Use of different types of enrichment in slower growing broilers

A pilot study

I.C. de Jong and M.C. van Wijhe-Kiezebrink

LIVESTOCK RESEARCH
WAGENINGEN UR

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Summary

The results of a pilot study to the use of different types of enrichment (perches, platforms, pecking object, Lucerne bales) in slower growing broilers during two subsequent cycles in a commercial broiler house are described. Based on counts of the birds using the enrichments, platforms were preferred over perches. Birds pecked more at the Lucerne bales than at the pecking objects. The most frequently observed behaviour on or under and close to all enrichments was sitting. No obvious differences were observed in behaviours in the sections of the house where the different enrichments were placed, and no obvious physical damage was observed that could be due to the enrichments. To conclude, the slower growing broilers seemed to prefer platforms over perches to rest on. Platforms can be provided in addition to the Lucerne (or straw or hay) bales that are currently used as enrichment.

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Foreword

In commercial broiler production systems it is common practice not to provide enrichment such as elevated platforms or perches for resting, straw bales or pecking objects.
Even in organic production it is not obligatory to provide elevated resting areas for broilers. According to the EU Directive for organic farming, perch space per bird is only specified for laying hens.
Broilers need elevated resting as much as other birds do (e.g. laying hens), provided their physical condition allows them to get on the elevated structure. For laying hens there are numerous scientific papers explaining the essential need for elevated resting. In Germany there was even a decision by court, stating that elevated resting belongs to the basic needs of laying hens and has to be taken into consideration and thus be fulfilled. Hence, perches have been installed even in cage-keeping systems for laying hens. In barn and in aviary systems for laying hens, perches are integral elements. Scientific studies have proven that it is important for the birds to be familiar with the system and to learn how to use elevated enrichments from a juvenile stage.
The animal welfare organization FOUR PAWS supports the research and the implementation of better living conditions for farm animals. Therefore the organization established an animal welfare label called "TIERSCHUTZ-KONTROLLIERT", certifying farms working according to high animal welfare standards.
FOUR PAWS and the University of Wageningen in the Netherlands initiated a pilot experiment on a farm producing under the guidelines of the label "TIERSCHUTZ-KONTROLLIERT" – one star for broilers resp. the label "Beter Leven" – one star in order to investigate whether the birds benefited from additional enrichment.
A second aim of this experiment was to deduct from the study practical recommendations for farming (concerning the space per bird needed for elevated enrichment), so as to include the determinants in the updated guidelines for the label "TIERSCHUTZ KONTROLLIERT"-one star for broilers.
Straw, Lucerne or hay bales are obligatory and commonly used on the pilot farm. During this pilot experiment, four different types of enrichment were offered to the animals and compared with respect to their acceptance: Lucerne bales, platforms, perches and pecking objects.
Within the study, the behavior of the birds regarding the use of the offered enrichment (whether the birds used the enrichments to sit on or to hide under them) was documented, and recommendations could be concluded with respect to the amount and the size of the elevated structures to be offered per bird from an animal welfare point of view.
FOUR PAWS appreciates very much the high interest and commitment of the University of Wageningen (special thanks to Dr. Ir. Ingrid (I.C.) de Jong and her team) to work on topics related to animal welfare in farm animal husbandry, as well as to carry out this important study.
FOUR PAWS would also like to take this opportunity and thank the Plukon Food Group for the provision of the structures for the study, as well as to express gratitude to the farmer Mr. Wolters on whose farm the study was carried out for his availability and support during the experiment.
In order to contribute to substantial improvements in the life of different species of farm animals in farming structures, FOUR PAWS continues to encourage studies and practical experiments that lead to significant changes for the better in the welfare of farmed animals.

Sabine Hartmann
Director of the Department Animal Friendly Product Management
FOUR PAWS International

Summary

The aim of the current pilot experiment was to study if slower growing broiler chickens produced under 'Tierschutz Kontrolliert' one star label or the 'Beter Leven' one star label would benefit from additional enrichment (in addition to the straw, Lucerne or hay bales that are currently provided). In one commercial broiler house, with about 20,000 Hubbard JA 757 broilers, four different types of enrichment were provided: Lucerne bales (control), platforms, perches and pecking objects. Each type of enrichment was placed in a quarter of the house (excluding the covered outdoor range) and the use of the enrichments and the behaviour of the broilers at 2, 4, 6 and 8 weeks of age was studied during two subsequent production cycles as indication of the use of the different enrichment materials and the possible preference of the birds for a specific type of enrichment. In addition, limited observations of bruises and contact dermatitis were performed at slaughter to find out if there would be a possible effect of enrichment on these parameters. To exclude preference of the broilers for a certain section in the house (independent of the enrichment being present in that particular section), the enrichments were rotated every two weeks.

Birds were observed to make use of all of the enrichments provided in the house, although there were differences in the extent to which the different types of enrichments were used. Birds used both platforms and perches to rest on and under. However, the number of birds using the platforms was much higher as compared to the perches. A possible explanation for the relatively low use of perches was the material and shape of the perches (round metal perches). Broilers showed pecking behaviour to both the pecking objects and the Lucerne bales, but based on the percentage of birds showing pecking behaviour the bales seemed to be preferred as compared to the objects. Observations of the behaviours at all ages also showed that sitting and comfort behaviours were more observed close to the enrichments than at a certain distance of the enrichments, indicating that enrichments can provide functional areas in the house so that resting and being active can be separated. Especially when young the broilers seemed to use the enrichments as an area where they could rest undisturbed; this was not only seen under the platforms or perches, but also around the objects and bales. No obvious differences were observed in behaviours in the sections of the house where the different enrichments were placed. At slaughter, no obvious damage due to the enrichments could be observed.

In conclusion, all enrichments seemed to be attractive for the birds to rest; birds could either rest on, under or close to the enrichments. Apparently, providing structures in a low complexity environment seems to be favourable in terms of welfare as it might promote undisturbed resting. The slower growing broilers seemed to prefer platforms over perches to rest on. The platforms seemed to have an additional value to the Lucerne (or hay or straw) bales that are currently used as enrichment for birds produced under the 'Beter Leven' one star or 'Tierschutz kontrolliert' one star label, as they were very attractive to the birds to rest on and under. Pecking objects seemed not to have the same value as Lucerne bales. Based on these results we advise to provide platforms in addition to Lucerne (or straw or hay) bales because of the beneficial influence on broiler welfare.

1 Introduction

Broilers are typically reared in relatively low complexity environments, consisting of a littered floor, feeders, drinkers, heathers and walls. These environments provide minimal stimulation to the birds. Slower growing broiler chickens produced under the 'Beter Leven' label (one star, NL) and also produced for the German Market ('Tierschutz-Kontrolliert', one star) live in a more complex environment as compared to standard broiler housing. They are provided with straw, Lucerne or hay bales as enrichment. Birds are able to peck at and explore the bales and can rest on the bales when these are intact, thus at least during a part of the rearing cycle. In addition, in these systems daylight is provided and grains are scattered in the litter to stimulate foraging behaviour.

There has been little research to the benefits and the use of enrichments by broilers. Studies in fast growing broilers showed that both perches and straw bales were well used by standard broiler chickens. It has been reported that perches reduce aggression and disturbance of other birds (Ventura et al., 2012). Straw bales stimulated activity of the broilers and a more even distribution of the birds in the house (Kells et al., 2001). In another study no consistent effects of straw bales on the behaviour of broilers was found, but gait score improved in the presence of straw bales as compared to control houses without straw bales (Bailie et al., 2012). Perches of various designs did not have an effect on production characteristics including final body weight, feed conversion and mortality (Pettit-Riley and Estevez, 2001; Heckert et al., 2002; Ventura et al., 2010) and the same was found for straw bales (Bailey et al., 2012).

The aim of the current project was to study if slower growing broiler chickens produced under the 'Beter Leven' or 'Tierschutz Kontrolliert' label would benefit from additional enrichment (in addition to the straw, Lucerne or hay bales that are currently provided). In one commercial broiler house four different types of enrichment were provided (Lucerne bales (control), platforms, perches and pecking objects), and the use of these enrichments and the behaviour of the broilers at the different ages was studied as indication of the use of the different enrichment materials and the possible preference of the birds for a specific type of enrichment. In addition, limited observations of bruises and contact dermatitis were performed at slaughter to find out if there would be a possible effect of enrichment on these parameters. To exclude preference of the broilers for a certain section in the house (independent of the enrichment being present in that particular section), the enrichments were rotated every two weeks. The study comprised two subsequent production cycles.

2 Materials and methods

2.1 Farm and enrichments

For this pilot study one house at a commercial farm was available during two subsequent production cycles (one production cycle lasts 8 weeks). In the first cycle (start 18-12-2013) 21,049 day-old chicks were placed in the house and in the second cycle (start 19-2-2014) 21,229 birds were placed in the house (Hubbard JA 757 broilers in both cycles). House dimensions were 80 x 20 metres indoors and a covered outdoor run of 80 x 6 metres was available to the birds. The covered outdoor run was in general open from about 14 days of age onwards but this was dependent on the outside temperature (in the current experiment, it was not available during the first observations at around 14 days of age). Wood shavings were used as litter. Three feeder lines (pan feeders) and four drinking lines (nipple drinkers) were present in the house, see Figures 1 and 2 for an overview of the house. Birds were housed on a 16 h light – 8 h dark cycle. Daylight could enter the house via windows in the roof (see Figure 1). If light intensity was too low, additional artificial sodium light was used. Birds were fed unrestricted and in the morning (around 09.00 h) the farmer provided maize in the litter to stimulate foraging behaviour. Management was according to the standard farm management.

Figure 1. *Overview of the broiler house (upper picture) and the covered outdoor range (lower picture) before the start of the experiment.*

Four types of enrichment were installed in the house, each enrichment in one section (quarter) of the house (see Figure 2). All enrichments were placed indoors. Location of the enrichments changed every two weeks; the enrichments were rotated clockwise (see Appendix 1 for the rotation schedule). Figure 3 shows a picture of the different enrichments used in the experiment. A house overview is shown in figure 2 with the approximate location of the different enrichments.

