Reproductive Performance of Native Romanian Turcana Sheep Breed Reared for Organic Meat Production under Highlands Conditions

Maria Sauer¹, Ioan Padeanu², Raducu Radu³, Dinu Gavojdian¹*, Walter-Ioan Sauer¹, Maria Stanciu³, Gabriel Vicovan³, Doru-Ioan Ratiu¹

¹ Research and Development Station for Sheep and Goats of the Romanian Academy for Agricultural and Forestry Sciences, 325400, Drumul Resitei km 2, Caransebes, Romania
² Faculty of Animal Science and Biotechnologies, Banat University of Agricultural Sciences and Veterinary Medicine, 300645, Calea Aradului 119, Timisoara, Romania
³ Research and Development Institute for Sheep and Goats of the Romanian Academy for Agricultural and Forestry Sciences, 900316, Palas, Romania

Abstract
Aim of the current study was to evaluate the effects of turning from conventional to organic production systems on the reproductive performance of native Romanian Turcana sheep breed reared for lamb-meat production under highlands conditions. Researches were carried out in two farms from highlands of western Romania, one farm was registered for organic production and the other reared sheep under conventional practices. In Turcana breed, average conception rate registered under organic production system was of 97.94%, while in conventional rearing the conception rate was of 94.72%, differences registered between the two system being significantly statistic (p ≤ 0.05).

Prolificacy was not influenced (p ≥ 0.05) by the production system in Turcana ewes, with average values registered of 118.18% under organic production system and of 115.16% under conventional conditions, respectively. It was concluded that shortcomings caused by restrictions required by organic production can be surpassed throughout proper management and rearing conditions.

Keywords: highland organic sheep farming, reproductive performance, Turcana breed

1. Introduction
Organic dairy sheep systems are an essential factor for rural development, because of the the environment friendly methods used and sustainable production system employed [1]. Currently the standards for organic sheep farming are detailed by the organic farming regulations of the European Community are being stipulated in the Council Regulation (EC) No 834/2007 of 28 June 2007 on organic production and labeling of organic products and repealing Regulation (EEC) No 2092/91 [2].

* Corresponding author: Gavojdian Dinu, 0040-723375804, gavojdian_dinu@animalsci-tm.ro

The International Federation of Organic Movements (IFOAM) from Germany in 2002 defined organic livestock production as a system based on the harmonious relationship between land, plants and livestock, respect for the physiological and behavioural needs of livestock; using organically grown feedstuffs or natural resources as fodders [3].

Organic meat production in small ruminants its becoming important in the highlands of Romania, because of the additional subsidies offered by the government for turning to organic production systems, and because of the increasing demand for organically reared lamb meat. In order to register and be able to produce organically, several conventional practices are being band, e.g. the use
of antibiotics and chemical fertilizers on pastures. Because of the restrictions, farmers’ major concerns lies with the overall profitability of their farms and production levels registered. Romanian mountain indigenous Turcana sheep breed belongs to the Eastern and Central Zackel strain [4, 5], currently representing 91.74% of the total sheep reared in western Romania and 98.08% of the animals reared in the highlands of the Banat region [6].

Aim of the current study was to evaluate the effects of turning from conventional to organic production systems on the reproductive performance of native Romanian Turcana sheep breed reared for lamb-meat production under highlands conditions.

2. Materials and methods

Researches were carried out starting autumn 2011 until spring 2012 in two farms from Caras-Severin County that rear purebred Turcana sheep, situated in the highlands of western Romania, the Banat region. First farm (Site 1) turn to organic lamb meat production system based on the regulations stipulated by the Council Regulation (EC) No 834/2007, here the reproductive performance of 292 Turcana breeding ewe was monitored. In site 1, the following production system conditions were respected: All animals raised for organic slaughter were fed 100% organic feed during their entire lifetime (lambs) and with 60 days before the admission to reproduction in the case of the transition breeding ewes; No use of genetically modified crops; Hay and concentrates were harvested from a certified organic field; Ewes were kept predominantly on pastures, except for the winter time, when kept indoors; Land was certificated with 36 months in advance; No prohibited health materials or feed supplements were fed or used in either the gestating ewes during the last 60 days or during the organic meat animal’s lifetime (no antibiotics, non-approved internal or external parasitic solutions, no minerals or vitamins with prohibited additives, animal origin feed etc); Artificial insemination was allowed, although not practiced; Breeding hormones were not used; The farm was certified by a third-party certification agency and inspected annually; A detailed record keeping was kept, including records of individual animals.

Second farm (Site 2) was a commercial one which practices conventional rearing conditions, and manages a number of 550 Turcana breeding ewes, animals which are registered for performance testing by the Romanian National Agency for Genetic Improvement and Reproduction. The following reproduction indices were registered: Ewes in estrous (Ewes that go into estrous / Breeding ewes x 100); Conception rate (Ewes that lambed / Ewes exposed to ram x 100); Prolificacy (Lambs born / Ewes that lambed x 100); Natality (Live lambs born / Breeding ewes x 100) and Weaning rate (Waned lambs / Breeding ewes x 100)

Data were statistically analyzed by non-parametrical Mann-Whitney test using Mini Tab 14® software. All decisions about the acceptance or rejection of statistical hypothesis have been made at the 0.05 level of significance. The study was performed in accordance with the EU Directive 2010 /63 /EU for animal experimentation [7].

