

INTENSIFICATION OR EXTENSIFICATION OF POLISH AGRICULTURE? – IN SEARCHING OF DIRECTIONS OF CHANGES. A CASE STUDY: THE NORTH-WESTERN REGION OF POLAND

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Abstract. This paper presents results of research referring to the evaluation of agriculture in relation to its tendency to intensification or extensification. The study was conducted at the commune level of the North-Western Region of Poland. During the investigation, the following groups of indicators were used: capital outlays, market-oriented production, agricultural land management, agrarian patterns, eco-natural conditions and socio-demographic conditions. As a result, four various types of farming have been distinguished.

Key words: production intensity, landscape patterns, intensification, extensification, indicators, North-Western Region

INTRODUCTION

In current European farming, two main tendencies of changes have been observed: production intensification, especially in densely populated areas, and on the other hand, extensification of agricultural activity which is typical for areas with unfavourable natural conditions for farming development (Pinto-Correia and Breman, 2008). However, there are different reasons that stimulate either one of the above mentioned phenomena, such as, global and regional economic conditions, government policy and demand for selected goods, for example. These aspects were a key point in the discussion

about the idea of Multifunctional European Model of Agriculture, where the conventional role of farming is being played in favour of the strengthening of non-production purposes (OECD, 2001; European Model of Agriculture..., 2006; Kołodziejczak, 2010; Kowalczyk and Sobiecki, 2011).

In relation to Polish agriculture, its significant spatial and socio-economic role can be seen in the predominance of agricultural land as a type of land use (accounting for 60% of the total area of the country), and also in a high employment rate (the average value is fluctuating around 15%) (GUS, 2013). Due to the major farmland resources and labour force potential high production efficiency should be expected, but unfortunately, this sector of national economy provides only 4% of the country's GDP (GUS, 2013).

As for farming production, it is predicted that the future transformation will happen in one of two contradictory directions: progression linked with production growth or regression leading to agriculture extensification. Undoubtedly, intensive production will be concentrated in the most urbanised or specialised agrarian regions, and in contrast, extensive farming will be observed in the peripheral regions, where areas with unfavourable conditions are naturally prone to marginalization. However, there is a question: In which scope will the agricultural landscape pattern influence

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production intensity? Agricultural landscape pattern, also known as agrarian structure, is understood as land fragmentation described using the following characteristics: a farm's size and the size shape and number of cultivated parcels (Woch et al., 2013). The reason for raising this issue is the fact that fragmented landscape patterns reduce agricultural efficiency, but on the other hand, create landscape diversity and keep environmental values.

THE AIM, METHODS AND STUDY AREA

The aim of this paper was to identify areas with different levels of intensification of agricultural activity. As a study area, the North-Western Region of Poland was chosen. During the investigation, numerous indicators relating to the natural, socio-demographic, organizational and technical dimensions were taken into consideration. The selection of indicators was made in relation to their significance in view of a methodological framework and the availability of statistical data.

As for the research agenda, firstly, selection of diagnostic features and indicators was conducted and these are presented in Table 1. In each group, indicators have been standardised and classified into five ranges according to a normal distribution using the Statistica software. Afterwards, for each analysed indicator, one of the five levels of farming intensity was assigned: from the most favourable to intensification to the most favourable to extensification. After that, the indicators presented, using these same values were subjected to data clustering. As a result of grouping, four types of agriculture have been distinguished: type A) highly-intensive agriculture with a slight fragmentation of agrarian pattern, type B) medium-intensive agriculture with a significant fragmentation of agrarian pattern, type C) medium-extensive agriculture with a slight fragmentation of agrarian pattern, type D) highly-extensive agriculture with a significant fragmentation of agrarian pattern (Fig. 1).

It should be noted that during grouping, the greatest importance was put on the relationships between: landscape structure and capital outlays, agricultural land management and market-oriented production. Of secondary importance were: socio-demographic determinants and eco-natural conditions.

Statistics were gathered from the Local Data Bank [<http://www.stat.gov.pl/bdl>]. Generally, the information

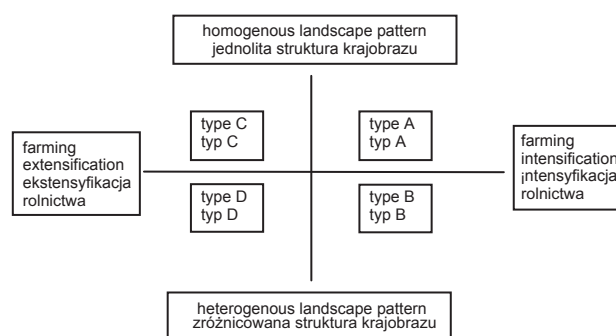


Fig. 1. Types of agriculture in relation to production intensification and landscape pattern

Source: own elaboration.

