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Comparing the Profitability of Organic and Conventional Broiler Production

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ABSTRACT

Organic broiler chicken production has recently received more attention worldwide. This study carried out an economic analysis to compare the profitability of organic versus conventional growing systems per unit of broiler meat production. In this study, 400 slow-growing broilers (Hubbard Red-JA) were reared in an organic production system and the same number of fast-growing broilers (Ross-308) were reared in a conventional system. Profitability was deduced from an economic analysis that compared total costs and net income. Results showed that organic broiler meat can cost from 70% to 86% more with respect to variable and fixed costs when compared with conventional production. The main reasons for the higher cost of organic broiler meat were feed, labor, certification, and outdoor area maintenance. The proportion of fixed costs in total costs was 1.54% in the conventional system and 7.48% in the organic system. The net income per kg of chicken meat in the organic system was €0.75, which is 180% higher compared with the conventional system (€0.27); however, organic broiler meat was sold at a twice as high price than the conventional one. In conclusion, organic broiler meat production was more economical than conventional rearing.

INTRODUCTION

The organic broiler production system operates according to specific and precise standards of production, and this farming technique is increasi has become increasingly popular. Organic broiler meat can be summarized as the product of a rearing system that entirely avoids conventionally-grown feedstuffs, including genetically-modified organisms, animal by-products, and synthetic additives, while using only organically-grown cereals, oil, seeds and roughage. The system also provides chickens with free access to outdoor areas and applies low rearing intensity.

Purchasing statistics indicate that consumers are increasingly interested in products that they perceive as naturally produced or environmentally friendly with a high level of nutrition, no contaminants, and good flavor. They also prefer products from systems that provide good welfare and health for the birds (Sundrum, 2001; Owens *et al.*, 2006). Indeed, there is a common belief that organic chickens are safer and more nutritious than conventional ones, so an increasing number of consumers are willing to pay a premium for certified organic chicken meat (Magdeliane & Bloch, 2004; Crandall *et al.*, 2009).

The organic meat sector is currently one of the fastest growing segments of the organic food industry, and poultry accounts for nearly two-thirds of this sector. United States (U.S.) retail sales of organic poultry were $161 million in 2005, well under one percent

of conventional poultry sales. However, retail sales of organic poultry have nearly quadrupled since 2003, and estimates of annual growth rates range from 23 to 38 percent until the end of the decade, with annual sales reaching nearly $600 million by 2010 (NBJ, 2009). Approximately half (51%) of organic poultry products were sold in natural food stores in 2003, 45% in mass market grocery stores (including conventional grocery, mass merchandiser, and club stores), and 4% of the American organic poultry was purchased through direct sales and other distribution channels (NBJ, 2004).

In the European Union (EU), there were 19 million poultry heads in 2007, out of which approximately one-third were laying hens. The organic sector features far more laying hens than the rest of the poultry sector in the entire EU. France is the leading member state. In Turkey, according to data published in 2009, while 34.5 tons of organic poultry meat was obtained from 69,150 broilers, and 42,650 laying hens were grown in the same year (MARA, 2010).

It is estimated that organic broiler production in Turkey will face no marketing problem for. A research study on broiler meat carried out in Ankara showed proportions of the households willing to pay price increases of 20%, 30%, 50% and 100% for organic meat were 5%, 4%, 3% and 4% (16% in total), respectively. These buyers presented the same consumption level. The results indicated there would be a large demand for organic broiler meat in the city center of Ankara (Koç *et al.*, 2001).

Although there is a relatively limited number of studies that have compared organic and conventional broiler meat quality (Castellini *et al.*, 2002; Ristic, 2004; Jahan *et al.*, 2004; Grashorn & Serini, 2006; Castellini *et al.*, 2006; Husak *et al.*, 2008; Martino *et al.*, 2008), we have not found a sufficient number of studies that define the differences of cost between organic and conventional broiler production. The cost of broiler production can vary depending on many factors, such as final crop characteristics (the name of the brand and the quality of the product), feed price (basically, cereal prices), climate factors and the genetic lines employed (FAO/EBRD, 1999). The production costs of organic broiler production are higher than the costs of conventional systems. The main difference in cost arises from the feed prices between the two rearing systems, and the main reason for the high cost of organic feed is the sale of organic cereals and soybean at prices 50-100% higher than conventional feedstuffs (USDA/AMS, 2003). Other differences between the two systems are small flock size, high mortality rate, and a long rearing period in the organic rearing system (Fanatico, 2008).

