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ORGANIC FARMING COMPARED TO OTHER PACKAGES OF AGRO-ENVIRONMENTAL PROGRAMME PROW 2007-2013 IN NORTH-EASTERN POLAND

Summary

The survey was performed with the method of direct interviewing in the years 2009-2014 in 160 randomly selected both organic and conventional farms participating in the agro-environmental programme PROW 2007-2013. The farms were situated in Czarnkowo-Trzciana, Piła and Złotów counties of Wielkopolska Province and in Wałcz County of Zachodniopomorskie Province. Farm size, the structure of agricultural lands, crop structure in arable lands and the area of orchards were determined based on performed interviews. The number of agro-environmental packages realised in farms and the amount of financial support obtained by this way were analysed. There were markedly more farms realising organic farming package. Organic farms had the area of agricultural lands similar to that in conventional farms. Permanent grasslands had a significant share in the structure of agricultural lands of farms in both production systems. The share of permanent grasslands increased with the area of agricultural lands and reached 50% in the largest organic farms. Remarkable differences were found in the crop structure of arable lands. Fodder crops and orchards dominated in organic farms and cereals – in conventional farms. Oil and tuber crops were important in the largest conventional farms. Analysis of the number of realised agro-environmental programmes did not show quantitative differences but revealed clear qualitative variability. In organic farms, the organic farming package was accompanied by “biological” packages like grassland management and preserving endangered genetic resources of plants in agriculture while in conventional farms – sustainable agriculture and soil and water protection with substantial contribution of “biological” packages associated with grassland management. Performed studies showed a higher interest in the organic farming package among farmers participating in agro-environmental programme and a greater support obtained through realisation of the programme within this package.

Key words: *farming systems, organic farming, agro-environmental programme, subsidising agriculture*

ROLNICTWO EKOLOGICZNE NA TLE INNYCH PAKIETÓW PROGRAMU ROLNOŚRODOWISKOWEGO PROW 2007-2013 W PÓŁNOCNO-ZACHODNIEJ POLSCE

Streszczenie

Badania ankietowe metodą wywiadu bezpośredniego przeprowadzono w latach 2009-2014 w wylosowanych 160 gospodarstwach rolnych, uczestniczących w programie rolnośrodowiskowym w ramach PROW 2007-2013, prowadzących gospodarstwa zarówno w ekologicznym oraz konwencjonalnym systemie produkcji. Wylosowane gospodarstwa zlokalizowane były na terenie powiatu czarnkowsko-trzcianeckiego, pilskiego i złotowskiego w województwie wielkopolskim oraz powiatu wałecznego w województwie zachodniopomorskim. Na podstawie przeprowadzonego wywiadu określono wielkość gospodarstw, strukturę użytków rolnych, strukturę zasiewów na gruntach ornych oraz powierzchnię sadów. Przedmiotem analizy była również liczba realizowanych w gospodarstwach rolnych pakietów rolnośrodowiskowych oraz wysokość uzyskiwanego z tytułu ich realizacji wsparcia finansowego. Stwierdzono wyraźnie większy udział gospodarstw realizujących pakiet rolnictwo ekologiczne. Gospodarstwa ekologiczne dysponowały zbliżoną powierzchnią użytków rolnych w porównaniu z gospodarstwami konwencjonalnymi. W strukturze użytków rolnych gospodarstw obu systemów produkcji znaczący udział miały TUZ-y, których udział wzrastał wraz ze wzrostem powierzchni UR, osiągając w grupie największych gospodarstw ekologicznych poziom zbliżony do 50%. Stwierdzono również znaczne różnice w strukturze upraw na gruntach ornych. W gospodarstwach ekologicznych dominowały uprawy paszowe i sadownicze a w konwencjonalnych zboża. W grupie największych gospodarstw konwencjonalnych duże znaczenie miała uprawa oleistych i okopowych. Analiza ilości realizowanych pakietów programu rolnośrodowiskowego nie wykazała wyraźnych różnic w sensie ich ilości, jednak widać wyraźne zróżnicowanie co do ich rodzaju. W gospodarstwach ekologicznych z pakietem rolnictwo ekologiczne, występowały pakiety „przyrodnicze” związane z gospodarką łąkarską oraz pakiet zachowanie zagrożonych zasobów genetycznych roślin w rolnictwie, podczas gdy w gospodarstwach konwencjonalnych: rolnictwo zrównoważone i ochrona gleb i wód ze znaczącym udziałem pakietów „przyrodniczych” związanych z gospodarką łąkarską. Przeprowadzone badania wykazały większe zainteresowanie pakietem rolnictwo ekologiczne wśród rolników uczestniczących w programie rolnośrodowiskowym oraz większą wysokość wsparcia uzyskiwanego z tytułu realizacji programu w tym pakiecie.

