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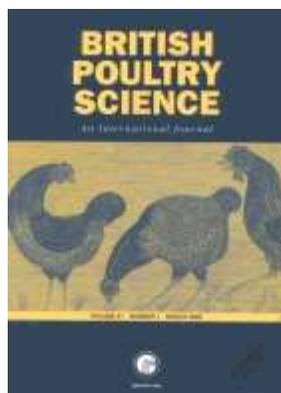
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**Comparison of three different diets for organic broilers:  
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3 Comparison of three different diets for organic broilers: effects on performance and body

4 condition

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13 **RUNNING TITLE: PERFORMANCE OF ORGANIC BROILERS**

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23 **Abstract** 1. The aim of this study was to assess the feasibility of 100% organic feed for  
24 organic broilers by comparing it with 80% organic feed (situation at the time of the  
25 experiment; 2004) and 95% organic feed (alternative).

26 2. Diets were optimised for nutritional value, allowing a maximum 10% increase in feed  
27 price when using 100% organic feedstuffs. This could only be achieved at the expense of the  
28 methionine content.

29 3. The birds were reared from zero to three weeks of age in a broiler house in three groups of  
30 500 broilers each on either an 80, a 95, or a 100% organic starter diet. At three weeks of age,  
31 they were transferred to 15 pens with an outdoor run. Each treatment group of 500 birds was  
32 divided into 5 groups of 95 and given an 80, a 95, or a 100% organic finisher diet.

33 4. Broilers receiving 100% organic feed reached a lower body weight and grew more slowly  
34 than those receiving 95% organic feed, mainly because of a lower feed intake.

35 5. Broilers on 95 or 100% organic feed had a higher incidence of breast blisters than broilers  
36 receiving 80% organic feed.

37 6. The cost price for meat from broilers that received 80% organic feed was € 1.83 per kg  
38 live weight. The cost prices for broilers that received 95 and 100% organic feed were € 1.84  
39 (+0.8%) and € 1.93 (+5.4%) per kg live weight respectively.

40 7. In conclusion, 95% organic feed led to a better performance than 100% organic feed in  
41 this study. Probably, the lower methionine content in the 100% organic feed negatively  
42 affected performance. The results for 95% organic feed were similar to 80% organic feed,  
43 except for a higher incidence of breast blisters.

## 44 INTRODUCTION

45 In organic animal husbandry, the feed must be produced from organic feedstuffs  
46 according to EU Council Directive 1804/1999. Until 2012, limited use of  
47 conventional feedstuffs is permitted, if there are too few organic feedstuffs available.  
48 After December 2011, all feed used in organic animal production should be produced  
49 from 100% organic feedstuffs. At present 85% organic feed is commonly used in