This study aims at comparing the profitability of organic and conventional production systems based on an economic analysis that calculates the results of an experimental trial in order to provide resources for the sector and for future research.

MATERIAL AND METHODS

This study was conducted in experimental units at the Poultry Research Institute. A total of 400 commercial, slow-growing (Hubbard Red-JA) and 400 commercial, fast-growing (Ross-308) one-day-old broiler chicks of mixed sex were used in this study. Birds were randomly assigned to one of the two rearing conditions. While the slow-growing broilers were reared under organic conditions, the fast-growing broilers were reared under conventional conditions.

In the organic rearing system, the slow-growing broilers were placed in an open-sided, naturally ventilated broiler house. The indoor space (10 birds per m^2) was equipped with two circular hanging feeders, a bell drinker, a tree-tier perch (30 cm/bird), and an outdoor area of 4 m^2 per broiler. Two drinkers and two perches were available in the outdoor area, as well. The natural grassland, including an alfalfa and trifolium mixture, was available for consumption in the outdoor area throughout the experimental period, which they were old enough to eat from 22 days old onward. The pop holes were open all day, giving free access to the outdoor area 24 hours per day during the entire experiment. No artificial lighting existed in this organic system.

In the conventional rearing system, the fast-growing broilers were placed in an open-sided, naturally ventilated broiler house, and standard management practices were applied. The lighting ratio in the fast-growing broiler house was 23 hours of light to 1 hour of darkness each day. Each pen was equipped with two hanging feeders, one bell drinker and two infrared lamps. Bird density was 18 chicks per square meter.

The conventional chicks' diets were in mash form, and water was provided *ad libitum*. Experimental feeds used in both the organic and conventional systems were based on corn, wheat, soybean meal, and a sunflower meal. Similar ingredients were used in the diets of both group diets in order to avoid discrepancies that arise from ingredient composition. In order to comply with EC Regulation 1804/99, at least 80 percent of the dry matter content of the organic feed mixture derived

from organically grown ingredients. Soybean meal (GMO-free sources) was the only conventional feed ingredient supplemented in the organic feed mixture at an inclusion level of 20 percent. Alfalfa meal, consisting of dried, whole plants grown in organic farming conditions, was added to the organic feed as a roughage source. Starter and grower diets were given to the fast-growing broilers between 0 to 21 and 22 to 42 days, respectively. Unlike the conventional schedule, the slow-growing birds were fed a starter diet between 0 to 28 days and a grower diet between 29 to 81 days. Slow-growing birds were slaughtered at 81 days of age while fast-growing birds were sacrified at 42 days of age. All technical data of the organic and conventional production systems appear in Table 1.

Table 1 – Technical data of organic and conventional production systems.

	Organic	Conventional
Birds at the start of a round (number)	400	400
Birds slaughtered in the round (number)	396	388
Slaughter age [(duration of a round) (days)]	81	42
Rounds per year (number)	3.5	5.5
Indoor space (birds m^2)	10	18
Outdoor space (m^2 per bird)	4*	0
Slaughter weight (g)	2,778	2,250
Carcass weight (g)	2,145	1,735
Total broiler meat production (kg $year^{-1}$)	2,973	3,702
Feed intake in the round (g per bird)	8,041	4,255
Feed conversion ratio (kg feed per kg growth)	2.930	1.931
Mortality (%)	1.00	2.83

*The outdoor run must be accessible for at least one-third of the broilers' life.

Before starting this comprehensive and innovative project, we planned the experimental design very carefully by conducting a pilot study, including where and how we could obtain the inputs. During preparation, we recorded current prices for organic broiler meat in the retail market. As in the case of other countries, we could not easily find organic inputs, such as feed intended for organic broiler production, apart from one and/or two supplier(s) in Turkey. During the period that this research took place, there were no organic broiler producers in Turkey. Moreover, there are only three in Turkey as of now, in April 2012. Thus, the prices employed in the study show consistency and reflect the truth. The same statement is valid for broiler meat price. The prices of all variables, including inputs, were recorded very carefully, and all calculations were performed using the rate of (Euro) €1 to (Turkish Lira) TL 1.85, according to the exchange rate from October to December 2006, which matches the period of the trial. According to current market prices for all the inputs and broiler meat at present, we can still observe that the same prices are valid in all parameters. Our price selection also ensured that there would be no structural price volatility and/or trends for organic feed and organic broiler meat. Similar price stability on chicken meat in Turkey was stressed by Cinar *et al.* (2006) and Terin *et al.* (2009).