In one section, five rows of six platforms were provided, each row consisting of one low platform (25 cm above floor level, to stimulate young birds to use the platforms) and five high platforms (50 cm above floor level). Between the rows there was ca 1 m free area. Total area of platforms provided was 30 m^2 (each platform measuring 1 m^2). See Figure 3 for an illustration and Appendix 2 for details. Ten perches were provided in one section of the house, each perch measuring 2.8 m in length and between the perches there was ca 1 m of free area. The floor area occupied by one perch was 2.8 x 1.1 m. Each perch had three levels, the first level at 25 cm above floor height and distance between the perch levels was 25 cm (see figure 3 and Appendix 3 for details). Ten pecking objects were provided per section of the house. Each object had a diameter of 12 cm. Height of the objects varied according to the age of the birds. Objects were placed at equal distance of about 1.75 m in between two objects (see figure 3). Lucerne bales were placed in a rack because this was farm routine. Eight bales were provided equally divided over the section of the house with ca 2 m in between the bales. Each rack with a bale measured 42 x 55 cm (l x w). Height of the bales differed (25 or 50 cm); the racks were first used upside down so that the young birds could peck the bales. Bales were replaced when completely consumed; this was done once per production cycle.

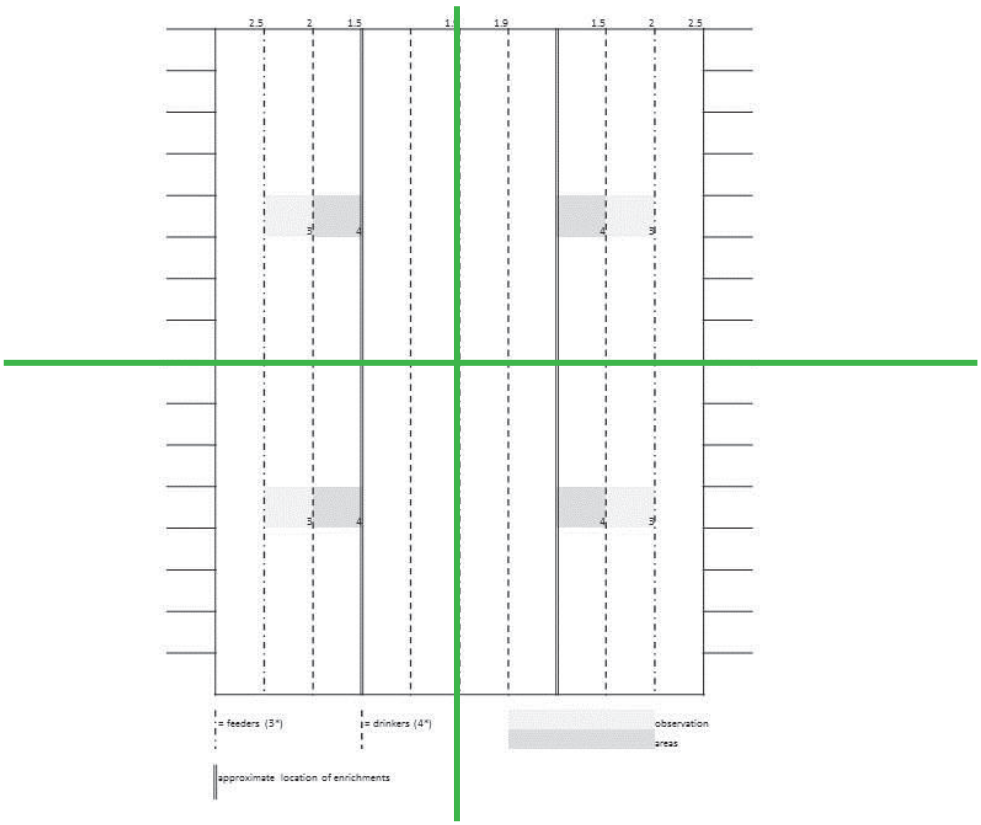


Figure 2. *Schematic diagram of the broiler house (indoor area), indicating the approximate position of feeder and drinker lines and the enrichments. The grey areas indicate the area of observations 3 and 4. The horizontal bars at the left and right side indicate the sixteen 'sections' of the house indicated by the construction frames. De entrance door was positioned at the bottom right in the corner. Sections of the house (indicated by the green lines) were marked A-D; A being at the lower left; B upper left; C upper right; D lower right (position of entrance door).*

[1] Als er een goede verklaring is voor een hogere sterfte en men kan aantonen dat er sprake is van overmacht, dan kan de staatssecretaris besluiten in dat geval een uitzondering toe te staan.

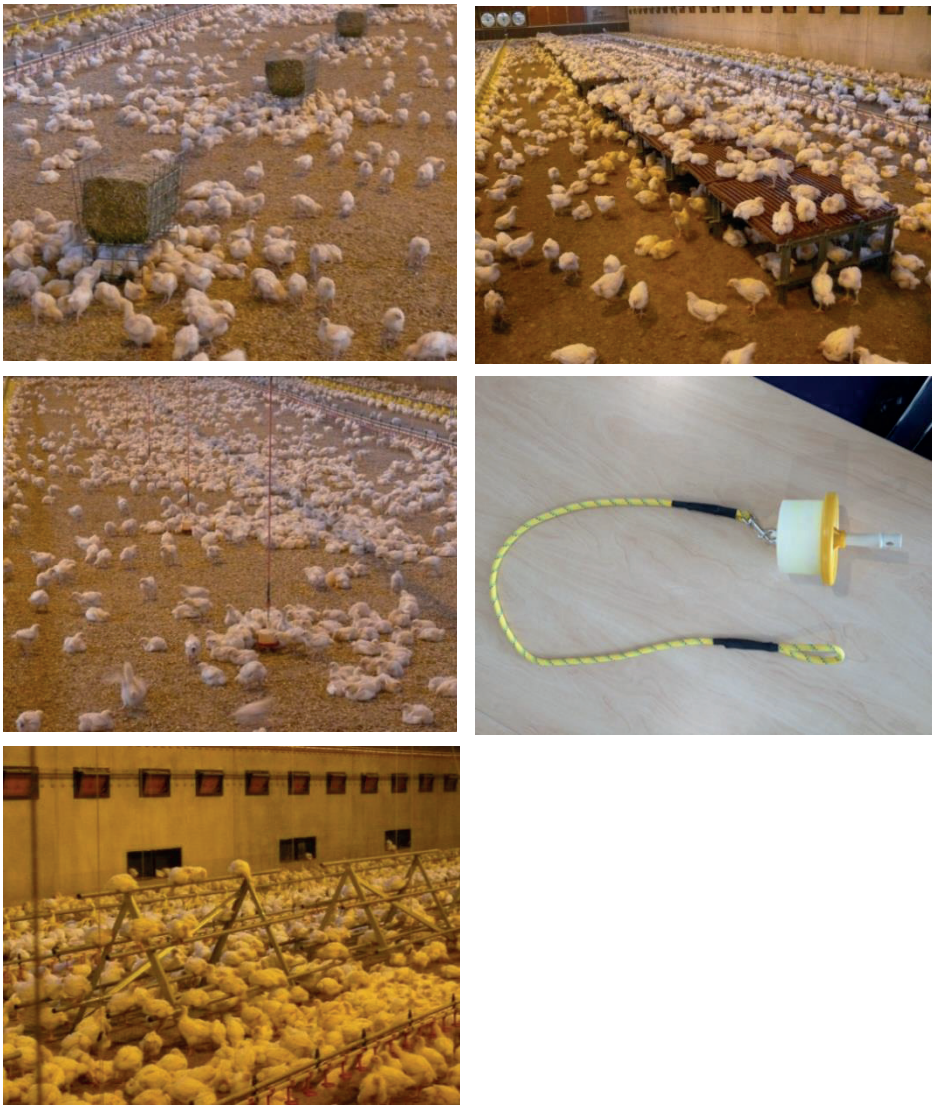


***Figure 3**. Overview of the different enrichments used in the experiment: racks with bales of Lucerne (top left), platforms (top right), pecking objects (middle) and perches (bottom).*

2.2 Behavioural observations

Behavioural observations were carried out by one trained observer by direct observations using the scan sampling technique. Observations were carried out four times per production cycle during the light period, at 2, 4, 6 and 8 weeks of age on one day per age and between approximately 09.00 and 17.00 h. Observations were carried out just before the rotation of the enrichments.

Per observation day, four similar blocks of observations were carried out, equally distributed over the day: block 1 starting at approximately 09.00 h; block 2 at 11.00 h, block 3 at 13.00 h and block 4 at 15.00 h; observations were finished at approximately 17.00 h.

Each observation block consisted of the following observations or activities, that are explained in more detail below:

(1) Estimation of the number of birds using the outdoor run;
(2) Standardised picture of the four sections in the house with enrichment.

This was followed by behavioural observations as described below, which were carried out in each section of the house. For each section, observations 3-5 were carried out and then the observer moved to another quarter in the house:

(3) Behaviour in an area not close to the enrichment;
(4) Behaviour in an area adjacent to the enrichment;

(5) Behaviour under and on the enrichment (if applicable).

(1) Estimation of the number of birds using the outdoor run

The observer always started an observation block with an estimation of the number of chickens using the covered outdoor run, to estimate the number of birds being inside and outside. The outdoor run could be divided in sixteen equal areas by the construction frames of the house. The observer calculated the number of birds in one randomly chosen area of the outdoor run indicated by vertical construction frames and from this the total number of birds in the outdoor run and in the house were estimated.

(2) Standardised picture of the four quarters in the house

To get an impression of the distribution of the birds in the house and the use of the enrichment, pictures were made from the four quarters of the house at the start of each observation block. The observer stood in the middle of the house and from this point pictures were made from all four sections.

