ECONOMICS OF ORGANIC APPLE AND STRAWBERRY PRODUCTION IN POLAND IN THE YEARS 2007-2009

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A B S T R A C T

In Poland about 32 thousand hectares of orchards and berry fruit are managed organically and the sale of organic fruit is constantly growing. The objective of this research was the evaluation of production costs and profitability of organic apple and strawberry production. The research was carried out on nineteen commercial fruit farms with conventional and organic production. In the case of apples, the cost of production per hectare was higher using the conventional system; with strawberries it was opposite. Costs of weed control and soil cultivation proved to be higher in the organic system for both investigated species. The conventional production of apples turned out to be far more profitable than the organic one. In the case of strawberries it was opposite – the organic production gave more net income than the conventional one.

Key words: organic apples, organic strawberries, profitability, costs of production

INTRODUCTION

Organic farming became one of the fastest growing segments of European agriculture during the 1990s (Hamm and Michelsen, 2000). Faced with economic and environmental problems, fruit growers are increasingly interested in organic farming systems because they hold real possibilities for reducing the negative effects of conventional agriculture (Reganold et al., 2001). They may also offer various health, market or even social advantages over conventional production practices. Organic

farming excludes or strictly limits, the use of most synthetic chemical pesticides and fertilizers and uses naturally derived products as defined by organic certification programs and the standards set by the International Federation of Organic Agriculture Movements (IFOAM). In Poland organic fruit production and sale continue to increase. About 32 thousand hectares of orchards and berry fruits are managed organically (Bielicki and Rozpara, 2008). According to the data obtained by author from The Main Inspectorate of Agricultural and Food Quality, in Poland in the year 2009 there was 28209.7 ha of certificated organically managed berry fruits and orchards and 31118.5 ha of them in conversion phase from conventional to organic.

There is a polarized debate among scholars and authorities about the future of organic farming. Some of them argue the superior sustainability of organic farming over conventional and integrated ones on the basis of environmental, horticultural, economics and consumer preference criteria (Reganold et al., 2001). Others suggest that greater overall benefits can be achieved by other means (Elliot and Munford, 2002). The opponents of organic fruit farming are raising many questions for example about the use of human labor for hand weeding (Gianessi, 2006).

The objective of this research was the evaluation of production costs and profitability of organic apple and strawberry production in Poland and thus to examine their competitiveness on the local markets.

MATERIAL AND METHODS

The research was carried out in the years 2007-2009 on nineteen commercial fruit farms; sixteen with apple production (twelve were conventional, four were organic) and seven with strawberry production (three were organic, four were conventional). All investigated farms were located in the central part of Poland. Because of a conspicuous technological gap between the best conventional apple farms from our set of farms, and the organic apple farms we had, the conventional apple farms for investigation were taken from the second less successful half of our conventional set of farms.

For both systems organic and conventional, appropriate management practices were followed. The organic system relied on manure from organic animal farms, compost and other certified natural fertilizers and foliar sprays for nutrients. Cultivation and mowing were used for weed control. Organically certified biological controls were used for pest management. Fruit thinning was done by hand. The conventional system included synthetic soil fertilizers and foliar sprays, pesticides, chemical fruit thinners and pheromone mating disruption. The size of the apple orchards in our study ranged from 1.1 ha to 3.5 ha for the organic system, and from 1.0 ha to 7.0 ha for the conventional system. The density of planting was from 260 to 860 trees per hectare for the organic systems and from about 400 to 1660 trees per hectare for the conventional ones.

The trees were from 7 to 34 years old. The size of the strawberry fields on the farms used in our study were from 0.4 ha to 3.5 ha. It was the second or third year of cultivation for the strawberry plants. All data necessary for the calculation of the costs and profitability were obtained from producers who answered special questionnaires and participated in additional interviews. All human labor on the apple farms was accomplished by timework, except a few farms where picking was done by piece work. The amount of money spent for the work, was the basis for the transformation into timework. In investigated strawberry farms, picking was exclusively accomplished by piece work and all others operations by timework. The computed costs and incomes from organic production of apples and strawberries in Poland were compared with outcomes from other countries. To express some quantities in PLN, the exchange rates from National Bank of Poland for appropriate periods were used.

