*STOWARZYSZENIE EKONOMISTÓW ROLNICTWA I AGROBIZNESU*
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# FARMS SPECIALIZATION IN RELATION TO THE PRODUCTION TYPE AND ECONOMIC SIZE OF FARMS

## *POZIOM SPECJALIZACJI GOSPODARSTW ROLNICZYCH W RELACJI DO SKALI I KIERUNKU PRODUKCJI*

**Key words: farm type, farm specialization, sales concentration, economic size of farm**

*Słowa kluczowe: typ gospodarstwa, gospodarstwa specjalistyczne, koncentracja sprzedaży, wielkość ekonomiczna gospodarstw*

**Abstract.** In the paper, results of the analysis of the specialization level depending on the production orientation and economic size of farms of the Polish FADN have been presented Specialization was measured using the concentration index of sales structure. The analysis shows that types of farming delimitated in the FADN system as specialist have on average a higher specialization level. However, there are noticeable differences between specific farm types. Farms delimitated as specialist granivores, specialist horticulture and specialist permanent crops have a strongly concentrated sales structure, whilst specialist field crops and specialist grazing livestock farms are closer to mixed farms. Some irregularities in the farm specialisation level in relation to the economic size of farms have also been identified. Shortcomings of grouping the FADN farms based on SGM may cause a false recognition of farms as mixed or specialized.

## Introduction

The process of farm specialization, apart from concentration and intensification, is one of the main phenomena observed in the most recent developments in the Polish farming sector. The initial diversification in undeveloped agricultural systems was a natural way of taking an advantage from diversified production possibilities (e.g. in connection with different soil's quality). Multidirectional production was allowing also to protect the farm against yields' variability as well as to assure better utilization of family labour [Tomczak 2005]. Because of economic pressures that today's agriculture faces, farms' specialization and concentration, due to the cost reduction potential, might be considered as an important factor allowing for income increase and efficiency improvement of a modern farm. The concentration of efforts on one or two activities and usually growth of scale of production leads to a decrease in cost of unit of production and results in an increase of farm value added [Juszczyk 2004]. On a global scale the process of specialization leads to an increase in comparative advantages and competitiveness [Stępień 2007]. In the study of Smędziak [2010], based on the Polish FADN sample of farms, the highest efficiency was found in specialized horticultural and granivore farms whereas the lowest in mixed and dairy farms. According to the author, the main reason of ineffectiveness is too low scale of production, which is usually connected with the level of specialization. Specialization, although justified from an economic point of view, in many cases leads to numerous problems in organizational and ecological areas of farm activity [Kuś 2000]. Simplification in the crops' structure leads to negative consequences for soils' fertility what is often compensated by increased application of mineral fertilizers and pesticides. In farms specialized in livestock production there is a problem of manure management, whereas crop farms face a challenge of balancing the organic matter.

An important issue is the question how to measure specialization level. One of the most popular approaches is the method formulated by Wojtaszek [1980] which allows to classify farms to one of the following groups:

– highly specialized farm (share of one activity in potentially commercial production above 60%),
– one activity oriented farm (share of one activity in potentially commercial production between 40-60%),
– two activities oriented farm (share of two activities in potentially commercial production between 40-60%),

– diversified farms with one leading activity (share of one activity in potentially commercial production above 30%),
– diversified farm (no activity above 30%).

In relation to general farms' profile in Poland a little different approach has been presented by Majewski [2002] who suggested to classify farms as specialized within production types using the following criteria:
– crop farms – number of animals below 2 LU or intensity of LU below 10 LU/100 ha,
– cattle farms – % of cattle in the total number of LU above 75%,
– pigs farms – % of pigs in the total number of LU above 75%,
– mixed farms – other.

An indicator expressing the specialization's level by one figure has been proposed by Ziętara and Olko-Bagieńska [1986], that can be calculated according to the following formula:

$$FS = \frac{1}{\sum_{i=1}^{n} dj * j}$$

where:
$FS$ – farm specialization index,
$dj$ – share of specified activity in the production structure,
$j$ – ordinal number of specified activity in the decreasing order in terms of the share in production structure.

A different method of classifying farms has been applied in the Farm Accountancy Data Network (FADN). To ensure representativeness of the results farms are assigned to the types of farming based on share of Standard Gross Margin (SGM)[1] of particular groups of activities within the farm. Based on that the farm population is divided into specialised and mixed types of farming [FADN 2010].

