Witzel, Ernst

Investment requirements and costs of stables for laying hens

The costs of livestock buildings are an essential criterion in farm management. However differentiated data are often not available. Therefore several models of houses for laying hens were checked concerning costs of different housing systems. In contrast to previous calculations also models for small group systems and for organic production methods were included.

Keywords
Laying hens, stable construction, investment requirements

Abstract
Landtechnik 64 (2009), no. 5, pp. 347 - 349, 3 figures, 1 table, 2 references

For the selected models it was crucial that they are of commonly used systems and stock sizes. Because of the limited number of models the point was not to present a large number of variants but varying individual aspects in order to be able to show their effects. The following variations were selected for the evaluation (**table 1**). For all models a comparable construction with steel beams, walls of sandwich elements, and roofing of fibre cement corrugated sheets were assumed. Due to a better comparability a manual egg-collecting unit was planned, although with large stock sizes automatic collecting units are used predominantly. The investment requirements of these models were determined by the Johann Heinrich von Thünen Institute (vTI) on behalf of the Association for Technology and Structures in Agriculture (KTBL). The data are based on entrepreneur achievements and accounted for the price level of 2008. It covers the benefits for the cost elements 300 to 500 according to DIN 276, that means the building with equipment and outside facilities. Not included are ancillary construction costs such as planning and permission fees, which have to be estimated with approximately 10 to 15 %. Furthermore the expenses for estate and developement are not included. Because of the outdoor-runs they will be a little higher in the models for organic production (**figure 1**). All values are displayed in the following without value added tax.

Investment Requirements in Comparison

Figure 2 shows the investment requirements of the examined laying hen houses in € per place. As to be expected the stock

Table 1

Criteria of the checked stable models

Haltungsverfahren *Housing system*	**Entmistung** *Manure removal*	**Tierplätze** *Animal places*	**Besatzdichte**[2)] *Stocking density*[2)]
Bodenhaltung, Kaltscharrraum *Litter system, scratching area*	Kotgrube, Schlepper *Manure pit, tractor*	4 500	9 LH/m²
		9 000	9 LH/m²
Bodenhaltung, Kaltscharrraum, Auslauf[1)] *Litter system, scratching area, outdoor runs*[1)]	Kotgrube, Schlepper *Manure pit, tractor*	3 000	6 LH/m²
		6 000	6 LH/m²
Bodenhaltung mit Volieren, Kaltscharrraum *Aviary system, scratching area*	Kotband *Manure belt*	9 000	13 LH/m²
		15 000	14 LH/m²
		24 000	14 LH/m²
Bodenhaltung mit Volieren, Kaltscharrraum, Auslauf[1)] *Aviary system, scratching area, outdoor runs*[1)]	Kotband *Manure belt*	6 000	9 LH/m²
Kleingruppenhaltung in 3 Etagen *Small group system on 3 floors*	Kotband *Manure belt*	15 000	16 LH/m²
		24 000	16 LH/m²
		40 000	2 • 16 LH/m²

[1)] EU-Öko-konform
[1)] *Conform to Commission Regulation (EC) No 889/2008*
[2)] Bezogen auf die nutzbare Stallgrundfläche
[2)] *Related to the usable stable surface area*

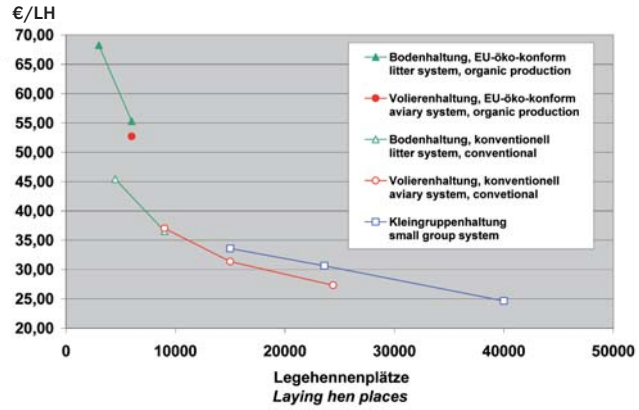
Fig. 1

Laying hen house with outdoor runs. Photo: E. Witzel

size significatly affects the investment requirements for each animal place. Over all model variations from the smallest to the largest housing system there is a cost degression of approximately 64 %.

The differences between the several housing systems are much less significant. For equal stock size the litter system is almost as expensive as the aviary system, because the aviary racks cost money, but on the other hand save building volume. With conventional housings the aviary system is some cent per place more expensive in comparison to the litter system. In contrast the organic aviary system is approximately 2.50 € per animal place cheaper. This is because in the conventional models with aviary system a double-row TWIN-system with additional perches was necessary. The investments for the aviary system are subject to a certain range, which is affected by different basic conditions. Within this variation and with consideration of the different manure removal systems there is no considerable difference between the investments for litter system and aviary system.

Fig. 2



Investment requirements for laying hen houses (€ per animal place) with consideration on housing systems and stocking size

In comparison to the small group system the conventional aviary system for the stock sizes of 15 000 and 24 000 hen places is about 2.50 € per place cheaper in spite of the additional TWIN-system. The considerable cost degression of the small group system with 40 000 places was effected by a more compact building due to two stable levels one above the other each with three cage floors.