All variables and fixed cost units were enrolled carefully as regular inventory systems from the beginning to the end of the experiment. The economic analysis was based on one growing period. Variable costs of feed, chicks, vaccines, other veterinary procedures and medicines, labor, litter, heating, electricity, water, disinfection, and slaughter expenses were taken into consideration.

The organic rearing system needs more intensive labor than conventional systems for three critical reasons. First, the slow-growing birds were slaughtered at 81 days of age in the organic system, while fast growing birds were sacrificed at 42 days of age in conventional production. The second point was that while one employer can manage a poultry house with 25,000 broilers in a conventional system, only 4,800 birds can be reared in organic production because of organic poultry regulations. Third, the use of high-level mechanization in conventional rearing reduces the conventional system's labor requirement. Due to the fact that organic rearing requires more intensive labour than a conventional system, labour cost was calculated as €172.98 and €10.81 in organic and conventional rearing for one production period, respectively. We determined this cost unit by using the current price on the basis of the concurrent time period with one worker in daily operations. Then, these labour costs were defined as €0.43 and €0.03 per broiler in organic and conventional broiler rearing systems, respectively.

Feed costs were calculated according to the formula: FC x (BS + 0.5 BD), where FC is feed consumption per bird, BS is the number of birds that arrived at the processing plant alive, and BD is the number of birds that died during the production round. Feed consumption of BD is multiplied by a half to estimate the amount of feed not consumed by the birds that died at different times during the production round (Bokkers & De Boer, 2009). Costs per kg feed were evaluated as €0.43 and €0.31 in organic and conventional systems, respectively, based on recorded data. Then, these feed costs were evaluated per broiler for both production systems.

Water intake was evaluated as 1.8:1. ratio to feed intake. Therefore, water intake per bird was calculated

by multiplying the feed that one broiler consumed by 1.8 (Vermeij, 2004). Water, watering costs, and other variable costs were calculated per broiler through a regular inventory system that we recorded (Table 2).

Table 2 – Total variable costs per broiler (€) in organic and conventional broiler rearing systems

	Organic	Conventional
Chicks	0.41	0.32
Feed*	3.48	1.31
Vaccines, and other veterinary costs and medicines	0.13	0.07
Labor	0.43	0.03
Litter	0.08	0.04
Heating	0.16	0.14
Electricity	0.03	0.10
Water and watering	0.54	0.01
Cleaning and disinfection of poultry house	0.19	0.27
Slaughter	0.52	0.43

Costs per kg feed were calculated as €0.43 and €0.31 for the organic and conventional systems, respectively.

Gross and net margins can be employed to compare organic and conventional poultry production (Padel *et al.*, 1997). Net farm income is one of the instruments employed for this aim. This analysis was used in some studies (Van Den Tempel & Giesen, 1992; Van Calker *et al.*, 2005; Seabrook, 2007; Bokkers & De Boer, 2009). Net farm income is defined as the difference between revenue and cost, excluding costs of family labor (Van Den Tempel & Giesen, 1992).

Total variable cost per broiler was obtained as the sum of total variable cost units. Variable cost per kg of broiler meat was obtained by dividing total variable costs by carcass weight measured at the end of the trial. Gross production value (sales) was calculated by multiplying total broiler meat successfully obtained from the experiment by selling price per kg of bird meat, which was an average of €1.89 in the conventional systems and of €3.78 in the organic production systems. In a similar study carried out from March through May of 2006 in Iowa, USA, the authors stressed that the average price for organic whole broilers ($7.03/kg) was 247% greater than the price for conventional whole broilers ($2.84/kg) (11). Gross margin (gross profit) was also calculated by subtracting variable costs from gross production value [gross margin = gross production value – variable costs] (Inan, 1998; Sheppard, 2004; Van Calker *et al.*, 2005) (Table 3).

Table 3 – Production costs and net income (€) per kg broiler meat produced in organic and conventional systems.

