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REPLACEMENT VALUE OF FARM BUILDINGS AND COSTS OF THEIR OPERATION IN ORGANIC FARMS¹

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ABSTRACT

A rising trend in the number of production buildings, mainly livestock buildings, which were given for use in farming, has been at the same level for several years. The paper presents the level and structure of equipment of the selected organic farms with farm buildings and their replacement value and operating costs were calculated. The scope of research included 50 facilities located in the southern Poland, which were granted an organic farm certificate. The investigated facilities were the object of research within the development subsidy titled "Innovative influence of technology and information management supporting system on production efficiency in organic farms". The analysed data concerned 2012. For the purpose of comparative analysis the researched facilities were divided into two groups which specialize in plant and animal production. Average area of buildings was 314.45 m² and was comparable in distinguished trend groups. In farms producing plants, storehouses prevailed and in case of animal farms – livestock buildings. Average annual replacement value of buildings was PLN 105.78 thousand and was also comparable in trend groups. In the structure of replacement value, storehouses prevailed, which constituted at the average 43.03% and livestock buildings – 37.68%. Average annual operating costs of buildings were PLN 58.61 thousand. The fact that these costs in animal farms were 2 times higher than in plant farms, should be emphasised. Renovation materials and ordered repairs constituted the highest costs.

Introduction

Organic farming is a farming system which is based on a possibly sustained plant and animal production within a farm. For protection of efficient course of production processes, these farms must have buildings and livestock and storehouse buildings, which are adjusted to the size and type of production and stored material (Tabor and Malaga-Toboła, 2004; Tabor and Kuboń, 2004; Kuboń, 2006; Golka and Wójcicki, 2010). Dynamic development

¹

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of organic farms and necessity of being competitive somehow forces the necessity of investing in new technologies, including new production buildings (Szeptycki, 2005; Loren-cowicz and Włodarczyk, 2009; Kocira et al., 2010).

Objective, scope and methodology of work

The objective of paper was to determine the quantity state and structure of equipment of the selected organic farms with farm buildings. Their area, replacement value and operating costs were calculated.

Research in the form of guided survey with a farm owner, who had a certificate of an organic farm, was carried out in 50 facilities located in the region of south Poland. The researched farms participated in a 3-year research project executed by the Institute of Agricultural Engineering and Informatics in Kraków as a part of development subsidy no NR 12-0165-10 "Innovative influence of technology and information management supporting system on production efficiency in organic farms". Data for analysis were accepted for 2012.

Replacement value of farm buildings, including garages and storehouses was calculated using a unit cost of construction of a building:

$$W_{ob} = f_b \cdot k_{jb} \quad (1)$$

where:

- W_{ob} – replacement value of buildings (PLN),
- f_b – surface area of a building (m^2),
- k_{jb} – unit current construction cost of a building ($PLN \cdot m^{-2}$) (GUS, 2012).

Operating costs of farm buildings were calculated as a sum of fixed and variable costs.

$$K_s = Amr + U + P \quad (2)$$

where:

- K_s – fixed costs (PLN),
- Amr – annual amortization ($PLN \cdot year^{-1}$),
- U – insurance of a building (PLN),
- P – tax (PLN).

Amortization of buildings was calculated according to the formula:

$$Amr = \frac{W_{ob}}{t} \quad (3)$$

where:

- Amr – annual amortization ($PLN \cdot year^{-1}$),
- W_{ob} – replacement value of a building (PLN),
- t – amortization period (years).

Amortization period of buildings was determined based on the GUS index.

Replacement value of farm...

Insurance was accepted based on information given by a farm owner. Variable costs were assumed acc. to data obtained from a farmer/farm owner as a sum of renovation costs and costs of electric energy consumption.

$$Kz = Kr + Ke \quad (4)$$

where:

- Kz – variable costs (PLN),
- Kr – renovation costs (inter alia material for repairs, costs of ordered and own works, paintings of rooms, spackling, plaster renovation) (PLN),
- Ke – electric energy consumption costs (PLN).

Description of the researched farms

Average area of agricultural land in the researched farms was 12.92 ha (table 1). Area of arable land (5.58 ha) was comparable to the acreage of meadows (5.18 ha), which resulted in a situation that after adding new pastures to them, grasslands prevailed in the structure of use constituting 53.02%. Farms which were emphasised, with regard to the production trend, differed. Area of agricultural land in facilities which specialized with animal production was 1.6 times higher than in the group of plant farms. Moreover, in farms maintaining animals, participation of grasslands was 69.08% whereas in the comparative group – it was only 24.82%.

