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Large open-front barn with automatic milking at Groß Kreutz

A future-oriented variant of milk production features the open-front house with two automatic milking systems introduced in 1999. Over the last year this housed an average of between 104 and 120 milking cows. A modern basis for Berlin and Brandenburg agricultural research has developed at Groß Kreutz. Numerous technical and management problems have still to be clarified. The first research results relating to free and regulated cow movement within a larger cattle unit indicate possibilities for optimising the total system.

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Keywords

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The Education and Research Institute for Livestock Breeding and Husbandry Ruhlsdorf/Groß Kreutz managed, at a Groß Kreutz location, a milking herd in an old byre which was in the vicinity of a housing development. Under these conditions no future-oriented education, research and advisory service was possible. Other possibilities were sought.

Concept

After the necessity for new facilities became clear, the State Institute for Agriculture and the LVAT, experienced sources from Humboldt University and the ATB were brought into the development of a concept. The task in hand featured seeking a solution for the complex challenge of creating facilities for 150 milk cows including milking premises, rooms for milk tanks and also manure and feed storage. The suggested solutions had to unite the following aims:

- Economical viability
 - Functional security
 - Application of new production systems
- Additionally, the housing of the livestock had to be achieved under appropriate animal welfare, health and hygiene conditions. By mid-1998 several variants had been worked-out. Typical characteristics of the variants were cubicle housing, naturally ventilated or outdoor climate buildings, and an automatic milking system (AMS). Litter bedding was not considered because of the straw balance on the farm. Herd management and milk production questions featured in subsequent planning stages.

Bearing in mind the typical herd size in Brandenburg, the standard management procedure of dividing herds into groups, and the AMS trials taking place at that time in other German research facilities, the following focal points were established:

- Maximum exploitation of the milking system,
- Dividing the milking cows into at least two feeding groups,
- Creating a technical basis for control of cow movement
- Ability to follow milking equipment disinfecting procedures usual in large herds.

At the time of planning, single box milking plants were only accessible from the left side. Finally, a constructional and functional concept for a dairy building was developed with facilities to allow scientific investigation of modern production systems and also their demonstration to farmers and the interested public.

Realisation

The planning office also had the task of incorporating other requirements, mainly relating to herd management, into the building. The final solution is a four-row cubicle barn with single-side feeding table (*fig. 1*). The cubicle passages and the feeding passage have slatted floors above slurry channels. The roofed area is 66 m long and 23 m wide. The feed table is situated along the southern, open, front of the building. Above 1.65 m, the north-facing longitudinal side is clad with spaceboards, the wall being solid up to this point. Timber is the main material for the building shell. Parts of the gables have no solid walling but instead windbreak netting and plastic roller blinds can be manipulated to give strong natural lighting and variable ventilation. Plastic roller blinds can also be used for closing-off the spaceboarding completely on the building north elevation, and up to the height of the feeding railings on the south side. The roof ridge features a permanently-open light access.

Cubicles

The lying surfaces are generously proportioned in-line with current advisory recommendations. Wall-side cubicles have a length of 2.50 m, double-row cubicles of 2.30 m. Cubicle width is 1.25 m in the milking, and 1.30 m in the dry cow, area. The dividing railings are cantilevered. Comfort rubber mats are standard floor surfacing in the cubicles with a underlay of 25 mm thick foam. Additionally, some are littered with a mix of wood shavings and chopped straw and further cubicles have waterbeds, with some other mattresses also being used.