1  
2  
3 50 organic broiler production. The transition from 85% to 100 % organic feed can cause  
4  
5 51 problems in poultry. The supply of protein and amino acids (especially methionine)  
6  
7  
8 52 is the most common problem, because some feedstuffs are not available from organic  
9  
10 53 origin and because organic feedstuffs generally have lower protein contents than  
11  
12 54 conventional feedstuffs (Hovi and Sundrum, 2001; Zollitsch and Baumung, 2004).  
13  
14  
15 55 Furthermore, addition of synthetic methionine is not an option, as this is prohibited in  
16  
17 56 organic farming (EU 1804/1999). It is possible to avoid shortage of methionine in  
18  
19 57 100% organic feed by addition of specific organic feedstuffs, such as organic sesame  
20  
21 58 seed expeller. The problem is that these feedstuffs are not generally available and are  
22  
23 59 relatively expensive. Rose *et al.* (2004) compared 100% organic diets with low and  
24  
25 60 high methionine levels and found that laying hens fed on the high methionine diet  
26  
27 61 performed better than hens given the low methionine diet. The higher ingredient  
28  
29 62 costs of the high methionine diet, however, resulted in a 50% reduction of the margin  
30  
31 63 of egg income over feed costs.  
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35  
36 64 In organic broilers, problems of 100% organic feed may be reduced because a  
37  
38 65 slow growing broiler, which has lower nutrient requirements than fast growing  
39  
40 66 broilers, is used for organic production (Zollitsch and Baumung, 2004). On the other  
41  
42 67 hand, imbalance of protein in the feed can lead to an increased water intake and wet  
43  
44 68 manure (Walker and Gordon, 2001). Wet manure can cause other problems, such as  
45  
46 69 a poor litter quality and a poor body condition (Weaver and Meijerhof, 1991). As  
47  
48 70 organic broilers have an outdoor run, it may be that they can partly compensate for  
49  
50 71 imbalances in the feed by foraging in the outdoor run, consuming vegetation, worms,  
51  
52 72 and insects (Hermansen *et al.*, 2004). Alternatives for 100% organic feed could be  
53  
54 73 95% organic feed or 100% organic feed with synthetic amino acids (Lemme *et al.*,  
55  
56 74 2005; Moritz *et al.*, 2005).  
57  
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3 75 The aim of the present study was to compare three different diets for organic  
4  
5 76 broilers: 80% organic feed (situation at the time of the experiment; 2004), 95%  
6  
7 77 organic feed (alternative) and 100% organic feed. It was hypothesised that broilers  
8  
9 78 that received 80% organic feed would have a better performance and a better body  
10  
11 79 condition than broilers that received 100% organic feed (due to the lower methionine  
12  
13 80 concentration), and that broilers receiving 95% organic feed would be intermediate.  
14  
15 81 Also, broilers that received 100% organic feed were expected to compensate for  
16  
17 82 possible deficiencies in the feed by increased use of the outdoor run.  
18  
19  
20  
21

## 22 83 MATERIALS AND METHODS

### 23 84 **Feed**

24  
25 85 A total of 6 feed formulations were used: starter (0-3 weeks) and finisher (3-11  
26  
27 86 weeks) feeds, each with 80, 95, or 100% organic feedstuffs. The feed was produced  
28  
29 87 by van Gorp-Teurlings BV, Waspik, The Netherlands. In 95 and 100% organic  
30  
31 88 feeds, conventional sesame-seed expeller and toasted soybeans were removed,  
32  
33 89 compared with the 80% organic feed (Table 1). Additionally, in 100% organic feed,  
34  
35 90 conventional maize gluten meal and potato protein were removed, compared with the  
36  
37 91 80 and the 95 % organic feed. The 80% and 95% organic feeds were mainly  
38  
39 92 supplemented with organic soya bean meal. Tables 1 and 2 near here  
40  
41  
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43  
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45

46 93 The feed manufacturer was asked to produce 80, 95, and 100% organic diets  
47  
48 94 from feedstuffs that are generally available and also to avoid feedstuffs or additives  
49  
50 95 that would make the feed too costly, allowing a maximum 10% increase in feed price  
51  
52 96 when using 100% organic feedstuffs. Within these restrictions, it proved impossible  
53  
54 97 to keep the content of digestible methionine the same in all diets. Methionine  
55  
56 98 concentration decreased as the amount of organic feedstuffs increased (Table 2).  
57  
58  
59

### 60 99 **Rearing**

1  
2  
3 100 Rearing of the broilers took place in June 2004. Three groups of 500 slow growing  
4  
5 101 broilers (Hubbard JA 957) were housed in three compartments of a climate-  
6  
7 102 controlled broiler house as d-old chicks. JA 957 chicks were used because this is the  
8  
9 103 hybrid that is generally used for organic broiler production in The Netherlands. Each  
10  
11 104 compartment measured 4.2 x 6.8 m with an available floor space of 28.1 m<sup>2</sup>. Each  
12  
13 105 compartment was fitted with 7 feeders (MiniMax, Roxell) and 45 nipple drinkers  
14  
15 106 (Avron). The broilers were housed on softwood shavings and had *ad libitum* access  
16  
17 107 to feed and water. One group received an 80%, one group a 95% and one group a  
18  
19 108 100% organic starter diet. During the first 2 d, continuous light was used. Thereafter,  
20  
21 109 an 18L:6D lighting schedule was used.