Rys. 1. Typologia rolnictwa w nawiązaniu do intensywności produkcji oraz struktury krajobrazu

Źródło: opracowanie własne.

was obtained from the Common Agricultural Censuses. For agriculture typology, data from 2010 have been used and for assessment of the changeability trend data from both 1996 and 2010 have been taken into account. Additionally, the National Population Census data was used.

As for the study area, the North-Western Region (NUTS¹ 2) was chosen. A detailed analysis was carried out at the level of communes (NUTS 5). However, in a comparative analysis reference to the regional provincial level (NUTS 3) appeared very often, including the voivodeships: Lubuskie, Wielkopolskie and Zachodniopomorskie. The study included rural (208) and urban-rural (176) communes, while in the latter urban areas were excluded from research.

Selection of the North-Western Region as a study area was decided on two key aspects. On the one hand, because of dynamic transformations in the agricultural activity over the past two decades, especially in the areas where state farms used to operate (the Zachodniopomorskie voivodeship), and on the other hand, the relatively stable condition of farming in areas where family-farms dominate (the Wielkopolskie voivodeship).

¹ NUTS – Nomenclature of Territorial Units for Statistics, established by Eurostat in order to provide a single uniform breakdown of territorial units for the production of regional statistics for the European Union.

Table 1. Indicators and diagnostic features of agriculture development

Tabela 1. Wskaźniki oraz cechy diagnostyczne rozwoju rolnictwa

Groups of determinants Uwarunkowania	Indicators with their units of measurement Wskaźniki wraz z jednostkami miary
Capital outlays Nakłady kapitałowe	mechanization ratio (number of tractors per 100 ha of agricultural land) wskaźnik mechanizacji (liczba ciągników na 100 ha użytków rolnych) livestock density (number of farm animals per 100 ha of agricultural land) obsada zwierząt (DJP na 100 ha użytków rolnych) artificial fertilizer utilization (kg per 1 ha of agricultural land) zużycie nawozów sztucznych (kg nawozów na per 1 ha użytków rolnych) outbuilding density (m ² of outbuildings per 100 ha of agricultural land) gęstość zabudowy gospodarczej (m ² zabudowy na 100 ha użytków rolnych)
Market-oriented production Towarowość produkcji	share of production destined for market (percentage share of total production) wielkość produkcji przeznaczanej na sprzedaż (procentowy udział ogólnej produkcji)
Agricultural land management Zarządzanie użytkami rolnymi	land use structure (percentage share of land use types) struktura użytkowania gruntów (procentowy udział poszczególnych typów użytkowania terenów) agricultural land pattern (percentage share of agricultural land types) struktura użytków rolnych (procentowy udział poszczególnych typów użytków rolnych) crop rotation (percentage share of cultivated plants) struktura upraw (procentowy udział roślin uprawnych)
Agrarian pattern Struktura agrarna	farms size (hectare) powierzchnia gospodarstw rolnych (ha) number of plots in individual farm (items) liczba parceli uprawnych w gospodarstwie indywidualnym (sztuki) acreage of individual plots (hectare) powierzchnia indywidualnej parceli uprawnej (ha)
Eco-natural conditions Uwarunkowania naturalne	quality index of agricultural production space (points) wskaźnik jakości rolniczej przestrzeni produkcyjnej (punkty) index of protected areas (percentage) wskaźnik udziału obszarów chronionych (%) synthetic environmental indicator for organic production (points) syntetyczny wskaźnik produkcji ekologicznej (punkty)
Socio-demographic conditions Uwarunkowania socjodemograficzne	employment in agriculture (percentage share of employees in agriculture sector and number of employees per 100 ha of agricultural land) zatrudnienie w rolnictwie (procentowy udział zatrudnionych w rolnictwie oraz liczba zatrudnionych na 100 ha użytków rolnych) farmers with higher education (percentage share of total education) udział rolników z wyższym wykształceniem (procentowy udział do ogółu zatrudnionych)

Source: own elaboration.

Źródło: opracowanie własne.

The study area is located in two agricultural regions: Wielkopolsko-Pomorski (the Wielkopolskie voivodeship) and Zachodniopomorski (voivodeships: Zachodniopomorskie and Lubuskie) (Stola and Szczęsny, 2004). The Wielkopolsko-Pomorski Region is characterised

by very good agro-ecological conditions with a predominance of self-sufficient family-farms, as opposed to the Zachodniopomorski Region which is distinguished by its lakeland and forestland. With regards to agrarian pattern, large-size holdings dominate here.

