

## PRODUCTIVITY AND MARKETABILITY IN RELATION TO TECHNICAL EQUIPMENT OF ORGANIC FARMS\*

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**Summary.** The objective of the paper was to determine the size of global and commodity production and analysis of mechanical tractive force equipment. The scope of work covered agricultural events in 100 ecological farms located in Małopolskie, Podkarpackie, Śląskie and Świętokrzyskie voivodeship. The researched farms were divided into 4 uniform groups. Production orientation, defined on the basis of commonly used methodology of standard gross margin estimation was a division criterion. The following were detailed: single-production field plants farms, single-production fruit farms, single-production animal farms and double-production farms. A method of a guided survey was used for collecting research material. Field plants production farms and fruit production farms obtained the highest marketability amounting to 67.5%. Fruit production farms had the highest number of tractors per 100 ha of AL – 48.84 items. Requirements of labour inputs in this type of farms, where harvest, care and fertilization of plantation are sources, may be the reason of such high equipment. Therefore, the highest unit power occurs in fruit production farms and amounts to 19.80 kW·ha<sup>-1</sup>. Farms may afford such high tractors equipment due to high production.

**Key words:** productivity, organic farms, technical equipment

### Introduction

According to Szeptycki and Wójcicki [2003] our farms will not be able to compete with farms from other EU countries unless they produce high quality food cheaply and efficiently. In the operation conditions of our farms, organic farming is an opportunity for improving this competitiveness. According to the International Federation of Organic Agriculture, organic agriculture means a set of various detailed concepts of farming compatible with soil, plants and animal requirements, the aim of which is to produce high quality food

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\* *The study was carried out within the project No NR 12 016510 "Innovative impact of technology and IT support of management on efficiency of production in organic farms"*

at the simultaneous maintenance of biological balance in natural environment [IFOAM 2002].

Therefore starting with any discussion concerning organic agriculture, one should consider many aspects and mainly such factors as:

- required quality of products and food in the aspect of consumers' health and taste values,
- food production costs proportions, carried out with ecological and traditional methods,
- almost total elimination of standard chemical substances,
- scale of market potential of organic products – distance from markets and their absorbency,
- geographic and land conditions, inter alia distance from pollution emitters in various forms.

The listed factors, are supposed to have a present and future decisive meaning in operation and development of food and organic goods production [Kowalski 2012].

Despite new opportunities of financing investments in agriculture, which occurred after accession of Poland to the European Union [Cupiał, Tabor 2005], still one of the problems of the Polish agriculture is an old tractors and machinery park and relatively low degree of its use [Szeptycki et al. 2005]. The process of replacing the old and worn equipment in Poland is hindered inter alia by a low marketability and a small scale of organic farms production [Pawlak 2004]. Low commodity production limits incomes, therefore limits its basic source of financing investments. This phenomenon is multiplied by tendency to limit expenditures and high self-sufficiency tendency [Prusak, Tabor 2010]. Usually, such activities lead to the decrease in productivity and subsequent limitation of incomes. Therefore, one may conclude that defragmentation and low efficiency of the Polish agriculture, including organic agriculture still constitutes a significant hindrance for introducing modern mechanization [Michalek 1998]. For improvement of competitiveness, a developing farm has to increase a scale of its production by quality and quantity. Moreover, it has to look for full market which loads them with additional inputs [Malaga-Toboła 2009]. Rational mechanisation of production helps to achieve this aim. It should also include technical means used in services [Kowalski et al. 2002]. High quality production at low production costs will be possible only in these conditions.

## **Purpose and methodology of research**

The study was carried out within the project „Innovative impact of technology and IT support of management on efficiency of production in organic farms” No 12 016510.

The objective of the paper was to determine the size of global and commodity production and analysis of equipment with mechanical tractive force. The scope of work covered agricultural events in 100 ecological farms located in Małopolskie, Podkarpackie, Śląskie and Świętokrzyskie voivodeship.

The researched farms were divided into 4 uniform groups for analysis. Production orientation, defined on the basis of commonly used methodology of standard gross margin estimation, was a division criterion. Single-production field plants farms were included in A1 group, single-production fruit farms were included in A2 group, single-production animal farms in group B and double-production farms in group D. A guided survey method was used for collecting research material.

### Plant production

Organic production is a sustainable system of managing plant and animal production, combining the most advantageous practices for environment, high degree of biological diversity, protection of natural resources, using high standards concerning animal welfare and methodology of production relevant to consumers' demands who prefer goods produced with the use of natural substances.

Single-production fruit farms, which possess a small number of livestock, only 0.01 LSU, are a distinguishing group. This livestock is maintained for household needs. Average area of orchards cultivation is 2.03 ha which constitutes 2/3 of agricultural land – table 1.