Table 1
Area and structure of agricultural land

Specification	Production trend				Average	
	Plant production		Animal production			
Number of farms	24		26			
	(ha)	(%)	(ha)	(%)	(ha)	(%)
Arable land	6.62	67.62	4.62	29.20	5.58	43.18
Meadows	1.91	19.51	8.20	51.84	5.18	40.12
Pastures	0.52	5.31	2.73	17.24	1.67	12.90
Orchards (ha)	0.67	6.84	0.25	1.59	0.45	3.50
Perennial plantations (ha)	0.07	0.72	0.02	0.13	0.04	0.31
Agricultural land (had)	9.79	100.00	15.82	100.00	12.92	100.00

In the structure of crops the highest differences concerned fodder plants and vegetables because in plant farms they constituted respectively: 31.87% and 14.35% whereas in facilities which deal with animal production: 62.85% and 3.39% (table 2).

Table 2
Area and structure of crops

Specification	Production trend				Average	
	Plant production		Animal production		(ha)	(%)
	(ha)	(%)	(ha)	(%)		
Grains	2.92	44.11	1.33	28.85	2.10	37.63
Root crops	0.27	4.08	0.23	4.91	0.25	4.48
Fodder crops	2.11	31.87	2.90	62.85	2.52	45.16
Vegetables	0.95	14.35	0.16	3.39	0.54	9.68
Herbs	0.37	5.59	0.00	0.00	0.17	3.05

Average number of headage was 8.81 LSU (livestock unit) whereas livestock – 0.63 LSU·ha⁻¹ (table 3). Cattle prevailed in the flock structure and constituted at the average 90% of headage. Plant farms maintained at the average only 2.54 LSU and farms which specialize in animal production almost 6 times more i.e. 14.60 LSU. Thus, livestock was respectively: 0.24 and 0.99 LSU·ha⁻¹.

Table 3
Number and livestock

Specification	Production trend				Average	
	Plant production		Animal production		(LSU·farm ⁻¹)	(LSU·ha ⁻¹)
	(LSU·farm ⁻¹)	(LSU·ha ⁻¹)	(LSU·farm ⁻¹)	(LSU·ha ⁻¹)		
Horses	1.25	0.09	0.14	0.04	0.67	0.06
Cattle	1.18	0.12	14.29	0.90	8.00	0.53
Pigs	–	–	0.09	0.03	0.05	0.02
Poultry and others	0.11	0.03	0.08	0.02	0.10	0.02
Total	2.54	0.24	14.60	0.99	8.81	0.63

Research results

Capital, composed of circulating assets and fixed assets, including inter alia buildings and structures, is one of production factors in farming. Intensity of scientific and technical progress and implementation of new technologies in agricultural production, related herewith, induce thus to balancing construction resources and determination of degree of their use (Mulica and Hutnik, 2007; Malaga-Toboła, 2009).

Area of farm buildings in the investigated facilities was at the average 314.45 m² (table 4). This area in distinguished groups on account of production trend was comparable and in

farm specializing in plant production was 321.79 m², and in animal production – 307.38 m². Storehouses, the participation of which was at the average of 45.10% and livestock buildings - 30.70% constituted the highest area. These results confirm earlier, obtained by many authors (Kowalski and Tabor, 2003; Kuboń, 2008b, 2011; Kuboń and Tabor, 2010; Malaga-Toboła, 2011) according to which in a great number of farms, both the possessed storehouses and livestock buildings potential, exceeds present demand both for storing and the quantity of livestock. Whereas, their low use causes the increase of production costs. Wasilewski (2004) emphasises that it influences particularly in case of storehouses, since farming is a branch, which characterizes with seasonal stocks.

However, a predicted, high area variety of particular types of buildings in trend groups was not reported. It is a fact that the participation of livestock buildings, on account of area in farms which specialize in animal production was by 10% higher than in plant farms. While, participation of storehouses in plant farms was higher by 14.53% in comparison to facilities which specialize in animal production.