(3) Behavioural observations not close to the enrichment

In each section of the house, but in an area where no enrichment was placed, the behaviour of the birds was observed by scan sampling (counting the number of birds performing a certain behaviour). Four subsequent scans were performed in an imaginary area measuring 2 x 3 m (using the feeder and drinker lines to define the area), see Figure 2. In each scan the number of birds performing the following behaviours was calculated: eating (pecking at the feeder), drinking (pecking at the nipples), walking (including running and flying), sitting, dustbathing and comfort behaviour (including preening, stretching and wing flapping), foraging (scratching at and pecking in the litter), standing, disturbance (one bird running over or pushing another, usually resting, bird), aggressive behaviour (including threatening, aggressive pecking, chasing and the developmental stages of this behaviour such as hopping) and other (all other behaviours).

(4) Behavioural observations in an area adjacent to the enrichment

In each section of the house, adjacent to the enrichment, the behaviour of the birds was observed by scan sampling as described under (3). The enrichments itself were not included in these observations. Four subsequent scans were performed in an imaginary area measuring 1.5 x 3 m in between the nipple line and the enrichment, see Figure 2. Except from eating, the behaviours were similar as described under (3).

(5) Behaviour on and under the enrichment

In each section of the house, on and under the enrichment, the behaviour of the birds was observed by scan sampling as described under (3). The observation area differed between the enrichments, which was inevitable due to the different design of the enrichments. For the platforms, behaviour was observed for birds on and under three (high) platforms (observation area 3 m^2 platform). For the Lucerne bales, behaviour on and under one bale of 42 x 55 cm (0.23 m^2) was observed. For the perches, behaviour was observed on one perch (total length 7 x 2.8 m perch = 19.6 m perch) and under the same perch (2.8 x 1.1 m = 3.08 m^2 observation area). For the pecking objects, behaviour under two objects was observed (observed area 2 x 12 x 12 cm = 0.29 m^2). As the objects were small, birds were often only partially under the objects. These birds were included in the observations. In each scan the number of birds performing the following behaviours were observed: walking, sitting, dustbathing and comfort behaviour, standing, pecking at the enrichment, aggressive behaviour, disturbance (a bird running over or pushing another bird), failed jumps (failing to jump on the enrichment), falling off the enrichment and other (all other behaviours). Before starting the observations and after the observations the number of birds sitting on and under the enrichment were counted.

2.3 Slaughter plant measures

Measures of bruises (legs, breast and wings), hock burn, breast irritation, thigh scratches and footpad dermatitis were carried out by slaughter plant personnel. These measures were done for the house with the different types of enrichment (house 3) and two similar 'control' houses at the same farm with only Lucerne bales (house 1 and 2). A sample of 300 chickens was scored per 5000 chickens, thus, four samples were taken per house, except for footpad dermatitis where 100 right feet were scored per 5000 chickens.

2.4 Data analysis

No statistical analysis was carried out because measures were only carried out in two subsequent production cycles in the same house. Data are presented as averages ± sd over the two production cycles.

3 Results

3.1 Number of birds being inside and outside

Table 1 presents the estimated percentage of birds being inside the house and in the covered outdoor range for both production cycles and the different ages. Appendix 4 shows the average temperatures in the house and outside at the day of the observations.

Table 1
Estimated percentage of birds inside the house and in the covered outdoor range.

Cycle	Age	% indoors	% in covered outdoor range
1	2	100	0
1	4	97.1	2.9
1	6	94.0	6.0
1	8	86.6	13.4
2	2	100	0
2	4	100	0
2	6	90.8	9.2
2	8	87.4	12.6

3.2 Distribution of the birds and use of enrichments

Appendix 5 shows a series of pictures taken at the different ages and the two production cycles. This gives an impression of the use of the enrichment and the distribution of the birds in the house. As can be seen from the pictures, at two weeks of age only a few birds were able to go up the platforms or lower perch, in contrast to the observations from four weeks of age onwards. The figures also show that the majority of birds only used the lowest perch. In addition, it is illustrated that the birds also used the Lucerne bales to stand or sit on. Figure 4 shows a detailed picture of the distribution of the birds around the pecking objects and Lucerne bales at two weeks of age. This grouping of birds is predominantly observed at two weeks of age for these enrichment objects.

Figure 4. *Examples of grouping of birds around the pecking objects (left) and bales (right) at 2 weeks of age.*

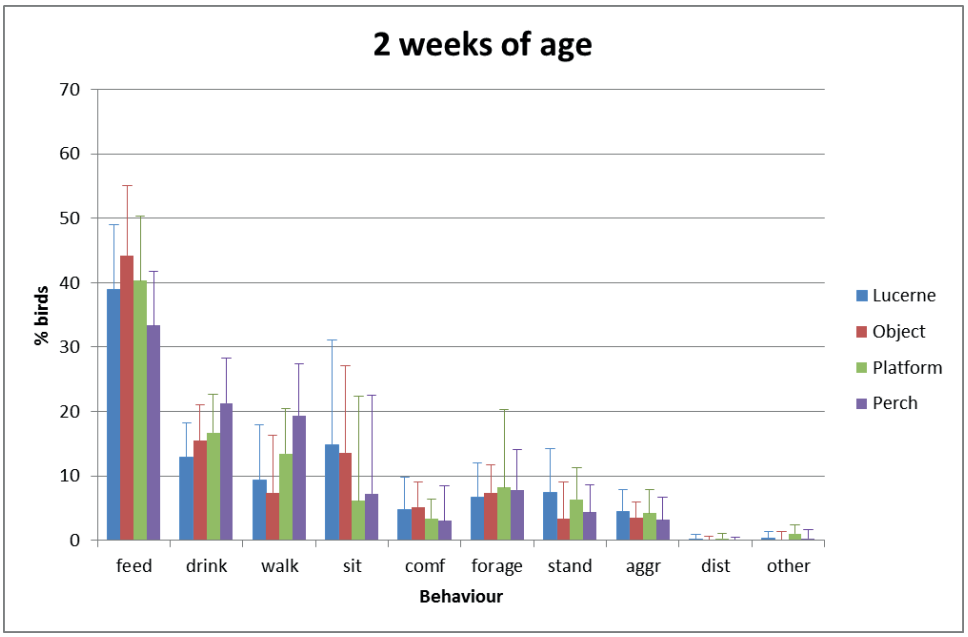
In the second cycle, especially at 6 weeks of age and to a lesser extent at 4 and 8 weeks of age, the observer noticed that the birds seemed to be distributed unevenly in the house at some time points during the day. There seemed to be less birds in the back part of the house, near the ventilation. The observer also noticed some air flow in that area and the unequal distribution was confirmed by the

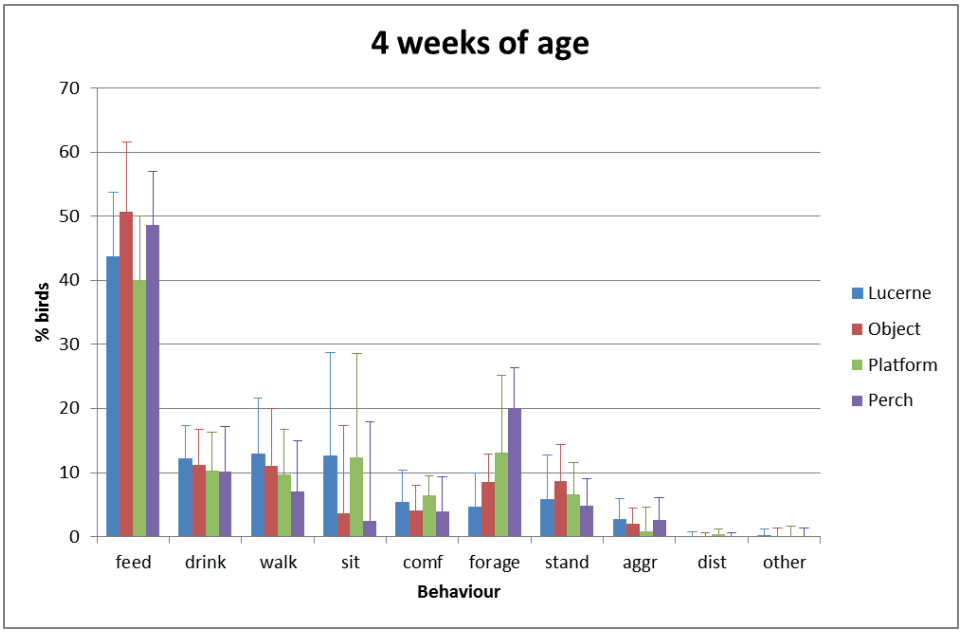
farmer. This might have affected the number of birds counted on or under the enrichments in these areas at these ages.

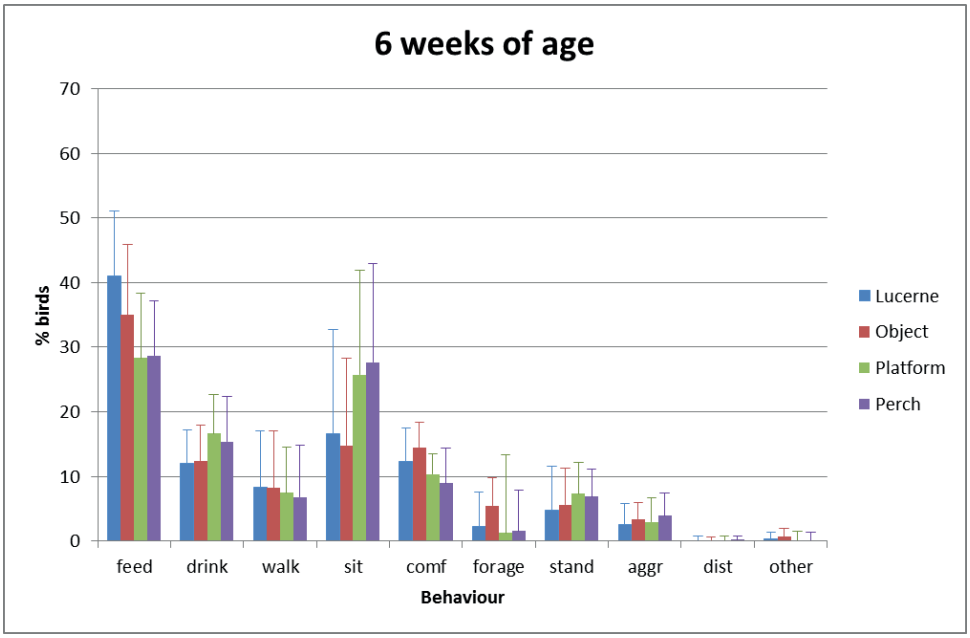
3.3 Behavioural observations

3.3.1 Behaviour in areas not close to the enrichments

Figure 5 shows for the different sections of the house where the enrichments were placed, the behaviour of the birds in an area not close to the enrichment. No obvious differences in behaviour can be observed between the sections where the different enrichments were placed. Only an effect of age can be observed, such as the majority of birds sitting at 8 weeks of age and the majority of birds being at the feeders at two and four weeks of age.