### 22 110 **Experimental design**

23  
24  
25 111 The experiment was conducted in July and August 2004. At three weeks of age, the  
26  
27 112 broilers were transferred to 15 pens with an outdoor run. Each pen measured 5.3 x  
28  
29 113 2.2 m with an available floor space of 11.4 m<sup>2</sup>. The pens were all located next to  
30  
31 114 each other. Each treatment group of 500 broilers was divided into 5 groups of 95  
32  
33 115 broilers, resulting in a total of 15 experimental groups. The remainder of the broilers  
34  
35 116 were excluded from the experiment. The 15 pens that were used from 3-11 weeks of  
36  
37 117 age had an open front that was covered only with windbreak netting. The broilers  
38  
39 118 were housed on softwood shavings and had *ad libitum* access to feed and water. Five  
40  
41 119 groups received an 80%, 5 groups a 95% and 5 groups a 100% organic finisher diet.  
42  
43 120 For each group, treatment during the experimental period was the same as treatment  
44  
45 121 during the rearing period (80%, 95% or 100% organic feed). The treatments were  
46  
47 122 allocated to the pens at random. During the experimental period, no extra light was  
48  
49 123 given (daylight only). Temperature and humidity in the pens were recorded  
50  
51 124 continuously using the uMETOS, manufactured by Pessl, Germany. After one week

1  
2  
3 125 of habituation to the new pens, the broilers had permanent 24 h access to the outdoor  
4  
5 126 run (approximately 7 m<sup>2</sup> per bird). The windbreak netting was pulled up 50 cm to  
6  
7  
8 127 allow the broilers access to the outdoor run over the full width of the pen. The  
9  
10 128 outdoor run consisted of a concrete part near the house (11.4 m<sup>2</sup> per group) and a  
11  
12 129 large part with long grass and other vegetation (640 m<sup>2</sup> per group). In the pen, the  
13  
14 130 broilers were kept at a stocking density of 8 birds/m<sup>2</sup>. The broilers were slaughtered  
15  
16 131 at 11 weeks of age.

### 132 **Observations**

133 Performance (body weight gain, feed intake, feed conversion ratio and mortality),  
134 use of the outdoor run, litter quality, gait score, body condition, and slaughter data  
135 were recorded. To evaluate performance, all broilers were weighed at 0, 3, 7, and 11  
136 weeks of age. Feed intake per group and mortality were recorded daily. To study the  
137 use of the outdoor run from 5 - 9 weeks of age, every Wednesday morning at 0830 h  
138 the number of broilers on the concrete part and on the grass of the outdoor run was  
139 counted. Litter samples were taken at 5, 7, 9, and 11 weeks of age from each pen to  
140 analyse the dry matter content of the litter, using a pooled sample from 5 locations in  
141 the pen. At 10 weeks of age, the gait of all broilers was assessed, using a group  
142 scoring method modified from the method described by Kestin *et al.* (1992). The gait  
143 score had a 6-point scale from 0 to 5, where 0 = no observable locomotory problems  
144 and 5 = unable to walk. In each pen, the percentage of broilers in each of the 6 gait  
145 score categories was recorded. At 10 weeks of age, the body condition of the broilers  
146 was recorded as well. The incidence and extent of breast smearing, breast irritations,  
147 scratches on the thighs, hockburns and footpad irritations were determined with a  
148 visual scoring method. The visual scoring method had a 4 point scale from 0 to 3,  
149 where 0 = no visual signs and 3 = severe visual abnormalities. At slaughter, the