Słowa kluczowe: *systemy gospodarowania, rolnictwo ekologiczne, program rolnośrodowiskowy, subwencjonowanie rolnictwa*

1. Introduction and study aim

Organic farming system supplies goods to a specific market shaped by the demand for ecological products and at the same time it facilitates environmental protection, animal welfare and the development of rural areas [Rozporządzenie WE 2007]. Renewable resources are the basis for functioning of this system. Organic plant production maintains a high degree of biodiversity, protects natural resources, maintains and increases soil fertility and counteracts its erosion [Tyburski 2007; Tyburski, Żakowska-Biemans 2007; Tyburski et al. 2008]. Basic elements of organic plant production are: management of soil fertility, selection of plant species and varieties, long crop rotation, recycling of organic matter and appropriate cultivation techniques [Tyburski 2007; Tyburski, Żakowska-Biemans 2007]. Animal production is important in this systems since it provides organic matter and nutrients thus improving soil status and contributing to sustainable development of agriculture [Rozporządzenie WE 2007; Tyburski 2007]. Organic farming in the European Union shows permanent dynamic development [Jończyk 2014; Kuś 2010; Szymona 2012]. Similarly, an increasing interest in organic farming and dynamic increase of the number of organic farms has been observed since Polish access to the EU [Niewiadomski 2007; Stalenga, Kuś 2007; Kowalska 2010; GIJHAR-S 2011] and supporting this system by subsidies that substantially improve economic effects [Jankowska-Huflejt, Prokopowicz 2011]. Organic farming in Poland is subsidised through agro-environmental programme PROW 2007-2013, in which organic farming is one of nine packages. Possible combination of selected packages of agro-environmental programme within a farm increases financial attractiveness of participation [Rozporządzenie 2009].

The aim of this study was to compare and assess the specific character of management in organic farms realising the organic farming package in combination with other package and to compare the effect with conventional farms participating in the agro-environmental programme PROW 2007-2013.

2. Study methods

Survey studies with the direct interview method were performed in the years 2009-2014 in 160 randomly selected farms (both organic, according to Rozporządzenie 2007,

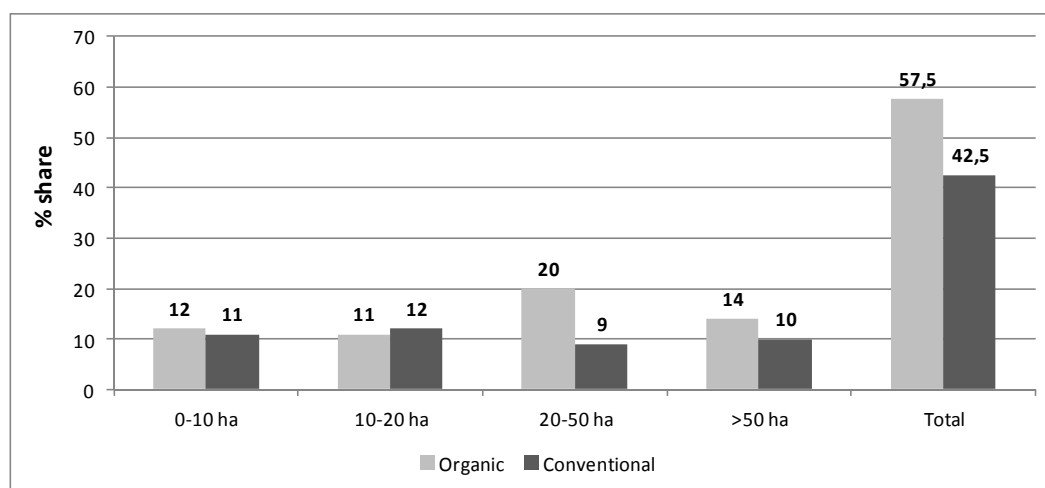
and conventional) participating in the agro-environmental programme PROW 2007-2013. The farms were situated in Czarnków, Trzcianka, Piła and Złotów counties of Wielkopolska Province and in Wałcz county of Zachodniopomorskie Province. All counties form a compact geographic area of similar geological and natural conditions [Ratajczak-Szczerba 2011, Ratajczak-Szczerba 2013]. Based on performed survey, the farms were divided according to management system, size, the structure of agricultural lands, crop structure in arable lands with the distinction of cereal, oil, tuber, fodder, vegetable and orchard crops. Farms were also analysed for the number of agro-environmental packages and the amount of resulting financial support.