Housings with organic production are characterized particularly by a lower stocking density. For the sake of simplicity the same basic models were therefore used and one third of the animal places reduced. The additional costs of larger roof overhang and the fence of the outdoor runs in the litter system are compensated by a smaller feeding system and fewer exhaust stacks. Because of the smaller stocking density in the organic production the aviary systems needs no TWIN-system so that it is absolutely even about 5 % cheaper than the conventional housing. For economic reasons the investment for each place is crucial, which increases clearly for the smaller stocking density. Thus based on 6 000 places one animal place in the organic litter system is nearly 13 € or approximately 30 % more expensive than conventional systems. For the aviary system this comparison is not directly feasible, but the difference might be smaller here.

Annual costs

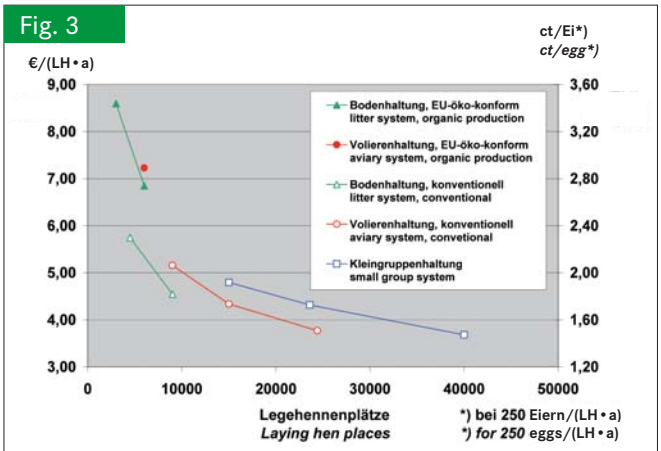
Usually in practice the running costs are of greater importance than the one-time investments requirements. Therefore also the annual costs of the buildings were determined, which contain the amortisation, interest, repair costs and insurance. For the determination of amortisation the cost elements were assigned a service life in each case. A long service life of 30 years was assigned in particular to the parts of the building cover; technical plants such as installations of electricity, water and heater have a middle service life of 15 years and the equipment has a short service life of only 10 years. In addition subordinate are 6 % interest rate on the half investments, 0.2 % insurance as well as repair costs of 1 % for long, 2 % for middle and 3 % for short usable elements of construction. **Figure 3** shows the resulting annual costs.

At first sight a similar picture results as in the case of the investment requirements. But it becomes clear that aviary systems are 0.4 respective 0.6 € per animal place and year more expensive than appropriate litter systems and the aviary systems again is cheaper than the small group systems. That is explainable because these systems have a higher part of short-living equipment, while the litter system consists predominantly of long-term usable building.

These differences might be even more distinct, if also the operating cost (electricity, heating etc.) were considered.

Presuming 250 eggs for each hen and year extra costs of 6 € per animal place and year result in only approximately a quarter cent per produced egg (**figure 3**, right). For the annual production of a housing system with 6 000 places however this difference adds up to 3 600 €.

Fig. 3



Annual costs for laying hen houses (€ per animal place and year) as well as their effects on the costs per egg

Further data

The evaluated models with the determined investment requirement are available as internet-tool „Baukost“ under **www.ktbl.de**. The password can be obtained for a small fee. Users of the CD Baukost 2.3 can download an update including the models. These applications show various differentiated data concerning the models. Each model is documented with floor plan and sectional drawing as well as building specification and characteristic data.

The investment requirement is structured according to DIN 276 and provided down to element level. Alternatively the distribution of costs on the functional groups of construction units (cost blocks) can be shown. To compare models more easily, it is possible to have the data of up to three models presented next to each other.

Individual adjustments of the values are also possible within certain limits. In addition to according models with varying stock sizes the values for intermediate sizes can be interpolated. Also the price level can be adjusted by a self-chosen factor.

Apart from these purely computational adjustments quantity, price per unit, and description of every single element can be changed. This however requires a high degree of specialized knowledge and is only recommended for changes in subfields.

Conclusions

The determined characteristic cost values of the presented model stables can of course not be transferred one-to-one to practice, since the regional and temporal price fluctuations are too large and the possibilities of concrete realizations too diverse. However they offer objective decision criteria when comparing various housing systems, production mode, and stock sizes. Increasing stock sizes reduces costs per place vastly. Litter system and aviary system need approximately the same investment per place, but annual costs are higher when using the aviary system. Small group system is slightly more expensive than the other two systems. Housings with organic production have to be about 50 % larger than conventional ones and require in litter system higher investments and annual costs of about 30 %. The smallest of all investigated models (organic litter system, 3 000 places) needs almost three times higher investments per place than the largest model (small group system, 40 000 places).

Literature

[1] Gartung, J. und K. Uminski: Forschungsbericht zum Investitionsbedarf für neue Haltungsverfahren für Legehennen. Interner Abschlussbericht an das KTBL im Rahmen des KTBL-Arbeitsprogrammes „Kalkulationsunterlagen (KU)“, 2008

[2] DIN 276: Kosten im Hochbau, Deutsches Institut für Normung e. V., 1993

Author

Dipl.-Ing. (FH) Ernst Witzel is a member of the scientific staff at Kuratorium für Technik und Bauwesen in der Landwirtschaft e.V. (KTBL), Bartningstr. 49, 64289 Darmstadt, Germany, E-Mail: e.witzel@ktbl.de