1  
2  
3 150 processing yields of 10 males and 10 females per pen were recorded. These broilers  
4  
5 151 were randomly selected and processed at a commercial processing plant. According  
6  
7  
8 152 to a standard procedure, carcass yield, and yields of wings, breast meat, back and  
9  
10 153 legs were determined. The carcass yield was calculated by dividing the carcass  
11  
12 154 weight by the total body weight. The leg, wing, breast, and back yield were  
13  
14  
15 155 calculated by dividing their weight by the carcass weight. Finally, data of the  
16  
17 156 experiment were used for an economic evaluation. Only significant differences and  
18  
19 157 tendencies for differences in performance between treatments were taken into  
20  
21 158 account for this evaluation. Other starting-points were taken from Vermeij (2004).  
22  
23  
24 159 Feed prices were supplied by the feed manufacturer.

#### 26 27 160 **Statistical analysis**

28  
29 161 Data were analysed in GenStat using analysis of variance, with the factor feed. Pen  
30  
31 162 was the experimental unit. The Bonferroni test was used to test for significant  
32  
33 163 differences between treatments in case of an overall effect of feed. Use of the  
34  
35 164 outdoor run and dry matter content of the litter were analysed using repeated  
36  
37 165 measures analysis of variance, to analyse the effect of age.

### 41 166 **RESULTS**

#### 43 167 **General**

44  
45 168 During the outdoor phase, temperature varied strongly between day and night; the  
46  
47 169 lowest temperature recorded was 8°C and the highest temperature was 32°C. The  
48  
49 170 mean temperature was 19°C. Air humidity was between 38 and 100% with a mean of  
50  
51 171 86%. During the outdoor phase (from 4 weeks of age) there was some mortality due  
52  
53 172 to predators, especially birds of prey. The mortality due to predation was distributed  
54  
55 173 equally over the treatments.

#### 57 58 59 174 **Performance**

1  
2  
3 175 At the end of the rearing period at three weeks of age, broilers that had received 95%  
4  
5 176 organic feed were numerically heavier than broilers from the other two treatments  
6  
7  
8 177 (Table 3; not tested for significance due to limited number of groups during rearing).  
9  
10 178 Over the entire growing period, broilers that received 100% organic feed reached a  
11  
12 179 lower body weight ( $F_{2,12} = 4.49, P < 0.05$ ) and grew more slowly ( $F_{2,12} = 4.37, P <$   
13  
14 180  $0.05$ ) than broilers that received 95% organic feed. There were no differences in  
15  
16 181 growth between broilers receiving 80 % organic feed and broilers from the other  
17  
18 182 treatments. There also were no differences in mortality between the treatments. Feed  
19  
20 183 intake was lower in pens with 100% organic feed than in pens with 80 and 95%  
21  
22 184 organic feed ( $F_{2,12} = 17.89, P < 0.001$ ). There was no difference in feed conversion,  
23  
24 185 as calculated in practice (uncorrected for mortality). After correction for mortality,  
25  
26 186 feed conversion tended to be better in pens that received 95% and 100% organic feed  
27  
28 187 compared with pens that received 80% organic feed ( $F_{2,12} = 2.89, P < 0.10$ ).

Table 3  
and  
Figure  
near here

### 188 Use of the outdoor run

189 During observations of use of the outdoor run, a mean of 9% of all the broilers was  
190 observed on the concrete part of the outdoor run, near the house, and 7% of the  
191 broilers on the grass (Figure). The broilers were mainly observed in the part of the  
192 outdoor run located closest to the pens. There were no differences in use of the  
193 outdoor run between treatments. Use of the outdoor run increased with age ( $F_{4,48} =$   
194  $5.55, P < 0.01$ ).

### 195 Litter quality

196 Dry matter content of the litter was lower in pens that received 100% organic feed  
197 than in pens that received 95% or 80% organic feed at 7 weeks of age ( $F_{2,12} = 38.70,$   
198  $P < 0.001$ ; Table 4). At 5, 9, and 11 weeks of age, there were no significant

1  
2  
3 199 differences between the treatments. Dry matter content of the litter increased from 5  
4  
5 200 to 11 weeks of age ( $F_{3,35} = 121.81, P < 0.001$ ).