Due to a great variability of size and crop structure in selected farms, following the method used by many authors [Kuś et al. 2013; Barszczewski et al. 2007; Jankowska-Huflejt et al. 2011; Golinowska 2013; Grabowski et al. 2014], we distinguished 4 size groups: I group – farms up to 10 ha, II group – 10.01-20.00 ha, III group – 20.01-50.00 ha and IV group – farms larger than 50 ha agricultural lands. There was significantly different number (from 14 to 32 farms) of farms in both managements systems within particular size group. There were 92 organic farms and 68 conventional farms in total. For further studies on land and crop structure and on the amount of subsidies, 10 farms from each size group and management system were randomly selected.

3. Results and discussion

Randomly selected 160 farms of both production systems were divided into size groups as shown in fig. 1.

The group of farms smaller than 10 ha included 19 organic and 18 conventional farms (12 and 11% of all, respectively). In the group of farms between 10.01 and 20.00 ha of agricultural lands there were 18 organic and 19 conventional farms. Significantly more organic (32 or 20%) than conventional farms (14 or 9%) were noted in the group 20.01-50.00 ha. Similar trend was found in the size group >50 ha, which included 23 (14%) organic and 17 (10%) conventional farms. All groups encompassed 92 organic farms (57.5%) and 68 conventional farms (42.5%). Surface area of agricultural lands was similar in farms of both production systems among the smallest farms of up to 10 ha (tab. 1 and 2).



Source: own work / Źródło: opracowanie własne

Fig. 1. Percentage of farms with various area groups participating in the research

Table 1. The structure of agricultural land and crops and the level of subsidies implemented packages on organic farms

Group	No.	Agri-environmet package number**	Number of Agri-environmet packages	Area of agricultural land ha	Area of arable lands ha	Area of permanent grass-lands ha	Crops on arable lands, ha						Level of subsidy per 1 ha of agricultural land in PLN	
							cereals	oil plants	tuber plants	fodder plants**	vegetables	other (including orchards)		
0-10 ha	1	2	1	1,55	1,55	0	1,55	0	0	0	0	0	810	
	2	2	1	2,13	1,96	0,17	1,96	0	0	0	0	0	1 407	
	3	2	1	2,99	2,99	0	0	0	0	0	0	2,99	1 696	
	4	2	1	3,28	3,28	0	0	0	0	3,28	0	0	810	
	5	2	1	5,56	5,56	0	0	0	0	0	0	5,56	1 696	
	6	2;3;6	3	5,93	2,22	3,71	2,22	0	0	0	0	0	0	928
	7	2;3	2	7,35	5,5	1,85	0	0	0	5,5	0	0	0	804
	8	2	1	7,4	7,4	0	0	0	0	0	0	0	7,4	1 540
	9	2	1	8,18	6,58	1,6	0	0	0	6,58	0	0	0	708
	10	2;3	2	9,49	4,48	5,01	0	0	0	4,48	0	0	0	798
	x		1	5,39	4,15	1,23	0,57	0	0	1,98	0	1,6	1 069	
10,01-20 ha	1	2	1	10,78	10,78	0	0	0	0	5,76	0	5,02	1 139	
	2	2	1	12,44	12,44	0	0	0	0	12,44	0	0	810	
	3	2	1	12,71	12,71	0	0	0	0	0	0	12,71	1 696	
	4	2;3	2	13,6	0	13,6	0	0	0	0	0	0	0	755
	5	2	1	14,39	14,39	0	0	0	0	14,39	0	0	0	810
	6	2;6	2	17,28	17,28	0	17,28	0	0	0	0	0	0	1 380
	7	2	1	19,1	19,1	0	0	0	0	19,1	0	0	0	790
	8	2;3	2	19,55	8,29	11,26	0	0	0	8,29	0	0	0	789
	9	2;3	2	12,3	0	12,3	0	0	0	0	0	0	0	765
	10	2;3	2	10,06	4,99	5,07	4,99	0	0	0	0	0	0	823
	x		2	14,22	10	4,22	2,23	0	0	6	0	1,77	970	
20,01-50 ha	1	2	1	20,96	20,96	0	3	0	0	17,96	0	0	691	
	2	2	1	22,8	22,8	0	0	0	0	0	0	22,8	1 636	
	3	2;3	2	24,92	0	24,92	0	0	0	0	0	0	713	
	4	2	1	28	28	0	0	0	0	28	0	0	810	
	5	2	1	28,42	25,57	2,85	0	0	0	0	0	28,42	1 153	
	6	2;3	2	28,89	22,89	6	22,89	0	0	0	0	0	729	
	7	2	1	34,34	34,34	0	0	0	0	0	0	34,34	1 696	
	8	2;3	2	36,98	15,21	21,77	15,21	0	0	0	0	0	0	428
	9	2;4;5	3	38,73	29,75	8,98	0	0	0	29,75	0	0	0	494
	10	2	1	44,8	25,67	19,13	0	0	0	25,67	0	0	0	564
	x		1	30,88	22,52	8,37	4,11	0	0	10,14	0	8,56	857	
>50 ha	1	2;3	2	52,58	11,6	40,98	0	0	0	11,6	0	0	719	
	2	2	1	57,87	57,87	0	0	0	0	57,87	0	0	753	
	3	2	1	58,21	58,21	0	0	0	0	0	0	58,21	1 540	
	4	2;3;6	3	62,68	29,98	32,7	21,17	0	0,49	8,32	0	0	822	
	5	2;3;4;5	4	70,35	24,6	45,75	0	0	0	24,6	0	0	885	
	6	2	1	89,49	89,49	0	0	0	0	89,49	0	0	790	
	7	2;3;6	3	95,76	90,87	4,89	52,75	0	0	0	0	38,12	1 148	
	8	2;5;6	3	161,18	65,52	95,66	61,02	0	0	0	4,5	0	0	1 241
	9	2;3	2	202,36	0	202,36	0	0	0	0	0	0	401	
	10	2;5	2	284,5	183,49	101,01	151,51	0	0	23	8,98	0	0	567
	x		2	113,5	61,16	52,34	28,65	0	0,05	21,49	1,35	9,63	800	

