of Poland's competitiveness subindices from editions of the Global Competitiveness Report from 2006/2007 to 2013/2014. These are components of the Global Competitiveness Index describing its three dimensions.

Figure 5.5. Competitiveness subindices of Poland in 2006-2013
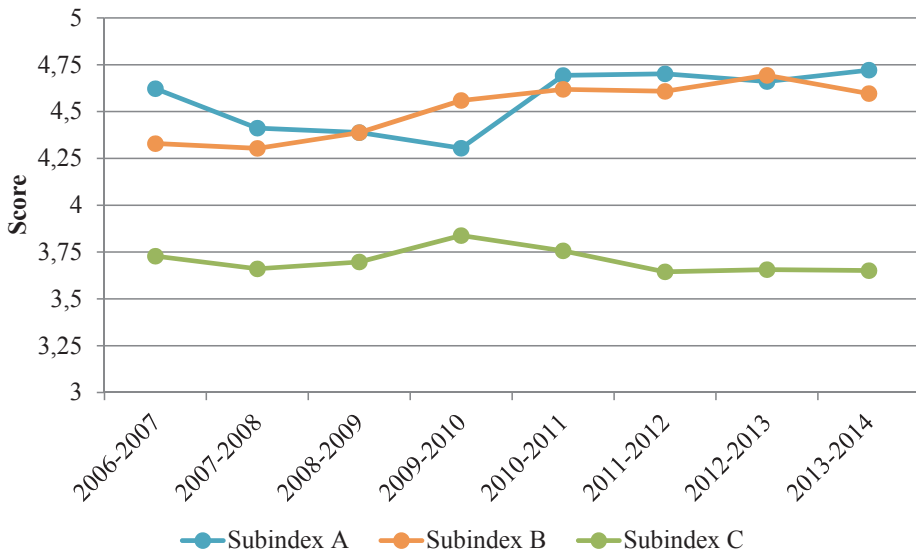
Subindex A represents factors having effect on the so-called basic requirements (the first four competitiveness pillars), subindex B refers to the effectiveness dimension (pillars from 5 to 10), and subindex C (consisting of two pillars) illustrates issues related to innovation and sophistication of business practices. Over the last years, the values of competitiveness pillars of Poland have seen some fluctuations. Considering data from the 2013/2014 edition and referring them to data from the 2006/2007 edition, it appears that the values of competitiveness pillars increased in eight cases, and decreased in four and they are: macroeconomic environment, health and primary education, labour market efficiency and innovation.

Data from the Global Competitiveness Report enable conducting analyses with regard to various economic phenomena in the scope covering most of economies in the world. An interesting dependence can be observed, important from the point of view of analysed relations between competitiveness of economies and their productivity (Figure 5.6). Assuming that the Global Competitiveness Index is a synthetic measure of competitive potential, its value can be referred to the value of gross domestic product per capita obtained by the analysed countries.

Figure 5.6. GCI and GDP per capita of economies included in the 2013/2014 Global Competitiveness Report
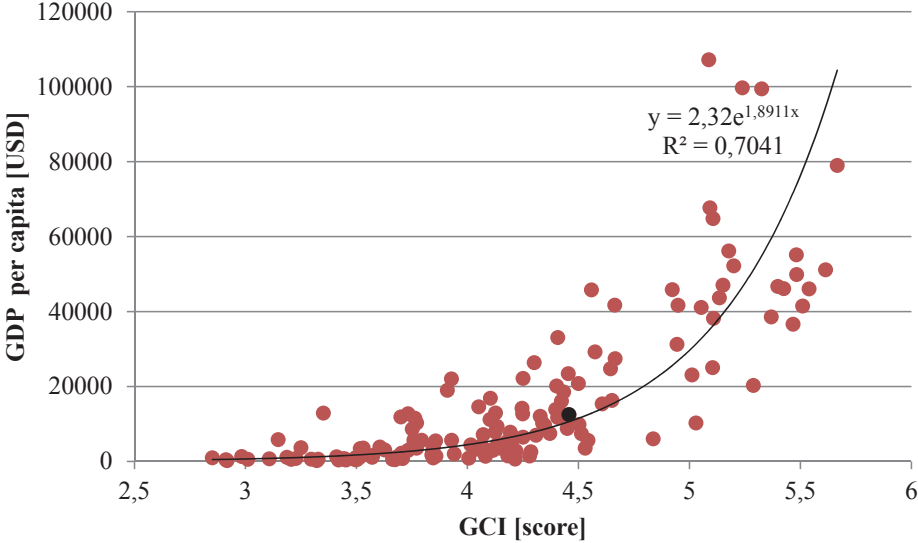
The equation shown on the chart:

$$y = 2{,}32e^{1{,}8911x}$$
$$R^2 = 0{,}7041$$

Source: Own elaboration based on World Economic Forum. Global Competitiveness Report 2013/2014.

GDP per capita, as an effect-type category, represents the productivity of an economy and well-being of its inhabitants. In the case of 148 economies analysed in terms of their competitiveness, there is a relation between analysed variables. The higher the competitive potential of an economy, the greater its productivity and the higher the welfare of its inhabitants.

From the point of view of this study, it is worth taking a closer look at one of the components forming the 11th competitiveness pillar, namely business sophistication. Indicator 11.3 is defined as *state of cluster development* and the values of this indicator are obtained from the worldwide survey addressed to managers. The question in the survey concerns the issue of how common well--developed clusters are in a given economy.

In the 2013/2014 Global Competitiveness Report, the highest values of the 11.3 indicator were obtained in the case of Taiwan, Italy, and United Arab Emirates (Figure 5.7). Such a high position of the Italian economy is not surprising, since knowledge about clusters is quite common in this country. It is due to the popularity of industrial districts (*distretti industriali*), promoted in the last century by many Italian economists.

Figure 5.7. Poland and 30 economies with the most developed clusters based on WEF methodology in 2006-2013
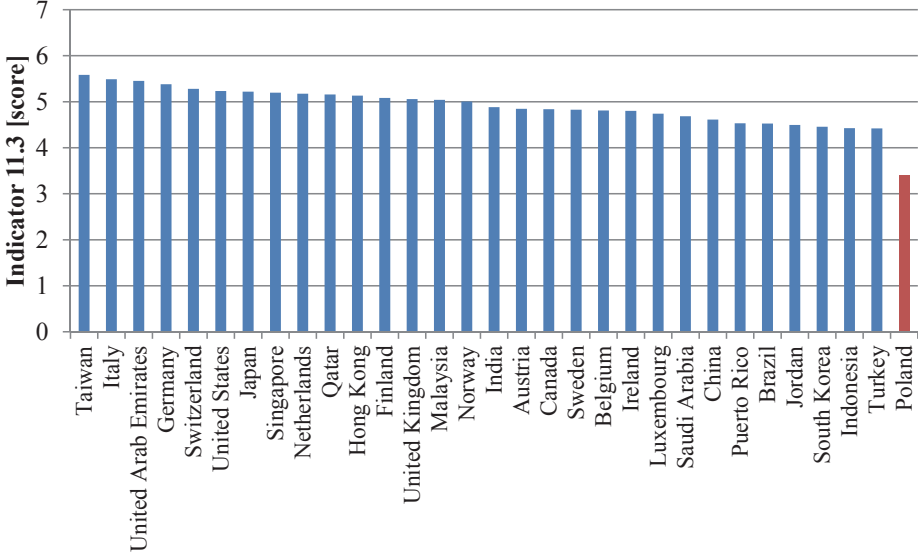
The results obtained for indicator 11.3 for Poland locate this economy at a distant place in the ranking (Figure 5.8). In the 2013/2014 edition, with the score of 3.41 (by 7 possible points), Poland is 104th among the 148 economies examined. Over the last eight years, the respondents of the World Economic Forum's survey gave varying answers evaluating the status of cluster development in Poland. The value of indicator 11.3 was decreasing from 2006/2007 to 2010/2011, and starting from the edition of 2011/2012 it was gradually increasing. In the group of other economies covered by the ranking in the analysed years, Poland was 81st at best in the world.

Figure 5.8. State of cluster development in Poland based on the WEF methodology in 2006-2013
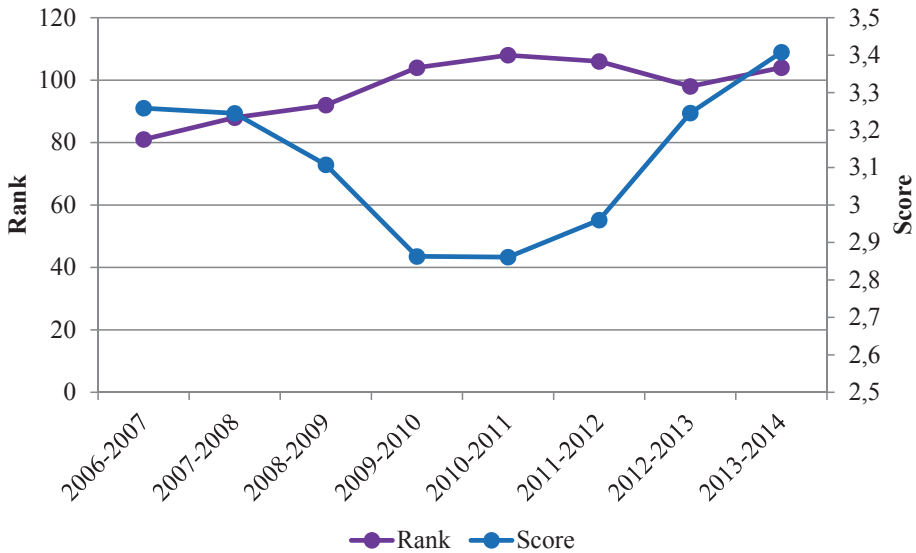
Figure 5.9 presents a list of indicator values specifying clusters development in relation to the GDP value per capita for 148 economies in the world. Assuming that clusters have substantial effects on competitiveness (in the microeconomic, mesoeconomic, and macroeconomic dimension), a confirmation of this assumption through the data used is expected. The more so, that it is a view supported by a large group of economists and it is reflected in many strategic documents on the national and international level used in creating economic and development policy.