7  
8 201 **Gait score**

9  
10 202 About 70% of all the broilers had no gait abnormalities. 25% of the broilers had a  
11  
12 203 slightly trembling gait and 5% of the broilers had a trembling gait. There were no  
13  
14 204 differences in gait score between treatments.

Tables 4 & 5  
near here

17  
18 205 **Body condition**

19  
20 206 Broilers that received 95 or 100% organic feed had a higher incidence of breast  
21  
22 207 blisters than broilers receiving 80% organic feed ( $F_{2,12} = 3.95, P < 0.05$ ; Table 5).  
23  
24 208 Furthermore, broilers that received 100% organic feed tended to have more footpad  
25  
26 209 irritations than broilers that received 95% organic feed ( $F_{2,12} = 3.26, P < 0.10$ ). There  
27  
28 210 were no differences in breast smearing, breast irritations, and hock irritations  
29  
30 211 between the treatments.

33  
34 212 **Processing yields**

35  
36 213 Broilers that received a 100% organic feed had a higher wing yield ( $F_{2,12} = 4.39, P <$   
37  
38 214  $0.05$ ) and tended to have a higher leg yield ( $F_{2,12} = 3.05, P < 0.10$ ) than broilers  
39  
40 215 receiving 80 or 95% organic feed (Table 6). There were no significant differences in  
41  
42 216 breast yield between treatments.

Tables 6 & 7  
near here

45  
46 217 **Economic evaluation**

47  
48 218 Feed prices for 95% and 100% organic feed were 4.6% and 7.6% higher compared  
49  
50 219 with 80% organic feed. The cost price for broilers that received an 80% organic feed  
51  
52 220 was € 1.83 per kg live weight. The cost prices per kg live weight for broilers that  
53  
54 221 received a 95% and 100% organic feed were € 1.84 (+0.8%) and € 1.93 (+5.4%)  
55  
56 222 respectively.

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58  
59  
60 223 DISCUSSION

1  
2  
3 224 Broilers that received 100% organic feed reached a lower body weight and grew  
4  
5 225 more slowly than broilers that received 95% organic feed. Possibly, the methionine  
6  
7  
8 226 level of the 100% organic feed was too low, resulting in an imbalance in amino acid  
9  
10 227 profile. Moran (1994) also found that broilers on a low methionine diet grew slower  
11  
12 228 than broilers from a control group, especially during the first six weeks of life. It may  
13  
14 229 also be possible that the 100% organic feed used in the present study had a lower  
15  
16 230 palatability than 80 and 95% organic feed, as the feed intake of broilers that received  
17  
18 231 100% organic feed was lower as well.

22 232       There were no differences in use of the outdoor run in this study and the use  
23  
24 233 was lower than in other studies, with a mean of about 15%. For instance, Christensen  
25  
26 234 *et al.* (2003) found a mean use of the outdoor run of about 35%. The lower use of the  
27  
28 235 outdoor run may be caused by the type of housing (open front), but it may also be  
29  
30 236 that counting once a week was too limited to get a good impression of use of the  
31  
32 237 outdoor run. Nielsen *et al.* (2003) did find an effect of type of feed on use of the  
33  
34 238 outdoor run in free range broilers. In their study broilers that received a moderate  
35  
36 239 energy feed made more use of the outdoor run than broilers that received a low  
37  
38 240 energy feed. Similarly, Moritz *et al.* (2005) showed that broilers that received lower  
39  
40 241 methionine levels in their feed spent more time foraging, especially if their feed  
41  
42 242 intake was restricted.