Explanation: * 2- organic farming; 3- extensive permanent grassland; 4- protection of endangered bird species and habitats outside Natura 2000 sites; 5- protection of endangered bird species and habitats in Natura 2000 areas; 6- preservation of endangered plant genetic resources in agriculture; ** mainly grass on arable land and a mixture of grasses with legumes fine-grained

Source: own work / Źródło: opracowanie własne

All organic farms of this size group had arable lands and grew cereals, fodder plants (mainly grasses on arable lands) and orchard crops. In none of organic farms of this group, above mentioned plants were grown in parallel. Moreover, oil and tuber plants and vegetables were not cultivated there. Four out of ten studied conventional farms did not possess arable lands and

the remaining ones produced mainly cereals, tuber crops and fodder plants. Both organic and conventional type of farming was characterised by a simplified system of crop rotation or did not apply it at all. Half of analysed organic farms did not have permanent grasslands while all conventional farms had them. The amount of subsidies differed between farms of two produc-

tion systems depending on realised agro-environmental packages. On average, subsidies were larger in organic farms.

In the size group 10.01-20.00 ha, mean area of agricultural lands in organic farms was 14.2 ha being smaller by 2 ha than that in conventional farms. Two organic farms did not have arable lands, in other cereals, fodder plants and fruit trees were

grown. These crops were not grown in parallel. In conventional farms of this size group, cereals were grown in 9 farms, tuber crops in 4 and fodder plants in one farm. Farm without cereal crops kept exclusively orchards. Six organic farms and 2 conventional farms did not have permanent grasslands. Subsidies were three times larger in organic than in conventional farms.

Table 2. The structure of agricultural land and crops and the level of subsidies implemented packages in conventional farms

