Small farms as "data producers" for the needs of entrepreneurship clusters - case study Poland

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Abstract

The challenge that humanity faces in the 21st century is to grow the world's population and ensure agricultural production to achieve food security. Proper agricultural policy, sustainable management and data acquisition gives the opportunity to create services and products, allowing them to benefit from business insights and providing them distinct market advantages and, above all, sustainable agricultural development. The fundamentals are the data. The purpose of this paper is to demonstrate the importance of data from small farms for the needs of entrepreneurship clusters. Clusters of entrepreneurship are established in order to increase effectiveness, competitiveness, environmental sustainability and entrepreneurship based economic development. Why is it important for small farms and clusters of entrepreneurship to work together ? Because cooperation in this field is crucial to increasing the capacity for agricultural productivity and offer the potential to implement innovative developments in the field of smart specialization.

International norms the Millennium Development Goals (UN, 2000) and Sustainable Development Goals (UN, 2015) (FAO, 2011a) postulates sustainable rural development. The Common Agricultural Policy EU Member States assumes sustainable rural development can be achieved by focusing on a limited number of key priorities relating to the transfer of knowledge and innovation in agriculture at the EU level (Regulation (EU) No 1305/2013).

The transfer of knowledge and innovation in agriculture may be achieved through the establishment of entrepreneurship clusters.
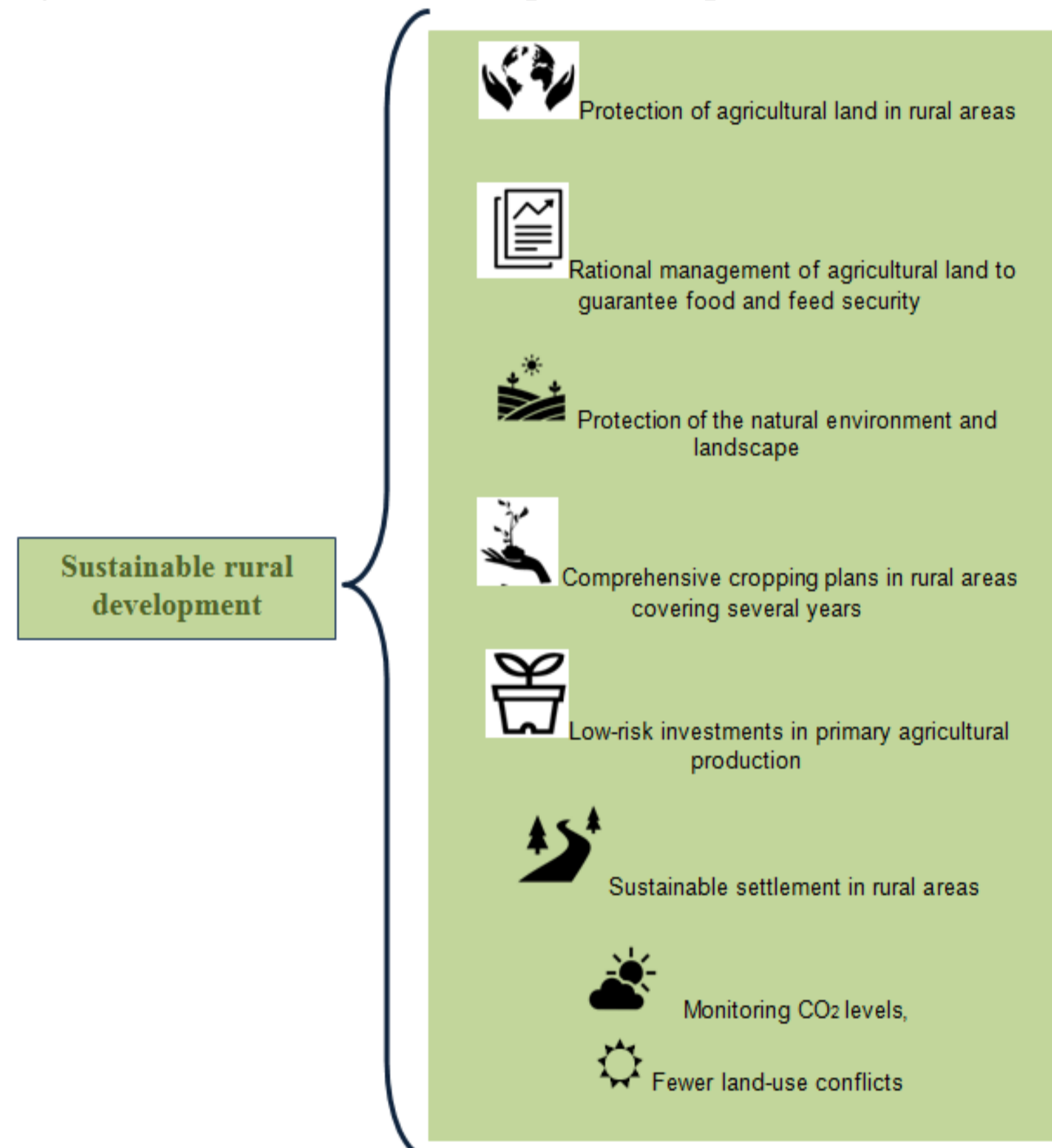