Table 1. Land use area in the researched organic farms [ha]

Tabela 1. Powierzchnia użytkowania ziemi w badanych gospodarstwach ekologicznych [ha]

Specification	Unit	Group			
		Single-production			Double-production
		plant production		animal production	
		field	fruit		
		A1	A2	B	C
Number of farms	item	17	8	34	41
Average area of arable lands	[ha]	15.53	3.07	8.22	14.80
– including: agricultural land		10.11	0.85	3.91	4.68
– permanent grasslands		5.42	0.19	4.05	9.29
– orchards and plantations		0.00	2.03	0.26	0.83

Source: author's own study

The biggest area of arable land occurs in single-production field farms and is at the average of 15.55 ha. Only a little bit less, i.e. 14.80 ha of arable land is owned by double-production farms. The smallest area of arable land was reported in the above-mentioned single-production fruit farms at the average of 3.07 ha.

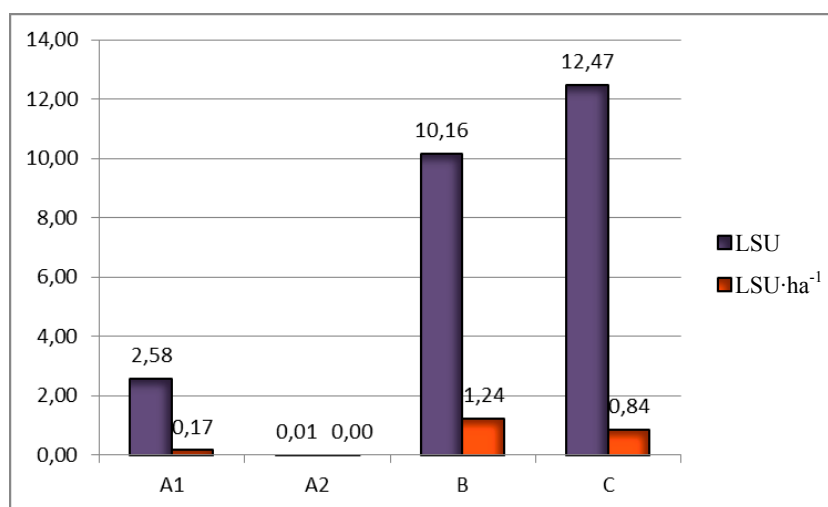
Agricultural land occurred in all groups of the researched facilities. Groups A1 covered 10.11 ha, i.e. 65% of the total agricultural land in facilities. The smallest area was reported in single-production fruit farms, where it accounted for 0.85 ha. While, the highest area of permanent grassland was characteristic for double-production farms, where it was 9.29 ha, which constituted 63% of AL area.

### Animal production

In ecological farms we may notice a self-sufficient system, which functions on the basis of a principle of mutual completion of plants and animals which stay in a farm. Animals are fed with plant fodder produced in a farm and plants are fertilized mainly with natural fertilizers which constitute a side product of animal production.

Figure 1 presents livestock in calculation units. The livestock is considerably varied. In field plants production and horticultural production we notice that it is marginal. While,

in single-production animal farms and double-production farms it increases significantly. The highest number of livestock is in double-production farms 12.47 LSU. While 10.16 LSU is in single-production animal farms. Referring the value of indexes to 1 ha of arable land an admissible level of unit indexes is noticed. Average livestock in animal farms is 1.24 LSU·ha<sup>-1</sup>, while 0.84 LSU·ha<sup>-1</sup> in double-production farms.



Source: author's own research

Fig. 1. Livestock expressed in livestock units  
Rys. 1. Obsada inwentarza żywego w jednostkach przeliczeniowych

### The size of production in organic farms

As a result of the research which was carried out, data defining the size of global and commodity production were obtained. Their average values for assumed groups per a statistical farm and per 1 ha of AL were presented in table 2.

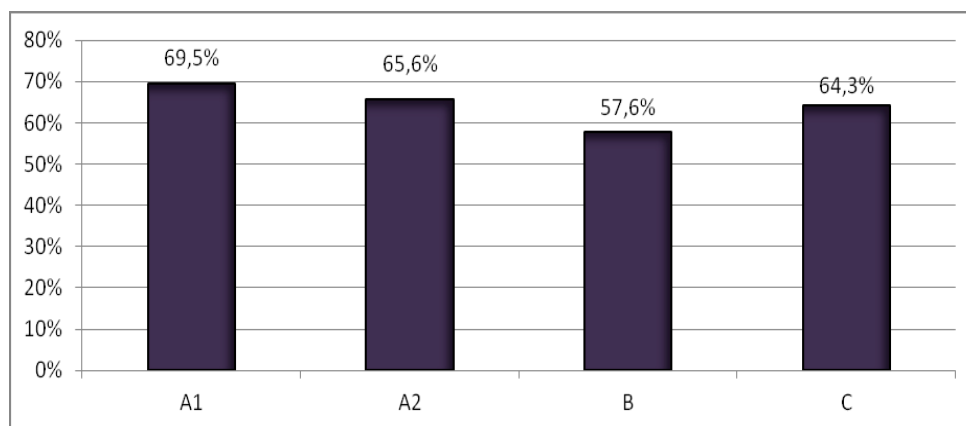
The presented data show that the highest global production occurs in single-production plant farms – 599.2 GU and in double-production farms where it amounts to 676.3 GU. The size of production is high and amounts to 459.9 GU in plant production farms. Per one ha of AL it respectively gives 38.6 GU·ha<sup>-1</sup> in case of field plants production farms, 38.9 GU<sup>-1</sup> in case of double-production farms and 60.3 GU·ha<sup>-1</sup> in case of animal production farms. In the last case the size of global production is therefore almost two times higher than in previous two farm groups. However, commodity production is more significant for the results of farms production activity.