Group	No.	Agri-environment package number*	Number of Agri-environment packages	Area of agricultural land ha	Area of arable lands ha	Area of permanent grasslands ha	Crops on arable lands, ha						Level of subsidy per 1 ha of agricultural land in PLN
							cereals	oil plants	tuber plants	fodder plants**	vegetables	other (including orchards)	
0-10 ha	1	4	1	1,97	0	1,97	0	0	0	0	0	0	1 302
	2	3	1	3,33	0,99	2,34	0	0	0	0,99	0	0	351
	3	3	1	3,55	0	3,55	0	0	0	0	0	0	500
	4	3	1	4,09	1,2	2,89	1,2	0	0	0	0	0	353
	5	5	1	4,41	0	4,41	0	0	0	0	0	0	1 415
	6	3	1	6,47	1,4	5,07	0	0	0	1,4	0	0	164
	7	3;8	2	8,8	5,44	3,36	3,44	0	1	1	0	0	353
	8	1;3;8	3	9,72	5,87	3,85	5,48	0	0	0	0	0,39	563
	9	5	1	3,6	0	3,6	0	0	0	0	0	0	1 426
	10	1;4;8	3	8,79	5,44	3,35	3,19	0	1,25	1	0	0	818
	x		2	5,47	2,03	3,44	1,33	0	0,23	0,44	0	0,04	642
10,01-20 ha	1	3	1	17,29	15,17	2,12	0	0	0	0	0	15,17	61
	2	1;8	2	17,51	17,51	0	17,51	0	0	0	0	0	659
	3	1;3	2	18,82	13,37	5,45	12,88	0	0,49	0	0	0	510
	4	3;8	2	16,63	10,59	6,06	9,32	0	1	0	0	0,25	245
	5	3	1	15,37	8,91	6,46	6,36	0	1	0,57	0	0,98	210
	6	1;8	2	19,9	18,78	1,12	17,18	0	1,6	0	0	0	552
	7	3	1	10,52	4,68	5,84	4,68	0	0	0	0	0	278
	8	8	1	12,52	12,52	0	12,42	0	0,1	0	0	0	401
	9	3	1	15,61	12,01	3,6	12,01	0	0	0	0	0	115
	10	5	1	17,22	10,92	6,3	6,82	0	4,1	0	0	0	524
	x		1	16,14	12,45	3,7	9,92	0	0,83	0,06	0	1,64	367
20,01-50 ha	1	3	1	24,21	11,21	13	5,5	0	2,3	3,41	0	0	255
	2	3	1	28,89	22,85	6,04	22,85	0	0	0	0	0	76
	3	1;8	2	29,49	28,58	0,91	24,08	4,5	0	0	0	0	383
	4	8	1	36,72	32,71	4,01	27,99	0	3,22	1,5	0	0	117
	5	3;8	2	44,67	33,46	11,21	15,6	0	0	17,86	0	0	181
	6	5	1	46,55	14,55	32	13,49	0	0	0	0	1,06	955
	7	3;8	2	48,03	26,14	21,89	22,81	0	1	0	2,33	0	278
	8	3	1	27,94	16,16	11,78	13,06	0	0	3,1	0	0	203
	9	3;8	2	23,36	14,08	9,05	11,7	0	1,45	0,7	0	0,23	249
	10	3	1	41,26	12,28	28,88	8,44	0	0	1,86	1,88	0,1	293
	x		1	35,11	21,2	13,88	16,55	0,45	0,8	2,84	0,42	0,14	323
>50 ha	1	1;6;8	3	56,1	56,1	0	56,1	0	0	0	0	0	1 241
	2	1;8	2	62,26	58,75	3,51	43,19	15,56	0	0	0	0	537
	3	4	1	76,75	38,76	37,99	38,76	0	0	0	0	0	272
	4	1;6	2	91,41	91,41	0	26,41	36	29	0	0	0	388
	5	1;3;6;8	4	107,8	105,3	2,5	72,1	14	19,2	0	0	0	754
	6	1;8	2	127,87	126,93	0,94	81,93	33	12	0	0	0	501
	7	1;8	2	137,19	132,1	5,09	89,99	42,11	0	0	0	0	623
	8	1;8;5	3	147,17	146,33	0,84	95,33	23	28	0	0	0	437
	9	8	1	158,09	156,59	1,5	115,59	41	0	0	0	0	157
	10	1;8	2	197,18	197,18	0	161,82	35,36	0	0	0	0	497
	x		2	116,18	110,95	5,24	78,12	24	8,82	0	0	0	497

Explanation: *1- sustainable agriculture; 3- extensive permanent grassland; 4- protection of endangered bird species and habitats outside Natura 2000 sites; 5- protection of endangered bird species and habitats in Natura 2000 areas; 6- preservation of endangered plant genetic resources in agriculture; 8- soil and water protection

Source: own work / Źródło: opracowanie własne

Mean area of agricultural lands was larger by 5 ha in conventional farms compared with organic farms in the size class 20.01-50.00 ha. From among organic farms of this size group, four farms did not have permanent grasslands and one - arable lands. Cereals were grown in two organic farms, fodder plants in four, orchards in three organic farms and in one cereals together with fodder plants were cultivated. All conventional and only six organic farms had permanent grasslands. Mean area of permanent grassland was larger by about 5 ha larger in conventional than in organic farms. Cereals were grown in all conventional farms and tuber and fodder crops – in some of them. Subsidies were 2.5 times higher in organic than in conventional farms of this size group.