Figure 1. Sustainable rural development; Source: own study based on Common Agricultural Policy EU

Definition of a cluster is "the geographical concentration of industries which gain advantages through co-location" . Porter (1998) "geographic concentrations of group of firms with similar products or services agglomerated and inter-connected companies and institutions in a particular field" Many clusters include governmental and other institutions, such as universities, standard-setting agencies, think tanks, vocational training providers, and trade associations that provide specialized training, education, information, research and technical support (Porter, 1998). In addition to the location, the companies included in the clusters have other benefits public goods, factor inputs, knowledge spillover (McCann and Folta, 2008).

The idea is that clusters reinforce competitiveness through the combination of inter-firm rivalry and collaboration (so called "co-opetition"), innovation (Verdú and Tierno 2019) and the rapid transmission and adoption of ideas, and the generation of important local externalities, such as a skilled labour pool, the availability of specialized inputs – physical, technical and legal (such as those relating to certification) – and enhanced access to information on, for example, technologies and markets (FAO, 2010).
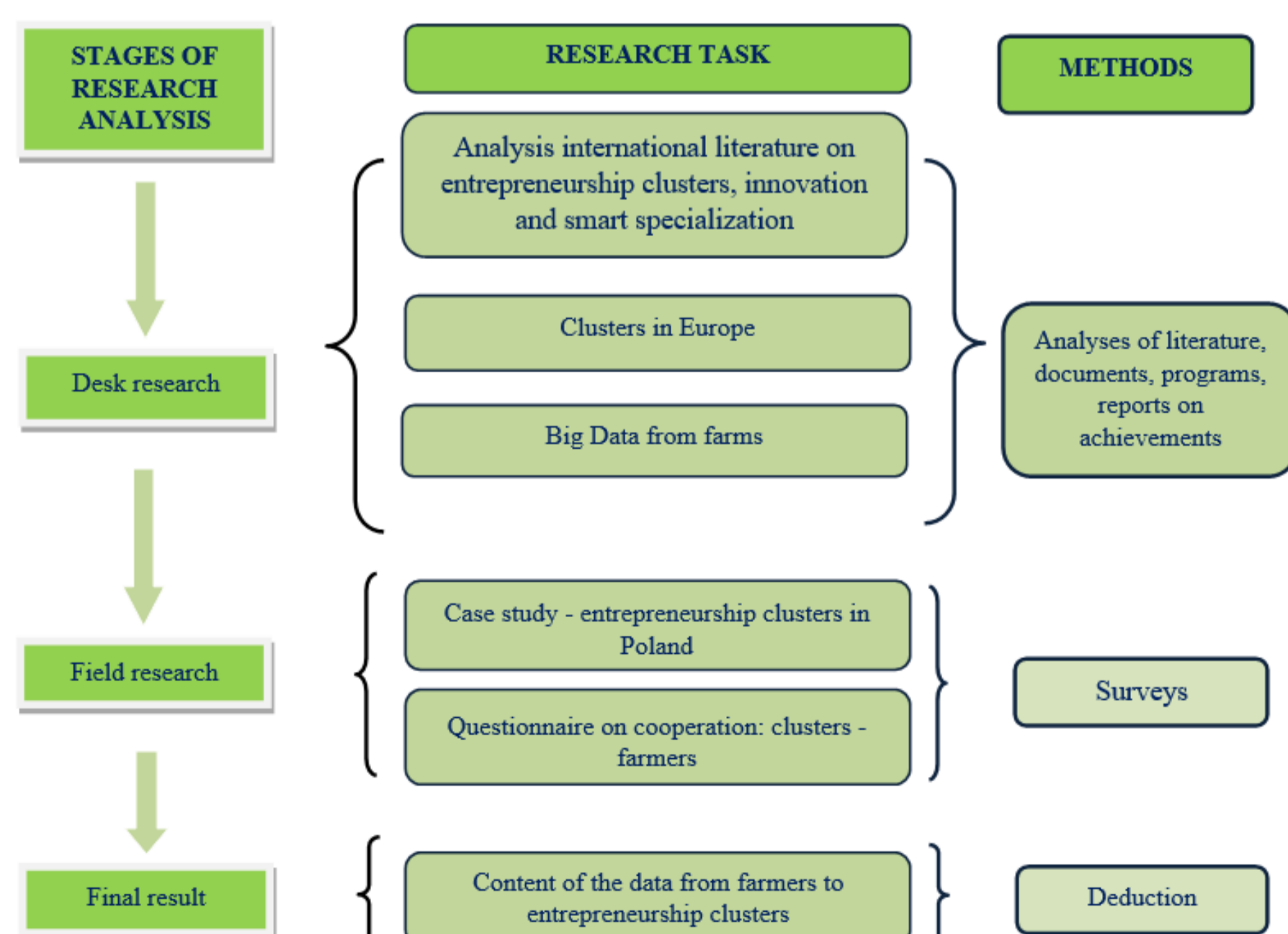

