

# CARCASS TRAITS OF ORGANICALLY AND CONVENTIONALLY FATTENED CATTLE IN SLOVENIA

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## ABSTRACT

In the present study, the carcass quality of organically and conventionally fattened cattle slaughtered between the years 2008 and 2015 were compared. Slaughtered animals were classified in different categories according to age and sex. The recorded data included hot carcass weight (HCW), slaughter age, net daily gain (NDG), EUROP conformation and fatness. Bulls and heifers older than 12 months from conventional fattening system had better HCW, NDG and conformation in comparison with organically fattened animals. Fatness was higher in bull and heifer carcasses from conventional fattening system compared to organic ones. On the contrary, calves from organic system younger than 12 months had better carcass quality compared to that from conventional system. Organically fattened calves had higher HCW, NDG and conformation, while no differences in fatness were found.

**Key words:** carcass quality, cattle, organic, conventional, Slovenia

## 1 INTRODUCTION

Organic production aims at creating a sustainable system based on the local resources (Lund and Algers, 2003). Animals in such a system should be reared according to the ethical and environmental standards that provide good animal health and welfare. The main purpose of the organic farming is to produce high quality food with high nutritional value and rich in vitamins, minerals and antioxidants. Since soluble fertilizers, pesticides, genetically modified organisms (GSO) and different growth promoters are prohibited in the organic farming, there are no residues of them in the crops and food (Smith-Spangler *et al.*, 2012).

Smith-Spangler *et al.* (2012) reported that organically produced food is richer in phosphorous, beneficial n-3 fatty acids, and vaccenic acid compared to conventional food. Superior fatty acid composition of organically produced beef was described by Kamihiro *et al.* (2015).

The reason could be the fact that organic livestock are fed with organically produced feed usually based on grazing and animals are provided with access to outdoors, fresh air, and more freedom in movement. There are not only the environmental factors that affect the carcass quality. An important factor is also the breed (Brandt *et al.*, 2010).

In the recent time, the number of organic farms has been increased in Slovenia. From the year 2000 to 2015, it increased by more than 23 times. In the last four years, from 2012 to 2015, the number of organic farms increased by 28 %. In the same time, the number of cattle in organic farms increased by 33 %, whereas the quantity of organically produced veal and beef decreased by more than 50 % (Statistični urad RS, 2016). Consequently, the increased interest in organic farming among farmers was not accompanied with the consumers' interests.

The purpose of the study was to compare the carcass traits of organically and conventionally fattened cattle in Slovenia.

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## 2 MATERIAL AND METHODS

The data on cattle slaughtered from 2009 to 2015 that included hot carcass weight (HCW), slaughter age, EUROP conformation and fatness were provided by the Ministry of Agriculture, Forestry and Food. The net daily gain (NDG) was calculated from the hot carcass weight and the animal age. The HCW was recorded within 45 min after the slaughter. The conformation and fatness were estimated by independent classifiers according to the EUROP classification system with subclasses. Conformation classes expressed with letters were transformed to the numbers (E+ = 15, E0 = 14, ..., P- = 1) and fatness classes as follows 1- = 1, 10 = 2, 1+ = 3, ..., 5+ = 15 (Rules ..., 2005). Only data belonging to the animals that were all their lives reared and fattened on the same either organic ( $n = 16\ 037$ ) or conventional ( $n = 240\ 960$ ) farm were considered. All animals from the organic production system were fattened according to the standards of organic farming, while only some of them were slaughtered and sold as organically produced meat.

Slaughtered animals were classified according to the animal sex and age into five categories as follows: A – young bulls, uncastrated male animals aged from 12 to 24 months, B – old bulls, uncastrated male animals aged more than 24 months, E – heifers, female animals aged from 12 months with no calving recorded, V – calves, animals (male or female) aged less than 8 months, Z – older calves, animals (male or female) aged from 8 to 12 months.