Table 4
Area and structure of farm buildings

Specification	Production trend				Average	
	Plant production		Animal production			
	(m ²)	(%)	(m ²)	(%)	(m ²)	(%)
Livestock buildings	82.38	25.60	110.15	35.84	96.54	30.70
Storehouses	168.42	52.34	116.23	37.81	141.81	45.10
Garages	35.00	10.88	38.46	12.51	36.76	11.69
Carpports	36.00	11.19	42.54	13.84	39.33	12.51
Buildings in total	321.79	100.00	307.38	100.00	314.45	100.00

Average replacement value of buildings with reference to a farm was PLN 105.78 thousand and to a hectare – PLN 8.63 thousand. (table 5). This index, in the first case was comparable in trend groups whereas in the second one differed considerably. Replacement value of buildings in farms, which specialize in plant production was by PLN 3.76 thousand·ha⁻¹ higher than in comparison to the second analysed trend group. It mainly followed from a higher by 52.19 m² surface area of storehouses in these facilities. This condition is correct, since the storehouses play a very significant function at storing produce, especially if these are organic products, which when stored in improper conditions lose their properties quickly.

Participation of the replacement value of storehouses in the group of farms, where plant production dominated was as much as 49.8% (figure 1). The fact that livestock buildings in animal farms, had the highest participation (43.3%) in the replacement value structure, is also correct. Replacement value of garages and carpports was comparable in the analysed trend groups and its participation was respectively at the average: 11.0 and 8.2%.

Table 5
Replacement value of farm buildings

Specification	Production trend				Average	
	Plant production		Animal production		(thousand PLN·farm ⁻¹)	(thousand PLN·ha ⁻¹)
	(thousand PLN·farm ⁻¹)	(thousand PLN·ha ⁻¹)	(thousand PLN·farm ⁻¹)	(thousand PLN·ha ⁻¹)		
Livestock buildings	34.08	3.48	46.95	3.13	39.86	3.26
Storehouses	53.53	5.46	39.57	2.64	45.52	3.70
Garages	11.47	1.17	12.32	0.82	11.68	0.95
Carports	8.30	0.85	9.47	0.63	8.72	0.71
Total	107.37	10.98	108.32	7.22	105.78	8.63

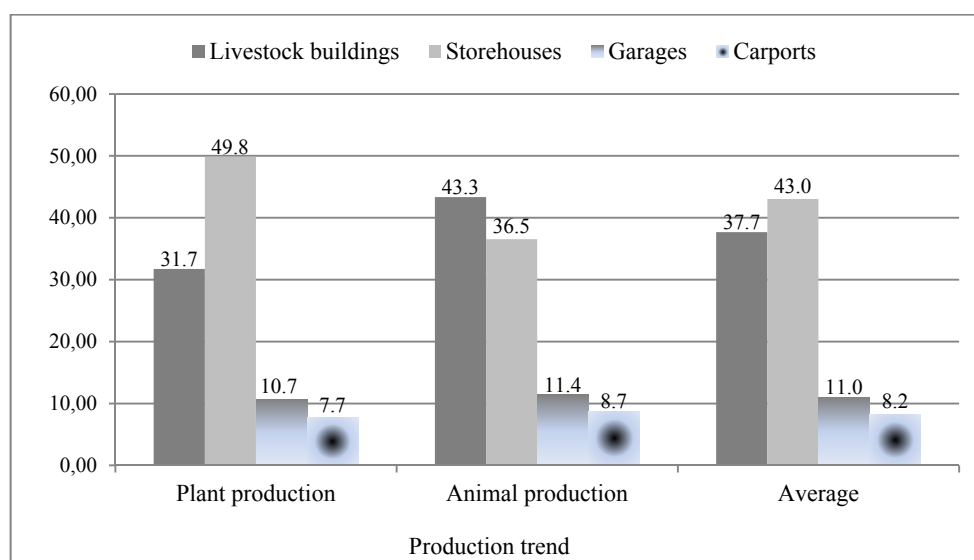


Figure 1. *Structure of the replacement value of farm buildings*

Total operating costs of buildings were PLN 58.61 thousand. (table 6). Average 67% of their value was per an animal farm (figure 2).

Table 6
Operating costs of farm buildings (thousand PLN·farm⁻¹)

