



## Review of the costs and benefits of verandas in barn and free range laying hen systems in the UK

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# 1 Introduction

Verandas in free range laying hen production are transition areas, or so-called ‘halfway houses’ (a term used in the FeatherWel advice guide <http://www.featherwel.org/rangehousing/improvinghousedesign>) between the henhouse and the range. In barn production systems, verandas are simply an addition to the house, and do not provide outside access. They can either be built as an additional element to the henhouse (retro-fitted) or they can be incorporated into a new build. The term “veranda” is not clearly defined. For the purpose of this report, verandas are considered to be litter-floored structures that offer bird access to and from the main house via a series of internal popholes. In free range systems, access to the range may be via external popholes, between the veranda and the range. Alternatively, the veranda may effectively be an awning with a roof and only a very low retaining wall for litter. From such a structure, birds may have continual and free access to the range.

Based on the specification for the study, this report will:

1. Review the current types of verandas used in the UK;
2. Make an assessment of the positive and negative aspects;
3. Provide images and diagrams of different types of verandas;
4. Provide an estimate of costs of the main types of verandas, including both capital and depreciation issues and the potential impact on production costs and returns.

The information for this report was gathered from industry experts and stakeholders. Experts include academic sources and individuals working within the egg supply chain. Other stakeholders include producers and government inspectors. Scientific literature was reviewed, however due to a lack of applicable information, for the purpose of this report, ADAS relied on grey literature and expert opinion. The report focuses on UK production systems and free range in particular, however some European contacts have also been used.

## 2 Current types of verandas

### 2.1 General

There are no absolute rules as to how verandas should be built; however the Defra Code of Recommendations (COR) for the Welfare of Laying Hens and the RSPCA Welfare Standards stipulate that:

- The materials used for the construction of verandas should not be harmful to the animals as well as being capable of being cleaned and disinfected appropriately; (COR)
- The design should provide shelter, exclude predators and have damp-proof membranes; (COR)
- The roof of the veranda should be waterproof; (RSPCA)
- The area surrounding the veranda should be built in a way to prevent flooding. (RSPCA)

Verandas can be ideal for providing extra litter material for the hens. The substrate used can be chosen by the producers and may include wood shavings, sand (ideal for dust bathing) and straw bales which the hens will tear apart with time. In free range systems, when the right substrate is added and kept in good condition, it may also serve to dry the hens’ feet when they return from the range in wet weather.

Some producers may choose to add feeders and drinkers as well as artificial light to the veranda and this may increase the number of birds using it.

## 2.2 Retro-fitted verandas

Retro-fitted verandas are ones that have been added to an existing henhouse. Retro-fitting verandas to existing henhouses can be done by the producers themselves, which is often the cheapest option. Producers may also contract local builders to do the work or ask specialist poultry house builders, however the latter option is less likely due to higher costs. Producers have different motivations for retro-fitting verandas; for example they might want to improve the ranging habits of their hens, they might want to improve the litter quality within the main house or they might want to increase the number of birds in the house by increasing the useable area. Conversely, some producers may simply want to increase the useable area that is available, without increasing the number of hens. The verandas can be built with different types of materials and different structures. Generally, retro-fitted verandas are “lean-to’s” with a sloping roof fitted just under the gutters of the main house (figures 1 and 2).



Figure 1- lean to/awning style veranda with sloping roof and metal sheets on the roof



Figure 2 - lean to/awning style veranda with sloping roof and metal sheets on the roof. This example has side walls made of wire

- Foundation:

The foundation needs to be solid (not slatted) in order to accommodate litter. The main options available for a solid floor are concrete, an earth floor or one made of compacted hardcore such as scalping. The use of wood to build the floor has also been reported, however it is not considered to be in common use.

- Walls:

The walls can consist of solid material such as wood (for example Yorkshire board) or blocks (figure 3) or non-solid materials such as open mesh/wire (figure 2 and 4) or netting (figure 5). The three walls don't need to be built out of the same material. Sometimes the two side walls are

built out of solid materials to prevent the creation of a wind tunnel whilst the wall that runs the length of the building is built out of non-solid materials to allow for natural light and ventilation (figure 3). Using non-solid materials in particular needs a balance between good ventilation and the ability to provide shelter from adverse weather; ideally it should be possible to regulate environmental imbalances between seasons and weather. In addition, prevailing wind directions should also be considered before deciding to use non-solid materials for the walls of the verandas. For free range systems, the long, outside wall needs to provide access to the range, for example via popholes (figures 3, 4 and 5).