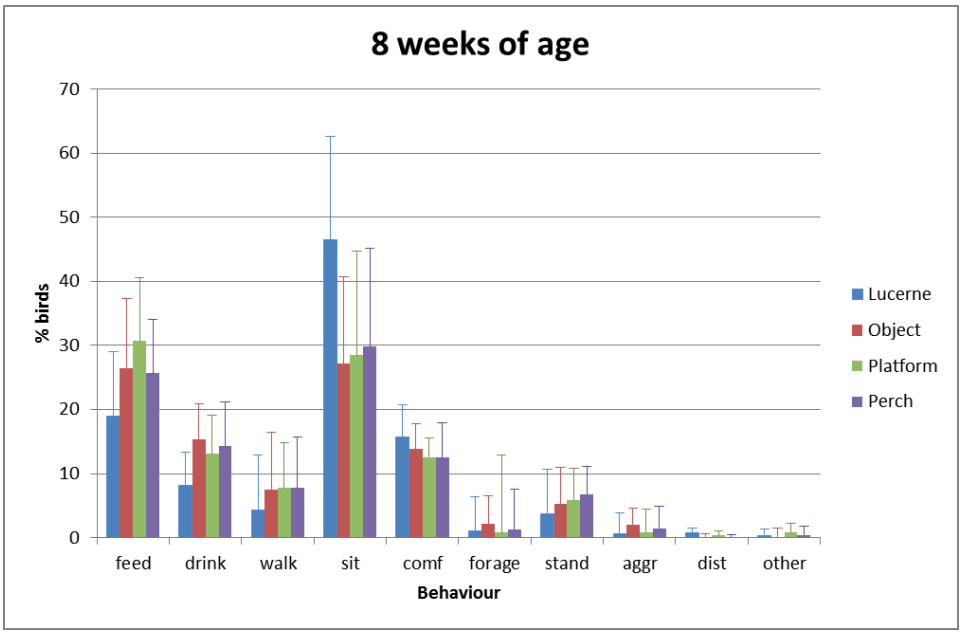


Figure 5. *Behaviour of the broilers at the different ages, in the areas where the different enrichments were placed but not close to the enrichment. Results are presented as mean ± sd for each behaviour. For the description of the behaviours, see paragraph 2.2.*

The number of birds in the observation areas are shown in Table 2. At two weeks of age this number is lower as compared to the other ages. At this age birds also grouped along the walls of the house, which may explain the lower number of birds in the observation areas. At four weeks of age the number of birds seems to be lowest in the house section with the perches, but this was not observed at the other ages. Similarly, the number of birds in the house section with the Lucerne seems to be higher at eight weeks of age. From these figures there seems not to be an obvious unequal distribution of birds over the house at the different ages.

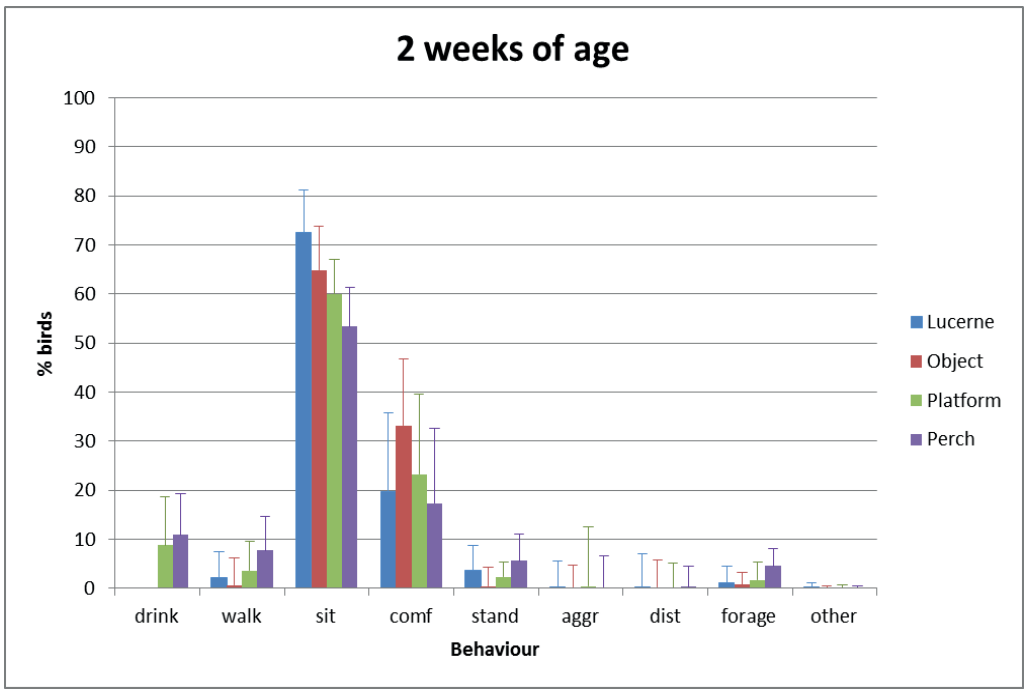
Table 2

Average number of birds in the areas of behavioural observations, not close to the enrichment but in the different sections of the house where the enrichments were placed. Numbers are presented as average over the four observation blocks (in italics) and per observation block.

Age (weeks)	Block	Lucerne	Object	Platform	Perch
2 weeks					
Average		*25.9*	*21.4*	*23.5*	*29*
	1	34	17.25	33	29.25
	2	25.75	18.5	19	16
	3	22.5	23.25	18	34
	4	21.25	26.75	24	36.75
4 weeks					
Average		*49.1*	*47.8*	*54.8*	*36.5*
	1	40.5	48	53.75	33.5
	2	53	43.75	50.75	33.75
	3	58	49	47.5	44
	4	45	50.5	67.25	34.75
6 weeks					
Average		*47.5*	*40.1*	*42.9*	*40.2*
	1	39.25	31.75	42	39.5
	2	55.5	52.75	43	37.25
	3	40	44.5	43.5	31.25
	4	55.25	31.5	43.25	52.75
8 weeks					
Average		*63.7*	*45.7*	*49.6*	*50.6*
	1	72.75	33.75	53	60.25
	2	69	47	59.25	48.5
	3	50.75	51.25	49	44.75
	4	62.5	50.75	37	48.75

3.3.2 Behaviour in areas adjacent to the enrichments

Figure 6 shows an overview of the behaviour of the birds in the areas adjacent to the enrichments (but excluding the enrichments). With respect to the different enrichments, only the percentage of birds sitting and being active seems to differ a little between the perches and the other enrichments at two weeks of age: the percentage of birds foraging, walking and standing seems to be higher for the perches and the percentage of birds sitting seems to be lower for the perches compared to the other enrichments. At four and six weeks of age, birds seemed to show the same difference in behaviour between the perches and Lucerne bales and the platforms and objects: less sitting for the perches and Lucerne bales and more active behaviours for these enrichments compared to the objects and platforms. Sitting is the most predominantly observed behaviour in the areas adjacent to the different enrichments and the percentage of birds sitting is higher compared to the areas not close to the enrichment (see Figure 6). Comfort behaviours were also more frequently observed adjacent to the enrichments as compared to the areas not close to the enrichments except for eight weeks of age when percentages were similar (see also Figure 6).


2 weeks of age
100
90
80
70
60
50
40
30
20
10
0
% birds
drink
walk
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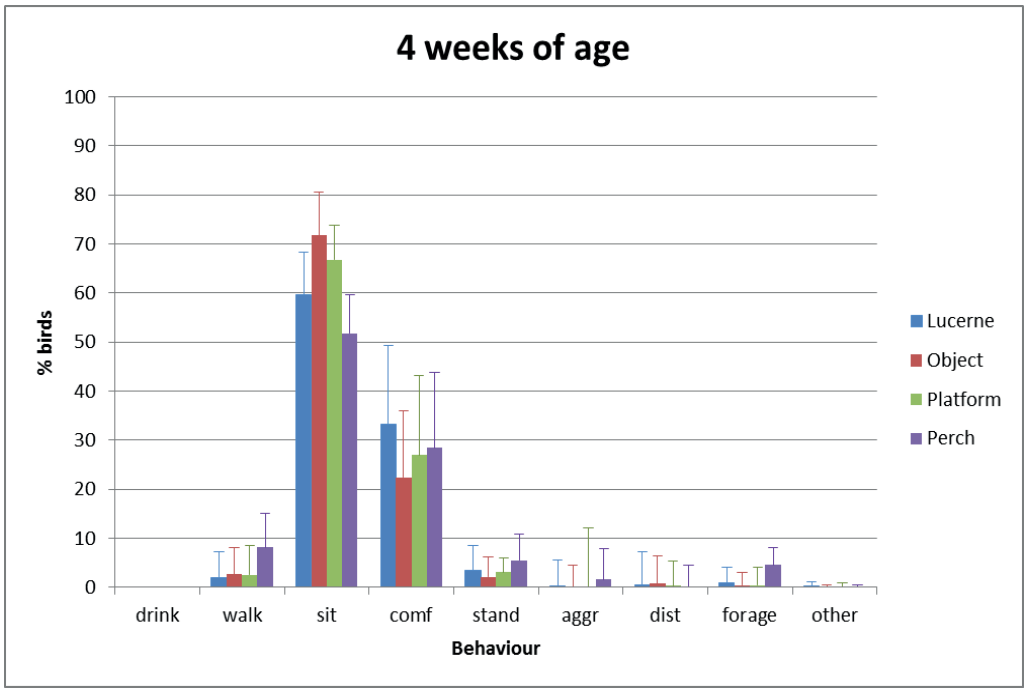
Lucerne
Object
Platform
Perch