Specification	Amortization	Insurance	Insur- ance	Raw mate- rials for repairs	Ordered repairs	Own work	Total costs
Plant production							
Livestock buildings	0.70	0.30	0.70	4.10	7.50	0.06	13.36
Storehouses	0.70	0.20	0.30	1.90	2.00	0.07	5.17
Garages	0.23	0.05	0.20	–	–	–	0.48
Carports	0.25	0.03	0.10	–	–	–	0.38
Buildings in total	1.88	0.59	1.29	6.00	9.50	0.12	19.38
Animal production							
Livestock buildings	0.94	0.26	1.87	11.35	7.50	0.08	21.99
Storehouses	0.53	2.29	0.92	5.03	5.00	0.07	13.83
Garages	0.25	0.09	0.40	1.60	0.50	0.02	2.86
Carports	0.27	0.16	0.12	–	–	–	0.54
Buildings in total	1.98	2.79	3.32	17.97	13.00	0.17	39.23
Total							
Livestock buildings	1.64	0.56	2.57	15.45	15.00	0.13	35.35
Storehouses	1.23	2.49	1.22	6.93	7.00	0.14	19.00
Garages	0.48	0.14	0.60	1.60	0.50	0.02	3.34
Carports	0.52	0.19	0.21	–	–	–	0.92
Buildings in total	3.86	3.38	4.61	23.97	22.50	0.29	58.61

From among the components of costs, only amortization was comparable in the investigated trend farms and its participation was 51.4% and 48.6%, respectively for facilities which specialized in animal and plant production. The remaining components of operating costs were decisively higher in farms, which maintained livestock animals and the scope of their participation was from 82.7% in case of insurance to 57.7% in case of ordered repairs and own work related to inter alia with painting rooms, spackling (fig. 2).

Repair materials (40.9%) and ordered repairs (38.4%) constituted the highest participation in total operating costs of buildings (figure 3). Many farmers, being aware of competitiveness, invest in farm development, in big part in modernization of livestock buildings, storehouses and garages. Thus, materials used for renovations of livestock buildings constituted 43.7% of storehouses – 36.4% and garages – 47.9% (fig. 3). Whereas, costs of ordered repairs were respectively: 42.4; 36.8 and 15.0%.