Regarding the breed, animals were divided into five breed groups (genotypes) as follows: Cika, Simmental, Limousine/Charolaise, Holstein Friesian/Brown and crossbreeds, which included other purebred animals that were in a very small number per breed.

Data were analysed using the GLM procedure in the statistical package SAS/STAT (SAS, 2001). The fixed effects of the rearing/fattening system, breed and year of the slaughter were included in the model.

## 3 RESULTS AND DISCUSSION

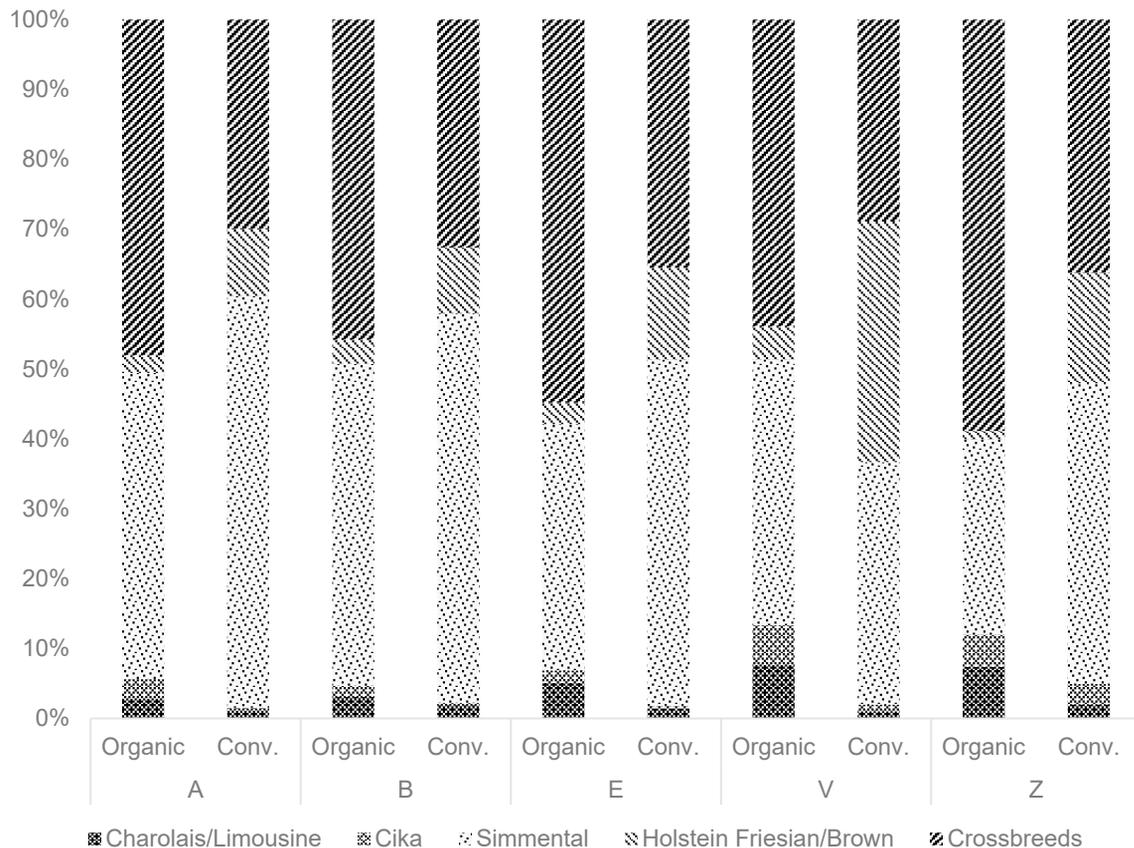
Although the number of organic farms in Slovenia has been increasing, the percentage of organic reared cattle population is still rather low (about 6 %) in comparison with some EU countries. For example, in the year 2014, Sweden had the highest percentage of organically reared cattle, with 19.6 % of the total cattle population, while seven EU Member States had over 10 % of organically reared cattle (EUROSTAT, 2016).