4 weeks of age
100
90
80
70
60
50
40
30
20
10
0
% birds
drink
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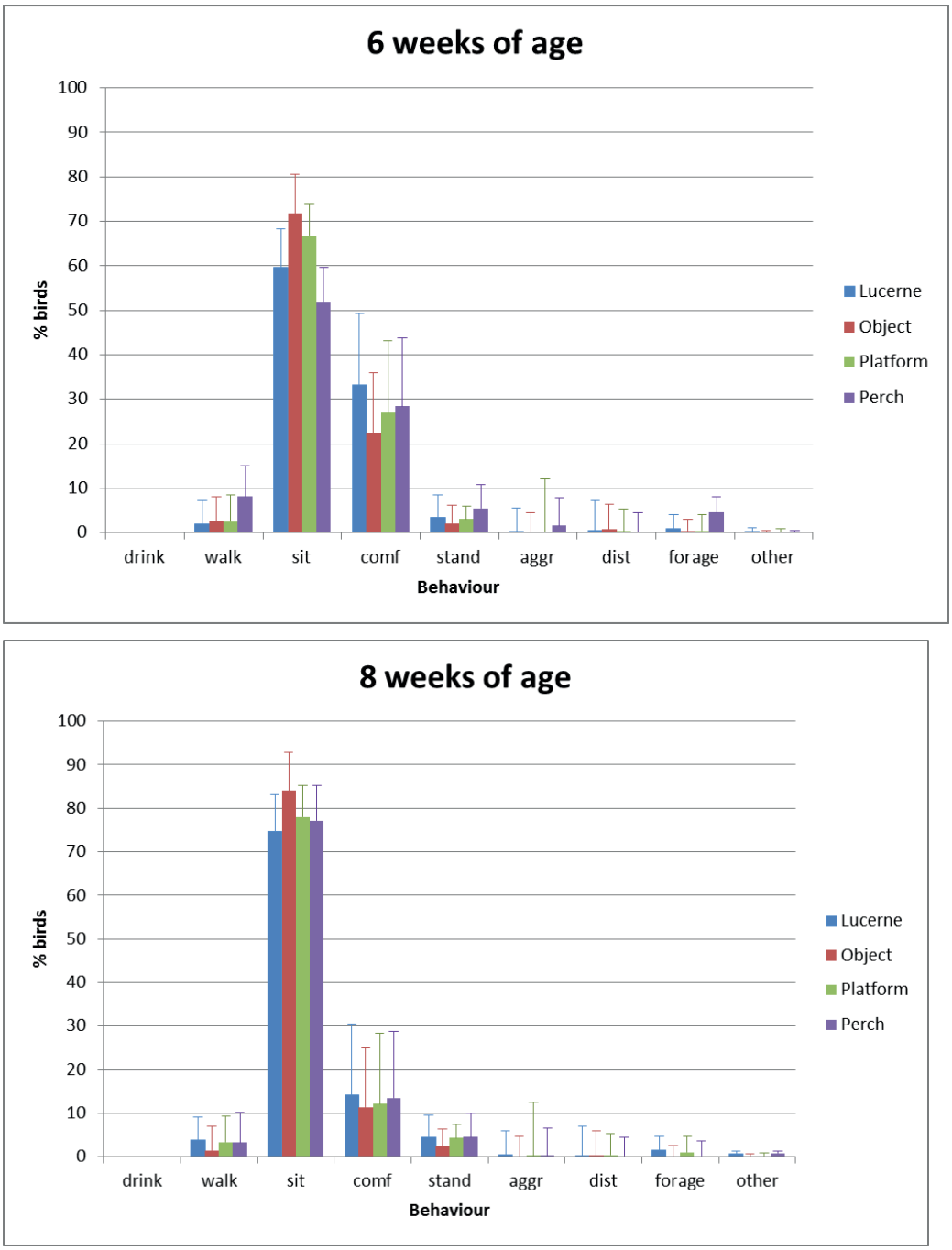


Figure 6. *Behaviour of the broilers at the different ages, in the areas adjacent to the different enrichments. Results are presented as mean ± sd for each behaviour. For the description of the behaviours, see paragraph 2.2.*

The average number of birds in the observation areas is presented in Table 3. At two weeks of age the number of birds in the areas adjacent to the enrichment is highest for the pecking objects. It is also observed on the pictures (see 3.2.) that birds group around the objects and the bales, but apparently the density is higher around the objects. At four and six weeks of age most birds are observed adjacent to the platforms, and at eight weeks of age again most birds are observed adjacent to the pecking objects.

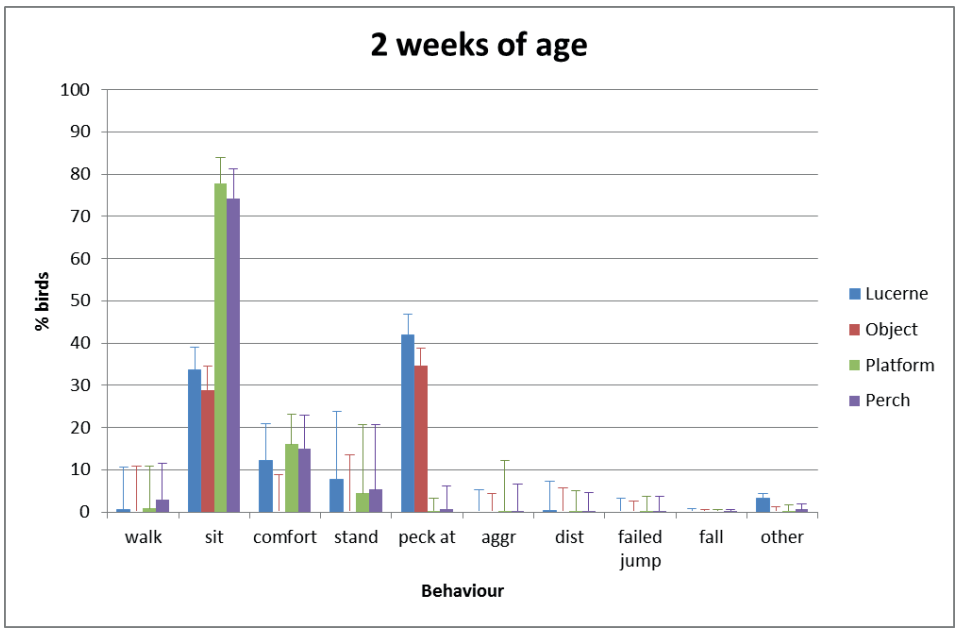
Table 3.

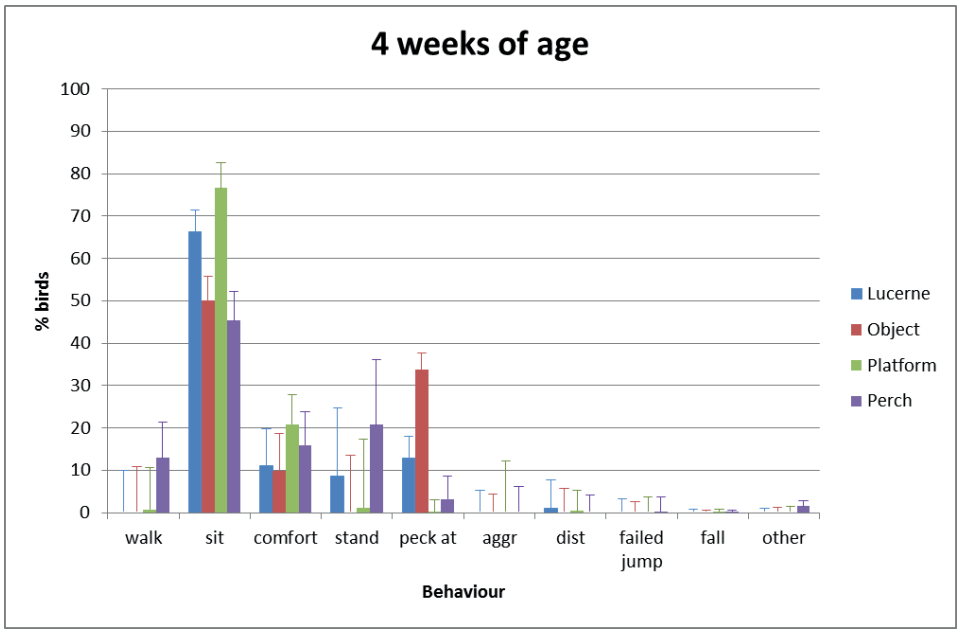
Average number of birds in the areas of behavioural observations, adjacent to the enrichment. Numbers are presented as average over the four observation blocks (in italics) and per observation block.

		Lucerne	Object	Platform	Perch
2 weeks					
Average		*73.65*	*109.425*	*66.25*	*95.45*
	1	88.8	122.3	60	*100.7*
	2	76	104.8	74	*83.2*
	3	64	106.6	62.3	*101.4*
	4	65.8	104	68.7	*96.5*
4 weeks					
Average		*81.375*	*92.375*	*100.125*	*86.25*
	1	77	113	108.5	*25*
	2	107	81.5	76	*65*
	3	86.5	95	88	*150*
	4	55	80	128	*105*
6 weeks					
Average		*81.875*	*64.25*	*133*	*81.25*
	1	107.5	65	147	*67*
	2	66	63	140	*80*
	3	54	70	130	*97*
	4	100	59	115	*81*
8 weeks					
Average		*78.5*	*116.75*	*84.5*	*95.75*
	1	76	120	92	*97*
	2	91	111	96	*87*
	3	69	116	75	*71*
	4	78	120	75	*128*

3.3.3 Behaviour on and under the enrichment including oral manipulation

Figure 7 gives an overview of the behaviour of the birds when they were on or under the enrichment. Object pecking is almost exclusively observed for the Lucerne bales and the pecking object. At six and eight weeks of age more birds were pecking at the bales compared to the objects. It is not surprising that more birds are sitting on and under the perches and platforms as relatively few birds can sit on the bales and no birds can sit on the pecking objects. Disturbance of birds, failing to jump on the enrichments or falling from the enrichments has only occasionally been observed. Besides sitting and pecking at the enrichments, comfort behaviour and standing are also observed on and under the enrichment. During the observations in the second production cycle, the observer also calculated the number of birds on the low, middle and high perch. Average bird numbers seen on these perches were 13, 1 and 0 respectively, indicating that the birds almost exclusively used the lowest perch although occasionally birds were observed on the highest perch.