43 243       Broilers that received 95 or 100% organic feed had more breast blisters than  
44  
45 244 broilers that received 80% organic feed. This difference could be caused by a poorer  
46  
47 245 litter quality or by a lower activity of the broilers. In the pens that received 100%  
48  
49 246 organic feed the dry matter content of the litter was indeed lower than in the pens  
50  
51 247 that received 80% organic feed (significant only in week 7), but this was not the case  
52  
53 248 in the pens that received 95% organic feed. Perhaps, broilers that received 95%

1  
2  
3 249 organic feed were less active than broilers that received 80% organic feed, but  
4  
5 250 activity was not recorded in this study. The wetter litter in the pens that received  
6  
7  
8 251 100% organic feed may have been caused by an imbalance of the amino acid profile  
9  
10 252 in the feed. This can lead to an increased water intake and wet manure (Walker and  
11  
12 253 Gordon, 2001). Contrary to expectations, the dry matter content of the litter was  
13  
14 254 lowest at 5 weeks of age and increased to the end of the growing period. This may be  
15  
16 255 caused by the access to the outdoor run from 5 weeks of age and by weather  
17  
18 256 influences. In comparison with other studies with slow growing broilers kept until 56  
19  
20 257 days of age (van Horne *et al.*, 2004), there was a higher incidence of gait  
21  
22 258 abnormalities in this study, probably due to the longer growing period.  
23  
24  
25

26  
27 259 Feed prices for 95% and 100% organic feed were higher compared with 80%  
28  
29 260 organic feed. The cost price for meat from broilers that received 95% organic feed  
30  
31 261 was slightly higher than the cost price for meat from broilers that received 80%  
32  
33 262 organic feed (+0.8%). For meat from broilers that received 100% organic feed, the  
34  
35 263 cost price was 5.4% higher. The smaller increase in costs for the meat from broilers  
36  
37 264 that received 95% organic feed was due to the fact that the improvements in feed  
38  
39 265 conversion ratio and live weight compensated for the higher feed costs.  
40  
41  
42

43 266 In conclusion, 95% organic feed led to a better performance than 100%  
44  
45 267 organic feed in this study. Probably, the lower methionine content in the 100%  
46  
47 268 organic feed negatively affected performance. The results for 95% organic feed were  
48  
49 269 similar to 80% organic feed, except for a higher incidence of breast blisters.  
50  
51

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60

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4  
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320 **Table 1.** *Feed composition of 80%, 95% and 100% organic starter (0-4 weeks) and finisher*

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*feeds as g/kg of total*

	Starter diets (0-3 weeks)			Finisher diets (3-11 weeks)		
	80%	95%	100%	80%	95%	100%
Maize organic	200	200	200	130	190	150
Wheat organic	390	430	370	450	465	435
Sunflower organic	40	60	70	80	70	70
Pea organic	30			80	50	40
Rapeseed organic	30	40	50		20	20
Soya bean meal organic	70	160	240	25	100	220
Sesame organic		10	10		10	10
Soja oil organic	5	15	25	5	15	25
Premix, Minerals and Vitamins	30	30	30	30	30	30
Maize gluten	20	10		40	10	
Potato protein	50	40		25	40	
Soybeans toasted	55			110		
Sesame seed expeller	50			25		
Yeast	25					
Organic acid	5	5	5			

322

323 **Table 2.** *Calculated feed composition of 80%, 95% and 100% organic starter (0-4 weeks)*  
 324 *and finisher feeds*