Young bulls from conventional fattening system had higher HCW and NDG. They were on average 60 days older than young bulls from organic system (Table 2). Conventional young bulls had higher conformation and fatness estimated according to the EUROP system. Likewise, old bulls from conventional fattening system had higher HCW, NDG as well as higher conformation and fatness score. Conventionally fattened heifers had higher HCW and NDG, and they were better classified in the EUROP conformation system. The fatness was also much higher in heifers from conventional fattening system compared to the organically fattened ones. According to the standards of certifying organization of organic production, at least 50 % of feed have to originate from the farm and at least 60 % of feed dry matter for ruminants have to originate from the forage (ES, Uredba komisije št. 889/2008). As mentioned before, there are many restrictions regarding the feed production in an organic system. These restrictions could potentially be the reason of lower

**Table 1:** The number of animals of different categories, breeds and fattening systems slaughtered between the years 2008 and 2015

|   | Rearing system | Charolais/<br>Limousin | Cika | Simmental | Holstein<br>Friesian/Brown | Crossbreeds | Total |
|---|----------------|------------------------|------|-----------|----------------------------|-------------|-------|
| A | Organic        | 118                    | 113  | 1801      | 104                        | 1975        | 4111  |
|   | Conv.          | 1135                   | 370  | 57590     | 9341                       | 29297       | 97733 |
| B | Organic        | 55                     | 28   | 824       | 104                        | 1975        | 1787  |
|   | Conv.          | 726                    | 117  | 21239     | 3592                       | 12437       | 38111 |
| E | Organic        | 122                    | 43   | 846       | 74                         | 1316        | 2401  |
|   | Conv.          | 628                    | 156  | 21508     | 5721                       | 15400       | 43413 |
| V | Organic        | 381                    | 283  | 1893      | 234                        | 2185        | 4976  |
|   | Conv.          | 567                    | 531  | 19053     | 18908                      | 15874       | 54933 |
| Z | Organic        | 204                    | 127  | 772       | 33                         | 1626        | 2762  |
|   | Conv.          | 135                    | 199  | 2913      | 1070                       | 2453        | 6770  |

A – young bulls; B – old bulls; E – heifers; V – calves; Z – old calves; Organic – organic fattening system, Conv. – conventional fattening system



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**Figure 1:** Percentage (%) of animals of different breeds in different categories, and fattening systems slaughtered between the years 2008 and 2015

nutritive value or an insufficient yield of forage provided considered that soluble fertilizers are not permitted. Russo and Preziuso (2005) found poor carcass conformation and fatness of slaughtered cattle from organic production system and concluded that the feeding program of cattle had probably been inadequate. They suggested an appropriate finishing period, respecting organic guidelines, which should be able to produce animals appropriate for the slaughter, resulting in better carcass quality. A similar conclusion was drawn by Therkildsen and Vestergaard (2014), based on the very poor fatness of organic fattened bulls. Woodward and Fernández (1999) reported about lower carcass weight and ribeye area in the organically produced steers as well. Likewise, the routinely treatment with antiparasitic drugs or for preventive purposes is not allowed in the certified organic system. Thereby the animals from the organic rearing system are commonly more infected with parasites (Hansson *et al.*, 2000).

The HCW of calves was higher in organic rearing system where calves were on average older. Therefore, there was no difference found in NDG. Carcasses

of organically fattened calves had higher conformation compared to the conventionally fattened ones. There was no difference in fatness within the calves (Table 2). Organically fattened old calves had better carcass traits in comparison to conventional fattened old calves. They had higher HCW, NDG and better carcass conformation, but there was no difference in fatness (Table 2). The most of organically fattened calves are probably from suckler herds and this could be the reason of better NDG and consequently better carcass traits. Higher weight gain of calves from suckler herds in comparison with the calves from artificial suckling system was reported in many studies (Roth *et al.*, 2009; Passille *et al.*, 2008).