Figure 5.9. State of cluster development and GDP per capita of economies included in the 2013/2014 Global Competitiveness Report
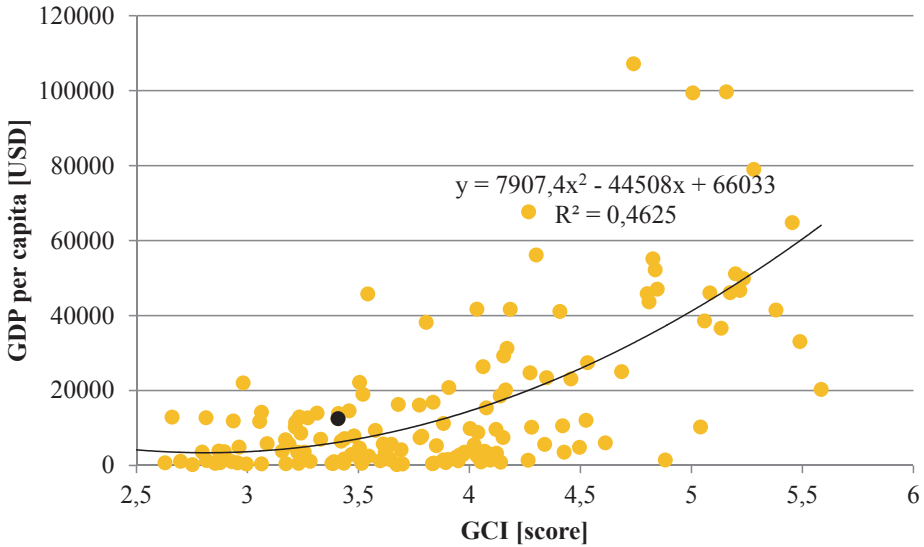
Source: Own elaboration based on World Economic Forum. Global Competitiveness Report 2013/2014.

The relation between variables examined is characterized by a relatively low determination ratio (46.25%). The reasons for such a situation may be found in the way the data is collected in the World Economic Forum's study. Indicator 11.3 specifying clusters development in a given economy is gathered through a survey. And as such it may be subject to errors resulting from being unfamiliar with the matter (lacking knowledge concerning the problem of clusters or lacking knowledge concerning the actual condition of their development in particular country), may entail subjective feelings of respondents about the matter or be an effect of non-objective evaluation on the part of respondents in an attempt to increase their country's chances for strengthening or improving its position in the ranking.

Currently, due to internationalization processes taking place in global environment, each entity operating on the market remains under influence of national and international competition. Therefore, competitiveness, as a relative category, has also an international dimension. Evaluation of competitive companies, industries, regions, and countries is performed with the use of data related to foreign trade.

In recent years, the value of the Polish international trade in the scope of agricultural products, including food, is characterized by clear growing trend

which is supported by data of World Trade Organisation of recent years (Table 5.2). In 2012, the value of agricultural products export from Poland (marked in Standard Classification of International Trade SITC with section symbols numbers of 0, 1, 2, 4 excluding groups 27 and 28) was at the level of USD 24.4 billion and constituted 1.47% of the value of world export in this category of products. For comparison, in 2005 Polish agricultural products export constituted 1.14% of the world export. Polish agricultural products strengthen, or even increase, their competitive position on world markets. Import of agricultural products to Poland in 2012 amounted to USD 20.0 billion, which constituted 1.14% of world's import in this category of products. As compared to 2005, the participation of the Polish agricultural products import in the world's import increased by 0.22 p.p.

Table 5.2. Polish agri-food trade in the years 2005-2012
[billion USD, current prices]

Trade direction	Type of products	Year							
		2005	2006	2007	2008	2009	2010	2011	2012
Export	Agricultural products	9.7	11.7	15.0	18.4	16.9	19.3	22.8	24.4
	Food	8.6	10.4	13.4	16.5	15.5	17.4	20.4	22.0
Import	Agricultural products	8.3	9.8	13.1	17.3	14.5	16.7	20.5	20.0
	Food	6.3	7.6	10.3	14.0	12.0	13.5	16.3	16.2
Export dynamics	Agricultural products	133%	120%	128%	123%	92%	114%	118%	107%
	Food	136%	121%	129%	123%	93%	112%	117%	108%
Import dynamics	Agricultural products	121%	118%	134%	132%	83%	116%	122%	97%
	Food	124%	120%	136%	135%	86%	113%	121%	99%

Source: Own elaboration based on data form the WTO.

Food is a subcategory of agricultural products in statistics used by the World Trade Organization, on the basis of SITC Classification of the United Nations. It includes three sections of the Standard Classification of International Trade with numbers 0, 1 and 4 and group 22. Food export from Poland in 2012 was at the level of USD 22.0 billion and was higher than in 2005 by 156%. As compared to 2003, and thus before accession of Poland to the European Union, the value of food export from Poland increased more than five times (USD 4.3 billion in 2003 as compared to USD 22.0 billion in 2012). At the same time, the value of food import to Poland amounted to USD 3.7 billion in 2003, USD 6.3 billion in 2005 and USD 16.2 billion in 2012, which means a growth by more

than four-times between 2003 and 2012 and constitutes 0.63%, 0.88% and 1.11%, respectively, of the world's import in this products category.

Both export and import dynamics (calculated year to year) of the analysed commodity categories was, in the recent years, mostly positive. Only in 2009, in the case of both commodity categories, as compared to 2008, the value of international exchange decreased, and in 2012, compared to 2011, the value of agricultural products and food import decreased. In addition, in the analysed period, the trade balance of both categories was positive and systematically growing. In 2012, the balance was at the level of USD 4.4 billion for agricultural products and at the level of USD 5.8 billion for food.

The Polish food industry is dynamically developing. It is caused by a number of factors of internal and external nature. A phenomenon that played a significant role in the food industry development in the last decade was the growing interest in the Polish food on foreign markets. Between 2000 and 2010, the export in this area of industrial processing increased from PLN 9.8 to 44.1 billion. It means growth by 16.1 p.p. of export share in sold production of the food industry, which reached 26.6% in 2010 [Mroczek and Szczepaniak 2012].

Between 2000 and 2010, sales of food, beverages, and tobacco products increased from PLN 92.9 billion to PLN 165.4 billion (calculated at base prices). In the analysed period, sold production of the food industry (calculated at fixed prices) increased by 55.7%, and agricultural commodity production increased by 27.6%. At the same time, consumption of food, beverages, and tobacco increased by 18% [Mroczek and Szczepaniak 2012].

The value of food industry products export in 2010 increased as compared to 2000 from PLN 9.8 billion to PLN 44.1 billion. With regard to the values of sold food industry production, it was a change from 10.5% to 26.6%. Growth recorded with regard to the export constituted approximately a half (47.3%) of the growth in main category, i.e. of sold food industry production. Thus, it played much greater role in the growth of sold production value of the food industry than internal demand [Mroczek and Szczepaniak 2012].

Results achieved by the Polish agricultural and food sector in international trade are reflected in its competitive position assessed with the use of the *RC* indicator, whose calculation is discussed in the previous sub-section. Figures 5.10 and 5.11 present this ratio for the EU-27 countries, calculated on the basis of WTO data concerning export and import for two trade categories, namely agricultural and food products, in the years 2006-2010. Particular countries have been arranged according to the value of the *RC* indicator, starting from the lowest up to the biggest.

**Figure 5.10. The values of the RC indicator for the agricultural products category in the EU-27 countries**
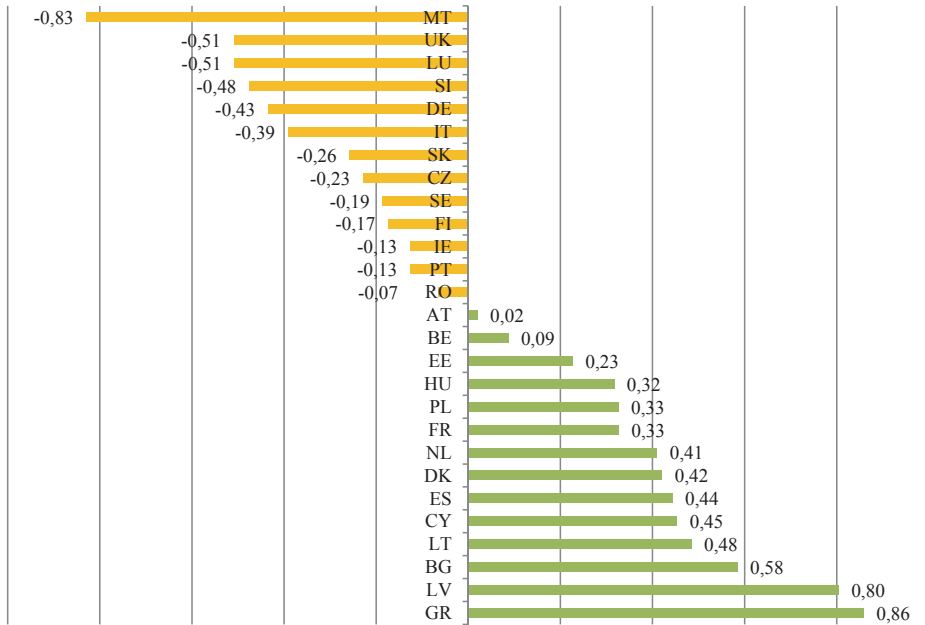
The values of the *RC* indicator for the agricultural products category are between -0.83 for Malta to 0.86 for Greece. For 13 countries, they are negative and for 14 countries they are positive with average value amounting to 0.05 at standard deviation equal to 0.44. A very similar picture appears from analysing the values of the *RC* indicator for trade category of food. The only country for which the *RC* value has changed from positive to negative is Estonia.

It should be emphasised, which is quite understandable, that the *RC* values calculated for the agricultural products and food trade categories are strongly correlated (correlation coefficient is 0.87 and is statistically significant at the level of $\alpha \leq 0.01$). However, attention should be paid to the fact that for the commercial category of food they are contained in a broader range, namely from -1.09 for Finland to 0.83 for Greece. Their average value is negative (-0.03), and their standard deviation is slightly higher (0.49). Also, their distribution is more asymmetric towards negative values. Thus, we may assume that the competitive position of the EU-27 countries in the food category is slightly weaker than in the agricultural products category.