- Roof:

The roof frame can be built of timber (figure 6) or steel (figure 7) or a combination of both (figure 5). The cover for the roof can be built out of wood (figure 3), metal sheets (figures 1 & 2) or even clear plastic sheets (figures 5, 6, and 7). In addition, producers may choose whether they want to insulate the roof or not; not insulating will reduce the capital costs but may increase running costs and make any level of environmental control very difficult to achieve. This can negatively impact on litter condition during colder weather and on bird health and welfare in both cold and hot weather.

Another option for retro-fitted verandas is to use a bolt-on poly tunnel. The foundation will still need to be built of solid material, however such poly tunnels offer a cheap alternative compared to other options. The benefits and disadvantages of poly tunnels are described in section 3.1.



Figure 3- example of a veranda that was built using bricks. The front wall is made of non-solid material



Figure 4- example of a veranda with a wall made of non-solid material.



*Figure 5- example of a veranda with a roof frame built from steel and wood and plastic sheets as roof cover.*



*Figure 6- example of a veranda with a timber roof frame and plastic sheets as roof cover.*



*Figure 7- example of a veranda with a steel roof frame and plastic sheets as roof cover.*

## 2.3 Verandas that are part of a new build

Producers that build new henhouses may choose to have verandas fitted as part of the new build however comparatively few do so. In such cases, the verandas are simply an extension of the henhouse and are generally built of the same material. Producers that buy new henhouses may decide to include verandas as part of the build for several different reasons. Firstly, the verandas are likely to be built to a good standard and to last longer; secondly, it is likely that the house manufacturers will offer a warranty on the new build which wouldn't be available if the verandas are retro-fitted, and finally the veranda is likely to be well insulated and offer optimal protection against adverse weather.

Figure 8 shows a section of a new build henhouse with verandas along the length of both sides, Figure 9 shows a top view of the same house.

An example specification for a new build with verandas provided by a specialist supplier is set out below (please note that the key points only have been summarised here for the purpose of this report):

- Veranda dimensions:
  - (1 either side) full length of bird area 3.50m wide (internally between walls).
- House Specification:
  - Panels c/w 70mm high density polystyrene insulation on gables.
  - All internal walls and ceilings fibre cement board.
  - Veranda exterior clad in corrugated green steel and 1000mm of windbreak.
  - Outer veranda walls clad with fibre cement board on the inside below the windbreak, but not insulated.
  - Roof insulation 100mm fibreglass insulation set on vapour barrier.
  - 20 internal popholes, 20 external popholes. External dwarf walls on veranda are 200mm high.