Figure 2. Diagram of the organization of the study. Source: Own study

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Research area - Poland

Table 1. General political and statistics data of agriculture – Poland

General location and area	Europe / 31.3 million ha
Poland area (km)	312 696
Division into sub-units (federal state)	Voivodships – (16); District level – counties (380); Local level – municipalities (2478)
Total area of agricultural land	14.62 million ha
Population (2018) IN THOUS.	38 411
population density,	/ 123 / sq. km (CSO, 2016)
including in rural areas IN THOUS.	15 344
Land (2018) (in thous. ha)	31269,6
Of which	
Agricultural land	18776,5
forest land as well as woody and bushy land	9534,2
lands under waters	652,0
minerals areas	29,1
transport	938,7
residential	747,5
wasteland	465,0

Figure 3. Research area – Poland Source: own elaboration based on www.google.com; www.klastry.gov.pl

Clusters in Europe

The interest in clusters in Europe stems from the efficiency gains that firms can achieve from the proximity of other similar industries. Understanding how these linkages form and how best to facilitate their development is therefore an important aspect of strategies aiming to bolster regional innovation, competitiveness and growth (EPCICh,2020).
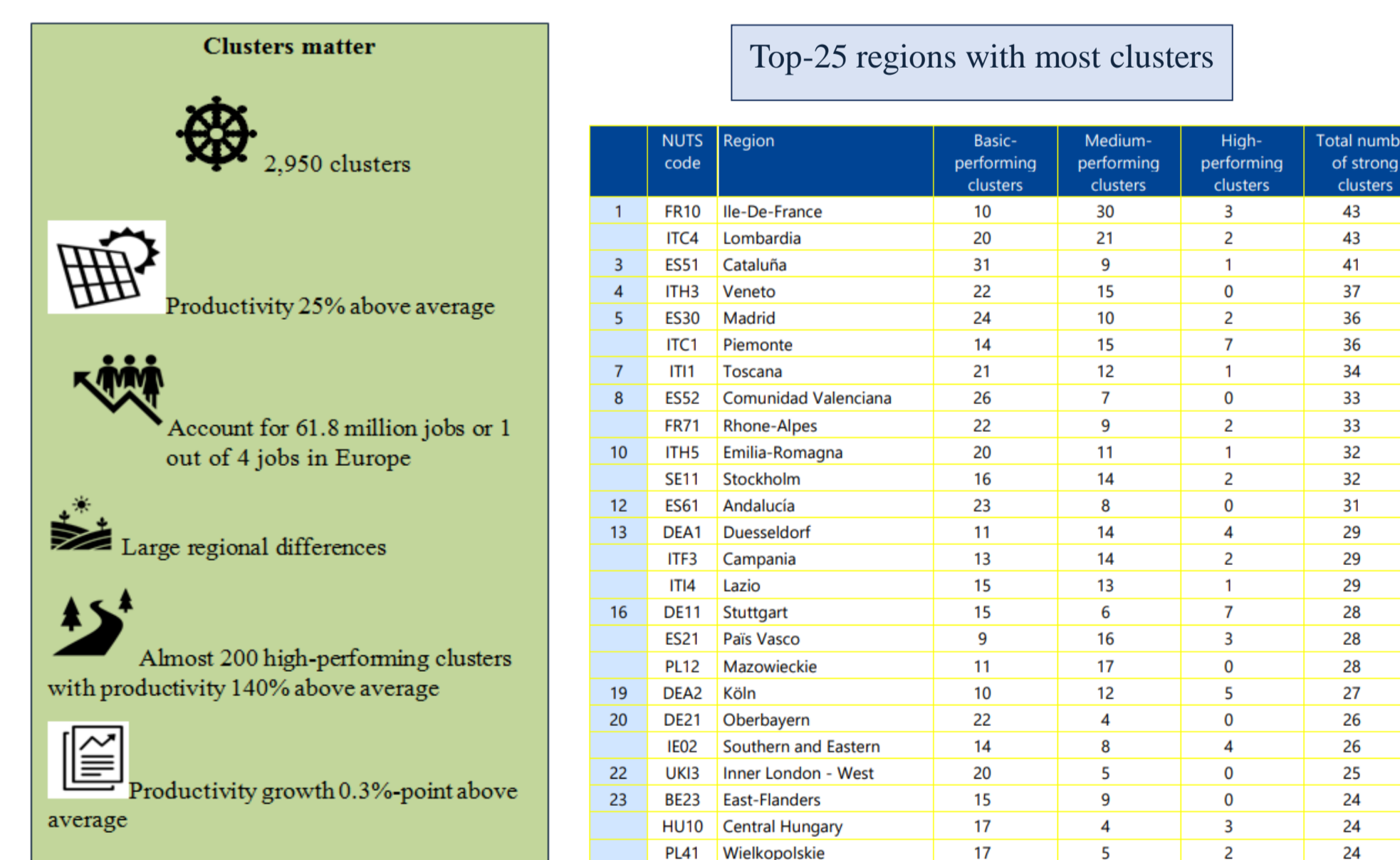

Figure 4. Clusters in Europe Source: own elaboration based on EPCICh,2020.