2 weeks of age
100
90
80
70
60
50
40
30
20
10
0
% birds
walk
sit
comfort
stand
peck at
aggr
dist
failed jump
fall
other
Behaviour
Lucerne
Object
Platform
Perch


4 weeks of age
100
90
80
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40
30
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% birds
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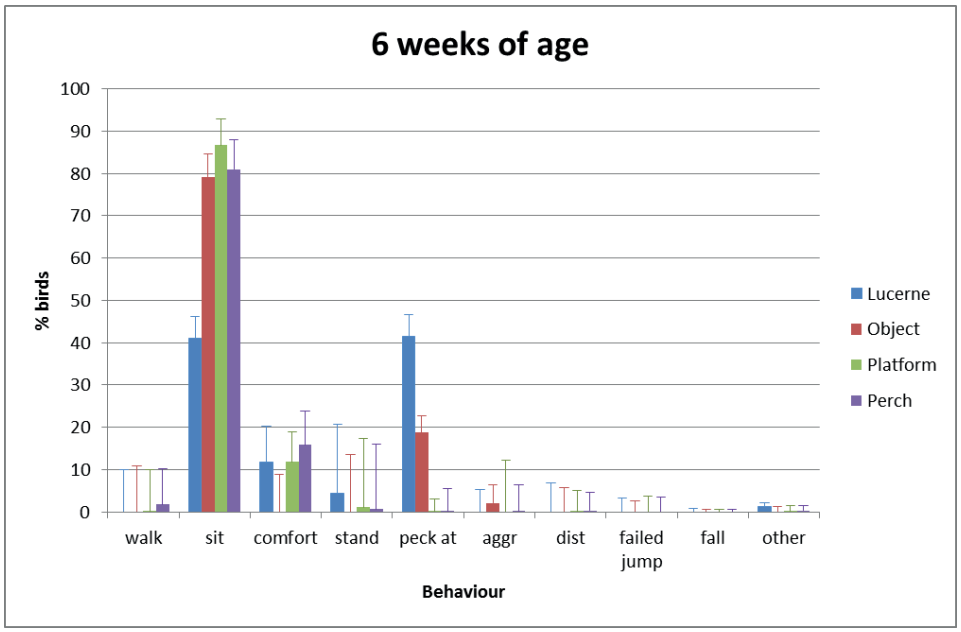
other
Behaviour
Lucerne
Object
Platform
Perch


6 weeks of age
100
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Behaviour
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Perch

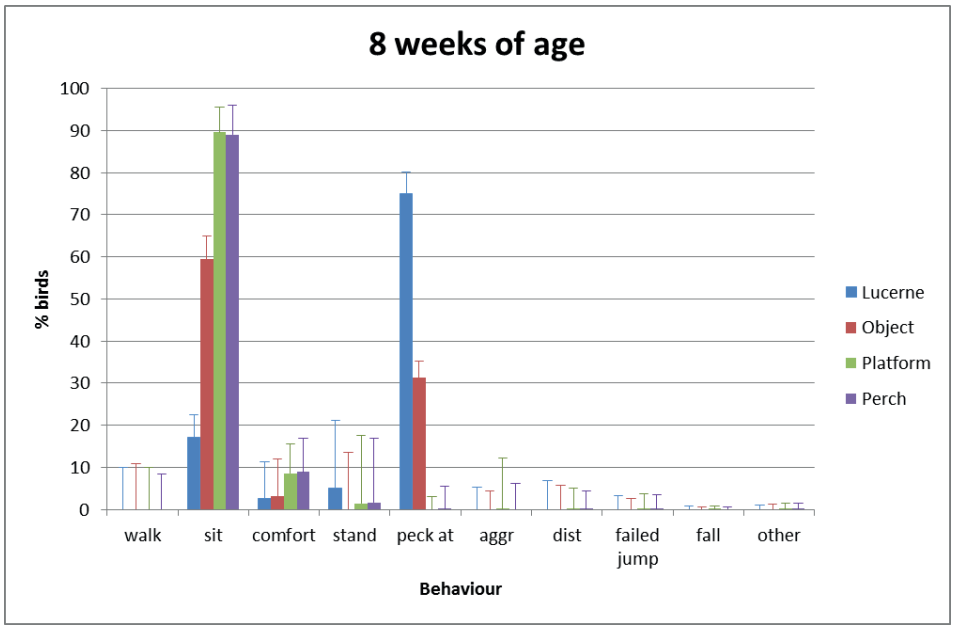
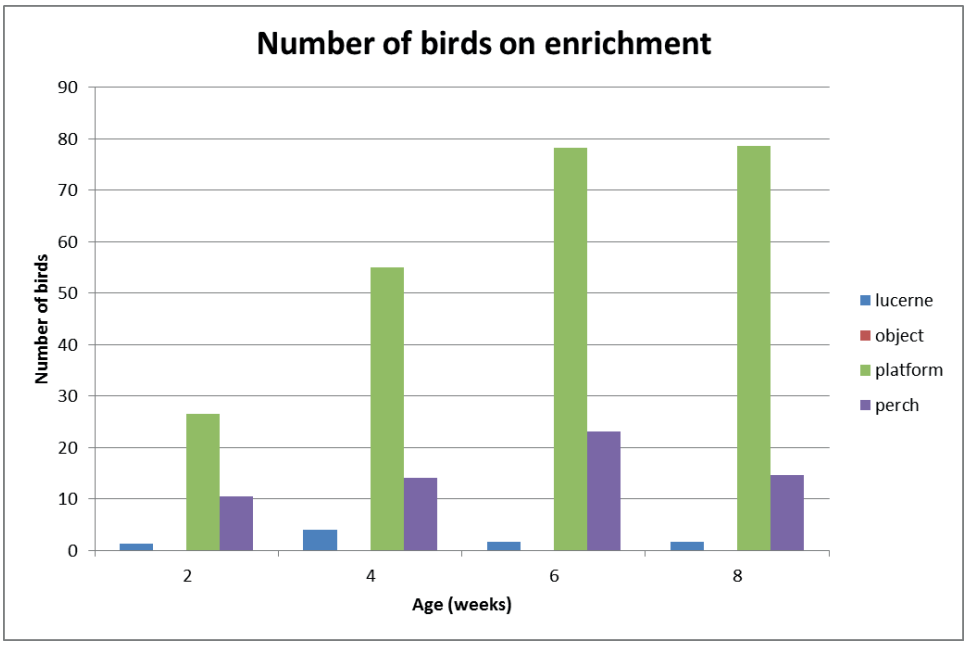


Figure 7. *Behaviour of the broilers at the different ages, on or under the enrichments. Results are presented as mean ± sd for each behaviour. For the description of the behaviours, see paragraph 2.2.*

Figure 8 shows the absolute number of birds observed on and under the enrichments, and Figure 9 shows the number of birds calculated per m^2 of enrichment. Both figures do not represent a 'fair' comparison between the different enrichments, due to different design and different areas observed; however, they give an indication of the preference of the birds for the different enrichments. As an example, for the pecking objects the number of birds sitting under the object was never more than 10 birds; if this number is expressed as birds/m^2 (figure 9) it seems crowded under the objects, which in reality only was observed at two weeks of age. Relatively few birds were sitting on the perches compared to the platforms, which can also be seen in the pictures in Appendix 5. At two and four weeks of age for the platforms and perches most birds were sitting under the enrichment, whereas at six and eight weeks of age most birds were sitting on the platforms or perches (Figure 8). Figure 9 shows that the bird density on the perches was very low.