RESULTS

Average yields in organic apple production in the years 2007-2009 amounted to 12.7 tons per hectare. Conventional apple production amounted to 23.5 tons per hectare. The lowest yields occurred in 2007 due to the late frost in spring (8.5 tons per hectare for the organic and 10.7 tons per hectare for the conventional one). The inputs of human labor in organic apple production were comparable to those in the conventional system (Tab. 1). The most apparent difference was for human labor inputs in the organic apple production system. The amount of hours spent for soil cultivation were eight times higher than in the conventional system.

The direct costs of apple cultivation were lower in organic farms and accounted for 8 236 PLN per hectare, while in conventional ones, 9 793 PLN per hectare. Because of the high price of pesticides, the pest and disease control was the priciest operation in the conventional system (Fig. 1).

Substances used for plant protection in the organic system were much cheaper. The nutrition of trees in the organic mode was accomplished by application of natural fertilizers whilst in the conventional, by synthetic fertilizers. The cost of nutrition for trees was almost twice as high in the organic system than in the conventional because of the high price of manure provided by certified organic animal farms. The biggest problem and the largest cost item in organic production was the mechanical and manual weed control. These methods of weed control accounted for 26.9% of the total direct costs of production. Pest and disease control amounted to 23.9% of total direct costs, in the organic production (Fig. 2). In the conventional mode it was the opposite. Pest and disease control amounted to 39.4% of total direct costs. Harvesting of fruit was 20.7% and weed control only 12.7%.

In organic strawberry production average yields amounted to 9.8 tons per hectare while conventional yields were 10.5 tons. The inputs of human

Table 1. The inputs of human labor and machinery work, in hours per hectare, in organic and conventional systems of apple cultivation

Operations	Organic		Conventional	
	man hrs	tractor hrs	man hrs	tractor hrs
Harvesting	88	3	185	8
Soil cultivation	105	22	12	12
Dormant & summer pruning	63	5	54	5
Pest management	21	10	19	12
Manuring or fertilizing	16	3	2	2
Other	11	3	35	3
Total	**304**	**46**	**307**	**42**

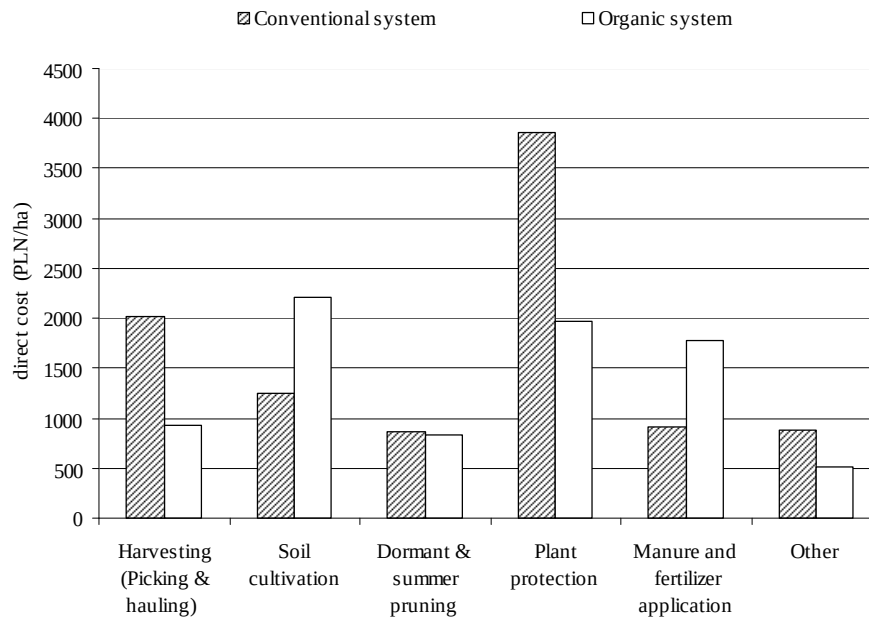

Figure 1. Direct cost of organic and conventional cultivations of apples, according to operations