Figure 5.11. Values of the RC indicator for food category in the EU-27 countries
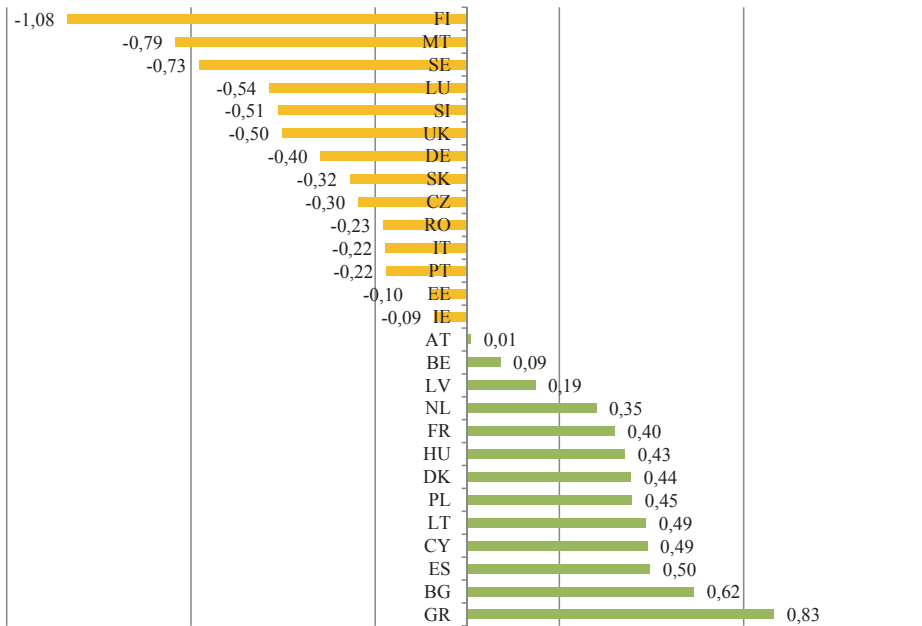
Source: Figiel et al. 2012.

Seeking for an answer to the question of whether the presence and strength of agri-food clusters in different countries is reflected in their competitive position in international trade, Figiel et al. [2012] have also conducted an analysis of dependence between the values of such measures used in evaluating business potential of the clusters, like specialisation ratio (LQ), focus, and size, and the values of the *RC* indicator. Using the ECO data, they have compared the values of business potential measures of three agri-food cluster types, separated on the national level on the basis of relative shares in employment. It turns out that in this regard a large diversity occurs in each of the three separated clusters types, namely: Agricultural Products, Farming and Animal Husbandry and Processed Food. However, statistically significant relationships between the values of the cluster economic potential measures and the values of the *RC* indicator were observed mostly in case of the Agricultural Products type of clusters and the food trade category [Figiel et al. 2012].

Analysing the competitive position of the Polish economy in international trade, it should be noted that the value of total export is regionally very strongly diversed (Table 5.3). In 2011, four voivodeships recorded export results exceeding the level of EUR 10 billion, namely: Śląskie (EUR 21.6 billion),

Mazowieckie (EUR 20.2 billion), Dolnośląskie (EUR 16.0 billion), and Wielkopolskie (EUR 13.9 billion). Their total share in total export amounted to 61.1% and was higher by 5.5 p.p. than in 2002. At the same time, their trade balance in the period 2003-2012 was positive.

Table 5.3. Export value by voivodeship in the period 2002-2011 [billion EUR]

Voivodeship	Year									
	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011
Dolnośląskie	4.7	5.2	6.1	7.6	10.5	12.0	12.7	11.4	14.3	16.0
Kujawsko-Pomorskie	1.8	1.9	1.9	2.5	2.8	3.5	4.2	3.1	4.1	4.2
Lubelskie	0.8	1.0	1.0	1.2	1.4	1.6	1.8	1.4	1.7	2.1
Lubuskie	1.4	1.6	1.8	2.2	2.5	2.9	3.2	3.1	3.6	3.9
Łódzkie	1.7	1.7	1.8	2.2	2.6	3.1	3.6	2.8	3.7	4.4
Małopolskie	2.4	2.6	3.0	3.9	5.2	6.0	6.4	4.6	5.7	6.8
Mazowieckie	7.6	8.1	9.6	12.0	15.0	17.1	17.8	15.0	17.6	20.2
Opolskie	0.7	0.9	1.0	1.2	1.4	1.6	1.8	1.5	1.9	2.1
Podkarpackie	1.7	1.8	2.0	2.3	2.9	3.2	3.2	2.6	3.3	4.0
Podlaskie	0.6	0.7	0.8	0.9	1.0	0.9	1.0	0.9	1.1	1.3
Pomorskie	4.9	4.8	4.9	5.4	6.6	7.6	7.4	5.6	6.7	8.6
Śląskie	6.8	7.9	11.7	12.4	14.6	17.3	20.5	15.6	18.8	21.6
Świętokrzyskie	0.5	0.6	0.7	0.9	1.2	1.4	1.5	1.1	1.3	1.4
Warmińsko-Mazurskie	1.1	1.2	1.3	1.5	1.7	2.0	1.9	1.6	2.0	2.5
Wielkopolskie	5.0	5.4	7.0	8.7	10	11.1	12.5	10.4	12.0	13.9
Zachodniopomorskie	1.6	1.9	2.3	2.5	2.9	3.2	3.8	3.1	3.7	4.3

Source: Own elaboration based on Małopolskie Obserwatorium Gospodarki 2012, Gawlikowska-Hueckel and Umiński 2007, 2009.

It is worth noting that the export performance of the voivodeships is closely related to the size of GDP per capita applied as a proxy variable of the competitive position of the economy. As an output variable, gross domestic product per capita is a productivity measure of the economic system and enables comparing the results achieved by particular economies. With this approach, when analysing the competitive position of particular voivodeships in Poland, it can be concluded that the most competitive regional economies are the Mazowieckie, Dolnośląskie and Wielkopolskie voivodeships (Table 5.4). Also in these voivodeships, the dynamics of GDP per capita changes between 2001 and 2011 was one of the highest in the country.

Table 5.4. GDP per capita in voivodeships in 2001, 2006 and 2011 [PLN]

Voivodeship	GDP per capita (PLN)			Change (%)
	2001	2006	2011	2011 to 2001
Dolnośląskie	20519	29695	44961	219.1
Kujawsko-Pomorskie	18625	24244	32596	175.0
Lubelskie	14613	18783	26919	184.2
Lubuskie	17973	24686	32795	182.5
Łódzkie	18294	25593	36750	200.9
Małopolskie	17260	24204	34107	197.6
Mazowieckie	31848	44383	64790	203.4
Opolskie	16346	22304	31771	194.4
Podkarpackie	14469	19078	26801	185.2
Podlaskie	15740	20378	28485	181.0
Pomorskie	20147	27438	37822	187.7
Śląskie	21927	29542	42830	195.3
Świętokrzyskie	15517	21093	29552	190.4
Warmińsko-Mazurskie	15566	20892	28635	184.0
Wielkopolskie	21733	29269	41285	190.0
Zachodniopomorskie	20024	25103	33485	167.2

Source: Own elaboration based on data from the Central Statistical Office (GUS).

Like GDP per capita, being a productivity measure of the whole economy and a reflection of its competitive position, the value of agricultural production generated per 1 ha of arable land, being a productivity measure of the soil factor, may be treated as one of significant competitive position assessment parameters of the agri-food sector. As it appears from the data of Figure 5.12, the value of agricultural production per 1 ha of arable land in 2011 was quite diversed in regional cross-section, ranging between PLN 3.22 (Podkarpackie voivodeship) up to PLN 6.78 thousand/ha (Wielkopolskie voivodeship).

Figure 5.12. Value of agricultural production per 1 ha of arable land in 2011 [thousand PLN] and its dynamics as compared to 2002 by voivodeship
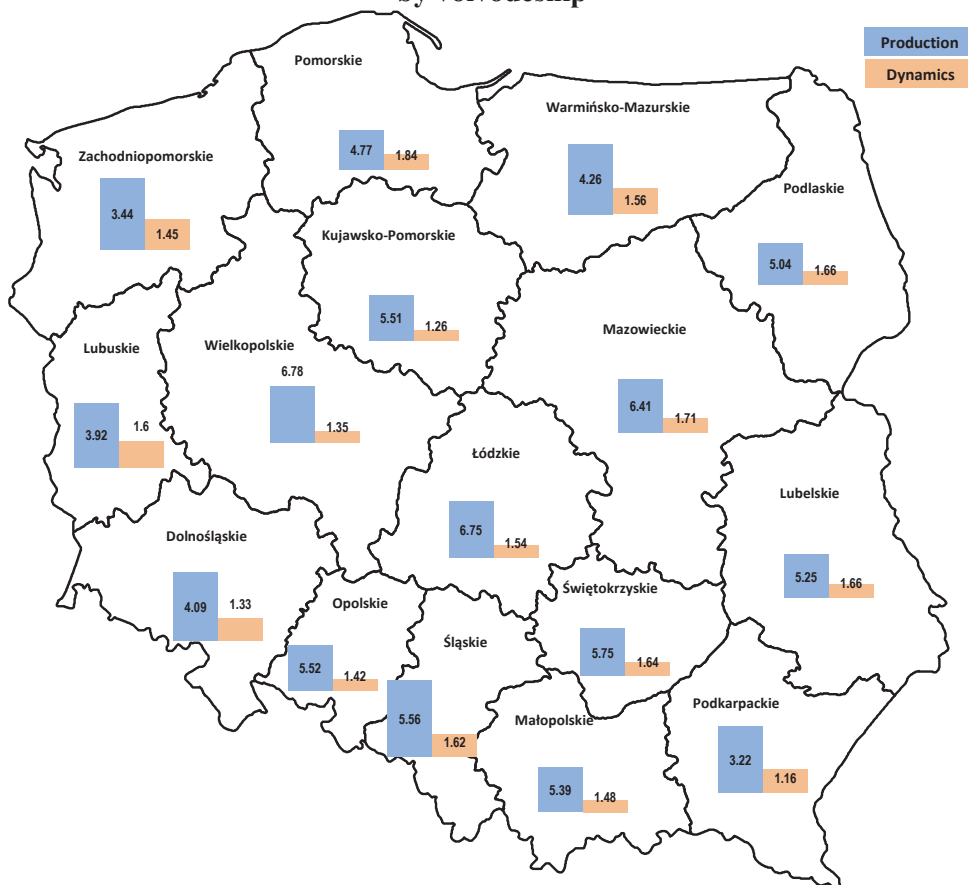
As compared to 2002, it increased on average for all the voivodeships by 52%, and the greatest growth was in the Pomorskie voivodeship (by 84%), and the smallest in the Podkarpackie voivodeship (by 16%). Being aware of methodical constraints concerning accuracy of such comparison with changes in GDP per capita presented in Table 5.4, recorded in practically the same period, it cannot be ignored that the pace of changes in the arable land productivity was clearly lower than the pace of changes in the productivity of the whole economy.

Gross value added is another economic category, which can be used in evaluation of competitiveness in terms of results. In the mesoeconomic dimension it enables identifying the effects of activities in a particular sector, or industry in a given timeframe. The gross value added reflects, among others, the

results of agriculture. In Poland in the years 2005-2009 it was higher than between 1999-2003 by 37% (expressed in fixed prices). Such a change was accompanied by an increase of production value (+8.6%) and a decrease of indirect consumption (-3.7%) [Józwiak i in. 2013].