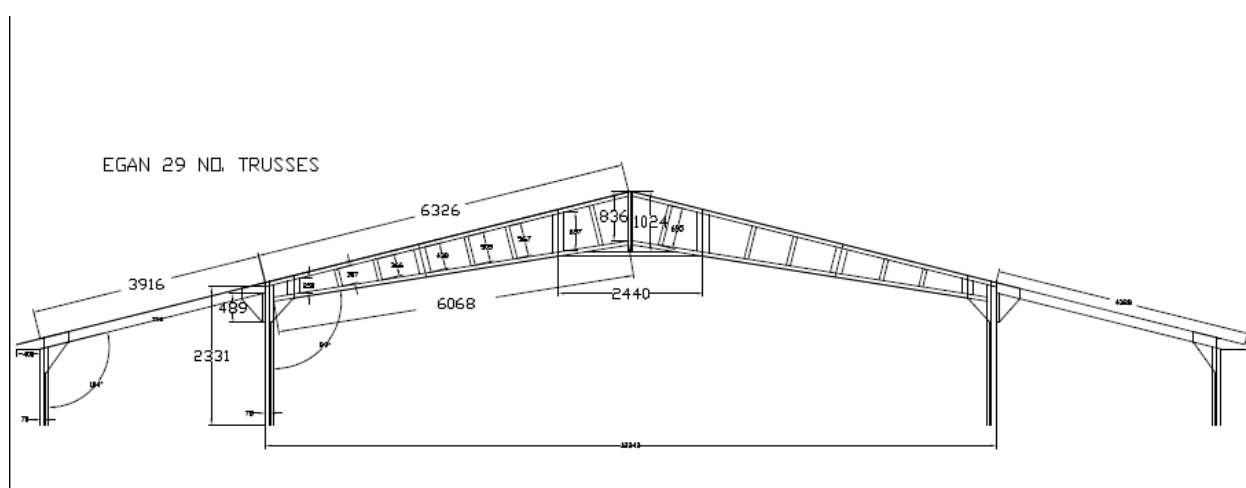


Figure 8 - section of a new build henhouse with verandas on both sides

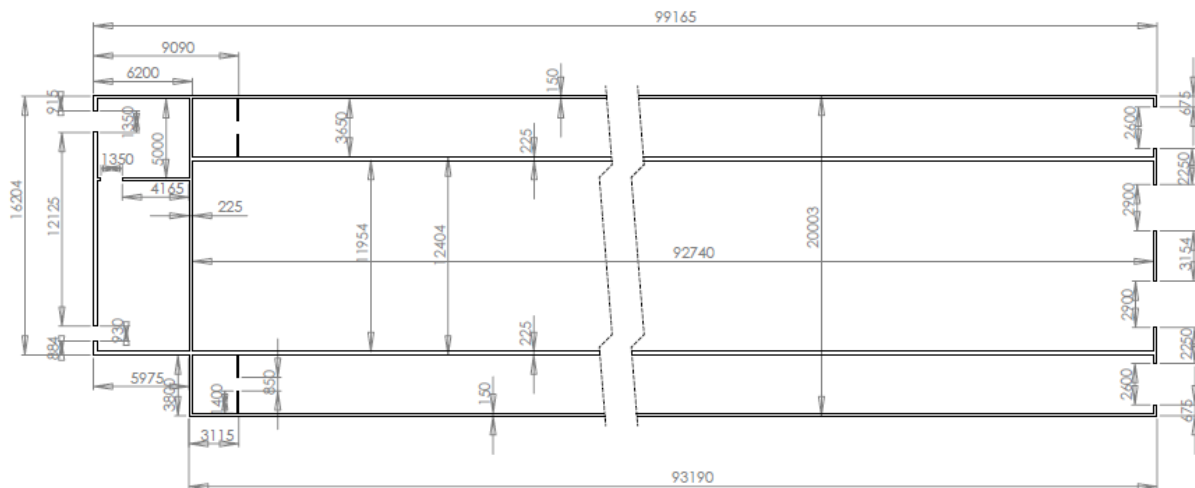


Figure 9 - top view of a new build hen house with verandas on both sides

### 3 Assessment of verandas

There is a general consensus between the producers and other industry experts that were interviewed for the purpose of this study, that adding verandas to henhouses can be very beneficial to the health and welfare of laying hens.

This section focuses on the advantages and disadvantages of verandas, mainly based on the views of those interviewed. Research references have been included where they relate to the assessments made by interviewees and these are shown as superscript numbers within this section, in the format <sup>1-6</sup>.

These references are set out in full in section 7 of this report.

#### 3.1 Advantages and disadvantages of different types /materials

Different materials that are used for building verandas have advantages and/or disadvantages specific to their features:

- Foundation:
  - Concrete: The advantages of a concrete foundation are the longevity and ease of cleaning and disinfecting; disadvantages include the higher cost.
  - Earth Floor: The advantages of an earth foundation are that it is the cheapest option and it can provide good drainage in some locations. The main disadvantages of an earth floor are that it may increase damp within the veranda and it is difficult to clean properly at turnaround time.
  - Compacted hardcore: the advantage of a compacted hardcore foundation is that it is cheaper than concrete and may provide better drainage than earth floors in some areas. Longevity and ease-of-cleaning are inferior to concrete.
  - Wooden: The advantages of a wooden foundation are that it is relatively cheap to build and can easily be repaired if damaged. Disadvantages include the fact that wood is more difficult to clean thoroughly as well as the fact that it may rot.