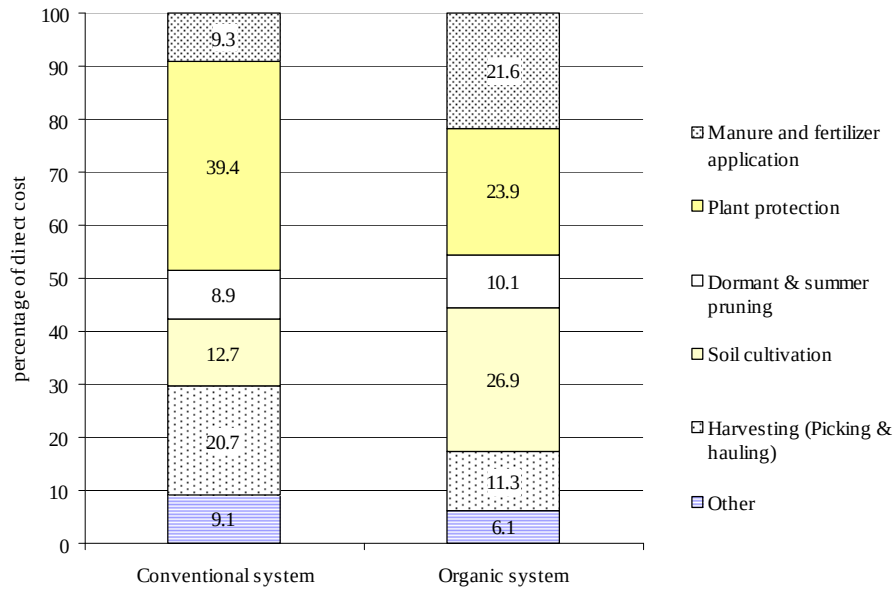

Figure 2. Structure of direct cost of conventional and organic cultivation of apples

labor in organic strawberry production were much higher than inputs of labor in the conventional system, because in the former, hour input of human labor for soil cultivation was eight times higher than in the latter (Tab. 2).

The direct costs of strawberry production were higher for organic farms – 12 938 PLN per hectare. Higher costs were due to higher expenses for manual work and for manure. For the conventional farm, direct costs of strawberry production were – 10 452 PLN (Fig. 3). Lower costs were due to the fact that conventional producers used much cheaper synthetic fertilizers. As in the case of organic apples, weed control posed the biggest problem for strawberry producers, because of the associated high demand for manual labor. Rainy seasons like in 2007, aggravated an already difficult situation.

The highest cost in both organic and conventional production was the harvesting. It was 48.1% of the total direct cost in organic production and 65.9% in the conventional one (Fig. 4).

The conventional production of apples turned out to be far more profitable than the organic production. The average net income per hectare was above three thousands PLN. Production in the organic system, however, brought a small loss only partly compensated through subsidies guaranteed by government authorities (Tab. 3). The main reason for the far smaller income from organic apples were yields which were

Table 2. The inputs of human labor and machinery work in hours per hectare in organic and conventional systems of strawberries cultivation

Operations	Organic		Conventional	
	man hrs	tractor hrs	man hrs	tractor hrs
Harvesting (piece work)	-	4	-	5
Soil cultivation	340	11	39	3
Pest management	7	5	12	7
Manuring or fertilizing	8	2	3	2
Other	25	1	17	3
Total	**380**	**23**	**71**	**20**

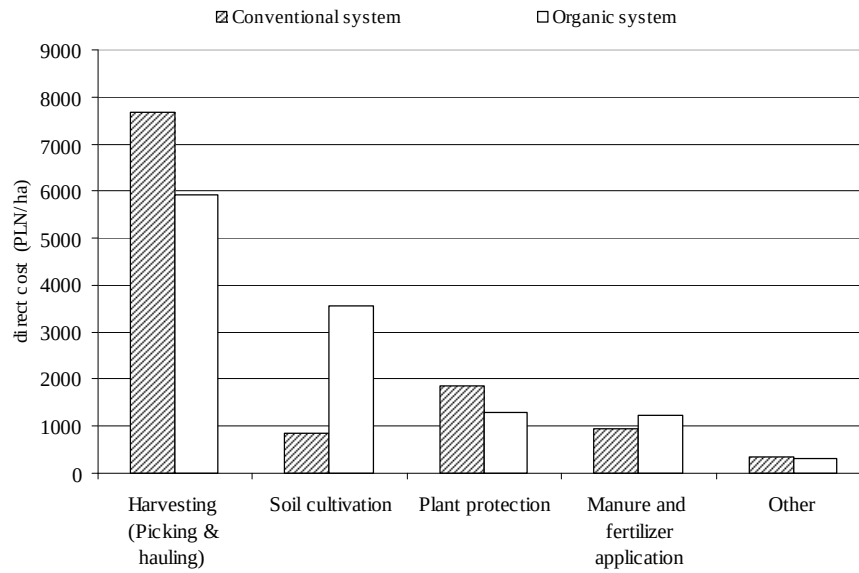

Figure 3. Direct cost of organic and conventional cultivation of strawberries, according to operations