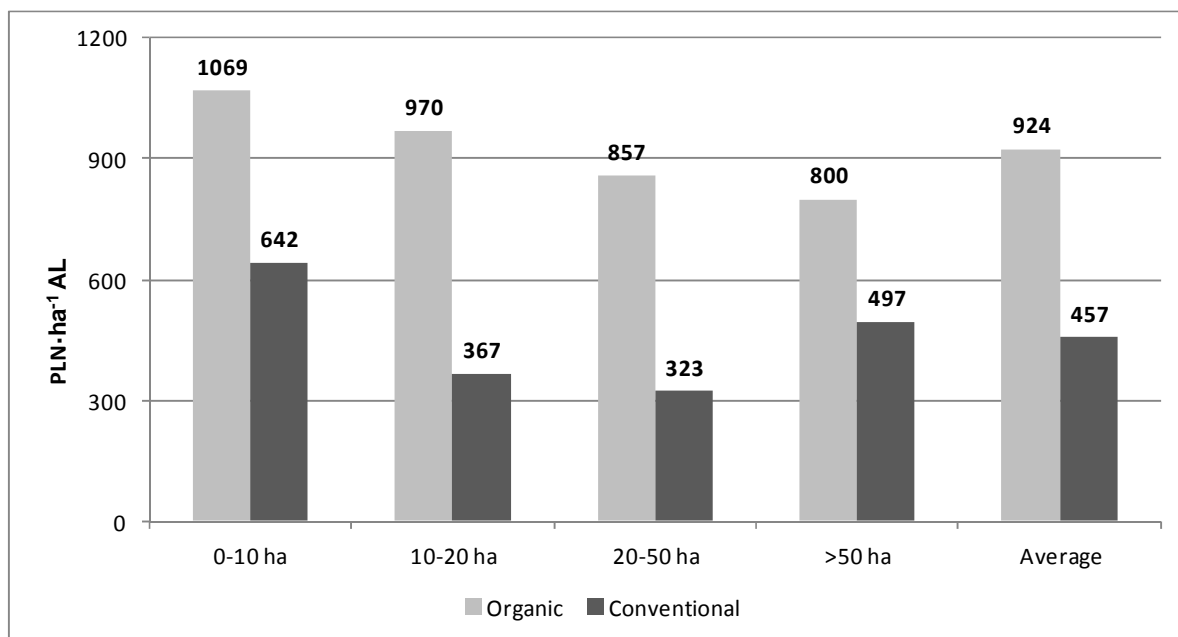
In the group of largest farms, mean farm area was similar in organic (113 ha) and conventional (116 ha) farms. Marked difference was noted in the share of permanent grasslands and arable lands between the types of farming. The share of permanent grassland in agricultural lands was 10 times higher in organic farms (52.3 ha on average) than in conventional farms. Crop structure in organic farms was dominated by fodder plants, cereals were grown in four farms (with no oil plants), tuber crops in one and vegetables and orchards – in two organic farms. Quite different was the crop structure of conventional farms dominated by cereals and oil plants. Moreover, tuber crops were grown in four farms on relatively large areas. Within this size group, the increased importance of “biological” packages associated with grassland management in organic farms was clearly visible when compared with complete lack of such packages in conventional farms. As in the other size groups, subsidies in organic farms were markedly higher than in conventional farms.

Significant differentiation of the area of arable lands was found in two groups of farms. In farms smaller than 10 ha, arable lands were two times larger in organic than in conventional farms. In farms larger than 50 ha the proportion was reverse. The share of permanent grasslands in crop

structure was not closely associated with organic farming (being markedly higher in conventional farms) with the exception of the largest farms, where permanent grasslands constituted nearly 50% of agricultural lands.

Crop structure in analysed size groups of both farming systems indicates significant share of cereal, tuber and oil crops in conventional farms and dominating role of fodder crops (mainly grasses on arable lands) and orchards (younger than 5 years) in organic farms. Closer examination of this structure shows marked simplification or lack of crop rotation in farms from both farming systems. In all size groups, organic farms achieved a higher level of subsidies per 1 ha of agricultural lands (fig. 2). Mean values from particular size groups differ most (by about 600 zł·ha⁻¹ in favour of organic farming) in the second and third size group (up to 20 and up to 50 ha, respectively). Mean financial support for organic production system was 924 zł·ha⁻¹ agricultural lands and 457 zł·ha⁻¹ in farms of conventional system across all size groups of farms.