Figure 5.13 presents changes in the gross value added in food production and beverages production. As compared to 2005, in 2009-2011 we can observe this value increasing nearly 1.5-times in the case of food production and a varying increase of nearly 2-times on average in the case of beverages production.

Figure 5.13. Gross value added in food production and beverage production in Poland (according to NACE 2007) in the period 2005-2011 [million PLN, current prices]
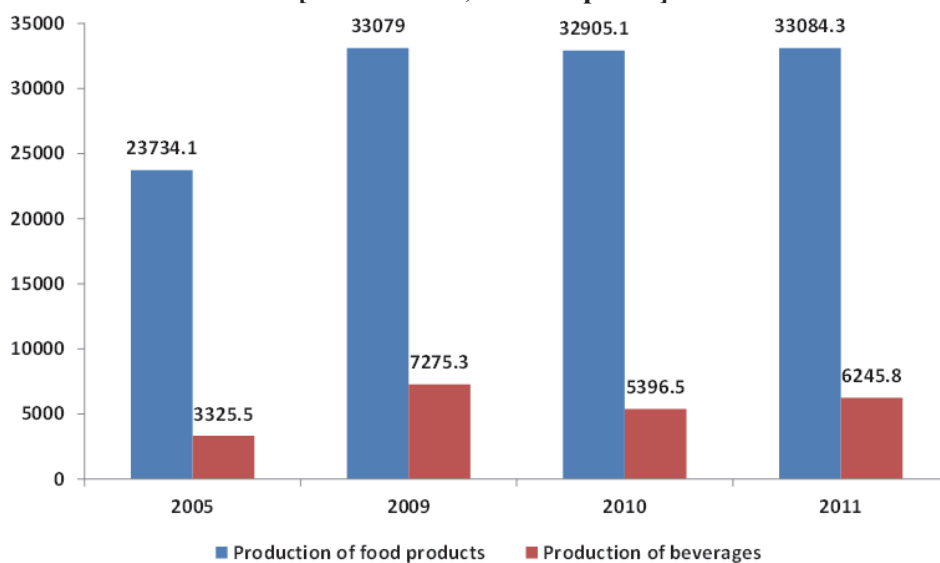
Source: Own elaboration based on data from the Central Statistical Office (GUS).

Figures 5.14 and 5.15 present gross value added generated in sections A (Agriculture, forestry, hunting, and fishery) and C (Industrial processing) in particular voivodeships in 2011 and its relative changes as compared to 2002. The voivodeships with the highest added value generated in section A include: Mazowieckie, Wielkopolskie, and Lubelskie. On the other hand, the voivodeships with the lowest generated added value level in this section are: Podkarpackie, Lubuskie, and Opolskie. The difference between voivodeships with the best (Mazowieckie) and the worst result (Podkarpackie) is more than 8 times.

Figure 5.14. Gross value added in section A in 2011 and its change as compared to 2002 by voivodeship [billion PLN, current prices]
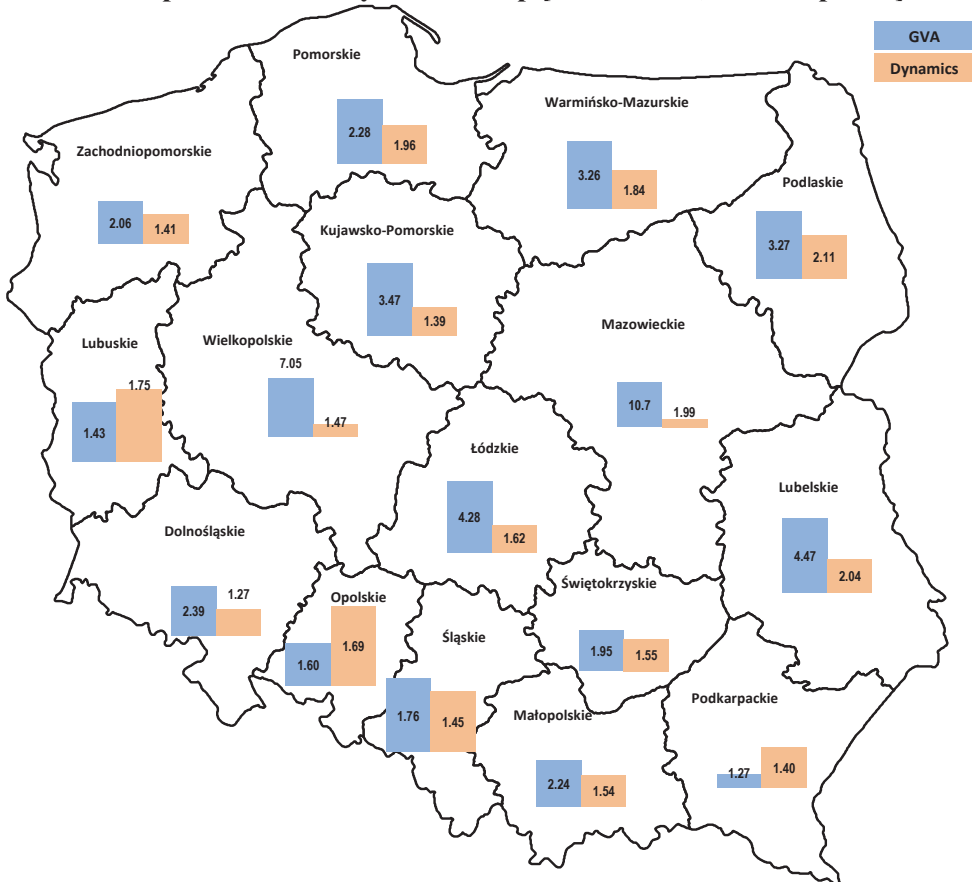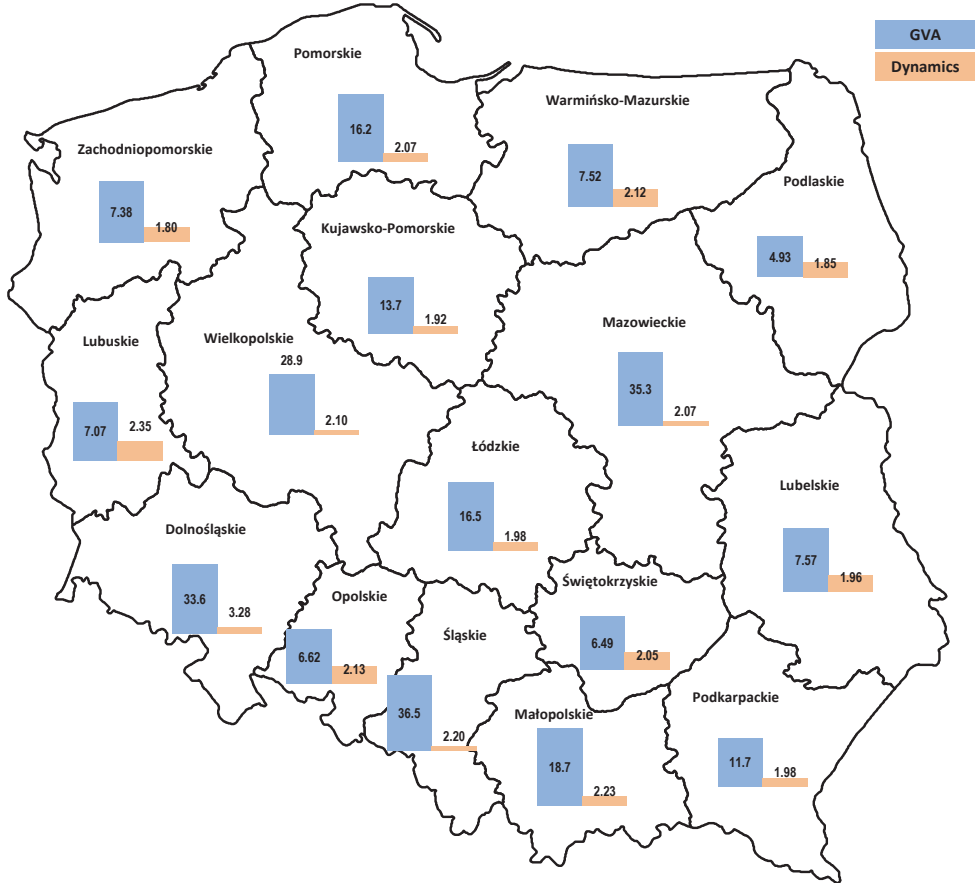

Source: Own elaboration based on data from the Central Statistical Office (GUS).

This diversity can be explained not only by the size of the voivodeships or the number of entities operating there, but also by the concentration degree of operations included in section A. Significant differences between the voivodeships also occur in the dynamics of changes in the added value in the period 2002--2011. The greatest progress in this respect occurred in Podlaskie, Lubelskie or Mazowieckie voivodeships. On the other hand, the smallest growth in the added value in this period occurred in the Dolnośląskie, Kujawsko-Pomorskie and Podkarpackie voivodeships.

Likewise in the case of section A, deep diversity in the level the gross value added between the voivodeships is observed in the case of section C, including, among others, food processing. In 2011 the following voivodeships

were on the top: Śląskie, Mazowieckie and Dolnośląskie. On the other hand, the Opolskie, Świętokrzyskie and Podlaskie closed this list.

Figure 5.15. Gross value added in section C in 2011 and its change as compared to 2002 by voivodeship [billion PLN, current prices]

The difference between the voivodeship in which the gross value added in section C generated in 2011 was the highest and the voivodeship in which it was the lowest, was more than 7-times. The highest growth dynamics in the gross value added generated in section C in the period 2002-2011, appeared in the Dolnośląskie, Lubuskie and Małopolskie voivodeships. On the other hand, the lowest dynamics of this growth characterized Zachodniopomorskie, Podlaskie, and Kujawsko-Pomorskie. Analysing these results, it is necessary to bear in mind the fact that, as opposed to section A, the value added generated by entities from section C includes also the results of activities not associated

with the agri-food sector. For this reason, such a comparison does not fully reflect the diversity of economic activity of the entities in this sector with regard to added value creation from the voivodeship perspective. It may be treated only as reflection of the density distribution of business entity operation types described according to PCA as an industrial processing, and of its changes in particular voivodeships in the period of 2002-2011.

5.3.   The role of cluster policies and related recommendations

Selection of areas, and hence in a way a cluster policy model, depends on a country, initiative location, its stage of development [Ministerstwo Gospodarki 2011a]. A characteristic feature of the cluster policy is that it is applied in a manner coordinated for specific cluster structures, which requires a process approach leading to determining optimal model or toolset for given conditions and using relatively flexible programmes and instruments of support [Ministerstwo Gospodarki 2011c].

