

The central figure in microeconomic theory is the consumer, who chooses from a given set of feasible solutions. The economic analysis begins with a model of consumer behaviour, which is the starting point for demand theory. However, in many applications, demand functions are specified without making the underlying model of consumer behaviour explicit. Most models in supply chain literature assume that demand has a particular functional form. The key characteristics of demand in Operations Research models is the presence of uncertainty.

Our project is devoted to the study of demand uncertainty impact on supply chain modelling. We plan to consider the following two main sets of problems:

- (1) The effect of additive demand uncertainty in Operations Research models.
- (2) Demand uncertainty in Organic Food Supply Chain.

The former focus mainly on investigating of additive uncertainty due to its special feature, namely, that the models with such uncertainty allow negative demand realizations. The negativity of demand is often neglected in many existing Operations Research models, which implies loss of generality and incompleteness of the results. Therefore, we plan to supplement these models with the nonnegativity constraint and carry out the optimization as if it is a new task. These problems are designed to assess the hypothesis that the nonnegativity assumption significantly changes the optimal solutions.

The other set of problems complete the first one and show the issue of demand uncertainty from another related perspective. These problems are devoted to Organic Food Supply Chain and supplement the theoretic, quantitative approach to supply chain analysis with the qualitative one. The idea of the Food Supply Chain is to optimize scarce resources and satisfy increasing requirements and demand for food around the world. Food Supply Chains are unique in many ways compared to other product or service supply chains. They have unique objectives related to issues of great importance to the whole society. The Food Supply Chain demands are influenced by two main sources, the supply and consumer demand. The production of food is harmed by uncontrollable natural phenomena because food can be affected by human or environmental factors. In order to secure food production to satisfy growing demand, it is required that the Food Supply Chain be improved not only in terms of economic and operational performance, but also environmental and social aspects. The research questions are as follows: What are the differences in the development of organic agriculture and organic markets between countries and regions? What factors affect consumer behaviour and the demand for organic food in Poland and the United Kingdom?

The project will have results of significance interest for the Operations Research community. Food Supply Chains have unique objectives. We identify the significant attributes of various Organic Food Supply Chains and analyse them according to the principles of sustainable development.