3. Results and discussion

Efficiency of lamb production is severely controlled by reproduction, mothering ability and milk production of the ewes, as well as growth rate and survival rates of the lambs [8, 9]. On the other hand, selection for prolificacy and other reproduction traits in sheep is a slow process due to the low heritability traits, 0.03 to 0.18 for the reproduction characters [10, 11].

Reproductive performances of the Turcana ewes managed under organic and conventional production systems are being presented in Table 1. Significant (p ≤ 0.05) differences were registered between the organic and conventional farms regarding the percent of ewes in estrous, with an average of 98.28 being registered in site 1 and 95.45% in site 2, respectively. Results registered in the current study for both production systems are within typical limits for the Turcana breed, which range between 92-97% [12].

Conception rate was of 97.94% under organic production conditions, and of 94.72% under conventional rearing practices. Differences registered of 3.22% being significantly statistic (p≤0.05). Conception rates registered in the two farms are above limits reported for the breed, of 90-95% [12, 13]. Differences could be the result of genotype by environment by year interactions,
taking into consideration that during the year 2011 the average rain falls and temperatures were higher than usual, which might have lead to a higher than normal quality pastures and thus, a natural flushing of the ewes. Difference registered of 3.02 % between the two productions systems for prolificacy was not significant statistically (p≥0.05). Highest prolificacy rate was registered under organic production system, of 118.18% compared to 115.15% under conventional rearing practices. Average prolificacy rates registered in both sites is significantly higher than average prolificacy reported by other authors for the Turcana breed, of 103-105% [14, 15]. As with the conception rate, the higher prolificacy could be explain by the more favourable interactions with the environment. Padeanu (2010) also reported that within the Turcana breed, a more precocious strain was created throughout selection and proper management, which is able to register prolificacy rates of 120-140 for primiparous and multiparous ewes, respectively [12]. Natality rate was on average 110.40% under organic conditions and 109.60% in conventional system, respectively. Difference of 0.89% for this trait was not statistically significant (p≥0.05). Natality rates registered in the current study are lower than one registered in a previous study on Transylvanian Merino, when average natality rates of 120.57% are being reported [16]. Differences between the current study and the previous one could be explained by the higher prolificacy rate of the Transylvanian Merino breed of 125-130%, compared with the Turcana breed which registered values of 115-118% in the current study.

### Table 1. Reproductive performances of Turcana ewes under organic and conventional production systems

<table>
<thead>
<tr>
<th>Trait</th>
<th>Production system</th>
<th>n</th>
<th>X ± s,</th>
<th>SD</th>
<th>cv %</th>
<th>Differences</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ewes in estrous (%)</td>
<td>Organic</td>
<td>292</td>
<td>98.28±0.007</td>
<td>0.129</td>
<td>13.22</td>
<td>2.83 % *</td>
</tr>
<tr>
<td></td>
<td>Conventional</td>
<td>550</td>
<td>95.45±0.008</td>
<td>0.208</td>
<td>21.84</td>
<td></td>
</tr>
<tr>
<td>Conception rate (%)</td>
<td>Organic</td>
<td>292</td>
<td>97.94±0.008</td>
<td>0.142</td>
<td>14.51</td>
<td>3.22 % *</td>
</tr>
<tr>
<td></td>
<td>Conventional</td>
<td>550</td>
<td>94.72±0.009</td>
<td>0.223</td>
<td>23.61</td>
<td></td>
</tr>
<tr>
<td>Prolificacy (%)</td>
<td>Organic</td>
<td>292</td>
<td>118.18±0.022</td>
<td>0.386</td>
<td>32.69</td>
<td>3.02 % ns</td>
</tr>
<tr>
<td></td>
<td>Conventional</td>
<td>550</td>
<td>115.16±0.015</td>
<td>0.359</td>
<td>31.17</td>
<td></td>
</tr>
<tr>
<td>Natality (%)</td>
<td>Organic</td>
<td>292</td>
<td>110.49±0.018</td>
<td>0.307</td>
<td>27.78</td>
<td>0.89 % ns</td>
</tr>
<tr>
<td></td>
<td>Conventional</td>
<td>550</td>
<td>109.60±0.012</td>
<td>0.294</td>
<td>26.90</td>
<td></td>
</tr>
<tr>
<td>Weaning rate (%)</td>
<td>Organic</td>
<td>292</td>
<td>93.01±0.015</td>
<td>0.255</td>
<td>27.47</td>
<td>2.19 % ns</td>
</tr>
<tr>
<td></td>
<td>Conventional</td>
<td>550</td>
<td>95.20±0.009</td>
<td>0.213</td>
<td>22.47</td>
<td></td>
</tr>
</tbody>
</table>

Weaning rate of the lambs born during spring 2012 was on average of 93.01% in site 1 and of 95.20% under commercial rearing conditions. Production system did not influenced (p≥0.05) weaning rate of lambs between the two farms taken into study.

### 4. Conclusions

Differences registered between the two rearing system were significant (p≤0.05) for conception rate and percent of ewes in estrous, the rest of the reproduction traits were not influenced by the rearing conditions. Therefore, it might be concluded that shortcomings caused by restrictions required by organic production can be surpassed throughout proper management and rearing conditions.

### Acknowledgements

This research was funded throughout the project ADER 733 “Organic Sheep and Goats Farming for Meat Production under the Highland Pasture Conditions of Romania” Funded by the Romanian Ministry of Agriculture and Rural Development throughout the Sectorial Plan ADER 2020

### References