The specified cluster policy model cannot, however, be considered permanent, because economic policies, including the cluster policies, are subject to recurrent evolution process, where the following stages can be distinguished [Jabłoński 2012]:
− traditional sectoral approach,
− sectoral clusters,
− innovative over-sectoral clusters,
− innovative cluster networks.

The traditional sectoral approach is an approach applicable on the national level. It relies on supporting the existing value chains and sectoral activities, implemented under strategies created for particular sectors. In other words, this is simply an industrial policy.

The sectoral cluster policy has regional scope resulting from different legal and political conditions. This policy assumes supporting the existing value chains, but also supporting business networks and cluster initiatives. Therefore, the sectoral cluster policy is compatible with regional development and industrial development policy.

The next step is to support new initiatives of regional nature, and their location may result not only from the economic, but also from the administrative conditions. This approach seeks to take advantage of the business potential and opportunities by supporting the R&D sector. However, the focus is directed not only on innovations, but also on structural changes (new specialities) within the existing sectors which as a result are becoming over-sectoral (horizontal). This

approach is characterized not only by the presence, but also by actual functioning of the so-called triple helix between business, science, and governmental sectors. The innovative policy created in this spirit includes other strategic documents, subordinating them in a way.

The fourth and the last of the so far identified stages of developing cluster policies are innovative cluster networks. Within this stage, initiatives of not just regional, but rather national and even supranational nature are promoted. Their goal is to support the R&D sector, innovations, and structural changes, also within sectors existing in horizontal perspective. The difference is that, as a result of such support new specialisations and emerging industries should be identified. Once again, the whole process proceeds with active participation of actually cooperating actors, forming a triple helix. At this stage, innovation policy is of critical importance. It can be said that both types of policies (cluster policy and innovation policy) are in a way combined, covering with their wide scope the research area, industry area, and regional development.

The evolution of the so understood cluster policy is an instrument for regional development, and not, as it is often claimed by its opponents, an element of fashion [Jabłoński 2012]. Cluster policy evolution can be also understood as transition from the classic policy stage, through the stage of supporting clusters as knowledge makers, to the policy of developing clusters as networks generating business opportunities based on the knowledge generated. It is worth highlighting that this process is accompanied by the evolution of innovative policies. In their scope, an innovation is no longer simply running R&D, but it is also a specific use of a possibly full range of proposals and ideas. Instead of emphasising the importance of research as well as the high technologies sector within the innovative policies, concentration in the whole spectrum of possible activities is more and more often. As a result, the support of these R&D institutions and of technology transfer are replaced by supporting innovations in all sectors with a conviction that enterprises are the axis of the policy. In other words, instead of knowledge creation and propagation, the support is aimed at its absorption.

By analysing Polish cluster policy in the context of its evolution, it can be concluded that it is located at the second stage – sectoral clusters. Though we have the industrial policy stage already behind us, still its too early to say that over-sectoral innovative clusters or innovative cluster networks are created in Poland in real terms. What gives a chance in this respect is the fact that programmes created within works on operational programmes planned for implementation in the new financial perspective of 2014-2020 include creation of key clusters of strategic importance. Assuming success of this type of activities, it can be said that we can find ourselves at the next stage of the cluster policy

evolution and the Polish economy's competitiveness will no longer be based above all on low manufacturing costs, but on world-class innovation policy.

So far, cluster initiatives forming in Poland are supported mostly by the Ministry of Economy along with the PAED subordinated to it, however cluster initiatives are developed and supported increasingly at the regional level. Undoubtedly, the interest in the subject of cluster initiatives at the governmental, local authorities and local administration levels results from the availability of the EU funds to develop clusters. It can be even said that the EU funds are the main reason for creating Polish cluster initiatives, and in more detail – the occurrence of cluster initiatives in Poland results from specified cluster policies – the EU policy, but also national, and regional, existing as well as planned policies.

The European Union assigns very high importance to its cluster policy, what has been clearly signalled in the title of one of its announcements *Towards world-class clusters in the European Union: Implementing the broad-based innovation strategy* [European Commission 2008]. It is one of the most important EU documents concerning clusters and creating effective conditions for supporting cluster initiatives development in Europe. Among major proposals and aims contained in it, the following are worth mentioning [Ministerstwo Gospodarki 2011c]:

–   increasing the number of world class clusters, raising their innovative potential, and improving international cooperation in the field of clustering is currently an important factor of the EU economic development;

–   activities implemented at the community level should create optimal development conditions for clusters;

–   main decisions concerning cluster policy lie in the responsibility of different member countries;

–   the EC is working to promote common initiatives designed to improve functioning of cluster initiatives, as well as their internationalization;

–   to ensure complimentarity and synergy between activities for building world class clusters, undertaken on the local, regional, and community levels, the EC proposes mutual learning of institutions responsible for the cluster policy and exchanging good practices, which should enable obtaining synergy effect of the policy at various levels;

–   the main emphasis should be put on bottom-up approach, and actions of the state should play only auxiliary function and be focused on creating relevant institutional infrastructure in the cluster environment;

–   creating a system of cluster initiatives evaluation by establishing *European Brand for Excellent Cluster Development Organization* based on the EFQM Excellence Model may: make possible directing aid from public

sources first of all to the best clusters, concentrating support instruments on the most competitive centers, as well as rationalizing public expenses and rising their effectiveness (there is a risk that the system will reduce opportunities for supporting less developed cluster initiatives, dominant in countries where clustering is at the initial stage of its development, e.g. in Poland);

– in order to develop strategies of raising cluster excellence in Europe and consulting services for particular Member States regarding programmes concerning clustering, and to develop cooperation in this area, the High Level Group for the European Cluster Policy can be established;

– preparing and improving cluster maps for the Member States on the basis of the European Cluster Observatory (an initiative managed by the Strategy and Competitiveness Centre functioning at the Stockholm School of Economics under the *Europe Innova* project) will help to obtain comparable information on cluster policy and cluster potential in the EU.

Currently the cluster concept is an important element of the EU economic policy, being included in the following priorities of the *Europe 2020* Strategy [Ministerstwo Gospodarki 2011c]:

– smart development – developing knowledge and innovation-based economy;

– sustainable development – supporting economy using resources more effectively, more environmentally friendly and more competitive;

– stimulating inclusion development – supporting the economy with a high level of employment, ensuring social and teritorial consistency.

In particular, the cluster concept is referred to by three documents listed below, and programmes related with them that are aimed at helping with the strategy impementation [Dzierżanowski et al. 2012]:

1. *Integrated industrial policy in the age of globalization – Competitiveness and sustainable development in the first plan.*
2. *Leading Project of the Europe 2020 Strategy – Union of Innovations.*
3. *Regional policy as a factor contributing to intelligent development under the Europe 2020 strategy.*

In the first one it reads, among others, that:

– policy regarding regional, national, and the EU clusters should be focused on overcoming irregularities in market functioning and financing deficiency, on creating a bridge between companies and research institutions;

– the regional EU policy and research framework programmes should help the regions in accepting smart specialization strategies, which will increase their competitiveness by developing innovative niches;

- traditional and technologically advanced clusters and competitive networks based on commercialization of research results and generating innovations should be developed;
- in order to develop clusters and to improve regions innovativeness, the Member States using the regional EU policy should support intelligent specializations.

In the second one, the emphasis is put on the need to spend the funds effectively, stating, among others, that:

- since too much funds are allocated to very similar projects, or priorities where a given region lacks advantages, there is the need to spend the structural funds more effectively;
- regions should administer the funds based on smart specialization and focus on their advantages, thanks to which they can achieve outstanding results.

In the third of the mentioned documents, among others, the following guidelines are contained:

- smart growth is to be achieved through national smart specialization strategies aimed at concentrating resources on the most promising areas of comparative advantage, namely clusters, existing sectoral and inter-sectoral operations, eco-innovations, markets with high added value, and particular scientific research areas;
- in creating the strategy, aid for technical assistance is to be used;
- strategies are to be subjected to international evaluation;
- the following will be increased: flexibility of regional policy programmes of the EU, and support from the European Regional Development Fund for education, scientific research and innovations;
- faster funds redirection will be possible;
- strategies are to be developed together by national and local authorities;
- strategies are to foster effective utilization of the public funds and to stimulate private investments;
- investment concentration should prevent dispersing the funds involved;
- strategy should be strictly related to other areas of the policy and should constitute an element of multi-level management in the context of integrated innovation policy.

Cluster policy in Poland has been introduced quite recently[12] and relates mainly to stimulating collaboration between the economy and the world of science.

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[12] Its beginnings reach activities realised in the period 2004–2006: action 1.1. *Strengthening Institutions Supporting Operations of Enterprises* and action 1.4. *Strengthening Collaboration between the R&D sector and the Economy* of the sectorial OP *Growth in Enterprises*

Just like on the EU level, it is being built in the bottom-up approach, according to which the most active participants in the cluster construction process are to be local enterprises. Consequently, the implementation takes place mainly as an element of regional development policy, while the state plays only an auxiliary role focusing on chosen support programmes and creating appropriate institutional infrastructure. The support is to be connected with correcting imperfections on the market [Ministerstwo Gospodarki 2011a].

As a result, it can be said that cluster policy in Poland is conducted at national and regional level. On the national level, it is not an independent policy and constitutes an element of the innovative policy formulated in the *Directions of Raising Innovativeness of the Economy for the years 2007-2013* document, which emphasises the meaning of supporting network joint activities of entrepreneurs focused on implementing innovative projects and cluster development is one of these activities. In particular, in the Infrastructure for Innovations area, the improvement in the operational conditions of innovative companies is assumed by supporting joint network activities of entrepreneurs, focused on implementing innovative projects, including those supporting cluster development. Support for cluster initiatives has been also assumed in *The National Programme of Reforms for the years 2008-2011* under action 3 *Implementation of Solutions Supporting Pro-Innovation Activities and R&D, including Streamlining of Knowledge Transfer and Innovations Diffusion* of the *Innovative Economy* priority [Dzierżanowski et al. 2012].

Years 2012 and 2013 were a period of discussion on the placement, directions, and assumptions of the cluster policy in Poland until 2020. However, it should be noted that the notion of a cluster in governmental documents was treated quite instrumentally. Apart from science-technology parks, incubators and technology transfer centres, it is one of the instruments for achieving specified goals of innovative policy, an element of infrastructure for innovations. On the other hand, in the *Directions towards Increasing the Economical Innovation*, a reference is made to creating aggregations of companies, as a task for innovation and entrepreneurship centers. They should be executed by combining in a given area business services with various forms of assistance for companies in the framework of technological parks, business zones or industrial parks. As a result, we cannot speak about existing economic development policy based on

Competitiveness, and activity 2.3. *Staff Development for Modern Economy,* scheme B*., Promoting System Solutions in the Scope of Adaptive potential and Knowledge-based Economy* of the OP *Human Capital,* under which the PAED has implemented the system project *Programme of Trainings to Promote Clustering.*

clusters. Clusters are not an object of influence on the national level, nor an object of coordination by other policies and support instruments.