	Unit	Starter diets (0-4 weeks)			Finisher diets (4-12 weeks)		
		80%	95%	100%	80%	95%	100%
CP	g/kg	220	207	205	194	185	197
Crude fat	g/kg	55	58	74	60	50	68
Crude fibre	g/kg	39	44	50	49	45	50
Crude ash	g/kg	61	60	63	59	57	61
ME broiler	MJ/kg	11.4	11.4	11.4	11.5	11.5	11.4
Lysine <sup>1</sup>	g/kg	10.7	10	9.8	8.85	8.8	9.4
Methionine <sup>1</sup>	g/kg	4.3	3.7	3.4	3.5	3.35	3.2
Methionine+Cysteine <sup>1</sup>	g/kg	8.3	7.5	7.1	7.1	6.8	6.75
Threonine <sup>1</sup>	g/kg	8.9	8	7.5	7.3	7.2	7.1
Tryptophan <sup>1</sup>	g/kg	2.6	2.5	2.5	2.2	2.2	2.4
Calcium	g/kg	9.5	9.5	9.5	10	9.5	9.5
Phosphorus	g/kg	6.9	7	7.2	6.1	6.1	6.3
Available Phosphorus <sup>2</sup>	g/kg	3.7	3.7	3.7	3.1	3.1	3.1
Linoleic acid	g/kg	21	20	26	26.5	18	23.5

325 <sup>1</sup>Total amount.

326 <sup>2</sup>available phosphorus = total phosphorus – phytate phosphorus.

327 **Table 3.** Performance of broilers receiving 80%, 95% and 100% organic feed  
 328 (0 – 11 weeks)

	80%	95%	100%
Body weight 1 day (g)	42	42	41
Body weight 3 weeks (g)	493	561	499
Body weight 11 weeks (g)	3051 <sup>ab</sup>	3094 <sup>a</sup>	2970 <sup>b</sup>
Growth (g/d)	41.2 <sup>ab</sup>	41.8 <sup>a</sup>	40.1 <sup>b</sup>
Mortality (%)	3.3	3.5	2.9
Feed conversion	2.65 <sup>(a)</sup>	2.59 <sup>(b)</sup>	2.58 <sup>(b)</sup>
Total feed intake (g)	7958 <sup>a</sup>	7900 <sup>a</sup>	7544 <sup>b</sup>
Daily feed intake (g/day)	109.0 <sup>a</sup>	108.2 <sup>a</sup>	103.3 <sup>b</sup>
Feed conversion (practice)	2.63	2.58	2.64

329 <sup>ab</sup>Values in a row not sharing a common superscript are significantly different ( $P < 0.05$ ).

330 <sup>(a) (b)</sup>Different superscripts between brackets indicate a tendency ( $P < 0.10$ ).

331 **Table 4.** *Dry matter content (%) of the litter of broilers receiving 80%, 95% and 100%*  
332 *organic feed from 5 - 11 weeks of age*

Age (weeks)	80%	95%	100%
5	63	63	56
7	70 <sup>a</sup>	73 <sup>a</sup>	61 <sup>b</sup>
9	72	76	73
11	77	79	77

333 <sup>ab</sup>Values in a row not sharing a common superscript are significantly different ( $P < 0.05$ ).

334 **Table 5.** *Body condition of broilers receiving 80%, 95% and 100% organic feed at 10 weeks*335 *of age*

	80%	95%	100%
Breast smearing: none	1.5	1.5	3.0
slight	79.5	85.5	84.0
moderate	19.0	13.0	13.0
Breast irritations: none	60.5	74.5	72.0
slight	32.5	20.5	22.5
moderate	7.0	5.0	5.0
severe	0.0	0.0	0.5
Breast blisters: none	45.0 <sup>a</sup>	24.5 <sup>b</sup>	22.5 <sup>b</sup>
slight	48.0 <sup>(a)</sup>	64.5 <sup>(b)</sup>	69.0 <sup>(b)</sup>
moderate	7.0	11.0	8.5
Hock irritations: none	88.0	85.0	84.0
slight	12.0	14.0	15.0
moderate	0.0	1.0	1.0
Footpad irritations: none	97.0 <sup>(ab)</sup>	99.5 <sup>(a)</sup>	94.5 <sup>(b)</sup>
slight	3.0	0.5	4.0
moderate	0.0	0.0	1.5

336 <sup>ab</sup>Values in a row not sharing a common superscript are significantly different ( $P < 0.05$ ).337 <sup>(a) (b)</sup>Different superscripts between brackets indicate a tendency ( $P < 0.10$ ).