FADN data are used in many European research projects like CAPRI [Gocht, Britz 2010] or SEAMLESS [Louhichi et al. 2009, Majewski at al. 2009]. Also in Poland growing use of FADN data can be observed in line with the development of the Polish FADN database [Niezgoda 2009, Mańko 2007, Sobczyński 2008, Sass 2010]. Commonly the researchers rely on the FADN typology making comparisons on economicsof different farm types. This is why a precise definition of farm types can be considered as important factor influencing quality of research results and conclusions. This paper aims to verifyhomogeneity of types of farming as defined in the FADN typology regarding their specialisation level.

## Methodology

The main goal of this paper is to assess the level of specialization in the FADN sample considering their economic size and type of farming. The hypothesis was, that estimating farm specialisation based on the share of SGM of farm activities may result with an improper delimitation of farms as mixed or specialised.

In the study over 12 thousand farms participating in the Polish FADN in the year 2009 have been analysed. The sample of farms has been divided into clusters of farm types using criteria of type of farming and, economic size. According to the GTF[2] farm typology used by the FADN the following types of farming are distinguished:
1 – specialist field crops,
2 – specialist horticulture,
3 – specialist permanent crops,
4 – specialist grazing livestock,
5 – specialist granivores,

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[1] Standard Gross Margin (SGM) of a crop or livestock item is defined as the value of output from one hectare or from one animal less the cost of variable inputs required to produce that output. To avoid bias caused by fluctuations, e.g. in production (due to bad weather) or in input/output prices, three year averages are taken. After decoupling of direct payment SGM has been replaced by Standard Output.

[2] GTF – General Types of Farming classification based on the 2003/369 EC regulation. In general in the FADN methodology the farm is assigned to the particular specialists production type if more than 2/3 of total SGM comes from production activities, that are typical for the type of farming. In other cases farms are classified as mixed or mixed with dominating activity.

6 – mixed cropping,
7 – mixed livestock,
8 – mixed crops-livestock.

To calculate farm specialization level the following formula based on the Herfindahl-Hirshman concentration index has been used:

$$FSI = \sum_{i=1}^{N} S_i^2$$

where:
*FSI*– farm specialization index,
*S* – shares of cash crops and activities in animal production in farm sales.

Possible values of the FSI are between 0 and 1. The closer to 0 the FSI is the higher the level of diversification of the production structure (sales) characterizes farms. On the opposite, the FSI equal 1 indicates fully specialized farms, providing for sales a product belonging to one group of activities only. For calculating FSI the following categories of farm activities have been distinguished: cereals, protein crops, sugar beets, oilseeds, other industrial crops, potatoes, fodder crops for sale, vegetables, seed crops, other crops, milk, beef cattle, other cattle, sheep and goats, pigs, poultry meet, eggs, wool, forest products, services, other activities.

Values of the FSI have been analysed for different farm types as distinguished according to the GTF typology as well as clusters of farms of varied economic size, measured in ESU[3].

## Results

The average FSI value for all farms in the sample was 0,57 (Tab. 1). As expected, farms assigned to the specialized types of farms (1-5) are characterized by higher FSI comparing with the mixed farms (6-8). However, groups of specialized farm types are not homogeneous. The most specialized are production types 2,3 and 5 with the FSI values of nearly or above 0.9 on the average, what indicates clearly that there is one activity dominating production structure. The FSI for other farms that are classified in the FADN as specialized (types 1 and 4) is much lower (0,52 and 0,60 respectively), at the level similar to that characterizing mixed farms (types 6, 7 and 8).

[3] ESU (European Size Unit) – the value of one ESU is defined as a 1200 EUR of Farm Gross Margin

**Table 1. FSI values for the GTF types of farming**
***Tabela 1. Wartość wskaźnika specjalizacji wg typu gospodarstwa***