On the other hand, there are many national financial policy instruments of the cluster policy that stimulate cluster development. The key instruments include implemented by the PAED: action 5.1 *Supporting of Cooperation Relations of Superregional Importance,* the OP *Development of Eastern Poland,* and action 1.4. *Promotion and Cooperation* (the *Cooperation* component), the OP *Development of Eastern Poland*. It should be added that through the years the PAED indirectly and directly has supported cluster development through research and analyses, trainings, promotion, or international projects.

The purpose of operation 5.1. was to support cooperative relations of superregional importance, in particular of joint projects of investment and advisory nature, contributing to facilitating transfer and diffusion of knowledge and innovations between cooperating entities. What is important, the support within this action could have been granted to all operations except for: agriculture, hunting and forestry, fishery and aquaculture, manufacturing and trade of products supposed to imitate or replace milk and dairy products, synthetic fibers production, coal mining, iron and steel industry and ship construction. This list is a result of the EU community regulations regarding public assistance for specific forms of business operations within the EU competition policy. The result is the exclusion of, among others, supporting the development of agri-food or maritime clusters (shipyard clusters). Moreover, the support is only available for strong and relatively spatially extensive clusters or cluster initiatives. On the other hand, the support from the OP *Development of Eastern Poland*, like the Programme for Central Europe, is available only to initiatives located in eastern voivodeships of Poland [Instytut Badań nad Gospodarką Rynkową 2009].

In addition, there have been many instruments of the innovative and technological policy stimulating the development of cluster structures like, for example, building local partnerships, cooperation networks between the economy and the R&D sphere, implementing common R&D projects of companies and R&D units. The support of this type is available not only under the OP *Development of Eastern Poland*, but also under competitions organized by the Ministry of Science and Higher Education, such as Initech.

Another direction of supporting clusters concerns performing so called soft activities, that is training, advisory etc. Support in this area is available under the OP *Human Capital*, in particular in an action 2.1 *Development of Personnel for Modern Economy* [Instytut Badań nad Gospodarką Rynkową 2009].

One cannot forget about pilot project implemented by the PAED in 2007 *Support for Cluster Development*, aimed at stimulation and activation of the

existing clusters in order to effectively utilize the funds originating from structural funds, planned in the *National Cohesion Strategy for the years 2007-2013*. The programme made it possible to prepare studies, documents, analyses, and reports, to promote and internationalize activities, to invest in the area of communication and exchange of information, and to purchase research infrastructure. In total, within 5 projects 1,636,835.19 PLN was spent [Instytut Badań nad Gospodarką Rynkową 2009].

On the other hand, when it comes to cluster development at the regional level, only in some voivodeships elements of development policy based on the clusters can be observed, whereas in most of them it is understood in a narrower sense, alike on the national level. Despite the above, almost every regional programme has funds for: cluster setting, creating new organizational structures and their administration, marketing activities and aiming at obtaining new participants, supporting best practices, creating cooperation between the members in order to transfer technology. In addition, the support may be obtained to implement investment projects ensuring necessary technical facilities for cooperation linkage taking into account e.g. room adaptation, equipment purchase, purchasing equipment for R&D activities, supporting operations of cooperation promoters, consulting in the scope of development plan preparation [Instytut Badań nad Gospodarką Rynkową 2009].

In practice, local initiatives that do not meet the requirements enabling their participation in competitions at the national level, reach for available funds at the regional level. Some think it is a unique paradox, because, after all, clusters are a regional phenomenon and the main entities supporting them should be local authorities. Since support programmes in each voivodeship are designed independently, they significantly differ from each other in terms of the offered support and conditions necessary to obtain it, and only in some voivodeships names are used directly indicating that it is about supporting cluster development. A consequence of this is the fact that two similar initiatives qualify for the support in some regions, in others they do not [Instytut Badań nad Gospodarką Rynkową 2009]. However, by analysing the Regional Operational Programmes (RPO), two main approaches to the cluster policy in Poland may be identified [Dzierżanowski et al. 2012].

The first approach is dominant and consistent with narrowly understood cluster policy. It considers supporting cluster initiatives and coordinators, with addition that in some Regional Operation Programmes (ROP) there is a possibility to support initiatives with structural funds, which is accompanied by an activity separated for this purpose, whereas other ROP combine actions supporting entrepreneurship, business environment institutions, and building relations

between companies, and the R&D sphere. In the extreme case of the Zachodnio-pomorskie voivodeship, no possibility for supporting the clusters is even mentioned, which forces potential beneficiaries to apply for national funds.

The second approach, observed in the Podlaskie, Podkarpackie, and Oposkie voivodeships, is concurrent with cluster based development policy. In regional development strategies, regional innovation strategies, or regional operational programmes, there is no separate activity dedicated to support clusters, but at the same time a suitable priority is given to activities being implemented promoting cluster development by placing relevant provisions in the selection criteria for subsidized projects.

The most interesting approach to cluster policy in Poland is observed in the Pomorskie voivodeship. A cluster supporting programme being implemented there for the period of 2009-2015 assumes support for: key, subregional (local), and embryonic clusters, having technological network character. The key clusters are chosen on a competitive basis while undertakings indicated and agreed in their strategies get additional points in evaluating the submitted projects within the operational programmes (coordination and concentration effect).

In addition, in some regions, regional authorities or other entities from the regional innovation system (RIS) implement projects indirectly supporting cluster development under activity 8.2. *Knowledge Transfer* of the OP *Human Capital*. On the other hand, in the Dolnośląskie and Wielkopolskie voivodeships, their cluster initiative support programmes have been started on the basis of small own funds. In a few regions, local authorities and regional institutions supporting regional development also participate in international projects aimed at raising knowledge and competence with regard to supporting clusters by exchanging experience and best practices [Dzierżanowski et al. 2012].

Table 5.5 presents different methods of supporting cluster initiatives under ROP. One may notice that both at the national and regional levels, cluster initiatives benefit most often from support dedicated not only to them. Competitions, where a support can be obtained from operational programmes financed with structural funds, serve to support extremely wide range of goals within different activities and are not adjusted to specific needs of the initiatives. In consequence, it is very difficult to compare submitted projects and to select the best ones. There are no activities to support cluster as an economic system, which more generally contributes to the problem of lacking coordination of financial policy instruments from various areas in terms of complex cluster policy. Funds necessary for developing clusters by investing in human capital, infrastructure, and in R&D are dispersed today.

In addition, despite the lack of evaluation on both levels of cluster policy with regard to its added value and its impact on the economic development, opinions that *activities in the scope of cluster policy should not be restricted to only these focused on creating and developing cluster initiatives and organizations, but they should be focused in more detail on coordinating and strengthening instruments related to investments in companies and investments in the R&D sphere* are becoming more popular [Instytut Badań nad Gospodarką Rynkową 2009].

Table 5.5. Methods to define support for clusters at regional level

Documents	Activity separated to support clusters	Activities taking into account supporting cluster	No activities dedicated to clusters
Regional Operational Programme	Świętokrzyskie Wielkopolskie Mazowieckie Warmińsko-Mazurskie	Podkarpackie Podlaskie Lubelskie ** Małopolskie* Łódzkie * Dolnośląskie Śląskie * Opolskie Lubuskie Kujawsko-Pomorskie Pomorskie ***	Zachodniopomorskie

* – support for clusters is present as a scheme or a component; ** – support for clusters as an example of activities in a scheme or a component is highlighted; *** – cluster is present as an example of project to be financed; no distinctions of support for clusters in the name of an activity and no division into schemes and components (including financial capital).
Source: Dzierżanowski et al. 2012.

In response to the current, widely commented shortages in the Polish cluster policy, both at the national and regional level, and facing the planned EU policy directions in the field of clusters, new, currently created Polish national strategic documents could not disregard the concepts of clusters and cluster policy. The effects are reflected in the following five documents [Dzierżanowski et al. 2012]:

1. *National Regional Development Strategy 2010-2020*;
2. *National Programme of Reforms for Implementing Europe 2020 Strategy;*
3. *Long-Term National Development Strategy – Poland 2030. Third Wave of Modernity*;
4. *Middle Term National Development Strategy 2020*;

5. *Innovation and Effectiveness Strategy for the period of 2010-2020 – Dynamic Poland* within operations direction 2.3. *Supporting Cooperation in Creating and Implementing Innovations*.

   In the *National Regional Development Strategy 2010-2020* it is stated that:
- supporting cluster development is to be an instrument of regional policy within supporting favourable regional and local specialisations;
- clusters with the biggest competitive potential on the international scale are to be supported in the first place;
- a goal of the regional policy within the cluster policy is to transform aggregations of companies into dynamic clusters with a high level of competition and cooperation, interactions and external effects;
- supporting clusters is to be broad and apply mainly to:
  - R&D activities,
  - supporting international expansion of companies,
  - quality growth of human capital in companies,
  - stimulating industry cooperation,
  - creating new companies;
- a separate support in the form of e.g. developing principles of participation and of accessing common infrastructure or activities, is to be obtained by legal entities managing clusters.

   The *National Programme of Reforms for implementing the Europe 2020 strategy* includes the following elements:
- the economic growth policy is supposed to be based on support for clusters;
- a mechanism is to be created to select the most competitive clusters, including those technological with the largest innovative potential, which are to be preferred under the system of expending structural and public funds;
- clusters must develop based on regional innovative systems supported on the regional and national level;
- the result is supposed to be forming the high technologies sector, attracting direct foreign investments, dynamic and innovative scientific-research back-up and industry network of competitive clusters on the global scale;
- support should be directed towards non-technological innovations in management and service areas;
- activities are to include developing, monitoring, internationalization and skills development with regard to functioning and managing cluster initiatives.

In the *Long-term National Development Strategy – Poland 2030. Third Wave of Modernity*, it was specified that:

– besides supporting the areas of growth and readiness for diffusing peripheral centers, it is planned to define priorities and selective areas of governmental intervention and investment;

– cohesion of activity and collaboration between centers supporting innovations – technology parks, technology transfer centers, entrepreneurship incubators, PE/VC funds is to be amended;

– centres for supporting business and science are to be strengthened institutionally and substantively;

– technology broker system will be created;

– social capital development is to be stimulated;

– clusters and initiatives can be methods to achieve objectives.