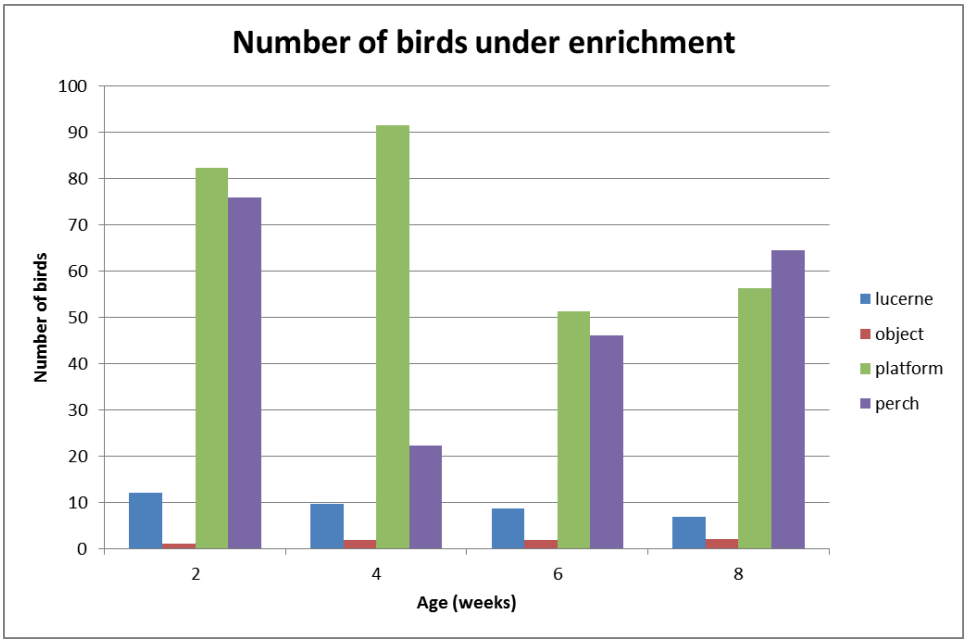
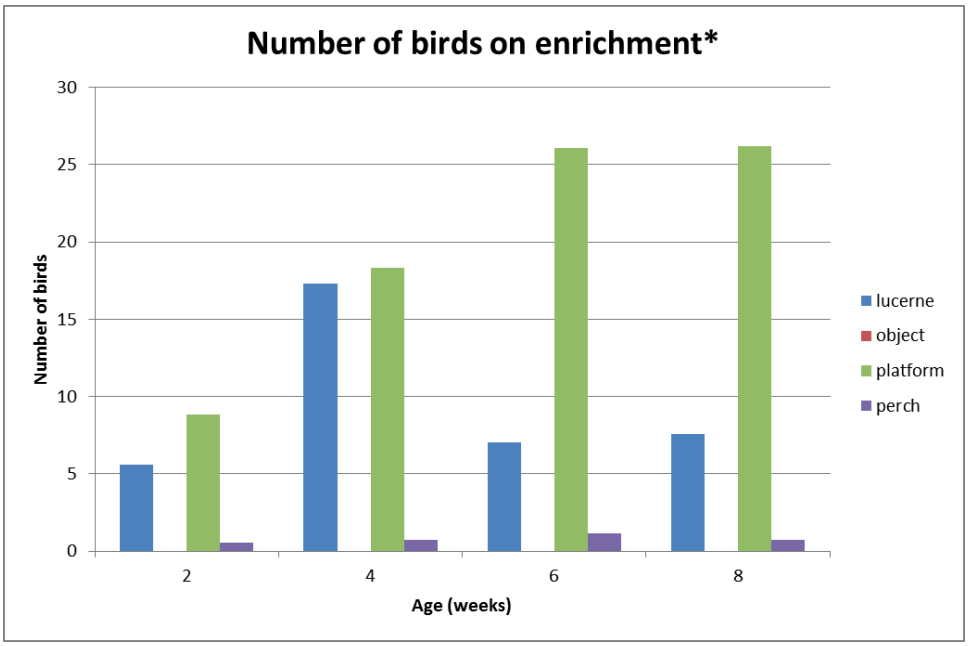


Figure 8. *Average numbers of birds on and under the enrichments. Note that the areas observed differed for the different types of enrichment. No birds could sit on the pecking objects.*



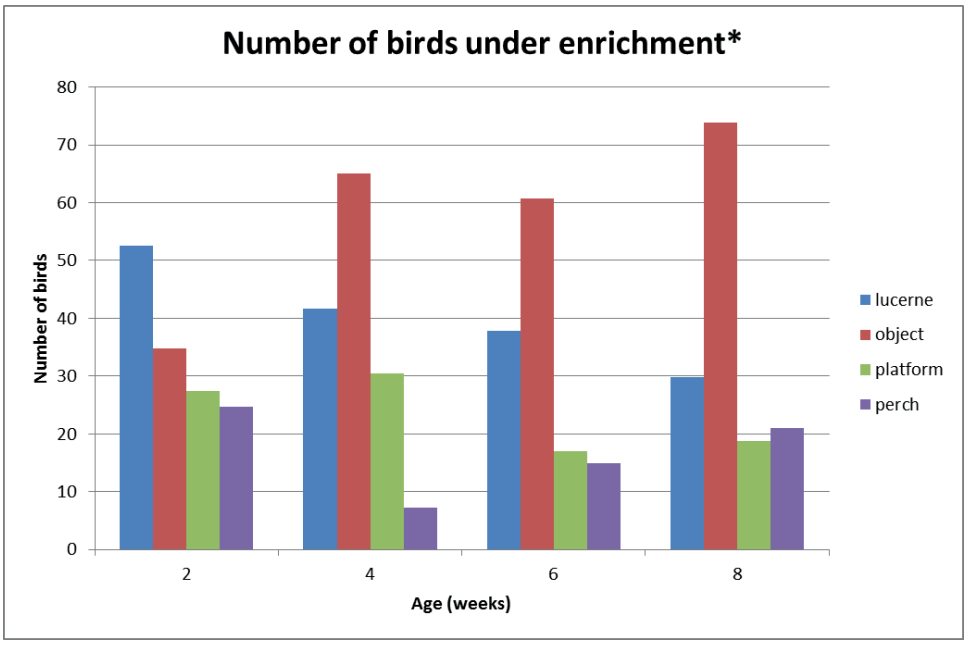


Figure 9. *Number of birds/m^2 on or under the enrichment. The numbers were calculated based on the areas occupied by the enrichment: for platforms, perches and Lucerne the area under the enrichment was determined and the number of birds per m^2 were calculated. For the perches, total perch length was used to calculate the number of birds per m perch. For the pecking objects, the number of birds under the enrichment (which us usually only partially, as the objects were small) and the number of birds very close to the enrichment (usually pecking at the enrichment) were taken into account. The figure shows the number of birds/m^2. Please notice that these pecking objects were small (12*12 cm) and that the figure shows the number of birds expressed per m^2, thus, in reality, only a small number of birds were sitting under the object or pecking at the object (see Figure 8). No birds could sit on the pecking objects.*

3.4 Slaughter plant measures

Table 4 presents the results of the various slaughter plant measures of the flock with enrichments (house 3) and two houses of the same farm with only Lucerne bales as enrichment (house 1 and 2). Results from the slaughter plant measures showed that there were no obvious differences between the control houses and the house with enrichment.

Table 4.

Average percentages of chickens with bruises, hock burn, breast irritation, thigh scratches and footpad lesions for both production cycles for the house with enrichments and both control houses (only Lucerne bales).

	Breast bruises	Leg bruises	Wing bruises	Hock burn	Breast irritation	Thigh scratches	No footpad lesions	Mild footpad lesions	Severe footpad lesions
House 1 (control)	0.62	0.53	3.69	0	0.33	2.08	80.12	19.37	0.5
House 2 (control)	0.75	0.54	4.33	0.37	0.37	2.33	91.62	8.37	0
House 3 (enrichment)	0.79	0.75	4.17	0.29	0.37	1.5	82.9	17.1	0

3.5 Estimation of number of enrichments needed

Appendix 6 provides a rough estimation of the number of enrichments (bales or platforms) that should be provided to meet the need of the birds. A first, rough estimation indicates that more bales/platforms will be needed than used in the current study to meet the needs of the birds, however, it should also be noticed that the current experiment was not designed to perform such calculations. The calculations should thus be interpreted with care. In addition, in the estimations it is not taken into account that there are also practical (house equipment and design) constraints that will determine how many enrichments should be provided.

4 Discussion and conclusions

In the current pilot experiment we studied if slower growing broilers produced under the 'Beter Leven' one star or 'Tierschutz Kontrolliert' one star label showed a preference for one of the four types of enrichments provided in the broiler house (Lucerne bales, platforms, perches and pecking objects) and if their behaviour was affected by the presence of one of these enrichments.

Birds were observed to make use of all of the enrichments provided in the house, although there were differences in the extent to which the different types of enrichments were used. Both platforms and perches can be used to rest on and under and birds were observed to do so. However, the number of birds using the platforms was much higher compared to the perches. Only a few birds used the middle and highest level of the perches, although the perch height and inter-perch distance were adapted to 25 cm. Probably the broilers seemed not to be motivated to fly up to the higher level or were physically unable to do so, especially when they were close to slaughter weight. The material and shape of the perches may have been a possible reason that relatively few birds used the perches. The metal may have been slippery and uncomfortable. As an example, laying hens in cages preferred wooden perches over plastic or metal perches and rectangular perches over round perches (Chen et al., 2014), and for laying hens slipperiness and grip quality have reported to be low for metal and round perches (Struelens and Tuyttens, 2009). Ventura et al. (2012) used wooden perches in their study with standard fast growing broilers which were relatively well used.

Although differences in behaviour adjacent to the enrichments were small, resting was more observed near the platforms and pecking objects as compared with the bales and perches. Lucerne bales will be attractive as pecking object and therefore birds are possibly be more active around the bales. Although both perches and platforms may stimulate resting, resting seems to be more predominant adjacent to the platforms as compared to the perches. Possibly, birds feel more comfortable under or near the platform as it provides shelter in contrast to the perches. In addition, if the perches were not very comfortable to the birds bouts of sitting on the perches might have been shorter, thereby stimulating activity near the perches and making this area less attractive for resting birds.

Broilers showed pecking behaviour to both the pecking objects and the Lucerne bales, but based on the percentage of birds showing pecking behaviour the bales seemed to be preferred as compared to the objects. It was also reported by the farmer that the birds seemed to prefer the bales over the objects. Bales were replaced once during the cycle as they had been consumed and destroyed completely, whereas the objects were almost completely intact after two production cycles.

Especially at two weeks of age birds seemed to use the enrichments as an area where they could rest undisturbed. This was not only seen under the platforms or perches, but also around the objects and bales, likewise it was observed along the walls. Apparently the birds seek for a possibility to rest undisturbed or they seek for shelter ,and this can be created by providing structures in the house.

Observations of the behaviours at all ages also showed that sitting and comfort behaviours were more observed close to the enrichments than at a certain distance of the enrichments, indicating that enrichments can provide functional areas in the house so that resting and being active can be separated. This should prevent disturbance of other birds, which has been reported as a positive effect of perches in a study with standard fast growing broilers (Ventura et al., 2012). In the current study disturbance of other birds was only measured at a low frequency and no differences between the treatments were observed. This can be explained by the relatively low bird density in the broiler house in the current study. In the study using perches in fast growing broilers it was shown that disturbance increased with increased stocking density (Ventura et al. 2012). However, the low frequency of disturbance in the current study could also have been caused by the sampling method, as scan sampling only allows a general comparison of the behaviour and involves a risk of missing behaviours of short duration.

Theoretically, there is a risk for more bruises when birds have difficulties to fly up the enrichments. However, no obvious differences have been observed between the control and experimental house, although numerically the incidence of bruises was a little higher in the house with enrichments. In contrast, a little less thigh scratches were observed in the experimental house although differences were also small and figures were in general low. Less thigh scratches can be caused by less disturbance of resting birds.