338 **Table 6.** *Processing yields of broilers receiving 80%, 95% and 100% organic feed at 11*  
 339 *weeks of age*

	80%	95%	100%
Carcase (% of live weight)	68.7	70.0	69.0
Leg (% of carcase weight)	33.9 <sup>(a)</sup>	33.8 <sup>(a)</sup>	34.3 <sup>(b)</sup>
Wing (% of carcase weight)	11.8 <sup>a</sup>	11.7 <sup>a</sup>	12.1 <sup>b</sup>
Breast (% of carcase weight)	21.8	21.3	21.2
Back (% of carcase weight)	9.6	9.8	9.7

340 <sup>ab</sup>Values in a row not sharing a common superscript are significantly different ( $P<0.05$ ).

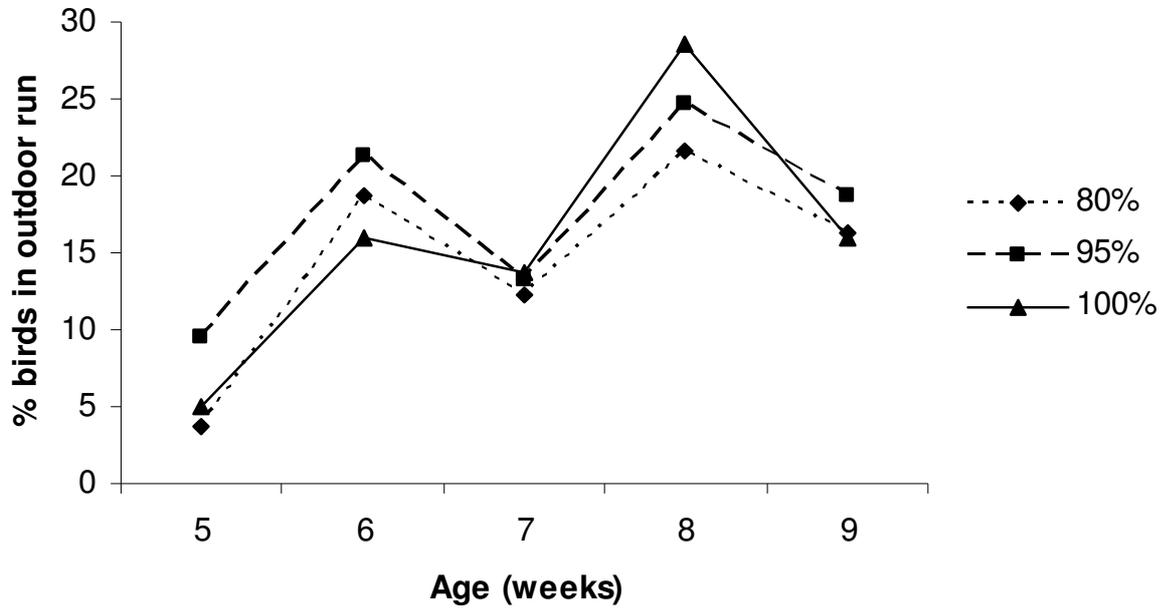
341 <sup>(a) (b)</sup>Different superscripts between brackets indicate a tendency ( $P<0.10$ ).

342 **Table 7.** *Economic results for broilers receiving 80%, 95% and 100% organic feed (€ per*  
343 *1000 kg live weight)*

	80%	95%	100%
Day old chicken	169	167	174
Feed costs	973	1000	1049
Other variable costs	113	112	116
Housing costs	185	182	190
Labour costs	283	280	291
Other non-variable costs	96	95	99
Total costs	1828	1843	1927

344

345 **Figure.** *Percentage of broilers observed in the outdoor run for groups receiving*  
346 *80%, 95%, or 100% organic feed from 5 - 9 weeks of age.*



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Review Only