The analysis of crop structure shows that conventional farms produce goods more or less for market using available subsidies due to participation in agro-environmental programmes. Such a tendency could not be confirmed in organic farms, with the domination of fodder plants and non-fruiting orchards and a lack of attractive market offer [Szymona 2010; Kuś and Jończyk 2013]. Existing crop structure of analysed farms does not confirm studies by Szymona [2010], who demonstrated more appropriate crop structure in organic than in conventional farms. In growing grasses or the mixtures of grasses and small-seeded legumes one may discern some pro-ecological activities such as increasing organic matter content in soil, improving soil fertility and its biological activity [Tyburski 2007 and Gawęł 2011] or decreasing gas emissions [Jarosz et al. 2013]. Dominating share of grasses in crops on arable lands is an evidence of a great simplification of plant production [Kuś, Jończyk 2009; Kuś 2010; Majewski 2010].



Source: own work / Źródło: opracowanie własne

Fig. 2. The average level of subsidy in each group of area farms (PLN·ha⁻¹ AL)

The study showed no direct relationship between a large contribution of permanent grasslands to the structure of agricultural lands and organic farming. This way, Szymona's [2012] conclusion on the dominating role of permanent grasslands in crop structure of organic farms has not been confirmed. Moreover, significant share of permanent grasslands was accompanied by a lack or unimportant animal production, which was also shown by other authors [Kuś et al. 2006; Stalenga, Kuś 2007; Kuś, Jończyk 2009; Kuś 2010]. Realisation of financially attractive "biological" packages points to their role as a source of subsidies and their landscape function [Barszczewski et al. 2009]. There are no mechanisms that would encourage farmers to increase market production in organic farms [Stalenga, Kuś 2007, Barszczewski et al. 2009]. This inclines farmers to treat agro-environmental subsidies as the main sources of incomes in a farm at parallel limitation of investments [Kuś, Jończyk 2007] but that was not the aim of financial support.

4. Conclusions

1. Realisation of packages of agro-environmental programme PROW 2007-2013 in both organic and conventional farms shows their financial attractiveness and appreciation of their environmental role.
2. Clearly more interest was found in organic farming as one of the packages of agro-environmental programme within PROW 2007-2013 among farmers realising this programme.
3. Larger on average subsidies in organic farms prove greater possibilities resulting from the combination of agro-environmental packages in a farm.
4. There is a risk of dealing agro-environmental subsidies in organic farms as the main source of incomes.