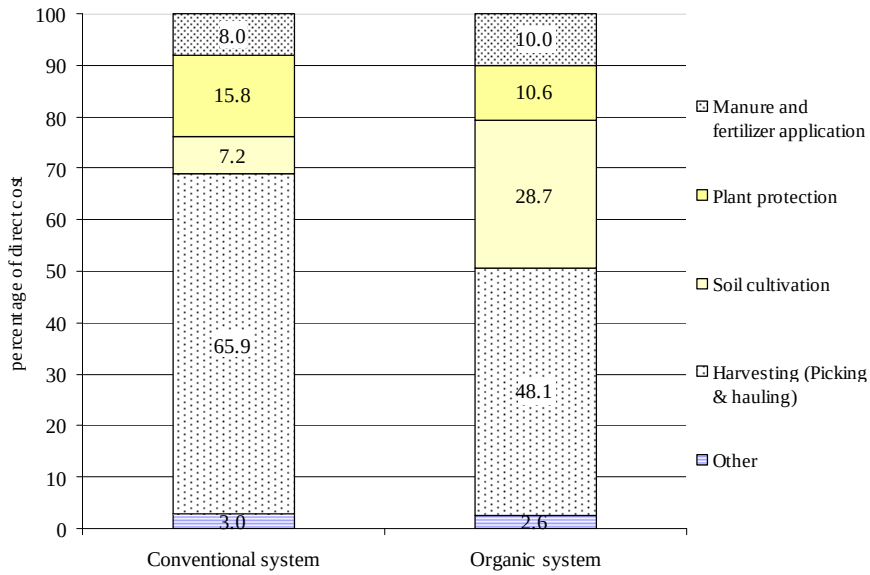

Figure 4. Structure of direct cost of organic and conventional cultivation of strawberries

Table 3. Costs and other economical features for apples and strawberries cultivated in the two systems; organic and conventional

Items	Apples conventional	Apples organic	Strawberries conventional	Strawberries organic
Yield (dt ha^{-1})	235	127	105	98
Average price (PLN kg^{-1})	1,10	1,25	2,53	2,91
Gross income (PLN ha^{-1})	25850	15875	26565	28518
Direct cultivation cost (PLN ha^{-1})	9793	8236	11665	12328
Recapture of established cost (PLN ha^{-1})	3720	2530	4950	4830
Grading costs (PLN ha^{-1})	2350	1524	0	0
Storage cost (PLN ha^{-1})	5405	3175	0	0
Overhead (PLN ha^{-1})	1469	1235	1750	1849
All costs (total) (PLN ha^{-1})	22737	16701	18365	19007
Net income (PLN ha^{-1})	3113	-826	8200	9511
Support payments (PLN ha^{-1})	0	1670	0	1670
Final economic result (PLN ha^{-1})	3113	844	8200	11181

46% lower than those in investigated conventional farms. The achieved unit price for organic apples -1.25 PLN per kg, also was not quite satisfactory. Although this unit price was about 14% higher than for conventional fruit, it was slightly lower than unit cost which was 1.31 PLN per kg.

In the case of strawberries it was the opposite. Organic production gave more net income than conventional production, and without government subsidies taken into account (Tab. 3). Although for further expansion of organically cultivated strawberries, some technological improvements are necessary to reduce the high demand for manual labor particularly for weed control.

DISCUSSION

Average yields in organic apple production in Poland (12.7 tons per hectare) were much lower than their counterparts in Germany, where in the years 2006-2008 an average (from chosen farms) of 32.7 t/ha was achieved (Fricke and Görgens, 2009). The highest yields for organically produced apples were reported in California, where depending on planting density and production location, they ranged from 16 tons per hectare to over 50 tons per hectare (Swezey, 2000).

The costs of manure and fertilizer application were much higher in the organic system than in the conventional one, which corresponds to the results of others studies (Reganold et al., 2001; Fricke and Görgens, 2009).