On the other hand, in the *Middle Term National Development Strategy 2020*, there are the following provisions:

– it is assumed that clusters increase innovativeness of the economy, enable faster introduction of knowledge to the market, increase productivity, attract investors, support scientific research, strengthen the industrial base and lead to the development of specific products and services;

– creating clusters is to be supported until 2015 and in the period 2016-2020, a market-participative model is to be implemented with the private sector having the leading role in their initiation, financing, and managing;

– transforming concentrations of companies into dynamic clusters is to be a modern instrument strengthening regional and local specialization;

– public intervention is to be focused on socio-objective and spatial potentials, which will ensure development generated internally in the future;

– a management system is to be created for defining rational and realistic goals, integrating various public policies, taking specific conditions and needs of different territories into account;

– the development policy is to be based on concentrating thematic effect (fields and undertakings providing the highest added value), and funds (limited number of priorities), as well as territorial approach (considering the specific nature of a given location).

In *Innovation Policy and Economy Effectiveness for 2010-2020 – Dynamic Poland*, which is a document within activity direction 2.3. *Supporting Cooperation in Creating and Implementing Innovations*, it is stated that:

– bottom-up approach is to be promoted in developing clusters, while the role of the public authorities is to create institutional infrastructure and offer assistance programmes to support cluster formation;

- instead of sustaining initiatives that without any assistance of the state would not be able to function, point intervention is to be used, supporting internationalization of products and services, or supporting joint research projects at the level of the EU;
- on the basis of a dialogue with companies managing special economic zones and a review of their industry specialisation, instruments will be introduced supporting cluster relations within these zones;
- as a result of strengthening collaboration between clusters and scientific-technological parks, research results are to be more effectively transferred into innovative and effective industry;
- clusters are to be supported also by preferences with regard to the access to funds and by creating technology centres, incubators, and shaping technical infrastructure according to their needs, and by appropriate adaptation of the education system in agreement with the regional authorities.

The Ministry of Economy offers broadening of the existing instrument catalogue for cluster supporting by the following solutions [Ministerstwo Gospodarki 2011d]:

- creating benchmark documents, such as articles, articles of incorporation, letters of intent that shall include legal solutions ensuring efficient functioning of an initiative and managing possible conflicts of interest;
- financing fixed costs of cluster organizer (coordinator), which will allow them to extend operation horizon beyond the period of the project;
- creating a handbook with regard to protecting intellectual property rights for entities involved in cluster structures;
- supporting auditing training needs of clusters;
- supporting creation partner projects networks by coordinators of Polish clusters with twin organizers of foreign clusters;
- organizing diagnostic workshops on cooperation between cluster members within the triple helix;
- creating a system of cluster initiative evaluation.

In addition, specific, large-scale works are in progress on the creation of a complex cluster policy, which would be consistent with assumptions of national and the EU strategic documents. Working group for cluster policy appointed by the PAED on the basis of programmes implemented in Sweden, Germany, France, and Hungary, as well as on the basis of Polish experiences, created an important proposal concerning directions and assumptions of the cluster policy in Poland until 2020. Main recommendations formulated by this group are listed below [Dzierżanowski et al. 2012].

1. The purpose of cluster policy should be strengthening innovation and competitiveness of the Polish economy on the basis of intensifying cooperation, interactions and flows of knowledge within clusters and supporting the development of strategic economic specializations (key clusters).

2. The first support direction should be financial support (mainly from a regional level) for coordinators and initiatives they implement, which ensures functioning of institutions serving crucial role in the development of cooperation, interactions, and flows of knowledge.

3. The second support direction assumes supporting selected clusters of key importance and having competitive potential for the national economy (central support) and particular regions (regional support), falling within the scope of intelligent national and regional specializations. Although entities from all clusters will be allowed to benefit from an available public support on the general terms, some of the support will be directed to projects performed by clusters chosen as the key ones. In other words, due to their significance for the country or regional economic development, they will use a priority financing path (owing to additional points in the projects evaluation system). All projects from the key clusters will undergo a standard procedure of formal and substantive evaluation, under which they will compete with other projects. These projects would be implemented by entities operating within a cluster or by consortiums created by those entities (which is preferred). They would include, among others, R&D activity, investments in common educational or research infrastructure, human capital development, internationalization etc.

4. Central and regional administrations should jointly develop a flexible programme of supporting initiative coordinators which, being notified to the European Commission, could obtain an option to allocate higher support than under *de minimis* assistance, with a diverse level of subsidies, and without any necessity of formal transfer of support provided to entities forming the cluster initiative.

5. Supporting coordination function should be activated at the regional level, while at the national level there should be additional, dedicated financial support available for coordinators of national key clusters, meant for internationalization.

6. Coordinators should have a possibility to acquire financing to implement specific, additional functions and services, and various kinds of already existing entities and institutions should be permitted to perform coordination functions.

7. The national key clusters should be selected in a competition. Their number should be limited, and the selection extended in time for subsequent competition rounds. The competition commission should include representatives of ministries and agencies financing cluster projects, and independent experts. Economic and scientific-technological potential should be evaluated. The development of national key clusters would be supported in a manner directed by public national and regional funds. Regions may also choose (through accreditation, competition, or analytical-consultation processes) and support regional key clusters being a part of intelligent specializations of these regions, which could apply for support on the national level. On the other hand, the national key clusters would have the status of key regional clusters.

8. Selecting the national and regional key clusters should lead to concentrated support, and the system awarding projects submitted by key cluster entities with additional points under various support programmes and operational programmes, including those under the responsibility of the National Centre for R&D, or the Minister of Science and Higher Education, should provide coordination and integration of the support. As a consequence, agreeing a common strategy of development and action plan will become an important task. A bundle of projects and development undertakings organized by various entities of a cluster or their consortiums, in different areas (investments in infrastructure, R&D projects, investments in human capital) shall be defined and implemented.

It is worth emphasising that comparing with the previous supporting programmes which used to be implemented indirectly through financing clusters coordinators and their activities, in the new model support for coordinators is kept, but a more extensive model of cluster based development policy has been formed. This model includes coordinating and concentrating various public policy instruments (innovative, scientific-technological, human resource development policy) which as a result of awarding additional points in the project evaluation system will be aimed directly at actors from the key clusters. In addition, in the model no top-down cluster initiative creation is assumed. A system of incentives is proposed instead, fostering their engagement in processes of common, strategic development planning, and defining joint projects. The support should have digressive character and be limited in time.

When it comes to gaps in regional innovative policies involving cluster policy, most often the following are listed [Jabłoński 2012]:

– fragmentation and duplication (reproduction) of public funds for R&D both in the regional and national scale;

- no critical mass of innovative processes in a region – reliance on competitions and lack of system solutions;
- lack of cooperation between all actors in knowledge-based economy – no quadruple helix – science, business, authorities, non-governmental organizations;
- insufficient support for innovative activities in superregional and supranational cooperation;
- inertia expressed in the existing gap between provisions in documents and their implementation, and reality;
- insufficient process management, improperly defined goals, and immature tools for implementation.

In the opinion of the authors of this study, in creating a support programme for various forms of cooperation for the needs of the agri-food sector, the following three principles should be followed:

- funds should be oriented at the development and practical implementation of innovative projects;
- awarded funds should take place on the basis of contests that enable selection and funding of the most competitive applications for project implementation, being evaluated by a group of experts representing science, consulting, and business practice;
- monitoring project implementation and eligibility of funds spending should proceed by evaluating their level of properly defined measurable indicators.

In the case of agri-food clusters, in particular the following issues should be taken into account [Jabłoński 2012]:

- clusters are an instrument, not a goal (an object) of the policy;
- real (system, not declarative-competitive) cooperation of the actors is necessary;
- current weakness of clusters and their fragmentation (financing fragmentation) should encourage promotion of integrating activities;
- it is necessary to end the classic, sectoral approach for the benefit of defining goals resulting from market needs;
- it is necessary to ensure permanent support and change monitoring process – inertia prevention.

When building recommendations, it is also worth underlining that, in accordance with the European Agricultural Fund for Rural Development (EAFRD) Regulation, Priority I of the development of rural areas in the new financial perspective 2014-2020 has a goal of facilitating knowledge transfer and innovations in agriculture, forestry, and in rural areas. This priority should be implemented,

first of all, by the following Rural Areas Development Programme (RADP) actions:

– *Knowledge transfer and information actions* (Article 15);
– *Advisory services, farm management and representation services* (Article 16);
– *Cooperation* (Article 36).

Functional relationships between these measures is characterized by quite significant horizontal penetration, which may constitute a difficulty in clear defining of entities authorized to use the support and structures responsible for implementing technical assistance. At this point, it should be emphasised that in accordance with the EAFRD regulation, a common trait of these measures is to focus on innovation preference. In consequence, the most important substantive requirement for the projects should be innovativeness which should be precisely defined.

It should be emphasised that, as compared to other forms of cooperation included in the *cooperation* measure, the project implementation process for a cluster should vary, especially with regard to such stages like selection procedure, and the implementation. Possible cluster policy should have selective character and be based on cluster mapping and studying their potential, and analysing subjective, and objective nature of functioning or undertaken cluster initiatives in order to indicate proper directions, and methods of improving cooperation and strengthening ties between entities necessary for strong clusters to exist. At least several reasons for such approach can be distinguished. Firstly, a cluster is not any group of enterprises referring to this name, but one having specific features and potential, and operating in a certain way. Secondly, as compared with other cooperation forms, a cluster is an undertaking requiring the largest commitment, and, at the same time, contributing the most to increase competitiveness of the sector. Thirdly, in most countries with regard to clusters within the cluster policy, top-down approach is applied.

In creating cooperation projects within a cluster, the National Rural Areas Network (NRAN) employees should assist. The projects should cover problems related to rural areas, and agriculture problems nationwide or voivodeship-wide (according to assumptions with regard to each forms of cooperation).

Special procedure of conduct for clusters should proceed as follows:
– selection of clusters of highest importance for competitive development of the national agri-food sector;
– transfer of responsibility for the cluster to an animator;
– autonomous establishment of an organization applying for funds within the *cooperation* measure by the cluster for the whole period 2014-2020;

–   incorporation of newly identified clusters.

In the cluster selection process, a team of experts from vertical structures (specialization in the area of a given form of cooperation), and horizontal structures (specialists in particular strategic areas: internationalisation, technology, quality) using quantitative and qualitative methods, should prepare initial list of priority clusters reflecting all strengths of the Polish agri-food sector. This list should be then accepted by all stakeholders, including representatives of firms and institutions involved. At this stage, a dialogue should be started to ensure better cluster adjustment to the set priorities. Quantitative data analysis should be supplemented with data obtained in the dialogue process, which will provide a justification to assume that the Polish agri-food cluster supporting policy is essentially based on the already existing or emerging clusters. The role of government agencies is, first of all, to support existing or emerging clusters, not to create new clusters of no significant economic importance. Any cluster list should be created on the national level involving the Ministry of Agriculture and Rural Development. The number of clusters selected should come from a compromise between the budget for this form of cooperation and the needs of particular clusters.