5. References

- [1] Barszczewski J., Jankowska-Huflejt H., Wolicka M. Bilanse azotu, fosforu i potasu w zróżnicowanych obszarowo gospodarstwach ekologicznych. *Journal of Research and Applications in Agricultural Engineering*, 2007, Vol. 52(3), 5-9.
- [2] Barszczewski J., Wasilewski Z., Jankowska-Huflejt H., Wróbel B. 2009. Stan i perspektywy wykorzystania trwałych użytków zielonych w Polsce. *Studia i Raporty IUNG-PIB*, Z. 17, 59-71.
- [3] Gaweł E. 2011. Rola roślin motylkowatych drobnonasienych w gospodarstwie rolnym. *Woda-Środowisko-Obszary Wiejskie*, T. 11, Z. 3(35), 73-91.
- [4] GIJHAR-S. 2011. Raport o stanie rolnictwa ekologicznego w Polsce w latach 2009-2010, Warszawa.
- [5] Golinowska M. 2013. *Rozwój rolnictwa ekologicznego*. Wydawnictwo Uniwersytetu Przyrodniczego we Wrocławiu.
- [6] Grabowski M., Barszczewski J., Grzelak M. 2014. Specyfika sposobów gospodarowania w ekologicznym systemie produkcji w regionie pomorskim. *Woda-Środowisko-Obszary Wiejskie*, T.14, Z. 4(48), 27-43.
- [7] Jankowska-Huflejt H., Prokopowicz J. 2011. Uwarunkowania w rozwoju i czynniki produkcji w łąkarskich gospodarstwach ekologicznych ze szczególnym uwzględnieniem subwencji. *Woda-Środowisko-Obszary Wiejskie*, T. 11(33), Z. 1, 113-124.
- [8] Jarosz. A., Faber A., Syp A. 2013. Ocena zmian wielkości emisji gazów cieplarnianych po zmianie profilu gospodarstwa z konwencjonalnego na ekologiczne. *Woda-Środowisko-Obszary Wiejskie*, T.13, Z. 4(44), 43-53.
- [9] Jończyk K. 2014. Rozwój rolnictwa ekologicznego w Polsce. *Zeszyty Naukowe WSEI, Seria: Ekonomia*, Z. 8, 129-140.
- [10] Kowalska A. 2010. Jakość i konkurencyjność w rolnictwie ekologicznym. Warszawa: Dyfin S.A.
- [11] Kuś J. 2010. Rolnictwo ekologiczne i perspektywy jego rozwoju. *Studia i Raporty IUNG-PIB*, Z. 26, 23-36.
- [12] Kuś J., Jończyk K. 2007. Ocena organizacyjna gospodarstw ekologicznych w Polsce. *Journal of Research and Applications in Agricultural Engineering*, Vol. 52(3), 95-100.
- [13] Kuś J., Jończyk K. 2009. Rozwój rolnictwa ekologicznego w Polsce. *Journal of Research and Applications in Agricultural Engineering*, Vol. 54(3), 178-182.
- [14] Kuś J., Jończyk K. 2013. Rozwój rolnictwa ekologicznego w ostatnim 20-leciu w Polsce i UE. *Journal of Research and Applications in Agricultural Engineering*, Vol. 58(4), 38-43.
- [15] Kuś J., Stalenga J., Kopiński J. 2006. Ocena ekonomiczno-organizacyjna wybranych gospodarstw ekologicznych. *Journal of Research and Applications in Agricultural Engineering*, Vol. 51(2), 94-103.
- [16] Majewski E. 2010. Produkcyjne, ekonomiczne i środowiskowe aspekty uproszczenia struktury zasiewów. *Roczniki Nauk Rolniczych, Seria G*, T. 97, z. 3, 159-169.
- [17] Niewiadomski K. 2007. Aspekty rozwoju rolnictwa ekologicznego w Polsce. *Zagadnienia ekonomiki rolnej*, Nr. 1, 71-86.
- [18] Ratajczak-Szczerba M. 2011. Charakterystyka geomorfologiczna obszaru położonego wzdłuż Doliny Środkowej Noteci. *Landform Analysis*, Vol. 16: 99-106 (2011).
- [19] Ratajczak-Szczerba M. 2013. Geo- i bioróżnorodność Doliny Środkowej Noteci i Doliny Dolnej Gwdy szansą rozwoju geoturystyki. *Acta Geographica Silesiana*, 14. WNoZ UŚ, Sosnowiec 2013, 71-86.
- [20] Rozporządzenie Ministra Rolnictwa i Rozwoju Wsi z dnia 26 lutego 2009 r. w sprawie szczegółowych warunków i trybu przyznawania pomocy finansowej w ramach działania "Program rolnośrodowiskowy" objętego Programem Rozwoju Obszarów Wiejskich na lata 2007-2013 (Dz. U. Nr 64, poz. 427 z późn. zm.).
- [21] Rozporządzenie Rady (WE) nr 834/2007 z dnia 28 czerwca 2007 w sprawie produkcji ekologicznej i znakowania produktów ekologicznych i uchylające rozporządzenie (EWG) nr 2092/91. 2007. *Dz. Urz. UE* L189/1.
- [22] Stalenga J., Kuś J. 2007. Rolnictwo ekologiczne w Europie i w Polsce. *Studia i Raporty IUNG-PIB*. Z. 6, 9-18.
- [23] Szymona J. 2010. Badania nad uwarunkowaniami produkcji ekologicznej na przykładzie wybranych gospodarstw rolnych. *Journal of Research and Applications in Agricultural Engineering*, Vol. 55(4), 142-145.
- [24] Szymona J. 2012. Problemy produkcji ekologicznej na przykładzie wybranych gospodarstw rolnych. *Fragmenta Agromonica*, Vol. 29 (1), 134-139.
- [25] Tyburski J. 2007. Żyzność gleby i gospodarka nawozowa w rolnictwie ekologicznym. W: *Możliwości rozwoju rolnictwa ekologicznego w Polsce*. *Studia i raporty IUNG-PIB*, Z. 6, s. 35-48.
- [26] Tyburski J., Jończyk K., Kibler M., Krzysztoforski M. 2008. Zawartość składników pokarmowych w glebach gospodarstw ekologicznych. *CDR w Brwinowie O. Radom*.
- [27] Tyburski J., Żakowska-Biemans S. 2007. *Wprowadzenie do rolnictwa ekologicznego*. Warszawa: Wydawnictwo SGGW.