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Investment Requirements for Dairy Cow Loose Housing Systems

Increasing dairy herd sizes is necessary to provide sufficient income. More and more herds have 100 or more cows. Within the framework of the KTBL work programme new calculation standards on investment requirements were ascertained by the Institute of Production Engineering and Building Research (IBB). New construction forms and technical systems were analysed, applying the cost pool method. With the unit construction system, the costs for open and closed construction, various milking technologies and different herd sizes can be estimated and compared.

Constructions are often necessary to sustain the profitability of livestock farming, especially for dairy cows. Due to the decreasing milk prices and increasing costs for construction, the building of new stables carries a considerable financial risk. Annual costs for buildings make on average up to 20% of the total costs of milk production. Only if costs for larger stable areas and additional cow comfort raise profitability through an increase of milk production and reduction of labour input, new constructions might be affordable.

Methods

Before starting construction, business economics and building plans have to be considered carefully. Alternative housing systems have to be studied to determine the optimal concept. The FAL Institute for Production Engineering and Building Research calculates the fundamental cost factor values on the basis of built and invoiced farm buildings.

The building costs of different housing systems are split into functional pools (cost pools „Stable“, „Manure/Sludge“, „Milk“, „Forage“), building elements and cost groups (according to DIN 276), and the specific values such as the cost variables (costs per cow), annual building occupancy expenses (annual costs) as well as standard production costs (costs per square metre gross floor area, GFA) are calculated (including 16% VAT).

These values are, e.g. basis for the standard prices of agricultural buildings published by the ALB-Hessen. Complete data will be presented on the KTBL homepage soon (www.ktbl.de/baukost). By means of the online program „BAUKOST - Investitionsbedarf und Jahreskosten für landwirtschaftliche Betriebsgebäude“ state-of-the-art housing systems (MV 20001-23003) and previous stable designs (MV 17001-19003) can be calculated.

Investigation of investment requirements

An assessment of investment costs for construction and technical facilities for dairy cow housing will be presented here as an example. For a detailed description of the 24 types of buildings, please have a look at the KTBL homepage (www.ktbl.de/baukost).

Figure 1 gives an overview on the investments per cow. Data for stables with different manure removal and bedding systems (lying boxes and slurry canals LG or solid

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Keywords

Investment requirements, annual costs of building, functional cost pool, dairy cows, loose-housing system

Literatur

References can be retrieved under LT 05403 at http://www.landwirtschaftsverlag.com/landtech/local/fliteratur.htm.

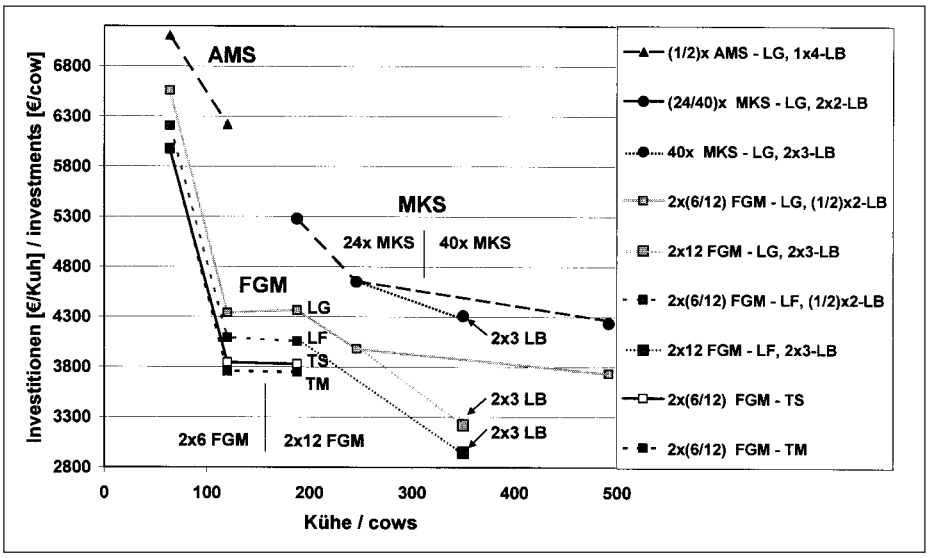

Fig. 1: Investment requirements per cow placedepending on herd-size and housing design

Legend of Figure 1 and 2:

FGM = herringbone milking parlour
AMS = automatic milking system
MKS = milking carousel
LG = lying boxes, slurry canals and storage
LF = lying boxes, solid manure
TS = deep litter
TM = trampled manure
LB = rows with lying boxes

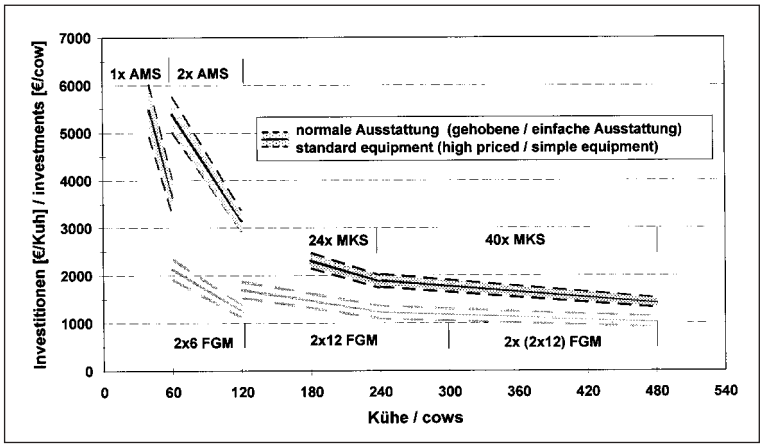

Fig. 2: Investment requirements for the functional cost pool MILK depending on herd-size and design

manure LF, trampled manure (sloped floor housing) TM, deep litter systems TS) are shown. Depending on herd size, the design of rows with lying boxes (LB) differs from 1x2 to 2x3 rows. Milking systems differ as well, including automatic milking systems (AMS) with 1 or 2 single boxes, 24x to 40x milking carousels (MKS) and 2x 6 to 2x 12 herringbone milking parlours (FGM).