| **General Types of Farming/** ***Typ rolniczy gospodarstwa*** | **Number of farms/** ***Liczba gospodarstw*** | **Farm Specialization Index/*Wskaźnik Specjalizacji Gospodarstwa*** | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | | **mean/** ***średnia*** | **SD*** | **minimum/** ***min.*** | **quartile/*kwartyle*** | | | **maximum/-** ***max.*** |
| | | | | | 1st | 2nd | 3rd | |
| 1 – specialist field crops/*uprawy polowe* | 2 596 | 0.52 | 0.21 | 0.16 | 0.36 | 0.48 | 0.61 | 1.0 |
| 2 – specialist horticulture/*uprawy ogrodnicze* | 417 | 0.89 | 0.17 | 0.26 | 0.86 | 0.99 | 1.00 | 1.0 |
| 3 – specialists permanent crops/*uprawy trwałe* | 507 | 0.91 | 0.15 | 0.34 | 0.89 | 1.00 | 1.00 | 1.0 |
| 4 – specialists grazing livestock/*zwierzęta żywione w systemie wypasowym* | 2 683 | 0.60 | 0.17 | 0.20 | 0.46 | 0.60 | 0.73 | 1.0 |
| 5 – specialists granivores/*zwierzęta ziarnożerne* | 1 224 | 0.87 | 0.15 | 0.29 | 0.77 | 0.92 | 1.00 | 1.0 |
| 6 – mixed cropping/*mieszne roślinne* | 840 | 0.41 | 0.20 | 0.15 | 0.27 | 0.34 | 0.49 | 1.0 |
| 7 – mixed livestock/*mieszne zwierzęce* | 1 434 | 0.47 | 0.19 | 0.15 | 0.33 | 0.43 | 0.57 | 1.0 |
| 8 – mixed crop-livestock/*mieszne roślinno-zwierzęce* | 2 555 | 0.45 | 0.19 | 0.14 | 0.31 | 0.41 | 0.54 | 1.0 |
| Total/*Ogółem* | 12 258 | 0.57 | 0.24 | 0.14 | 0.37 | 0.52 | 0.75 | 1.0 |

* standard deviation/*odchylenie standardowe*
Source: own study
*Źródło: opracowanie własne*

Analysis of the FSI distribution shows, that even in the specialist farm types characterized by the highest average FSI farms with a strongly diversified sales structure can be found as the minimal FSI values within the range 0.15-0.21 indicate. The number of such farms in the most specialized farm types 2.3 and 5 is most likely marginal, since the FSI values in the first quartile are between 0.77 and 0.86.

Differently, in the specialist field crops (type 1) the FSI for about 50% of farms is below 0.5 (0.36 and 0.48 in the first and second quartiles respectively). Also grazing livestock farms (type 4) from the first quartile are strongly diversified (FSI value 0.46).

Similarly, but to a lesser extent, there are farms classified as mixed, although the FSI reaches value 1. This indicates, that among farms assigned to the mixed type of farming a number of specialized farms might be found. The 3rd quartile values show that 25% of farms within those types of farming is characterized by FSI values on 0.49-0.57 level. It means that there is one main group of products contributing to more than 2/3 of sale value in over 25% farms being recognized as mixed.

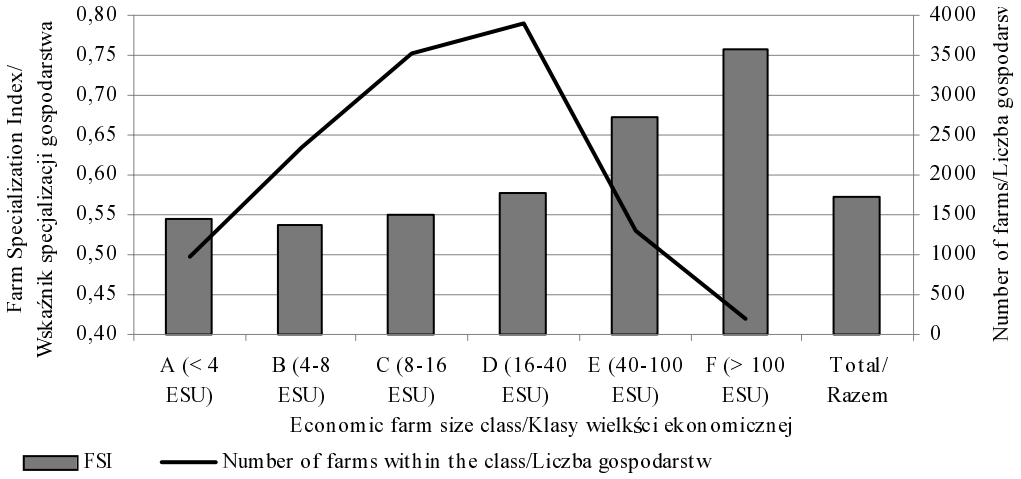


**Figure 1. FSI values in relation to the economic size farm clusters**
***Rysunek 1. Wartości Indeksu Specjalizacji Gospodarstw w stosunku do klastrów wiekości ekonomicznej gospodarstw***
Source: own study
*Źródło: opracowanie własne*

Values of standard deviation in considered farm types are quite similar. However some lower numbers could be observed in case of most specialized farms. It could be explained by very high mean values, which is close to the maximum and thus limiting volatility of FSI.