Production costs and net income (€ kg^{-1})	Organic	Conventional
Selling price (gross production value)	3.78	1.89
Variable costs	2.80	1.59
Fixed costs	0.23	0.03
Total costs	3.03	1.62
Gross margin (profit)	0.98	0.30
Net income	0.75	0.27

Fixed costs consisted of depreciation, maintenance and repair costs of the building and machinery. Costs for the outdoor run were based on the interest rate of the land value, maintenance and fencing, and certification expenses were added to the total fixed costs in the organic system. While closed space inside (40 m^2) and outdoor run space (1,600 m^2) were considered in organic rearing, only closed space inside (22.22 m^2) was calculated for conventional breeding. For conventional and organic systems, investment costs were estimated at €56.76 per m^2 for the building, while investment costs were calculated as €10.81 and €18.92 per m^2 for the machinery in organic and conventional production systems, respectively. The depreciation of the conventional building was 3.5 percent and 3 percent for the organic building. Maintenance costs of the building amounted to 1 percent of total costs of both system. Depreciation costs (6.5 percent) and maintenance costs (2 percent) of the machinery and inventory were similar for both systems (KWIN, 2003/2004). Costs for the outdoor run were based on land interest (€0.09 per m^2), and fencing (€0.025 per m^2) and maintenance (€0.02 per m^2) costs. For the certification, prices were based on an annual fee of €260 and an additional €0.05 per bird (Vermeij, 2004).

Total fixed cost per bird was calculated by dividing total fixed costs by the number of broilers slaughtered at the end of the trial. Fixed costs per kg of broiler meat were calculated carcass weight basis for both rearing systems. Total production costs per kg of broiler meat were determined by adding variable and fixed costs. Net income per kg of broiler meat was calculated by subtracting the selling price of 1 kg of broiler meat from total costs (Inan, 1998; FAO/EBRD, 1999; Rossiter, 2001) (Table 3).

Finally, according to the technical and economic data obtained from this experiment, total net income gained from one broiler house was used to calculate house income in one year. This study used 3.5 rounds per year for organic and 5.5 for conventional systems (Table 4).

Table 4 – Production costs and net income (€) in organic and conventional broiler production systems during one year.

Production costs and net income (€)	Organic	Conventional
Total selling price (total gross production value)	11,249.19	7,003.78
Feed	4,843.72	2,840.94
Chicks	567.57	713.51
Vaccines, and other veterinary procedures and medicines	181.62	154.59
Labor	605.41	59.46
Liter	113.51	95.14
Heating	227.03	297.30
Electricity	37.84	225.95
Water and watering	756.76	11.89
Cleaning and disinfection of poultry house	264.86	594.59
Slaughter	726.71	911.28
Total variable costs	8,325.03	5,904.64
Depreciation costs of the building	68.11	44.14
Maintenance costs of the building	22.70	12.61
Depreciation costs of machinery and inventory	28.11	27.32
Maintenance costs of machinery and inventory	8.65	8.41
Costs of the outdoor run	216.22	0.00
Certification expenses	329.24	0.00
Total fixed costs	673.03	92.48
Total costs	8,998.06	5,997.12
Total gross margin (profit)	2,924.16	1,099.14
Total net income	2,251.13	1,006.66

RESULTS AND DISCUSSION

Total variable costs per broiler are indicated in Table 2. Feed expenses comprised a major part of the total variable costs in both rearing systems. The feed costs of organic production (€3.48) were almost three times higher than the feed costs in the conventional system (€1.31).

The economic data (per kg of broiler meat) obtained from the experiment are shown in Table 3. Total costs per kg of organic broiler meat were calculated at €3.03, including variable costs (€2.80) and fixed costs (€0.23). In the conventional system, total costs per kg broiler meat were estimated at €1.62, including variable costs (€1.59) and fixed costs (€0.03). The results showed that the cost per kg of broiler meat was 75 percent for variable costs and 86 percent for fixed costs higher in organic rearing systems than in conventional production. Higher feed, labor, certification, and outdoor access costs accounted for the higher prices of the organic rearing system.