Table 2. The size of global and commodity production of organic farms

Tabela 2. Wielkość produkcji globalnej i towarowej gospodarstw ekologicznych

Specification	Unit	Group			
		Single-production			Double-production
		plant production		animal production	
		field	fruit		
A1	A2	B	C		
Global production	[GU]	599.2	182.8	495.9	576.3
	[GU·ha <sup>-1</sup> ]	38.6	59.5	60.3	38.9
Commodity production	[GU]	416.5	120.0	285.9	370.3
	[GU·ha <sup>-1</sup> ]	26.8	39.1	34.8	25.0

Source: author's own study



Source: author's own study

Fig. 2. Marketability in the researched farms [%]

Rys. 2. Towarowość w badanych gospodarstwach [%]

The highest level of commodity production was obtained in single-production field plants farms, i.e. 416.5 GU and in double-production farms, i.e. 370.3 GU. Number of grain units obtained from a hectare is there at a similar level and amounts to respectively 26.8 and 25.0 GU·ha<sup>-1</sup>. It is especially high in horticultural production farms, where it amounts to 39.1 GU·ha<sup>-1</sup>. While, it is the least advantageous in double-production farms where is amounts to 25.0 GU·ha<sup>-1</sup>.

Marketability of agricultural production is a relation of the amount of commodity production (intended for sale) of a farm to the amount of global production expressed with %. Increase in marketability of production may be reached inter alia by specialization and production intensification. As we see in figure 2, the highest marketability occurs in plant production farms, respectively 69.5% (field) and 65.6% (horticultural). It results from the

fact that the obtained products are aimed for sale in majority. While, the lowest index was reported in single-production animal farms - 57.6%. This index confirms the fact of transferring majority of plant production for fodder in animal production.

### Equipment of the researched farms with tractors

Equipment of the researched farms with tractors in the system of their groups, on account of production orientation was presented in table 3. Tractors have a basic meaning for every farm since they constitute a source of mechanical tractive force [Kuboń et al. 2011]. The highest number of tractors was in single-production horticultural farms – 1.50 item, while a bit lower – 1.34 item in double-production farms. 0.9 class and lower tractors occurred most frequently in single-production horticultural farms and it was 0.75 item. While, 0.9 class tractors occurred most frequently in field production farms (0.59 item) and double-production farms (0.51 item). Tractors of the highest tractive force in single-production horticultural farms (0.50 item) and in double-production farms (0.54 item).

Table 3. Equipment of farms with agricultural machines [item]

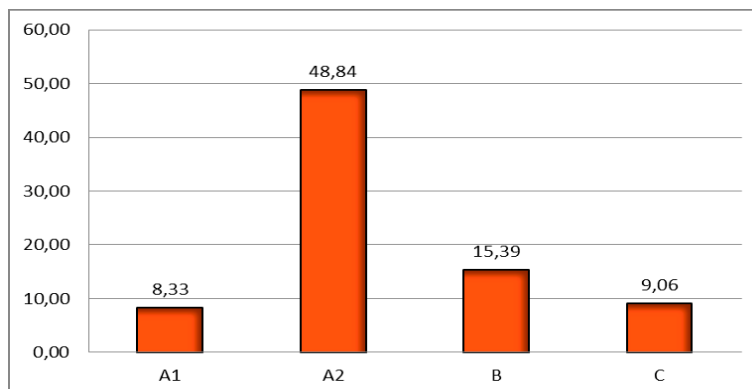
Tabela 3. Wyposażenie gospodarstw w ciągniki rolnicze [szt.]