- Walls:
  - Wooden: The advantages of installing wooden walls are that they are relatively cheap, offer good protection against predators and a level of natural insulation and protection against severe weather. Similarly to using wood for the foundation, the disadvantages are the difficulty in cleaning and the decreased longevity due to potential rotting.
  - Panel or Sheet: Walls such as plastic-coated galvanised steel offer good cover and are very durable, ideally they should be insulated to reduce heat gain inside the veranda. The higher cost compared to other materials is however a disadvantage.
  - Block: The advantages of using blocks to build the veranda walls are the ease of cleaning and disinfecting and longevity of the structure; in addition they offer good protection from the elements. The disadvantages include the higher capital cost.
  - Non-solid materials: Using non-solid materials such as net and wire offer the advantages of natural ventilation and very low material costs as well as the best “transition” to the range in free range systems. However, non-solid materials offer less protection against adverse weather. They are also likely to have lower durability and still require a low wall at floor level to retain litter. Generally a minimum retaining wall height of around 200mm should be sufficient for this purpose. A further point to be made about non-solid materials is that these should not be used if access to the verandas is continuous because of the lack of protection against adverse weather and low temperatures.
- Roof frame:
  - Timber frame: The advantage of a timber structure for the roof is the comparatively low capital cost. Disadvantages include durability and difficulties with cleaning and disinfection.
  - Steel frame: The advantages of a steel frame for the roof include durability and ease of cleaning and disinfecting. However a steel structure is likely to be more expensive compared to a timber one.
- Roof cover:
  - Wooden roof (with protective material such as roofing felt): The advantage of a wooden roof cover is the low capital cost. Disadvantages include durability and difficulties with cleaning and disinfection.
  - Steel sheets: Steel sheets offer good cover and are very durable, however they do need to be insulated to reduce heat gain inside the veranda. The higher cost compared to other materials is however a disadvantage.
  - Clear plastic sheets: clear plastic sheets offer the advantage of good cover and a transition to the outside environment. Disadvantages of using plastic sheets include high light intensity (which has been associated with increased severe feather pecking<sup>1</sup>) on bright days and potential for making the veranda area very hot during the summer which might prevent the hens from going into the verandas and in turn, out on the range.

Finally, structures such as poly-tunnels have the advantage of being very easy and cheap to install. Disadvantages include not having a long life and being difficult to clean.

### 3.2 General advantages of verandas

- Space:

Verandas provide extra space for the hens relieving the density of birds within the main house. This is considered to reduce the risk of injurious feather pecking<sup>2, 3, 4</sup>. It also gives pariah birds more opportunities to escape.

- Transition between inside and outside spaces:

Verandas offer a buffer for the main house from the weather, thus protecting the main house from events such as high winds and rain. In addition, in the case of severe weather when fewer hens choose to go out on the range, verandas offer a halfway solution for fresh air and natural ventilation<sup>5</sup>. They also offer a gradual transition between inside and outside (in terms of light, temperature, sight) which is thought to encourage more birds to go out on the range. If so, this would be considered to have welfare benefits, but the evidence available at present is largely anecdotal.

- Litter within the main house:

The use of verandas is generally associated with better litter quality in the house but again the evidence for this is largely anecdotal. Adequate litter substrate in the verandas allows the feet of the hens to dry before they enter the main house in free range systems and this may result in fewer dirty eggs.

Wet litter has also been associated with increased feather pecking<sup>3</sup> whereas drier, more friable litter is likely to encourage foraging. In addition, if the litter is drier, there is clear evidence to show that ammonia emissions will be lower. Because of this, the importance of dry litter in poultry systems is included within the Best Available Techniques (BAT) Reference Document for the Intensive Rearing of Poultry or Pigs<sup>a</sup>.

A high level of ammonia in a building can also have consequences for bird health and productivity (and for human health)<sup>6</sup>. For example, it may cause damage to the respiratory tract of poultry, in turn increasing the frequency of respiratory diseases. Flock performance (in terms of egg numbers, egg weight and feed intake) may also be adversely affected.

- Transition for pullets:

Verandas are also useful in introducing pullets to the range environment shortly after they are transferred to the laying house. The general consensus between industry experts and producers is that more hens go out onto the range when verandas are present, however further study in this area is needed to be able to state this with certainty.

### 3.3 General disadvantages of verandas

- Number of birds in the house:

If access to the verandas is continuous (day and night), verandas can be counted towards the useable floor area and as such producers often increase the number of birds within the henhouse. Whilst this is not a disadvantage in itself, by doing this, an important potential benefit offered by the addition of verandas is counteracted. Higher stocking density has been associated with increased rates of feather pecking and decreased use of the range<sup>2, 3, 4</sup>.