The mechanical and manual weed control in organic production of apples, was one of the most expensive operations in this study. The reason for the such an expense was the high input of human labor which was as high as 105 hours per ha. In comparable organic apples cultivation in Germany (3500 trees per 1 ha, period of mature production), they were as high as 84 hours per ha (Stockert T.). The orchard floor management is so important in organic apple production, that even various combinations of rootstocks and methods of treatments were tested to find the most effective solutions (Stefanelli et al., 2009).

The total costs of organic apple production in Poland, at 16 701 PLN per hectare, were much lower than in Germany, where in the two years of 2006-2008 it was 41 500 PLN per hectare (Fricke and Görgens, 2009). Polish farmers achieved on average only 15875 PLN of gross income per hectare while their German counterparts averaged from 76 840 PLN per ha to 86 200 PLN per ha, thanks to a two and a half times higher yield and a two-fold higher average unit price for sold apples. The price for organic apples in Poland was only 14% higher than for conventional ones. In Germany, the price for organic apples was twice as much as those grown in conventional orchards. In Switzerland the price for organic apples was one third higher (Weibel et al., 2005) and in USA, the price for non-organic fruit was half as much as for organic fruit (Reganold et al., 2001). Bringing up average prices for organic fruit through ski-

ful marketing activities, could be very promising. But Polish consumers may not be willing to pay higher prices. For this reason, increasing the yield is a matter of first importance for Polish organic apple farmers.

In organic strawberry production, average yields per hectare were lower than in conventional one and the cost of production was higher, which is in agreement with other studies from USA and Europe (Pritts and Handley, 1999). Labor inputs were four times higher than in the conventional system, whereas for example in USA, labor requirements may be as much as twice those of a conventional system (Pritts and Handley, 1999). Since organic growers face higher costs of production, they must secure a premium price in order to make a profit (Bolda et al., 2003). However, organic price premiums are declining as larger growers are getting into organic production, marketing and distribution systems are improving, and a larger supply of organic berries are reaching the market. In this study, organic strawberry production turned out to be more profitable than the conventional one, which conforms with the results of others studies (Swezey, 2004).

The conventional production of apples in Poland turned out to be far more profitable than organic which is opposite of results from most studies from other countries like Germany, Switzerland and USA (Fricke and Görgens, 2009; Weibel et al., 2005; Reganold et al., 2001). But this was mainly due to the lower yields obtained by Polish producers. Financial support for organic farms in Poland is one of the lowest in the EU-countries.

CONCLUSIONS

1. A stronger support from research and extension agencies is necessary to increase the quantity and quality of yields in organic production of apples in Poland. This would then help to increase apple production profitability and competitiveness on the market.
2. The main reasons for growing organic apples in Poland were the government subsidies.
3. High demand of manual labor for weed control in organic production of strawberries seems to be the limiting factor in its further expansion. Hence, some technological improvements could be very productive.
4. Due to the lower labor costs compared to other European countries, there is a big opportunity for further development of organic fruit production in Poland, particularly berry production.

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EKONOMIKA EKOLOGICZNEJ PRODUKCJI JABŁEK I TRUSKAWEK W POLSCE W LATACH 2007-2009

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S T R E S Z C Z E N I E

W Polsce powierzchnia ekologicznych upraw sadowniczych wynosi około 32 tys. ha, stopniowo wzrasta także sprzedaż owoców z tej produkcji. Celem niniejszych badań było poznanie i porównanie kosztów i opłacalności ekologicznej produkcji jabłek i truskawek w Polsce. Badania prowadzono w dziewiętnastu gospodarstwach sadowniczych z produkcją ekologiczną i konwencjonalną. W przypadku konwencjonalnej produkcji jabłek koszty w odniesieniu do jednego hektara były wyższe niż w produkcji ekologicznej, natomiast w przypadku truskawek, koszty produkcji ekologicznej były wyższe niż konwencjonalnej. Charakterystyczną cechą produkcji ekologicznej zarówno truskawek, jak i jabłek były wysokie koszty odchwaszczania i utrzymania gleby. Konwencjonalna produkcja jabłek okazała się bardziej opłacalna niż ekologiczna, inaczej było w przypadku truskawek, gdzie produkcja ekologiczna była bardziej opłacalna.

Słowa kluczowe: jabłka z produkcji ekologicznej, truskawki z produkcji ekologicznej, opłacalność, koszty produkcji