In total there are 2,950 regional industrial clusters across Europe, of which 198 are high-performing clusters, 898 medium-performing clusters and 1,854 basic-performing clusters.
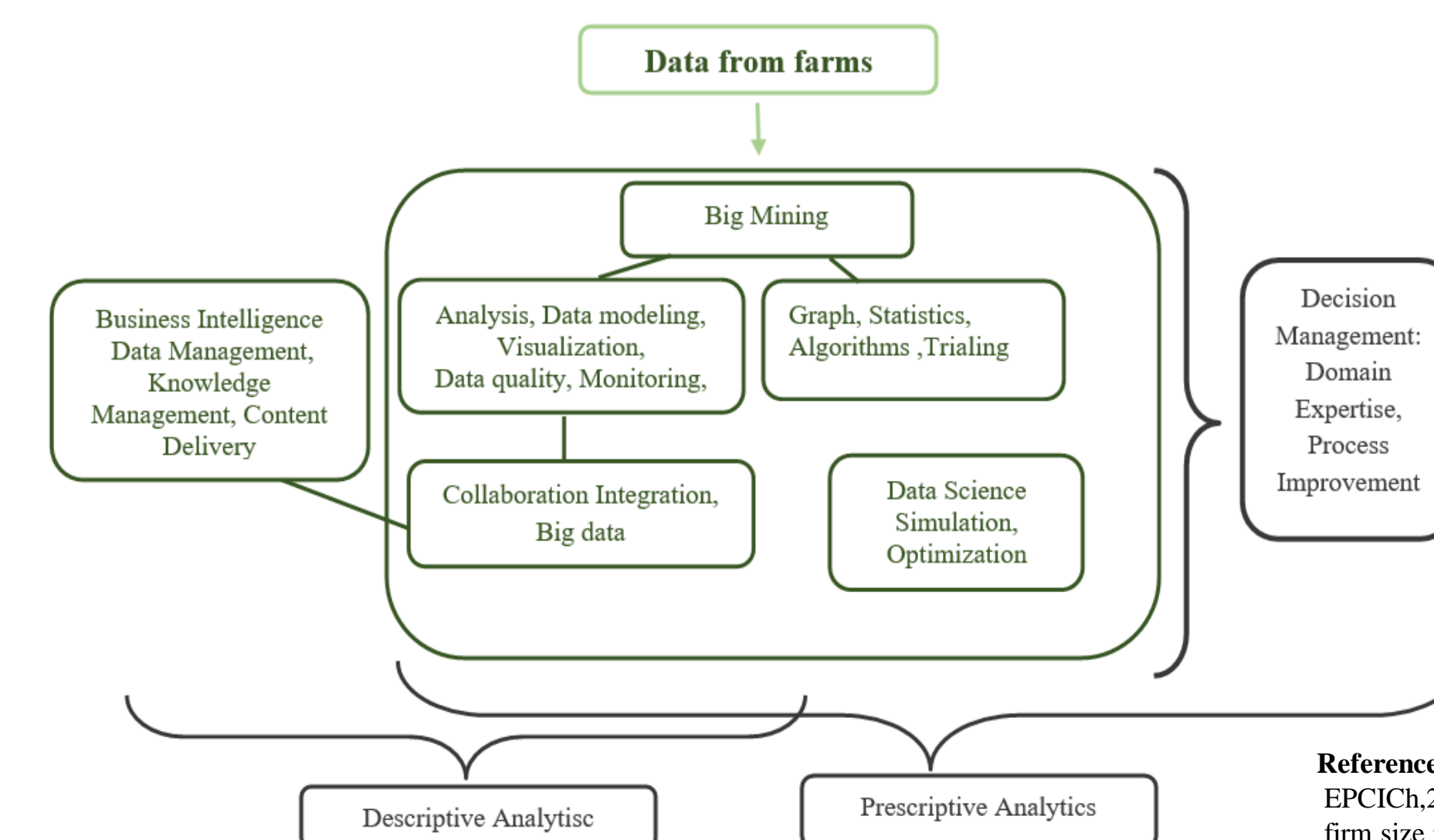

Figure 5. Big data from farms. Source: own elaboration.
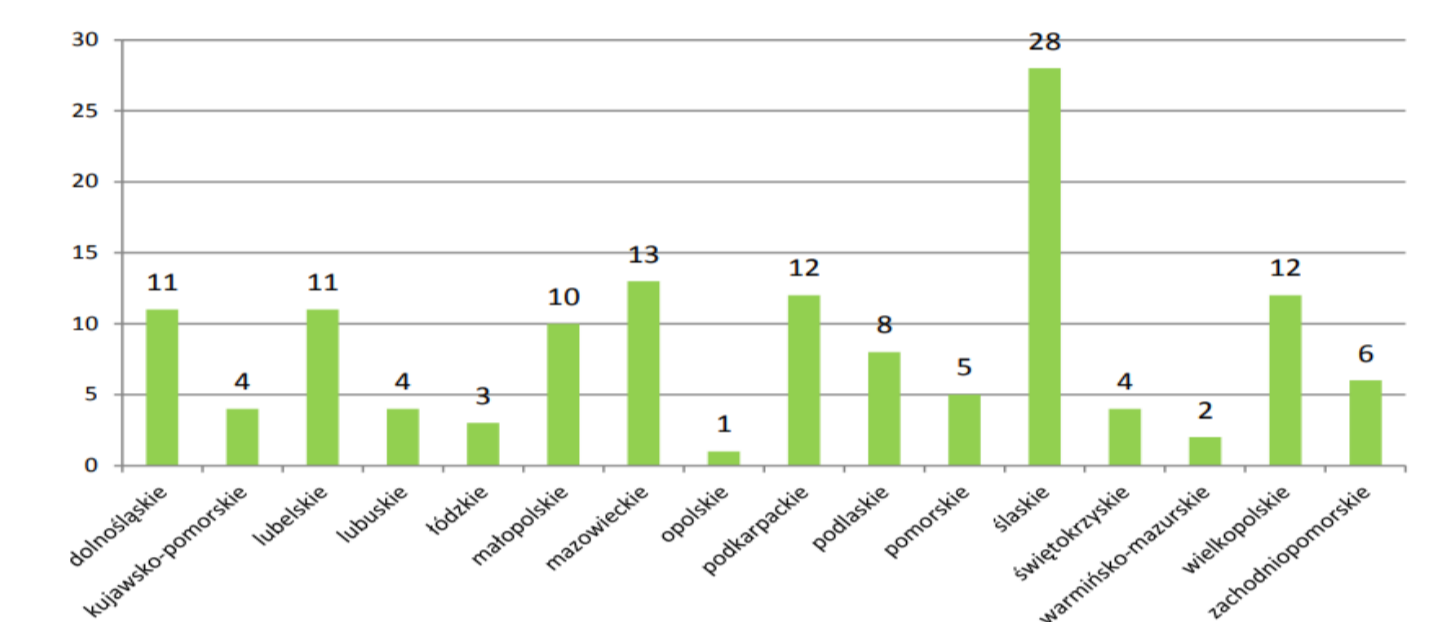