Specification	Unit	Group			
		Single-production			Double-production
		plant production		animal production	
		field	fruit		B
Equipment with farm tractors	[item]	1.29	1.50	1.26	1.34
including classes: up to 9 kN	[item]	0.29	0.75	0.50	0.29
9 kN	[item]	0.59	0.25	0.44	0.51
above 9 kN	[item]	0.41	0.50	0.32	0.54

Source: author's own study

Figure 3 presents how the number of tractors per 100 ha in particular farm groups is varied. The highest number of mechanical tractive force occurs in horticultural production farms and is  $48.84 \text{ item} \cdot 100\text{ha}^{-1}$ . In the remaining farms this number is between  $8.33$  and  $15.39 \text{ item} \cdot 100 \text{ ha}^{-1}$ . Farms of horticultural production vary considerably with the number of tractors per 100 ha. This state forces to carry out a considerable number of tasks in a relatively short agrotechnical periods of time and at a relatively low labour capacity, especially concerning mechanical care and fruit harvesting.

When analysing power distribution, both in a general view as well as in unitary view (table 4) it becomes more notable that the highest power installed in tractors, per one farm was characteristic for single-production facilities (76.2 kW). Relation between the number of the installed kW and area of farms is presented in the second part of table 4, which presents the power index per one hectare of AL. The highest index was reached by single-production fruit farms and it reached  $19.8 \text{ kW} \cdot \text{ha}^{-1}$ . The remaining farms are indexed at a comparable level amounting to  $3.8$  to  $5.9 \text{ kW} \cdot \text{ha}^{-1}$ . These indexes are similar to those presented in figure 3.



Source: author's own study

Fig. 3. Equipment of farms with tractors [item·100 ha<sup>-1</sup>]

Rys. 3. Wyposażenie gospodarstw w ciągniki rolnicze [szt. ·100 ha<sup>-1</sup>]

#### Power installed in tractors

Table 4. Power installed in tractors

Tabela 4. Moc zainstalowana w ciągnikach

Specification	Unit	Group			
		Single-production			Double-production
		plant production		animal production	
		field	fruit		
	A1	A2	B	C	
Power installed	[kW]	59.3	60.7	48.8	76.2
	[kW·ha <sup>-1</sup> ]	3.8	19.8	5.9	5.1

Source: author's own study

#### Conclusions

1. Field plants production farms and fruit production farms obtained the highest commodity production amounting to 67.5%. It results from the fact that majority of products is aimed for sale while single-production animal farms move the produced goods for the animal production needs, therefore index in these farms is lower and it is 57.60%.
2. Fruit production farms have the highest number of tractors per 100 ha of AL – 48.84 items. Such equipment may result from requirements of the work input in these type of farms, which are related to harvesting, care and fertilization.
3. The highest unit power occurs in fruit production farms and amounts to 19.80 kW·ha<sup>-1</sup>. Farms due to high production may afford such high equipment with tractors.

4. Double production farms had the highest power installed in tractors (76.2 kW). Works carried out in these types of farms require better tractors of higher towing power since works in this type of farms are varied because of varied production.

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## PRODUKCYJNOŚĆ I TOWAROWOŚĆ A WYPOSAŻENIE TECHNICZNE GOSPODARSTW EKOLOGICZNYCH

**Streszczenie.** Celem pracy było określenie wielkości wytwarzanej produkcji globalnej i towarowej oraz analiza wyposażenia w mechaniczną siłę pociągową. Zakresem badań objęto gospodarstwa w 100 gospodarstwach ekologicznych, położonych w województwach: małopolskim, podkarpackim, śląskim i świętokrzyskim. Badane gospodarstwa podzielono na 4 grupy jednorodne. Kryterium podziału stanowił kierunek produkcji, określony w oparciu o powszechnie stosowaną metodykę szacunku nadwyżki bezpośredniej. Wyszczególniono: gospodarstwa jednobiegunowe o kierunku produkcja roślinna polowa, gospodarstwa jednobiegunowe o kierunku produkcja roślinna sadownicza, gospodarstwa jednobiegunowe o kierunku produkcja zwierzęca i gospodarstwa dwubiegunowe. Do zebrania materiału badawczego wykorzystano metodę wywiadu kierowanego. Gospodarstwa o kierunku produkcji roślinnej polowej oraz sadowniczej osiągnęły najwyższą towarowość, wynoszącą średnio 67,5%. Największą liczbę ciągników przypadającą na 100 ha UR cechują się gospodarstwa sadownicze – 48,84 szt. Przyczyną tak wysokiego wyposażenia mogą tu być wymagania co do nakładów pracy w tego typu gospodarstwach, w których źródłem są zbiór, pielęgnacja oraz nawożenie plantacji. Dlatego także najwyższa moc jednostkowa występuje w gospodarstwach o kierunku sadowniczym  $19,80 \text{ kW}\cdot\text{ha}^{-1}$ . Gospodarstwa te z racji wysokiej produkcji mogą sobie pozwolić na tak duże wyposażenie w ciągniki rolnicze.

**Słowa kluczowe:** produktywność, gospodarstwo ekologiczne, wyposażenie techniczne

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