

Natural conditions of the sustainable agriculture development in the eastern part of the Łowicko-Błońska Plain

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Abstract: Sustainable agriculture appears to be the optimal form of farming in the agricultural areas. Limiting the use of fertilizers and plant protection products allows production of healthy food and protects natural environment. Analysis of natural components of eastern part Łowicko-Błońska plain allowed assessing the possibility of certain crops cultivation and their rotation in the system of organic and integrated farming. Sustainable farming seems to be a chance for this area.

Key words: Łowicko-Błońska plain, sustainable agriculture, integrated agriculture, organic agriculture, crops

Introduction

From the environmental point of view the sustainable development is one of the best concepts of agriculture (Stolze et al., 2000). Sustainable agriculture is composed of two subtypes: organic and integrated farming. Organic farming is based on a closed matter circulation, does not permit the use of chemical pesticides and fertilizers (Corseilius et al., 2001). Integrated farming allows the use of pesticides and fertilizers, provided that the dose will be adjusted to the crops needs (Faber, 2007, Stolze et al. 2000).

Area, aim and test methods

The analysed area is located on the border of Mazowieckie and Łódzkie voivodship. According to the division of Kondracki (1998) it is in mezoregion Łowicko-Błońska plain (fig. 1).

The aim of the study was to present natural conditions for sustainable agriculture of east part of the Łowicko-Błońska plain. The paper analyses natural components for selected crops in order to verify the possibility of introducing them to this area. For the purposes of this project, literature studies and analysis of cartographic materials (detailed geological maps 1:50 000, maps of soil and agricultural 1:100 000) were conducted. People who have certificates of organic farming in the area of research were interviewed.

Results and discussion

For agricultural activities soils are the most important. They affect the abundance of nutrients resulting in soil permeability and ability to hold water. The brevity has an impact on the shape of roots and tubers. Considering lithology most of the land has very good and good predisposition for agriculture. Eastern part of the Łowicko-Błońska plain is built of clays, fluvio-glacial sands and gravels, fluvial sands and gravels, sands and humic peat-muck formations. In this area mosaic of lithology is one the features differentiating the agricultural activity.

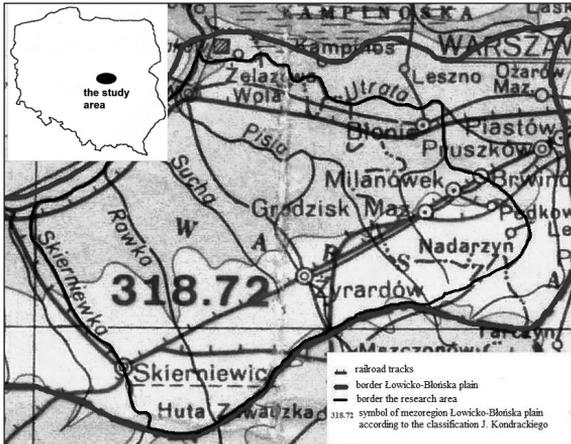


Fig. 1. The area of research (Kondracki 1998, changed)

Łowicko-Błońska plain creates good conditions for agricultural development. Flat terrain facilitates agrotechnical activities. Lack of hills and hollows makes all areas equally vulnerable to frost and erosion. Because of its uniformity, relief is not a differentiating factor for crop planting capabilities. In terms of climate Łowicko-Błońska plain could be considered valuable for agriculture because of the long vegetation season and favourable temperature in the warm season. Limiting condition may be quite low rainfalls and the risk of frosts. Due to the similar climatic conditions around the area it is not a differentiating factor for crops.

Water conditions which depend on the rainfalls may be a limiting factor for agricultural development.

The amount of water available for plants is affected

by the lithology. The eastern part of Łowicko-Błońska plain is located in the catchment Bzura. The first level of groundwater in this area occurs at a depth of 2-5 m below the ground level.

Suitability of the eastern part of the Łowicko-Błońska plain for agriculture in terms of soil fertility can be divided into north and south area. Northern area is dominated by the fertile soils (Molic Gleysols, Cambisols and Luvisols), which are favouring the development of agriculture. The southern area soils are weaker (Podzols, Fluvisols). There are many areas where forests should be planted. Due to the mosaic of soils occurring in this area they are a differentiating factor for crops.

On the basis of following natural conditions: the substrate, the soil and the human impact on the environment, three types of areas with different predispositions for agriculture were delimited. These are areas suitable for: organic, sustainable and intense agriculture (fig. 2). The area where intensive agriculture should occur was differentiated based mainly on the human impact on the environment. Around cities rings with radius of at least 30 km were designated, where it is impossible to introduce sustainable agriculture because of urban pollution (Malinowska, Lechnio, 1991).