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<sup>a</sup> [http://eippcb.jrc.ec.europa.eu/reference/BREF/IRPP\\_Final\\_Draft\\_082015\\_bw.pdf](http://eippcb.jrc.ec.europa.eu/reference/BREF/IRPP_Final_Draft_082015_bw.pdf)

- Temperature control:

When continuous access to the verandas is granted, the temperature in the house might be more difficult to control and may result in higher feed intake. Also, depending on the design of the verandas (solid vs non solid external walls), the main part of the house may potentially become damp, thus increasing ammonia emissions. Conversely, verandas provided in addition to the useable area are generally associated with drier litter.

- Cost:

At present, the extra cost of building a veranda (or buying a new-build that includes verandas) cannot be recovered through producers receiving a premium price from their packer for eggs supplied. There is some anecdotal evidence suggesting that costs may be recovered through improved bird performance and this is considered in more detail in Section 4. However further studies are needed to determine a) whether performance does indeed improve when verandas are present and b) what the economic impact of those benefits is, compared to the extra cost incurred by producers for installing verandas.

- Floor eggs:

It has been suggested by the producers and other industry experts that were interviewed that systems with verandas in place could result in an increase in floor eggs; the possible impact of this is also considered in Section 4. However no clear evidence has been found to quantify any increase in floor eggs and there is a view that increases can be avoided by good management and stockmanship. More investigation into the matter is needed.

## 4 Cost of Verandas

It is very difficult to correctly estimate the cost of verandas due to the large variations in building materials used and the fact that there is no “one type” of veranda.

It is broadly estimated by industry stakeholders that adding a veranda to a henhouse can typically cost between £1 and £2 per bird. Whilst this is comparatively low compared to the price of a whole new house, an additional capital cost of £16 - £32,000 for a 16,000 bird house would still be significant. The actual cost is likely to vary considerably depending on the specifications of the veranda, the dimensions and whether verandas are fitted along each side or just one side of the henhouse.

New built verandas are more expensive compared to retro-fitted verandas and are estimated to cost around £2 per bird. These are likely to be built to higher standards and have a longer life compared to retro-fitted ones which results in their value depreciating at a slower rate over time.

With regards to retro-fitted verandas, a large variation in costs can be expected depending on building materials and whether they are built by on-farm labour or by local builders. Producers building verandas themselves probably only consider the material costs rather including a price for their labour.

An established and reliable guide to agricultural building costs in the UK is the “Farm Management Pocketbook” (John Nix). According to the 2015 edition of the pocketbook, the cost of an open-sided **timber frame** structure with a concrete base is estimated to be £80 per square metre of floor area. The cost for an open-sided **steel frame** structure can be as high as £135 per square metre. Such structures are considered appropriate for retro-fit veranda construction by an agricultural buildings company.

Table 1 below uses these typical prices to calculate the likely cost per bird of a veranda for a typical single- and multi-tier laying house for 16,000 hens, with a fixed width of 19 metres. The costs shown in Table 1

include the roof, however the costs for wall materials are not included. Finally, other miscellaneous costs such as litter material should also be considered.

It can be seen that the costs calculated in Table 1 are between £1 and £2 per bird for timber frame constructions but the total exceeds £2 per bird for steel frame constructions in single tier systems. These figures assume a veranda on one side of the house (only) but costs per bird would double if a veranda is fitted on both sides.

**Table 1** showing the likely effect of applying standard building costs (source: Farm Management Pocketbook) to typical single- and multi-tier housing.

Housing Type	Single Tier	Multi-Tier
House capacity	16,000 birds	16,000 birds
Stocking density (hens /m <sup>2</sup> )	9	15
Length of a 19m wide house (m)	94	57
Cost of a timber frame veranda 3.5m wide (£, based on £80 / m <sup>2</sup> , one side only)	26,320	15,960
Cost per hen (£)	1.65	1.00
Cost of a steel frame veranda 3.5m wide (£, based on £135 / m <sup>2</sup> , one side only)	44,415	26,933
Cost per hen (£)	2.78	1.68

In Table 2 below, we have set out a range of different capital costs per bird for verandas, based on the estimates in Table 1. The effect of two different building depreciation rates have been considered, namely 10 years for more basic, wooden-framed structures and 20 years for higher-specification structures. The table shows the impact that these variables have upon typical egg production costs, in terms of pence per dozen at farm level.