Functional Cost pool ratios

As storage for animal feed is not included, the functional cost pool „Forage" contributes a minor part (< 5 %) of investment costs. Of more importance, and therefore with a higher potential for cost reduction, are the cost pools „Manure/Sludge" (13 to 27 %), „Milk" (27 to 51 %) and „Stable" (31 to 51 %).

Functional cost pool „Stable"

As a rule it is „the bigger the more expensive". This means, the more space per cow, the higher the costs for the building. Cost-effective design means to minimise overbuilt areas with toptimal use of space. At least 60 to 70 € are „sacrificed" for every unnecessary square metre concrete floor.

Where to reduce space? Lying boxes are necessary for every cow - maybe some centimetres can be saved. Feeding slots can be reduced conditionally - only if herd management is congruent. Courses between lying boxes, feeding and milking places are to be used by more or less animals ñ this is the best saving potential. For a small herd, with one double row of lying boxes at a lateral feeding table, 10.75 m^2/cow are needed, bigger herds with two triple-rows of lying boxes and a central feeding table only need 7.20 m^2/cow. This difference saves 700 to 900 € per animal. The increase of herds makes use of economies of scale (*Fig. 1*): With more cows less area per cow is needed and the lower are investment costs and annual costs (about 10 % of building costs) per cow. The labour requirements per cow and therefore labour costs will be reduced, too.

A further main expense factor is the building's hull. To ensure almost outdoor climate, favourable for animal welfare, stables should cover huge volumes and / or have big sized openings. Most popular are stables with a saddleback roof and high gutter (min. 4 m). Depending on herd size, 110 to 160 €/m^2 of developed area have to be invested into the hull of these voluminous buildings. For additional equipment (grids of lying boxes and feeding places, cow scrubbers, fans) 40 €/m^2 GFA are to be paid. In all, investments for hull, concrete floor and equipment add up to 210 to 270 €/m^2 GFA. Loose-housing systems with lying boxes and liquid manure removal require between 2700 € (60 cows) and 1700 € (480 cows) just for one cows space within stable. A look at alternative solutions is worthwhile:

Especially for small herds, saddleback roof designs with parallel naves are much more beneficial. Investment charges can be further reduced by uncovered, open courtyards used as gangways for the cows, which affect the house climate of these low volume stables (6 m ridging, 3 m gutter height) positively as well.

Related to standard buildings, savings are possible by reducing the wall area (open fronts, open sides with curtains). An even more economical solution is the use of lightweight construction halls with textile coverings. With 80 €/m^2 GFA the price per square metre is about 40 % below standard constructions (130 €/m^2 GFA). About 500 € per cow will be saved. Tests at the FAL in the 1980s revealed the usefulness of textile coverings for dairy cow houses. The USA, Canada and neighbouring EU-countries are precursors for this [2].

Functional cost pool „Milk"

Technical equipment and structural design for milk extraction, delivery and storage make up 27 to 51 % of total costs for new dairy cow housing systems. The total amount depends on the size and technology used (*Fig. 2*). Separate buildings for milk installations may be favourable for future upgrade of herd size, but cannot be recommended for less than 120 cows because of great expense. Besides this, the main cost factor is the milking parlour chosen. Depending on number of cows and available milkers, Side by Side or Herring-bone (FGM: ≥ 900 €/cow) are lower than rotary milking parlours (MKS: ≥ 1400 €/cow) or even automatic milking systems (AMS: ≥3000 €/cow). Rotary milking parlours and AMS save permanent staff, but investment costs per cow are high and therefore are only profitable with optimal exploitation of the facility.

Functional cost pool „Manure/Sludge"

The cheapest regarding this cost pool is deep litter housing with about 500 to 800 €/cow, followed up by trampled manure (sloped floor housing) and littered lying box loose housing with about 650 to 950 €/cow. Despite beneficial investment costs, solid manure systems are rarely chosen for new construction because of high labour requirements: labour is expensive! Thus liquid manure systems are standard at present. According to design and size, 900 to 1700 €/cow as investment have to be expected. Within liquid manure systems, planed floors and mechanical manure removal or dung removal by tractor are lower in price. But caution: investment costs, costs for the tractor, operating costs and labour costs are not considered within construction costs.

Conclusions

The construction costs for the types of dairy cow housing systems taken into account amounted to 3000 to 7100 € per cow, depending on design, equipment and herd size. The main factor is mostly the functional cost pool „Stable" - except if a milking carousel or automatic milking system is installed, then it is the cost pool „Milk". With regard to the current economic environment it must be considered carefully if the new construction might be profitable. In case of doubt, construction should be avoided.