The direction of production and technical equipment versus the level of sustainability in organic farms

In Poland, in 2000, the European model of multifunctional agriculture was introduced, which adopted managing in accordance with the principles of sustainable development, protecting the environment and biodiversity of rural areas. The development of agriculture is mainly based on the concept of three orders which cover a number of issues concerning human functioning in the social, economic and environmental sphere. Due to the continuous improvement, sustainable and at the same time ecological development introduces the new methods of production and consumption, as well as new business organization methods in which environmental protection and the quality of life have become the main keystone of each strategy.

On the market of food producers an agricultural holding must meet proper standards and act with accordance to the strategies appropriate for manufacturing enterprises. Therefore, it is of fundamental importance to use the available resources effectively, which will enable to generate a production with a value higher than its incurred costs. Only then can the farm have the opportunity to grow and hold its position on the market. Otherwise, there is a decrease in the resources held, resulting in a reduction in production capacity, and in the longer term, the expulsion from the market of food producers. Unfortunately, the producers of organic food have to function in such economic conditions. However, in their case, the rational use of resources, including human labour, must be accompanied by caring for environmental values and the compliance with ecological sustainability standards. Therefore, for this activity, it is characteristic to conduct production processes based on the natural circulation and reproduction of nutrients, including mainly mineral components (NPK) and organic matter. At the same time, due to economic conditions, it is necessary to generate agricultural income in the amount enabling an appropriate parity of family income and securing the investment needs of the farm. Therefore, in this context, it is necessary to meet the norms of economic and social sustainability, where economic labor productivity remains its basic measure. This constitutes the ratio of the value of generated agricultural income to the resources of human labour.

With the use of small material inputs coming from outside the farm, it can be assumed that agricultural technology will be the main factor determining the level of productivity. Properly selected, it will result in the reduction of human labour resources, and at the same time will be a source of inputs that should dominate in the structure of production costs.

The scope of the research covered the performed characteristics of 50 ecological farms located in four provinces of southern Poland: Małopolska, Podkarpackie, Śląskie and Świętokrzyskie. Basic research included events from two full economic years, implemented

between 2011 and 2015. Most of them were conducted as part of the NCBiR development project entitled "Innovative impact of technology and information technology and management support on production efficiency in organic farms". The project was carried out at the Faculty of Production and Power Engineering at the Institute of Agricultural Engineering and Computer Science of the University of Life Sciences in Krakow.

The work sought to answer the following questions:

1) which factors and to what extent determined ecological sustainability, and which ones and to what extent decided on economic sustainability?

2) whether the dominant factors enabled a proper description of the phenomenon depending on the direction of the production activity being conducted, and in the case of economic balance also of the technical equipment characteristic of this direction?

3) whether, due to the dominance of certain factors and the similarity of the objects, it was possible to distinguish the ranges or classes of balance appropriate to the direction of the production activity and technical equipment characteristic of this direction?

4) how strong was the impact of factors common to ecological and economic sustainability, including those determining technical equipment, within certain ranges and sustainability classes?

5) whether these factors could have a decisive influence on the choice of the direction of the conducted production activity and the selection of technical equipment characteristic for this direction?

For the purpose of answering the above questions, it was necessary to adopt the following research hypothesis:

1) in ecological farms operating in a specific direction of production rationally selected and used technical means are the main factor of economic sustainability, with this factor having no impact on ecological sustainability;
2) however, due to the fact that ecological sustainability and technical equipment depend on the direction of the production activity, there is a relationship between ecological and economic sustainability, which should be significantly affected by the same production factors.

To verify the hypothesis, it was necessary at this PhD thesis to carry out the following assessments and analyzes:

1) the assessment of the production structure and technical equipment, as well as the division of farms into the directions of their activity;
2) the determination of the amount of material inputs and the amount of human labor inputs and objectified work in technical means;

3) the assessment of ecological sustainability, taking into account the balance of minerals and organic matter;
4) the assessment of the amount and structure of production costs and value of produced production;
5) the assessment of social and economic sustainability based on the estimation of economic efficiency of human work;
6) the determination of the relationship between factors characterizing the resources possessed and their use, and indicators of ecological and economic sustainability using different regression models and analyzes enabling the reduction of dimensions;
7) the assessment of farm sustainability with the use of clustering models.

The consequence of the assessments and analyzes carried out in such a way was the possibility of answering previously asked questions, and the conclusions formulated on this basis may not only have cognitive but also utilitarian significance.