Referring to transferring the responsibility for a cluster to its organizers, after selecting priority clusters, the core of actors should be arranged, which will allow an introduction of the bottom-top processes and to ensure a possibly large diversity in the final cluster portfolio, which will allow to reduce risk. Immediately after the end of any cluster identification process, animators responsible for each cluster should be called upon to actively participate. This is not a difficult task, considering the fact that in many of the clusters identified and deemed priority clusters, the core of actors already exists, and in some industries there is natural tendency to establish cooperation e.g. in the dairy or meat industries. Transferring the responsibility for a cluster on members of the private sector should be a key factor at the time of the final selection of clusters being supported at the governmental level, because this means that some groups of entrepreneurs declare financial support for initiatives. In any other case, cluster policy would not have any solid justification, which ultimately would result in its abandonment. Indeed, in the events when potential participants refuse to take their responsibility for any initiative, cluster structure operations should not be formalized.

Establishing by a cluster an organization applying for funds under the *co-operation* measure for the whole period of 2014-2020 should be a consequence of a choice made by experts. After meeting formal and substantive requirements, all qualified organizations should be supported. The beneficiaries should be

obliged to submit their annual action plans containing, among others: a report and analysis of the situation in the cluster as well as a description of goals and activities planned, an operation schedule, a budget project, sources of financing, and indicators permitting later analysis and an evaluation. It may be also required to prepare a strategic plan covering following years, including internationalisation, technology and quality areas. The implementation of the strategic plan may proceed in annual stages. In addition, cluster organizations should appoint special committees, supervising the implementation of each area. All cluster initiatives should operate in at least three areas: technology improvement, quality improvement and internationalisation stimulation, promoting cooperation ideas in each of them. Each cluster should have objectives set in each of the areas mentioned, and there should be an opportunity to broaden the scope of the objectives, for example by training targets. Operations of the cluster supporting organization should be financed both with public and private funds. Amounts reported by members should depend on the size of their entities. The rest of the expenses may be financed within the cluster policy, on the basis of contracts concluded between a governmental agency and particular cluster structures. Of course it does not exclude possibilities of project financing from other sources within public programmes of technology, quality improvement, or internationalisation support, if only the requirements concerning participation in any specific project are met. Therefore, each of the projects, depending on its specific features, may develop its own mechanisms to acquire funds, and the share of public funds in it should be individually defined.

The incorporation of newly identified clusters should proceed by systematic research used to determine any emerging real possibilities to form new concentrations. Apart from that, an important challenge in successful cluster development is adoption of a perspective approach, taking into account tendencies such as, among others, ageing of the society, or the needs of the sustainable development and environmental protection policy. As a result, after three years we can repeat the cluster identification process and incorporate it into new projects.

To sum up, it is also necessary to emphasise the importance of smart specialization issues in the development of the agri-food sector clusters. Owing to their large potential and importance, agri-food clusters may be candidates for key clusters. In this context, one cannot forget that intelligent specializations may mean also completely new specializations. For instance, such new specialization in this respect may be the *health* direction as an interface of the agri-food sector with nutrition sciences. These are also the *environment* or *creative sectors* directions.

At the same time, these should not be subjected to any top-down selection process, since this may result in improper choice, mostly in the context of problems related to actions of strong interest groups. The intelligent specializations should not be a process of naive imitation e.g. as a result of benchmarking. The process of their creation should rely on connecting the top-down and bottom-up approaches. By definition, however, the business sector should play the key role in uncovering, indicating, and developing appropriate specialization areas, whether within traditional technology, horizontal (cross-sectional) technology, or by identifying and using market niches.

Conclusions

The cluster concept can be useful in shaping economic policies oriented towards improvement of competitiveness of an economy, or its specific sectors, such as for example the agri-food sector. However, in order to formulate proper assumptions of such policies research and analytical work regarding determinants of emergence and development of clusters in a given economic environment are required. While certain causes of business clusters existence and development seem to be universal, a collection of factors and their importance may be dependent upon the specific nature of an economy influencing its sectoral specialization.

An analysis of economic and institutional determinants of emergence and development of business clusters in the Polish agri-food sector suggests that this process is supposed to be stimulated mostly by supply factors associated with production potential of the sector. Demand factors might influence this process less advantageously, especially in the long run. Identification of objectively occurring consumer trends and ability to adjust to them will decide about successes of companies operating in the food markets. Structural and institutional determinants, which up to now cannot be seen as supportive enough of development of strong agri-food clusters will also play a significant role. The most serious drawback is insufficient involvement of R&D activities in the cluster structures.

There are many methods of identifying and analysing clusters, both of quantitative and qualitative type. However, possibilities of applying them, especially the quantitative ones, are often dependent upon accessibility of appropriate data. Therefore, methodological difficulties connected with this constraint and variety of analytical approaches call into question a reasoning about existence and strength of typified clusters, and consequently its role in building a competitive economy. It seems that in analysing clusters aimed at formulating relevant polices it is necessary to combine quantitative approaches based on statistical methods with qualitative methods such as for instance a directed interview or a case study. Having this in mind it needs to be realized that a bottom-up established cluster initiatives, or a top-down formed clusters, without former checking of a real economic potential of cluster structures being created or developed can all be ineffective efforts. This also means that assumptions of cluster policies should be based on a well enough detailed mapping and examination of how clusters function with respect to improving cooperation and strengthening ties between entities belonging to them. This is

of particular importance in the Polish agri-food sector where due to historic experience with collectivization people attitudes are often characterized by distrust and concerns about jeopardizing their private interests.

Cluster mapping in the Polish agri-food sector was carried out using methodology of the European Cluster Observatory (ECO) supplemented by the Authors' own solutions regarding calculation of the location quotient (LQ) values based not only on employment data, but also on number of entities representing classes of operation included in three types of clusters: Agricultural Products, Farming and Animal Husbandry, and Processed Food. Calculated LQ values reflecting relative concentration of employment and occurrence of entities indicate that the strongest Agricultural Products clusters exist in such voivodeships (regions) as Kujawsko-Pomorskie, Lubelskie, Łódzkie, Opolskie, and Wielkopolskie. The strongest Farming and Animal Husbandry clusters are in the following voivodeships: Lubuskie, Opolskie, Warmińsko-Mazurskie, Wielkopolskie, and Zachodniopomorskie. As to Processed Food clusters the strongest ones are in Kujawsko-Pomorskie, Lubelskie, Lubelskie, Łódzkie, Podlaskie, Warmińsko-Mazurskie, and Wielkopolskie voivodeships. In fact, considering Porter's definition of cluster and the mapping method used, it could be rather stated these regions (among 16 in total) represent the highest development potential of the agri-food clusters in Poland.

Based on the Internet query 132 cluster initiatives acting in different fields of the Polish agri-food sector operations, or resource related with this sector and rural areas, have been identified. The majority of them act at the regional level and only very few aspire to be national. Also, when analysing their organizational structures and economic profiles it can noticed that apart from few exemptions they were not very strongly oriented on the agri-food sector and the identified types of clusters connected with this sector. This could be caused by insufficient cooperation and low degree of integration of farmers and food processing companies, among other factors.

Differences in values of the Intensity & Branch Orientation Index (IBOI) are not consistent with differences in cluster development potential connected with the degree of concentration of the agri-food sector activities in particular voivodeships. It means, that cluster initiatives exhibiting relevant profiles do not always function in those voivodeships where strong agri-food cluster can grow relatively easily. Hence, considering peculiar spontaneity of establishing cluster initiatives – often wrongly equated with clusters being in fact objectively occurring economic formations – supporting them may not bring expected results

without checking the actual, dependent on determinants, economic potential of this way promoted cluster structures.

Similar supposition can be formulated when confronting number of cluster initiatives and their spatial distribution with existence of the cluster economic potential. It means, that the designed cluster policies should be selective based on cluster mapping and examination of their development potential, as well as, on thorough analysis of the organizational and economic profiles of functioning or created cluster initiatives in order to indicate proper directions and ways of improving cooperation and strengthening ties between all entities indispensable for appearance of strong clusters.

In general, the phenomenon of establishing cluster initiatives is itself a positive movement. However, considering dispersion and kind of eclectic branch orientation and lack of clear specialization of many identified initiatives, it seems obvious that well directed support for cluster initiatives should better reflect real chances for successful development of clusters in the Polish agri--food sector. The natural preconditions for successful cluster development are shaped by a certain level of concentration of economic activities. This concentration is manifested in the first place by number of entities such as companies and employment connected with this concentration. Ultimately, these two factors create an economic ground for emergence of strong clusters, which can significantly improve innovativeness and productivity as well as contribute to generation of higher value added in the Polish agri-food sector, what would consequently lead to increase in wages and overall economic welfare.

Potential for development of strong business clusters can be considered at different levels of economic aggregation. In general, as compared with some of the EU member states, in Poland there is yet a lack of agglomerations that are large enough to constitute a basis for strong international agri-food clusters. It was also found that potential for development of the agri-food clusters in Poland is highly differentiated in regional terms. The group of voivodeships, where this potential was revealed as being the greatest vary slightly depending on whether number of entities, or employment is used as a criterion. This is caused by the fact that concentration of employment is not identical to concentration of entities due to differences related to company size and scale of employment. Nevertheless, such voivodeships as Kujawsko-Pomorskie, Opolskie, Podlaskie, Warmińsko-Mazurskie, and Wielkopolskie show the highest potential no matter which criterion is applied.

The role of clusters in building competitiveness of the agri-food sector depends not only on their economic potential but also on policy support in the framework of public intervention. Role of government in creating conditions to increase competitiveness of an economy is manifested through various types of economic policies supporting formation of competitive structures. Results of the analysis carried out indicate a positive impact of clusters on value added and exports. It is an argument in favour of supporting development of agri-food clusters in Poland, especially regarding innovativeness and smart specialization, what seems to be very important considering possibly weakening conventional sources of competitive advantage. Although, a cluster policy which could address this challenge has to be well directed. The key problem is that financial support provided for various cluster initiatives should be properly justified by sufficient level of concentration of activities constituting the core of a cluster. Then, after meeting this condition effective use of the funds to increase innovativeness, and consequently development of strong traded agri-food clusters is much more likely to happen. However, a too far going regionalization of this support and scattered allocation of the funds related to it may not be as conducive to this development as a concentrated well focused use of the funding.

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