RESEARCH OUTCOMES

As a result of analytical research, four types of agriculture have been distinguished with various levels of farming production and landscape fragmentation: type A)

highly-intensive agriculture with a slight fragmentation of agrarian pattern, type B) medium-intensive agriculture with a significant fragmentation of agrarian pattern, type C) medium-extensive agriculture with a slight fragmentation of agrarian pattern, type D) highly-extensive

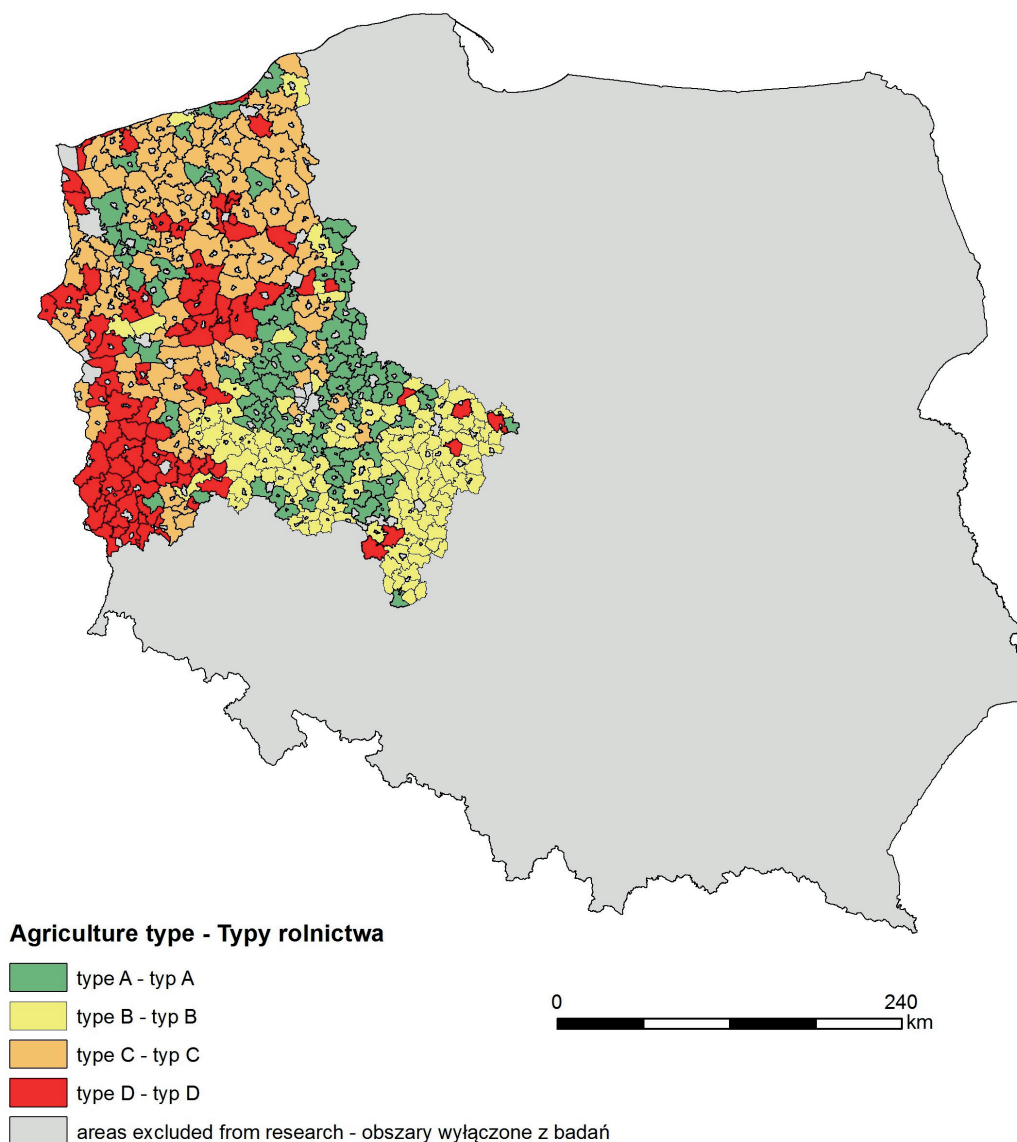


Fig. 2. Spatial distribution of different agriculture types in the North-Western Region of Poland (explanation in the text)

Source: own elaboration.