The analysis of farm specialisation in relation to the economic size (Fig. 1) leads to a logical observation that the specialisation index is rising with the increase of the economic size of farms. The highest, average FSI values reach 0.75 in the cluster of farms bigger that 100 ESU.

It does not prove, however, that the size of farm determinates the level of specialization. As presented in table 2 there is no regularity in terms of the specialization level in different farm size clusters if analysed within type of farming according to GTF classification. In all farm size clusters of types of farming 2, 3 and 5 (specialist horticulture, specialist permanent crops, specialist granivores) the FSI value is at the very similar level, showing that the farm size has no impact on the specialization level. In the farm type 1 (specialist field crops) the FSI diminishes when the farm size increase. In the mixed farms there is no clear pattern of changes in the FSI value, with an exception of the type 6 (mixed cropping), where the FSI in the cluster of the largest farms (above 100 ESU) is the lowest.

The scope of the analysis and data gathered do not allow to explain this phenomenon. In the practice of farming there are several possible reasons for diversifying production, thus sales structure. Such potential causes as variation in soil quality in individual farms, excess of labour or, still practiced in some family farms, introducing activities providing food for self-consumption. On

**Table 2. FSI values in relation to type of farming and economic size class of the farm**
*Tabela 2. Wskaźnik specjalizaji gospodarstwa a klasa wielkości ekonomicznej*

| **Farm economic size class/** *Wielkość ekonomiczna gospodarstwa* | **Farm specialization index (mean)/***Wskaźnik specjalizacji gospodarstwa (średnia)* | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | **Type of farming [GTF]/***Typ rolniczy gospodarstwa* | | | | | | | |
| | **1** | **2** | **3** | **4** | **5** | **6** | **7** | **8** |
| A (< 4 ESU) | 0.61 | 0.92 | 0.92 | 0.55 | 0.86 | 0.45 | 0.47 | 0.46 |
| B (4-8 ESU) | 0.55 | 0.85 | 0.91 | 0.54 | 0.88 | 0.42 | 0.48 | 0.46 |
| C (8-16 ESU) | 0.51 | 0.87 | 0.92 | 0.57 | 0.87 | 0.40 | 0.46 | 0.45 |
| D (16-40 ESU) | 0.49 | 0.87 | 0.92 | 0.61 | 0.86 | 0.36 | 0.48 | 0.44 |
| E (40-100 ESU) | 0.47 | 0.93 | 0.86 | 0.69 | 0.86 | 0.37 | 0.47 | 0.47 |
| F (> 100 ESU) | 0.45 | 0.98 | 0.96 | 0.66 | 0.90 | 0.35 | 0.54 | 0.43 |

Source: own study
*Źródło: opracowanie własne*

the other hand, there are various reasons for specialization, to mention such as more efficient use of machinery or labour.

The fact remains, that classification of the FADN farms does not give a clear picture regarding specialization level in farms considered to be specialized by definition.

## Conclusions

The results of the study show that the most specialized farms are specialists granivores, specialist horticulture and specialist permanent crops types of farming. Defined as specialist field crop production farms, however, represent on average a low level of specialization measured with the FSI. Moreover, within specialist types of farming there are clusters of farms with the FSI values similar to those characterizing mixed farms. Less in number, but also some mixed farms have a high specialization level. This might be considered as a shortcoming of the delimitation of farms based on SGM as used in the FADN methodology. This could be a subject for deeper analytical work and search for more accurate classification of farms. It can be concluded, that uncritical acceptance of FADN delimitation of types of farming may lead to incorrect conclusions in considerations related to farms' specialization.

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## *Streszczenie*

*W pracy przeprowadzono analizę specjalizacji gospodarstw rolniczych mierzoną poziomem koncentracji struktury sprzedaży z uwzględnieniem różnic między gospodarstwami ze względu na kierunek produkcji i wielkość ekonomiczną gospodarstw. W badaniach wykorzystano dane polskiego FADN z 2009 roku. Wykazano, iż gospodarstwa o ustalonym kierunku produkcji charakteryzuje wyższy poziom specjalizacji w stosunku do gospodarstw wielokierunkowych, jakkolwiek istnieją znaczne różnice w poziomie specjalizacji w zależności od kierunku produkcji. Wskazano również, kierunki zmian wskaźnika specjalizacji wraz ze zmianą wielkości ekonomicznej w poszczególnych typach badanych gospodarstw. Wykazano niedostatki w sposobie podziału gospodarstw na specjalistyczne i mieszane w oparciu o kryterium standardowej nadwyżki bezpośredniej stosowane dotychczas w FADN, które mogą prowadzić do nieprecyzyjnej klasyfikacji gospodarstw.*

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