The rest of area shows possibility of introducing sustainable agriculture. Based on soil-agricultural map this area has been divided into zones designated for organic or integrated farming. In the areas where soils were of 1-4 and partly of 5 class of the agricultural suitability integrated agriculture was suggested because of good soil, climate and water conditions. These natural conditions allow reduction of environmentally harmful chemical

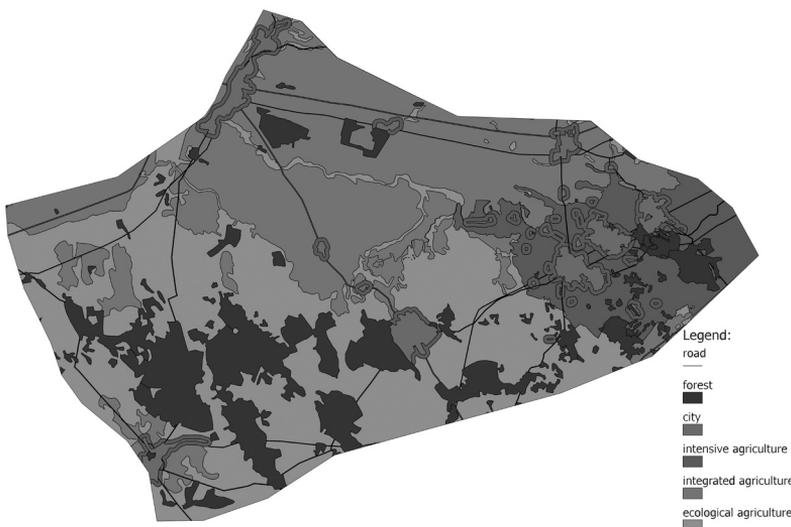


Fig. 2. Division of the research area according to the preferred form of agriculture.

Own work based on the agricultural soil maps 1:100 000

substances that stimulate plant growth and replacing them by organic resources. Obtained yield should be similar as in case of traditional farming methods. Areas for organic farming were proposed on weaker soils, where the introduction of integrated farming is less profitable because of weak soils. In places where soil conditions are worse, introduction of meadows and ecological animal husbandry is suggested. An additional element which promotes organic farming in the southern part of the analysed area are protected areas, such as Bolimowski Landscape Park and the areas included in Natura 2000 sites as the "Valley Rawka" or "Forest Glade Bolimowski". It is reasonable to encompass the protected sites with areas of ecological agriculture.

In the analysed area possibility of growing 40 types of plants was examined. Most of the crops would have at least satisfactory productivity within the limits proposed for integrated farming. In this area focus on healthy food production and livestock farming, including commercial purposes should be made. By reason of the current economic situation of organic farming and the natural potential of the eastern part of Łowicko-Błońska plain, the food is produced mostly for own needs.

Yields of most crops proposed for the area of organic farming are low, often below the cost-effectiveness. An important element in sustainable agriculture is the selection of crops suited to the habitat and their rotation. Based on agricultural soil maps and Soil Science (Dobrzański, Zawadzki, 1989) diagrams presenting possibility of growing selected crop were created. Analysis of the natural crops conditions shows that some of them form groups with similar requirements:

- 1) rye (fig. 3), potatoes (fig.3)
- 2) brassica nigra, hordeum, grain maize, alfalfa, fiber flax, mustard plant
- 3) winter barley, field poppy, pea
- 4) spring oilseed rape, field beans, sugar beet, white mustard
- 5) fodder beet, turnip, red clover, clover Swedish
- 6) fodder carrots, malting barley
- 7) field peas, millet.

The introduction of sustainable agriculture in this area will improve the environmental conditions. In the analysed area shallow groundwater is very sensitive to environmental changes, and surface waters are often

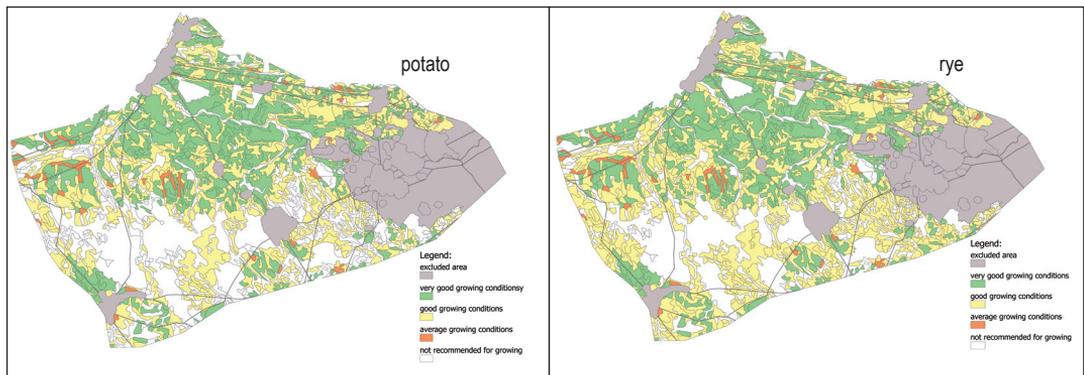


Fig. 3. Natural crops conditions. Study based on agricultural soil maps 1:100 000 and Soil Science (Dobrzański, Zawadzki, 1989)

contaminated. In order to protect water, the use of chemical pesticides and fertilizers should be stopped, or limited to a minimum. Long term planning of organic and mineral fertilization in sustainable agriculture could greatly contribute to improvement of water quality of the Łowicko-Błońska plain.

In summary, sustainable agriculture is promising opportunity for the eastern part of the Łowicko-Błońska plain. Appropriate agricultural activities, corresponding with the natural components can provide not only protection of environment, but also improve the life quality of the present generation. Sustainable agriculture is able to provide healthier food than intensive farming. To persuade farmers to turn to sustainable agriculture it is important to provide environmental education and financial benefits, such as subsidies to agri-environment schemes.

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