**Table 2** showing the effect of capital cost and building depreciation rate on costs of production (pence per dozen).

	Veranda Capital Cost Per Bird			
	£1	£1.70	£1.70	£2.75
Rate of building depreciation	10 years (basic, wooden frame, single-tier)	10 years (basic, wooden frame, multi-tier)	20 years (higher spec structure single tier)	20 years (higher spec structure, single tier)
Annual depreciation cost per bird excluding interest payable (pence)	10	17	8.5	13.8
Additional cost per dozen (pence) based on average 52 weeks production*	0.5	0.8	0.4	0.7

\*Note that the cost per dozen calculation in the Table assumes 300 eggs per bird in a 58 week production period (17-75 weeks) with an additional 4 weeks for clean-out. For a typical 52 week period, it can be calculated that average output is 252 eggs or 21 dozen per bird place i.e.  $(52/62) \times 300$ .

Whilst there are a number of price differences and uncertainties, the additional capital cost associated with a veranda on one side of a building is likely to add between half and one penny per dozen to production costs (excluding interest payments).

A veranda on both sides of the same building would double these costs.

The report has also identified that the addition of a veranda may also impact upon:-

- Egg output, which may slightly increase due to factors such as reduced stress and lower mortality;
- Second quality eggs, as a result of cleaner eggs in the nest areas (fewer seconds), more floor-laying within the veranda (more seconds). It is also possible that increased useable area and better ranging could reduce stress and this may in turn improve some aspects of egg quality.
- Feed intake, with a small increase being likely due to the risk of lower temperatures in verandas.

Table 3 considers the financial impacts for farmers of small changes in egg output, seconds and feed intake, based on typical current prices. These are presented to provide an indication of the likely financial implications of such changes, in the absence of data being available. Whilst each of the three parameters are considered in isolation in the Table, in practice the impacts are likely to be cumulative, with some cost items increasing whilst others reduce.

**Table 3** showing the financial effect of small input and output changes (egg output, seconds and feed intake)

Assumed Production Change	Current Value of the Parameter Changed	Effect of Assumed Production Change
Output increased by 3 eggs per bird per year	Average free range egg price is 96p per dozen (source: BFREPA)	Annual output increased by 24p per bird
Seconds changed by 3 eggs per bird per year (either increasing or decreasing)	Price differential between first and second quality eggs assumed to be 50p per dozen (source: estimate)	A variation of 12.5p per bird depending on whether seconds increase or decrease
Feed intake increased by 3 grams per bird per day	Current feed price of £205 per tonne (source: BFREPA)	Feed cost increased by 22p per bird

Whilst the financial implications of similar changes in barn production have not been calculated, it is likely that the impact of changes in egg numbers and seconds will be less pronounced, because of lower farm gate prices and because of the smaller differential between the value of first and second quality barn eggs, compared to free range.

## 5 Conclusions

The general consensus between industry experts and producers is that verandas offer a great range of benefits for the hens and may improve physical performance which could be beneficial for the producer. The benefits include more space for the hens, more chances to “escape” for pariah birds and more opportunities for the hens to perform natural behaviours such as dustbathing. Benefits for the producer, stockpersons and the birds include better litter and better air quality inside the house. The additional capital costs are considerable, typically estimated at £1-2 per bird and it is difficult to determine the extent to which these costs could be offset by improved performance.

Many of the perceived advantages and disadvantages of adding verandas to henhouses still need further study:

- Ranging: It is believed that verandas promote ranging behaviour as they act as “transition” between the house and the range. This is purely based on expert opinion and observations from producers as no scientific literature in relation to verandas was found on the topic.
- Bird performance: It is unclear whether the performance of the hens increases (in terms of increased egg numbers) when verandas are present. As well as reviewing performance in more detail, further work is needed on the economic impact of installing verandas.
- Floor eggs: It has been suggested by the people that were interviewed for this report, that there might be an increase in floor eggs when verandas are present, however no evidence in literature has been found on this.

The stakeholders consulted considered that mortality was not directly affected by the presence or absence of verandas but it is possible that some other welfare benefits could arise. It would be interesting

to further explore this possibility with more producers and to better understand the motivations of producers for installing verandas and the perceived benefits. It is clear that the cost of building verandas (whether as part of a new build or retro-fitted to an existing henhouse) is likely to play a major role in the decision-making process, however, the fact that some producers do install verandas despite the costs, indicates that advantages can be gained.

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- Jeff Vergerson industry consultant
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