In addition, the extended slaughter age in the organic production system (81 days vs. 42 days) and the extra feed required for these older chickens is another reason for the higher costs. It has been suggested that slow-growing broiler hybrids are suitable for consumption at the minimum slaughter age of 81 d. The inferior feed conversion efficiency in organically-reared, slow-growing birds compared to fast-growing, conventional lines is another important reason for the higher costs of the organic broiler production system. Furthermore, ingredient prices, which were 40% higher than the price of conventional raw materials, exaggerated the cost of producing organic chicken meat. These indications proved that feed cost was the main contributor to total variable costs in both systems. Therefore, a few straightforward calculations make it clear that the proportion of feed cost to total cost is higher in organic production than a conventional system. Such determinations have been stressed in many studies (Padel *et al.*, 1997; Rossiter, 2001; USDA/AMS, 2003; Vermeij, 2004; Fanatico, 2008; Rodenburg *et al.*, 2008). A related work emphasized that the cost of organic feed was 54 percent higher than the cost of conventional feed (Bokkers & De Boer, 2009). Prices of feeds composed by 95 and 100% organic ingredients were 4.6 and 7.6% higher than the cost of feed that was only 80% organic. The cost price of broilers that consumed the 80% organic feed was €1.83 per kg of live weight. In a similar study, the prices of 95 and 100% organic feed were 4.6 and 7.6% higher compared with 80% organic feed. The cost price of broilers fed 80% organic feed was €1.83 per kg live weight. The cost prices per kg live weight of broilers fed 95 and 100% organic feeds were €1.84 (+0.8%) and €1.93 (+5.4%), respectively (Rodenburg *et al.*, 2008). In the present trial, feed costs represented 64% of the total cost of the organic system and 57% of the total cost of the conventional system. Fortunately, grass consumption in the outdoor area in the organic production system was equivalent to 12% of the birds' total feed intake (Çınar *et al.*, 2009). This grass consumption would thus reduce their concentrated feed intake (Küçükyılmaz *et al.*, 2007).

Labor requirements for broiler production vary significantly depending upon availability, degree of automation, and the level of unsalaried (farm family)

labor involved on a day-to-day basis (Padel *et al.*, 1997). Since the number of birds managed by one worker in organic systems is lower than that managed in conventional systems, labor cost per broiler is higher in organic production.

Water and watering costs in the organic system were higher because of the watering maintenance of the natural grassland, including the alfalfa and trifolium mixture available for consumption in the outdoor area throughout the experiment, which broilers consumed from 22 to 81 days of age. Therefore, water and watering costs comprised 10% of total costs, accounting for a relatively higher proportion in the organic system.

While the rate of fixed costs was 1.54% of the total cost in the conventional system, it was 7.48% in organic rearing. In a study carried out on organic broiler production using a portable broiler house with a tractor, that rate was 5.84% (Rossiter, 2001). The main reason for the high fixed costs in the organic system was the cost of outdoor runs, a relatively ample space of 4 m^2 per bird, and plus the certification expenses than in conventional production, which does not use the two parameters indicated above. Since certification costs represented 3.65% of the total costs in organic systems, if the size of broiler flocks increases, the rate of those costs may be proportionately reduced. In fact, an earlier study emphasized that the rate could drop to 1.48% of the total costs (Bokkers & De Boer, 2009).

At the gross margin level, the primary determinants of profitability of all systems analyzed were total feed costs (reflecting price, feed conversion efficiency, and slaughter age) and sales value. In this study, gross margins per kg of bird meat were calculated as €0.98 and €0.30 for the organic and conventional systems, respectively. Nevertheless, net income was higher in the organic system (€0.76) than in the conventional system (€0.27) (Table 3).

For a one-year period, total variable and fixed costs were higher in the organic system than in conventional production. Although costs in the organic rearing system were 50% higher, the organic system produced 123% higher gross margin (profit) than the conventional system (Table 4). According to the results calculated over the course of one year, gross margin and net income were higher in the organic system, at 230% and 180% for organic and conventional systems, respectively. In a similar study, the results showed that organic broiler production was 156% more profitable than conventional rearing (Bokkers & De Boer, 2009).

The better economic performance of organic broiler production arises mainly from the ratio of feed prices to sales prices per kg of broiler meat. Net income obtained per kg of broiler meat represented 14% of the selling price in the conventional system. If the same net income could also be obtained in an organic system, meat should be sold at a price 87% (€3.54 per kg broiler meat) higher than that of conventional broiler meat.

CONCLUSIONS

This study determined that organic broiler meat production was more profitable than conventional production. The high sales price – which, unfortunately, is the main constraint for the increase in the demand for organic products – should be studied to determine how production costs could be reduced, so that a farmer would not need to rely on high prices to turn a profit. This type of solution, which focuses on lower production costs and lower selling prices, should increase the demand and the market opportunities for organic broiler meat. Given that feed comprised the vast majority of costs, alternative, cheap, and sustainable feed resources are probably the most effective way to reduce production costs.

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