Anna Traczyk
The summary of PhD thesis:

The system of spatial organization of vegetable industry in the Lodz Voivodship at the beginning of the 21st century

The research problem undertaken in this dissertation is the spatial organization of vegetable industry in the Lodz Voivodship at the beginning of the 21st century. The vegetable industry is one of the sectors of the food industry involved in the production, processing and distribution of vegetables. It covers the process of food (vegetables and their products) delivery from the producer to the consumer.

The main purpose of this dissertation is to identify the spatial organization of vegetable industry in the Lodz Voivodship and to explain its functioning at the beginning of the 21st century. The work focuses on indicating links between specific parts of vegetable industry, and their characteristics, with particular attention to their spatial distribution within the examined region. Although the spatial scope of the work covers the area of the Lodz Voivodship, the research has been conducted in three spatial scales - the voivodship, poviats and municipalities. The time frame covers the years 2003-2016.

While preparing the thesis, various research methods were used: 1) desk research of literature and data on vegetable industry; 2) queries carried out in the Statistical Office in Lodz, the Central Statistical Office in Warsaw and in the Institute of Agriculture and Food Industry in Warsaw; 3) surveys presenting the relations between the distribution of vegetable cultivation and the location of entities dealing with their processing. Surveys were carried out with enterprises involved in the processing of vegetables in the Lodz Voivodship. The collected information and data were presented in the form of a verbal description supported by statistical and cartographic methods. For the cartographic illustration of the discussed phenomena, various GIS methods were used, i.e.: vectorization, symbolization, georeferencing, geocoding, buffering, network analysis, data grouping.

Vegetable industry is a system consisting of many related elements and activities directly or indirectly involved in food production processes. The considerations presented in this thesis were based on the concept of a spatially-perceived food economy proposed by R. Kulikowski (1984) who distinguished four basic links among elements of this system.
These are: 1) a raw material production link (vegetable growing), 2) a processing link (fruit and vegetable processing industry\(^1\)), 3) a trading link (wholesale and retail trade), 4) supply of services and means of production link.

The basis for the vegetable industry is the raw material production link - vegetable growing. In the years 2003-2016, vegetable cultivation in the Lodz Voivodship occupied an average of 20.6 thousand hectares and accounted for approximately 2.6% of the sown area. The size of the crops was 549.9 thousand tons per year. In the analyzed period, both the area of vegetable cultivation and the size of their crops were limited. The area of cultivation decreased at an average rate of 2.7% per annum, while the crops’ size at the rate of 0.7% per annum. The factor responsible for slowing down the size of vegetable crops declining rate, with almost 4 times higher rate of limiting the area of their cultivation, was the increase in crops obtained from the area unit. Increasing the crops was possible thanks to the introduction of more efficient varieties of vegetable species. Progress in agrotechnics also contributed to the growth of efficiency in vegetable cultivation.

Due to the fact that vegetables are plants with high environmental requirements, their cultivation is limited to areas characterized by high agricultural production quality. Therefore, the vegetable cultivation in the Lodz Voivodship is unevenly distributed. About 70.0% of the vegetable cultivation area is located in the north of the voivodship, mainly in the Łęczyca and Kutno poviats.

The second link in the vegetable industry is the vegetable processing. In 2016, 151 entities conducting business activity in vegetable (and fruit) processing were recorded in the Lodz Voivodship. Around 72.0% of all enterprises were microenterprises. Organization model of the fruit and vegetable processing industry in the Lodz Voivodship was similar to that observed on the national scale: with a small number of large processing plants covering a large part of the market and a large number of small enterprises meeting local needs. Entities operating in the vegetable processing industry were unevenly distributed and were generally located in areas characterized by a high area of vegetable cultivation or in their close proximity.

\(^{1}\) The vegetable processing industry and the fruit processing industry function under a common name - the fruit and vegetable industry.
Trade is the third link in the vegetable industry. The wholesale trade plays an important role in the turnover of vegetables, which is the initial link mediating the movement of products from the producer to the consumer, as well as retail trade, which is the last link intermediating in the distribution process. In 2016, 1062 business entities specialized in trade of vegetables and their products (564 business entities of wholesale sales and 498 of retail sales in specialized stores). An important role in the process of vegetable distribution in the voivodship was played by the Lodz Wholesale Market „Zjazdowa”, which was a direct distribution center for vegetables from the Lodz Voivodship. The entities dealing with wholesale and retail sales of vegetables and their products were mainly active in the urban municipalities. A large number of enterprises dealing in wholesale trade also functioned in rural and urban-rural municipalities characterized by high area of the vegetable cultivation. The most important role in distributing vegetables and their products was played by the city of Lodz where 31.0% of the total number of entities dealing with the trade of vegetables and their products, operating in the Lodz Voivodship, were registered. The high importance of Lodz in the field of vegetable marketing was also due to the location of the only wholesale market for agro-food products - Lodz Wholesale Market „Zjazdowa”.

The fourth link of vegetable industry is supply and services. The link is responsible for supplying production means and providing various services for agriculture and the food industry (including machine, agro-technical and transport services). In the Lodz voivodship, there was a significant number of entities dealing in the distribution of plant protection products (495 entities), agricultural machinery and equipment (200 entities), as well as providing services supporting plant production (543 entities). The high number of entities specializing in this field was an important factor supporting the functioning of vegetable industry in the region.

The summary of the undertaken research on spatial organization of vegetable industry in the Lodz Voivodship was its regionalization, aimed at identifying areas of concentration of particular activities within the sector in the studied region and their characteristics. The analyzes showed that the main source of production of vegetables (production link) was located in the north of the voivodship, i.e.: in Łęczyca and Kutno poviats and partly in Łowicz, concentrating 60.0% of the total area of vegetable cultivation in the region. The processing industry was concentrated mainly in two areas - in the southern part of the voivodship, the Pajczański poviat - carried out by 20.0% of the total number of entities
operating in this particular activity in the voivodship and in Lodz, where 15.2% of entities dealing with fruit and vegetable processing were registered. Vegetable. The main area where the marketing of vegetables and their products took place was Lodz, with this activity carried out by 31.0% of the total number of entities registered in the voivodship. Lodz played a key role in the trade of vegetables also due to the wholesale market being an important distribution center for agri-food products in the Lodz region. In the case of the supply chain and services, the largest concentration of entities dealing with this activity was in the west and north of the voivodship. The high number of these entities was caused by well-developed agricultural production directions, for which the link played a significant role due to the wide range of services provided.

The proposed model of analysis of vegetable industry is the first attempt to verify the concept of a spatially-perceived food economy developed by R. Kulikowski (1984). In current geography studies, this concept has not been used to analyze the food economy or any of its sectors. The proposed model has been used in order to combine two research concepts: economic and geographic. The geographic distribution of individual elements of the vegetable industry along with the mathematical-statistical analysis gives a complete picture of the vegetable industry in the Lodz Voivodship.

The analyzes undertaken for the purpose of this dissertation may be the basis for further research on the vegetable industry. It would be interesting to analyze this sector according to production and consumption models. Including the sphere of consumption as one of the links in the food economy could provide a valuable information on the connections within the vegetable sector, thus enabling a more comprehensive understanding of the processes taking place in this field.