Field Research

Figure 6. Clusters in Poland by voivodeship Source: Cluster 2016

Location of clusters reflects the economic potential of Polish regions as 48% of clusters are located in four most developed regions: Mazovia (13 clusters), Lower Silesia (11), Upper Poland (12) and Silesia with the highest number of 28 clusters.

The 134 inventoried clusters represent a wide variety of industries, from traditional to high-tech - altogether 28 specializations were distinguished. A significant number of clusters belong to such sectors as ICT, energy, construction, tourism, production technologies and agricultural production. The following industries have single representatives: furniture, clothing, machinery, wood, nanotechnologies, geodesy, pharmacy and cosmetics, and maritime economy.

In 2018, Poland's rural areas covered 29.1 million hectares, accounting for 93.0% of the country's area. The agricultural land was 14.62 million.

Poland with such a significant agricultural capital is one of the leading food producers in the European Union. Clusters give the opportunity to increase the efficiency of agricultural production through innovation and implementation of smart specialization. To achieve this goal it is necessary to implement the model of linkages (academia-industry-government-citizenry).

The framework for action should be the citizens-farmers and their data for operation and improvement of entrepreneurship clusters.

Final result

No.	Data group	Data from farmers
1	Land-use types	The use of owned AL (possible change of use for other purposes, e.g. construction). Temporal changes in land use Distance to the farthest field
2	Infrastructure data	Technical data concerning farm buildings, buildings for agricultural production, Type of fencing, hardened paths, access Poland, small garden and agricultural architecture.
3	Soil and water conditions	Soil nutrient supply, Soil pH (Repeated), Fertilizer Type, Irrigation Type.
4	Climate	Information on unfavorable weather conditions, atmospheric anomalies: droughts, hailstorms, air trumpets.
5	Environmental pollution and threats	Waste management
6	Agricultural production	Planned changes in agricultural production, seeds, preplanting, planting, cultivation, harvesting, storage, processing, food safety and quality
7	Roads	Communication by your own means
8	Ecosystem services	Usefulness of drainage ditches. Use of renewable energy sources and ecosystem services,
9	Economic and management data	Planned investments, consumption, inputs, profits. Average Yield of the crop per hectare realised by Farmer. Postharvest Processing
10	Technology / machines	Equipment with fixed assets (all available machines for crop automation, year of purchase and production, value, consumption, fuel type, computer programs, applications
11	Staff	Actual number of employees on the farm. Plans for changes in employment

Source: own elaboration.

Conclusions

Clusters are considered economic drivers of nations and regions.

Extensive and updated knowledge is needed on cluster population size, their state of development and growth potential and sustainable development. Clusters, like any enterprise are based on up-to-date data.

Farmers collect data and set up their own information systems to improve their knowledge. One key conclusion of this paper would be that farmers are an important part of in the cluster functioning model, not only as food producers, but also as data producers.

The future lies in big data as a basic element of machine learning, and without farmers active participation will not possible growth and development clusters.

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