Rys. 2. Rozmieszczenie przestrzenne różnych typów rolnictwa w regionie północno-zachodnim (objaśnienia w tekście)

Źródło: opracowanie własne.

agriculture with a significant fragmentation of agrarian pattern. The spatial distribution of communes, representing the above mentioned agriculture types are presented in Figure 2.

Highly-intensive agriculture (type A) is characteristic of areas, where agrarian production has a predominant role in the local economy. The highest capital expenditures that can be observed here are associated with a high degree of market-oriented production. Furthermore, this type of agriculture is marked by a major share of the agricultural land in the total area of a commune, a lack of fallows, intensive livestock production and plant cultivation focusing on industrial crops and intensive cereals. Specialized holdings and family farms can be found here, where a major share falls on large-size farms exceeding 15 hectares. Simultaneously, a slight landscape fragmentation is observed, because the average number of parcels in a farm reaches only 6 items, and the individual acreage of a parcel exceeds 5 hectares. This homogenous landscape structure, from an economic point of view, creates favourable conditions for the development of intensive production. These areas fulfil the appropriate conditions for the maintenance of the traditional role of agriculture, and for this reason it is expected that in the future production will continue at a comparable level as nowadays. Nevertheless, the environmental quality is exposed to potential hazards due to the high utilization of chemical fertilizers and therefore special attention should be paid to the application of environmentally friendly agrarian techniques, such as adjustment of the amount of fertiliser to the actual plants requirements.

Generally, this type of agriculture is representative of 90 communes (24% of the total units of the study region), and the vast majority of them fall on the Wielkopolskie voivodeship (Fig. 3). As for spatial distribution, the highest concentration can be found in northern and central parts of Wielkopolskie (Fig. 2), which overlaps with the occurrence of highly market-oriented households.

The second type, medium-intensive agriculture with a significant fragmentation of agrarian pattern (type B), has much in common with the previous one, however, it is worth mentioning some of the dissimilarities. For example, in many communes, higher capital expenditure and a higher degree of marketability is observed. On the other hand, the landscape pattern is more fragmented, which indicates the presence of family farms.

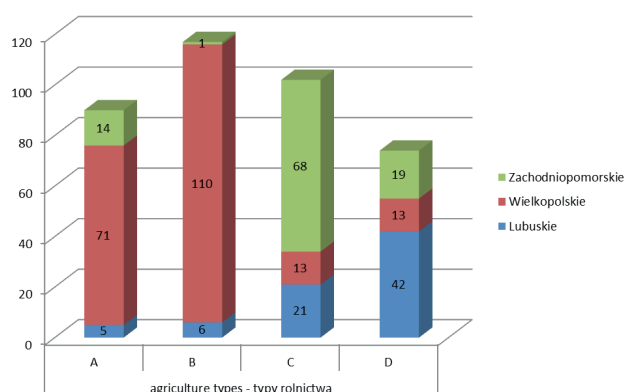


Fig. 3. Number of communes representing different types of agriculture in analyzed voivodeships

Source: own elaboration.

Rys. 3. Liczba gmin reprezentująca poszczególne typy rolnictwa w badanych województwach

Źródło: opracowanie własne.

In addition, the natural conditions are less favourable here. However, in this category there is a large number of areas which are in favour of organic farming. Taking into account these favourable ecological circumstances, in order to reduce the negative impact of farming, good agricultural practices should be actively implemented here. Furthermore, in a number of communes, valuable natural areas occupy a considerable acreage which in conjunction with a highly fragmented landscape provides an opportunity for multifunctional landscape usage.

This agriculture type occurs in 117 communes (30% of the total units of the study region), and as before, the predominant share falls in the Wielkopolskie voivodeship. This type is typical for family farming with a long tradition of private landownership. For this reason, the greatest concentration is encountered in the south-eastern and south-western parts of this voivodeship.

Medium-extensive agriculture with a slight fragmentation of agrarian pattern (type C) predominates in the Zachodniopomorskie voivodeship. However, the total number of communes representative of this type of farming is 102 (27% of the total units of the study region). Although family farms represent a medium level of production, the marketability ratio does not exceed 40% which indicates the presence of self-sufficient farms here. Additionally, this category includes areas with a significant share of fallow land, where in some

cases the share reaches up to 20% of the total arable land in a given commune. This is a consequence of changes in the management of agricultural land since the economic transformation began in the 90s. Until that time, the majority of farmland was owned by state farms, and after discontinuation of their activities, uncultivated fields turned into set-asides. That situation changed together with Polish accession to EU. Thanks to subsidies, fallows have been re-utilized which has depleted the share of wastelands. Besides this, over the last two decades the analysed type of farming was distinguished by quite rapid changeability in crop rotation, which was the farmers' response to changing demands for certain agriculture goods.