#### 4 CONCLUSIONS

Conventionally fattened cattle in Slovenia, older than 12 months, have better growth and carcass characteristics than cattle reared according to the organic standards. This is probably due to inferior quality of feed

**Table 2:** Carcass traits (LSM ± SE) of cattle from different fattening systems and different categories

|   | Rearing system | Hot carcass weight (kg)  | Slaughter age (d)        | Net daily gain (g/d)     | EUROP conformation (1–15) | EUROP fatness (1–15)     |
|---|----------------|--------------------------|--------------------------|--------------------------|---------------------------|--------------------------|
| A | Organic        | 252.8 ± 2.3 <sup>a</sup> | 552.8 ± 2.8 <sup>a</sup> | 462.9 ± 3.5 <sup>a</sup> | 6.92 ± 0.09 <sup>a</sup>  | 4.57 ± 0.08 <sup>a</sup> |
|   | Conv.          | 323.4 ± 0.9 <sup>b</sup> | 613.4 ± 1.1 <sup>b</sup> | 528.9 ± 1.4 <sup>b</sup> | 7.68 ± 0.03 <sup>b</sup>  | 6.11 ± 0.03 <sup>b</sup> |
| B | Organic        | 306.8 ± 3.7 <sup>a</sup> | 865.2 ± 5.8 <sup>a</sup> | 360.2 ± 5.1 <sup>a</sup> | 7.35 ± 0.13 <sup>a</sup>  | 4.44 ± 0.11 <sup>a</sup> |
|   | Conv.          | 353.4 ± 1.4 <sup>b</sup> | 833.0 ± 2.2 <sup>b</sup> | 429.8 ± 2.0 <sup>b</sup> | 7.81 ± 0.04 <sup>b</sup>  | 5.92 ± 0.04 <sup>b</sup> |
| E | Organic        | 202.7 ± 2.8 <sup>a</sup> | 606.9 ± 8.9 <sup>a</sup> | 354.5 ± 4.1 <sup>a</sup> | 6.42 ± 0.10 <sup>a</sup>  | 5.75 ± 0.14 <sup>a</sup> |
|   | Conv.          | 238.5 ± 1.2 <sup>b</sup> | 677.8 ± 4.0 <sup>b</sup> | 365.2 ± 1.9 <sup>b</sup> | 6.70 ± 0.04 <sup>b</sup>  | 7.22 ± 0.06 <sup>b</sup> |
| V | Organic        | 109.1 ± 0.5 <sup>a</sup> | 161.6 ± 1.0 <sup>a</sup> | 716.0 ± 4.4 <sup>a</sup> | 7.46 ± 0.05 <sup>a</sup>  | 4.42 ± 0.04 <sup>a</sup> |
|   | Conv.          | 97.0 ± 0.3 <sup>b</sup>  | 144.1 ± 0.5 <sup>b</sup> | 717.1 ± 2.5 <sup>a</sup> | 7.25 ± 0.02 <sup>b</sup>  | 4.34 ± 0.02 <sup>a</sup> |
| Z | Organic        | 160.5 ± 2.2 <sup>a</sup> | 298.5 ± 1.6 <sup>a</sup> | 539.4 ± 6.8 <sup>a</sup> | 7.12 ± 0.11 <sup>a</sup>  | 4.69 ± 0.11 <sup>a</sup> |
|   | Conv.          | 150.9 ± 1.2 <sup>b</sup> | 301.4 ± 0.9 <sup>a</sup> | 501.3 ± 3.8 <sup>b</sup> | 6.48 ± 0.06 <sup>b</sup>  | 4.54 ± 0.06 <sup>a</sup> |

LSM – Least square means; SE – standard error; <sup>ab</sup> LSM without the same superscript differ significantly,  $p < 0.05$ ;

A – young bulls; B – old bulls; E – heifers; V – calves; Z – old calves; Organic – organic fattening system, Conv. – conventional fattening system

since there are many limitations in organic feed production. On the contrary, carcass characteristics of calves and old calves were better in those from organic system, supposed the majority of them were from suckler herds.

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