From a practical point of view, the materials used as enrichment should be easy to clean. The farmer indicated that cleaning was not very easy for the platforms used in the current experiment. This was due to the shape of the plastic wire that was used which caused that litter and manure were difficult to remove. Therefore, platforms that could be cleaned more easily (smoother surface) are advised if they will be used in practice.

Because of the experimental set-up it is difficult to estimate the area of preferred enrichments needed in the house to meet the behavioural needs of the birds. A rough estimation indicates that more platforms or bales should be provided to meet the needs of the birds, but this should be confirmed in a new study where only these enrichments are provided in a house. It is advised to adapt the height so that young birds are able to peck at or jump on the enrichment (25 cm for lowest perch, for the low platform, or the Lucerne bales and objects). In addition, practical issues should also be taken into consideration, such as the location of the enrichments related to feeder and drinker lines in order to provide sufficient space for the birds to move around in the house. In addition, the farmer should be able to check the birds, especially the birds under the platforms.

4.1 Conclusions

The behavioural observations in the current pilot study indicated that the slower growing broilers preferred platforms over perches. However, relatively low preference of broilers for the perches might have been caused by the material and shape of the perches used. With respect to pecking behaviour, the observations indicated that the broilers preferred the Lucerne bales over the pecking objects.

All enrichments seemed to be attractive for the birds to rest; birds could either rest on, under or close to the enrichments. Apparently, providing structures in a low complexity environment seems to be favourable in terms of welfare as it might promote undisturbed resting and/or provide shelter.

The platforms seemed to have an additional value to the Lucerne (or hay or straw) bales that are currently used as enrichment for birds produced under the 'Beter Leven' one star or 'Tierschutz kontrolliert' one star label, as they were very attractive to the birds to rest on and under. Based on the results of this pilot experiment we advise that providing platforms in addition to Lucerne (or straw or hay) bales may therefore be beneficial for broiler welfare. The height of the platforms (or other enrichment) should promote the use of enrichments by the young birds. In case of platforms, higher platforms can be used on the condition that there is one low platform that can be used to reach the higher ones. A rough estimation, based on the number of birds being under, on or close to the bales ore platforms, indicates that more bales/platforms seem to be necessary to meet the needs of the birds, however, this needs to be further studied in houses only equipped with the combination of bales and platforms.

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Appendix 1

Table

Rotation schedule of the enrichments.

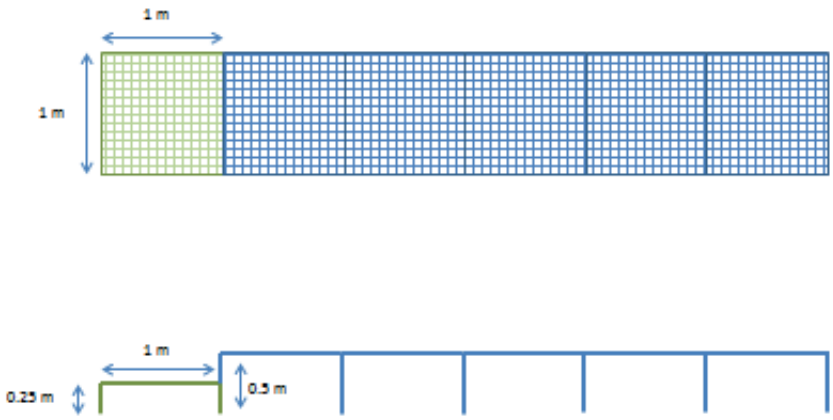
Cycle	Age (days)	Quarter of the house[1]	Enrichment
1	14	A	Platform
1	14	B	Lucerne
1	14	C	Perch
1	14	D	Object
1	28	A	Perch
1	28	B	Platform
1	28	C	Object
1	28	D	Lucerne
1	42	A	Object
1	42	B	Perch
1	42	C	Lucerne
1	42	D	Platform
1	51	A	Lucerne
1	51	B	Object
1	51	C	Platform
1	51	D	Perch
2	14	A	Perch
2	14	B	Object
2	14	C	Platform
2	14	D	Lucerne
2	28	A	Platform
2	28	B	Perch
2	28	C	Lucerne
2	28	D	Object
2	42	A	Lucerne
2	42	B	Platform
2	42	C	Object
2	42	D	Perch
2	51	A	Object
2	51	B	Lucerne
2	51	C	Perch
2	51	D	Platform

[1] As described in Figure 3.

Appendix 2

Figure

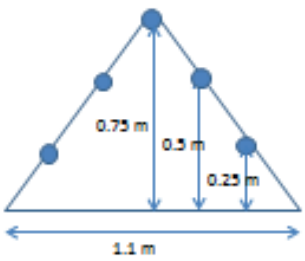
Details of the platforms used in the experiment. Detail of the surface (upper panel); schematic drawing of the series of platforms as used in the experiment (lower panel). Green colour: low platform (25 cm above the floor); blue colour: high platform (50 cm above the floor). View from above resp. side view.



Appendix 3

Figure

Details of the perches used in the experiment. Upper panel: picture of the perches. Lower panel: schematic drawing indicating the height of the perches.



Side view perch

Front view perch

Appendix 4.

Table
House temperatures and outdoor temperatures on the days of observations.

Production cycle	Date	Age chickens (days)	House temp min (°C)	House temp max (°C)	Outdoor temperature[1]
1	31-dec-13	14	26	27	9
1	14-jan-14	28	21	23	5
1	28-jan-14	42	17	20	5
1	6-feb-14	51	17	20	7
2	4-mrt-14	14	25	27	5
2	18-mrt-14	28	22	23	10
2	1-apr-14	42	18	23	13
2	10-apr-14	51	18	20	13

[1] Average outdoor temperature on that particular day, according to the Royal Dutch Meteorology Institute (http://www.knmi.nl/klimatologie/maand_en_seizoensoverzichten/)

Appendix 5.

Figure 5.1. *Overview of the different sections in the house at 2 weeks of age in cycle 1 (upper four pictures) and 2 (lower four pictures), pictures taken at 11.00 h.*



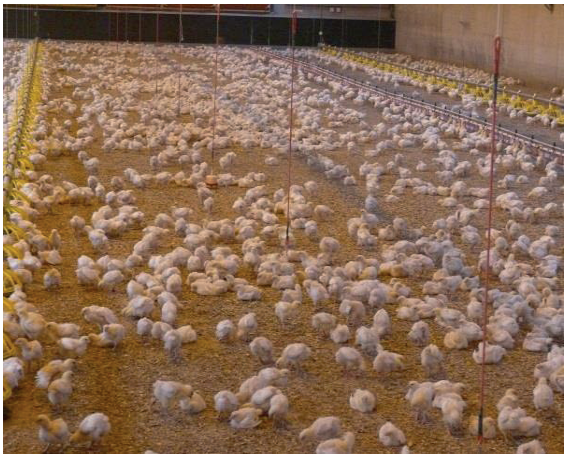



Figure 5.2. *Overview of the different sections in the house at 4 weeks of age in cycle 1 (upper four pictures) and 2 (lower four pictures), pictures taken at 11.00 h.*

Figure 5.3. *Overview of the different sections in the house at 6 weeks of age in cycle 1 (upper four pictures) and 2 (lower four pictures), pictures taken at 11.00 h.*

Figure 5.4. *Overview of the different sections in the house at 8 weeks of age in cycle 1 (upper four pictures) and 2 (lower four pictures), pictures taken at 11.00 h.*

Appendix 6.

Below, we present a very rough estimation of the total area of platforms or number of Lucerne bales needed in a house if either one of these enrichment types will be used. It should be kept in mind that this is a rough estimation based on the figures of the current study. For a more reliable estimation, measures should be carried out in houses that are fully equipped with platforms and bales. In addition, lay-out of the houses (number and location of drinker and feeder lines, other equipment) will affect the number of enrichments that can be placed. Moreover, some farmers use straw bales instead of Lucerne bales, these have other dimensions. Calculations below are not valid for straw bales or other types of enrichment.

To provide a very rough estimation, we used the number of birds on, under and adjacent to the enrichment at 4 and 6 weeks of age (Table 3, figures 8 and 9) as indicator of the number of birds that probably would like to use the enrichment. We can however not exclude that these birds were also attracted because of other birds sitting close to the enrichment (social attraction). Clustering of birds at 2 weeks of age might also be caused by other factors – they also cluster near the walls at this age – and at 8 weeks of age stocking density in kg/m^2 is much higher which may affect the opportunity of the birds to go to their preferred area.

The figures as calculated below **should be interpreted with care** as these **only provide a rough estimation** based on a very limited number of observations:

Platforms:

- About 72 birds/m^2 were on, under or close to the enrichment, this number is included in the calculation as indication of the number of birds that prefer to be on or under the platforms.
- We observed on average 46 birds/m^2 under or on the platforms.
- If not 46 birds/m^2 but 72 birds/m^2 would like to use the platforms, the total area of platforms should be increased to 150% of the area provided in the current experiment (in one section of the house). Thus, instead of 30 m^2 in a quarter of the house, we should provide 45 m^2 per quarter of the house, i.e. 180 m^2 in the whole house (80 x 20 m excluding the covered outdoor run) if only platforms are provided. Of course, it should be determined if this is practically possible due to constraints such as other house equipment, sufficient free litter space for the birds and costs.

Lucerne:

- The density of birds close to the Lucerne was 18 birds/m2; this number is included in the calculation as indication of the number of birds that prefer to be on or under the bales.
- Per bale of Lucerne, approximately 12 birds were able to sit on or under the bales.
- If the area around a bale occupied with chickens is estimated to be 1 m^2, it should mean that 30 birds were attracted to the bales (18 birds adjacent to the enrichment and 12 birds on or under the enrichment); implicating an estimated preferred number of bales which is about two-three times the current number of bales. Thus, the number of bales should theoretically be increased to 16 bales/house section (64 per house) if only bales are provided and on the condition that there are no other constraints (house equipment, sufficient free litter space and costs).

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