With regards to highly-extensive agriculture with a significant fragmentation of agrarian pattern (type D), this type is distinguished by an important share of forestland, where natural condition for agricultural purposes are limited. The greatest amount of communes representative of this type can be found in the Lubuskie voivodeship. Generally, this category of the least preferable conditions for farming is represented by 75 communes (19% of the total number of cases). On the other hand, a less polluted environment, a greater amount of green areas, topographic variety and the methods of land use create a fuzzy natural landscape. This all affects the landscape diversity, while at the same time offering great potential for the implementation of non-production functions, such as e.g., leisure activities, second homes, etc.

CONCLUSIONS

The aim of the study was to determine the areas with varying degrees of intensity of agricultural activity in the North-Western Region of Poland: intensification or extensification. The results revealed regional differences in the level of intensity of agrarian production which means that no particular leading course of alteration is impossible to design.

Studies have confirmed the relationships between long agricultural tradition, good agricultural practices, well-established ownership structure and highly intensive farming, the rural areas of the Wielkopolskie voivodeship provide confirmation of this. However, one point should be highlighted here: these areas are threatened by chemical components accumulating in the soil and ground water and therefore some steps should be taken towards combating this negative impact of

farming. In such a case it is recommended to implement sustainable agriculture or at least a code of good agricultural practices (Floriańczyk and Buks, 2013).

As for those rural areas with extensification trends, and even sometimes some symptoms of agriculture marginalization, less favourable natural conditions, remoteness from urban centers and small demographic potential are responsible for that. This situation applies to large rural areas of the Lubuskie voivodeship and also partly to Zachodniopomorskie. However, with regards to the latter, two kinds of areas can be defined: in some cases a weakening of agricultural activity is observed, while in others – there is a strengthening of production purposes. The reasons for this are, on the one hand, the natural circumstances restricting farming development, and on the other hand, the very important role played by factors stimulating agricultural activities, especially after the Polish accession to the EU, which particularly regard to financial subsidies for farmers (Markuszczyńska, 2013).

As for rural areas affected by marginalization, it is worth noting that they fulfill the necessary criteria for the implementation of non-agricultural functions, such as eco-tourism, protection of agricultural biodiversity and preservation of natural and cultural heritage of the region. However, this does not reject the continuation of farm production, but in situations like those it is recommended to implement a sustainable way of farming, especially in relation to the natural environment, as well as the untapped demographic potential and burdensome landscape structure (Woś and Zegar, 2002; Skubiak, 2013). On the other hand, sustainable development of rural areas is very close to the idea of multifunctional agriculture, where, as Wilkin (2008) points out, except for food security provision, some actions are taken to maintain biodiversity and to protect natural resources and the cultural heritage of rural landscape.

In addition, the research showed interesting findings in the case of relationships between farmland fragmentation and production intensity. It is said that fragmentation of the agrarian pattern is not appropriate for cultivation and that agricultural activities conducted under such conditions derived lower benefits. However, the study revealed that a large group of farms with a high fragmentation in the agrarian pattern is able to generate a higher income than some of the large-scale holdings. This example indicates that landscape fragmentation does not necessarily reduce the production efficiency, on condition of the maintenance of high

capital expenditures. It proves that it is possible to conduct farming production and simultaneously to keep the landscape mosaic, so important in relation to the protection of the cultural heritage of a given region.

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INTENSIFYKACJA CZY EKSTENSIFYKACJA POLSKIEGO ROLNICTWA? – W POSZUKIWANIU KIERUNKÓW ZMIAN. STUDIUM PRZYPADKU: REGION PÓŁNOCNO-ZACHODNI

Streszczenie. Artykuł prezentuje wyniki badań dotyczące oceny rolnictwa w zakresie jego intensyfikacji lub ekstensyfikacji. Badania zostały przeprowadzone na poziomie gmin w regionie północno-zachodnim. Podczas badań wykorzystano wskaźniki i cechy diagnostyczne dotyczące: nakładów inwestycyjnych, towarowości rolnictwa, zarządzania gruntami rolnymi, struktury agrarnej, uwarunkowań naturalnych i potencjału społeczno-demograficznego. W efekcie wyróżniono cztery różne typy rolnictwa.

Słowa kluczowe: intensywność produkcji, struktura krajobrazu, intensyfikacja, ekstensyfikacja, wskaźniki, region północno-zachodni

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