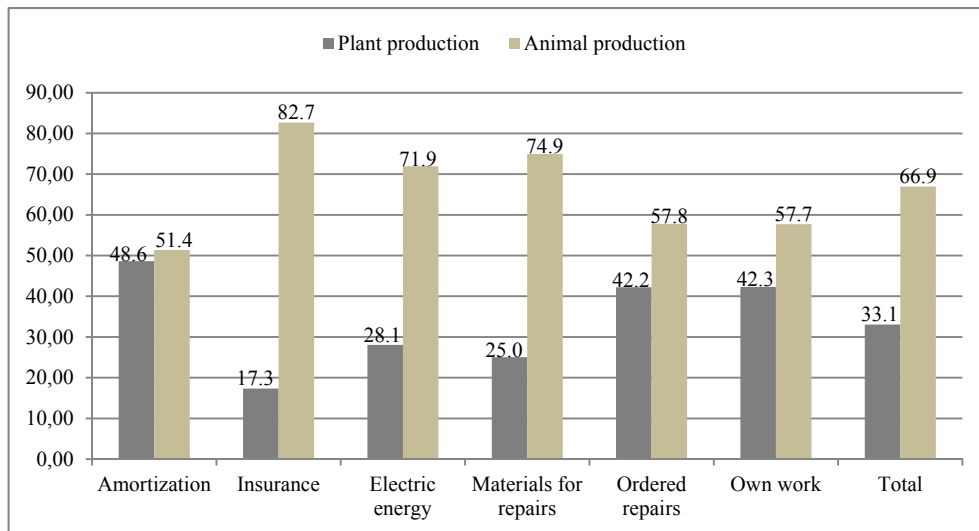


Figure 2. Structure of operating costs of buildings in trend groups

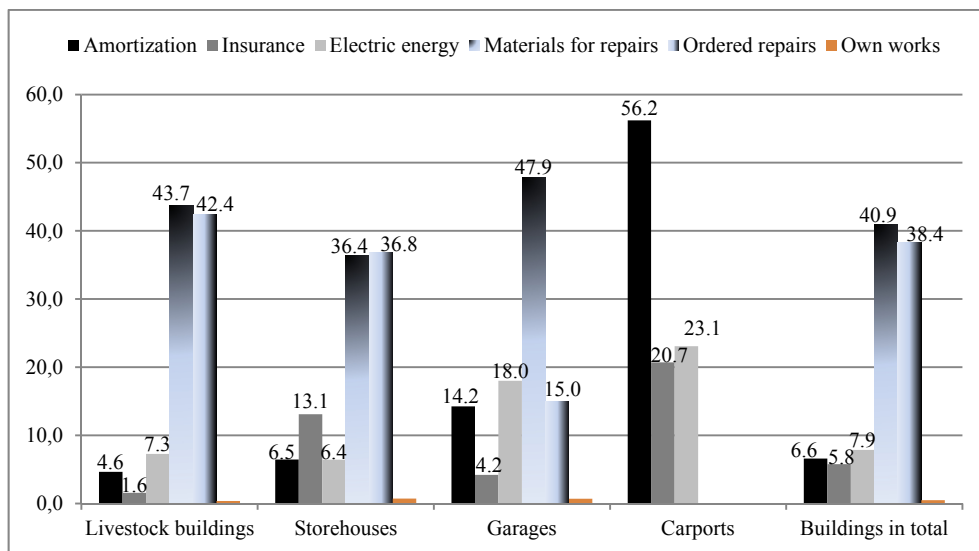


Figure 3. Structure of operating costs of buildings depending on their type

Participation of the remaining composing costs did not exceed 10%. Only, operating costs of carports shaped differently because only their 3 components occurred, that is: amortization, insurance and electric energy.

Costs of electric energy consumption compose the operating costs of buildings. Research shows that the sector of construction is responsible for over 40% of energy consumption in the European Union and livestock buildings are characterized with one of the highest indexes of energy consumption (Myczko et al., 2003). Thus, with regard to energy aspects, specialists suggest designing livestock buildings.

Conclusion

Average area of farm buildings in the investigated facilities was 314.45 m² and was comparable in the distinguished trend groups. In plant farms, storehouses occupied the biggest area and in case of animal farms - livestock buildings.

Average replacement value of buildings was PLN 105.78 thousand and with reference to a farm, it was also comparable in trend groups. Whereas, per an area unit of agricultural land, this value was considerably higher in facilities which specialized in plant production. In the structure of replacement value storehouses and livestock buildings prevailed, which constituted at the average 43.03% and 37.68%.

Facilities which maintained livestock animals incurred decisively higher operating costs of buildings. Participation of their particular components was within 51% to 83%. Average operating costs of buildings were 58.61 thousand PLN·farm⁻¹, whereas with reference to a hectare of AL – PLN 4.54 thousand. The fact that these costs in livestock animal farms were 2 times higher than in plant farms, should be emphasised (PLN 39.23 thousand) than in plant farms (PLN 19.38 thousand). Renovation materials and ordered works constituted the highest costs.

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WARTOŚĆ ODTWORZENIOWA BUDYNKÓW GOSPODARSKICH I KOSZTY ICH EKSPLOATACJI W GOSPODARSTWACH EKOLOGICZNYCH

Streszczenie. Od kilku lat utrzymuje się tendencja wzrostowa w ilości oddawanych do użytku budynków produkcyjnych w rolnictwie, głównie obiektów inwentarskich. W pracy określono poziom i strukturę wyposażenia wybranych gospodarstw ekologicznych w budynki gospodarskie oraz obliczono ich wartość odtworzeniową i koszty eksploatacji. Zakresem badań objęto 50 obiektów położonych w rejonie Polski południowej, posiadających certyfikat gospodarstwa ekologicznego. Badane obiekty były przedmiotem badań w granie rozwojowym pt. „Innowacyjne oddziaływanie techniki i technologii oraz informatycznego wspomaganie zarządzania na efektywność produkcji w gospodarstwach ekologicznych”. Analizowane dane dotyczyły roku 2012. W celu analizy porównawczej badane obiekty podzielono na dwie grupy: specjalizujące się w produkcji roślinnej i zwierzęcej. Średnia powierzchnia budynków wynosiła 314,45m² i była porównywalna w wyróżnionych grupach kierunkowych. W gospodarstwach ukierunkowanych na produkcję roślinną przeważały magazyny, a w przypadku gospodarstw utrzymujących zwierzęta – budynki inwentarskie. Średnia roczna wartość odtworzeniowa budynków wynosiła 105,78 tys. PLN i również była porównywalna w grupach kierunkowych. W strukturze wartości odtworzeniowej przeważały magazyny, które średnio stanowiły 43,03%, a 37,68% budynki inwentarskie. Średnie roczne koszty eksploatacji budynków wynosiły 58,61 tys. PLN. Na uwagę zasługuje fakt, że koszty te w gospodarstwach utrzymujących zwierzęta były 2-krotnie wyższe, niż w obiektach z produkcją roślinną. Największe koszty stanowiły materiały remontowe oraz naprawy zlecane.

Słowa kluczowe: gospodarstwa ekologiczne, budynki gospodarskie, wartość odtworzeniowa, koszty eksploatacji