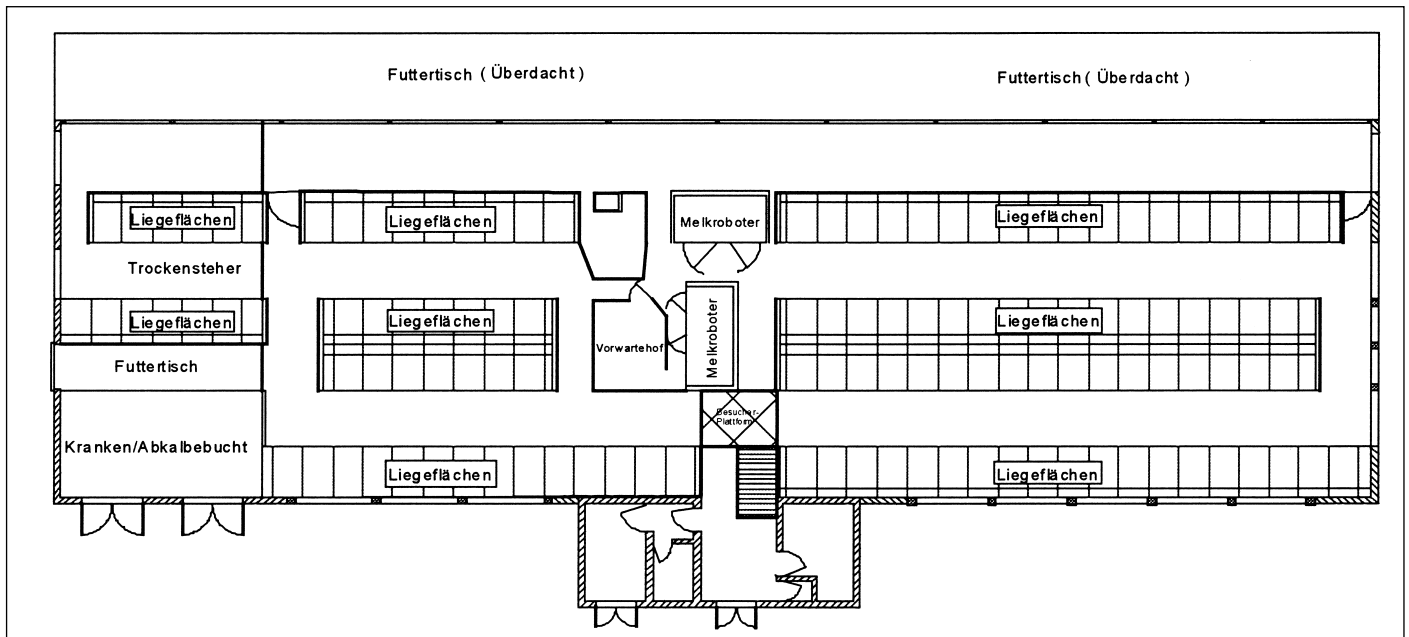


Fig. 1: Ground plan of a front-open dairy cow house in Groß-Kreutz

Space division

At the eastern gable end is positioned a solid floor littered calving pen of 40 m², and 15 cubicles for dry cows. The dry cows have a separate feeding fence. Main building space is for housing the milking herd in two groups with 65 and 72 cubicles. In the barn middle are positioned the two single-box milking systems, spaciouly-designed pre-milking waiting area and selection facilities, cross-passages between the longitudinal cubicle passages, and an access to the feeding passage. Further cross passages are situated at the opposite end of the group pen. The open positioning of the milking facilities within the building means that precautions have to be taken against frost damage. Thus all supply and exit pipelines are insulated. The milk boxes can be closed-off above by insulation plates. When required, milking box entrance and exit ways can be shielded with plastic curtains. In the milking and technical area, warm air heating is used.

The building was first stocked in May 19, 1999 and officially handed over on June 29, 1999. All the cows on the farm have been housed there since October, 1999.

Management

Envisaged in the original management concept were three feeding and two housing groups of cows, with the dry cows representing a housing and a feeding group. The milking cows were divided into two feeding groups but a single housing group being guided into their respective feeding areas via a selection gate. Through this arrangement the

milking boxes were available to all the milkers. Behind this concept there lay the intention to exploit the milking robots as fully as possible and also to take full advantage of the cows' readiness to be milked. The cows visited the milking boxes voluntarily. Entry to the feeding passage is possible via the milking boxes and a separation gate as well as via a further passage in each case.

The capacity utilisation of the house up until now has been a maximum 90% of the available cubicles. The exterior temperatures recorded so far of from minus 11°C to plus 36 °C have led to no noticeable detrimental effect to the welfare, health or performance of the animals. A feed intake group trial has been carried out since January 2000. According to this, individual dry matter intake of these months lay between 18.8 and 21.7 kg per day. In the same period daily milk yield on a monthly basis lay between 22.6 and 25.2 kg.

Separating the milking herd into two groups without dividing the herd for housing failed to succeed because uncontrolled access meant there was no separation in fact of the feeding groups. Accommodating the dry cows within a single housing and feeding group without individual concentrate feeding highlighted limitations in the performance-oriented ante-parturition feeding.

From March 2000, a one-way gate separated group 1 (fresh milkers and high yielders) from group 2 (those further-on in the lactation). The continued possible access into group 2 by group 1 cows through the shared usage of the second milking box was designed to meet the group 1 cows' greater willingness to be milked. The milking frequen-

cy was not improved and the necessary driving of the cows was not reduced.

Variants were analysed towards further improvement of the herd management. The regulated cow movement (access to feeding passage only over the AMS) hid the danger of masking reduced feed intake. First trials were carried out with group 2 cows. Featured in the trial period were a 7-day settling-down period after group separation with a subsequent seven day period for becoming used to the altered access system. Along side milk recording, the effect of the number of visits to the feed table was observed through increased video observation and analysed. The regulated movement of cows led to a clear increase in milking frequency from 2.04 to 2.39 milkings per cow and day. The necessity of human help in driving the cows ceased entirely. The frequency of feed table visits was reduced from 7.5 to four visits per cow and day. The exploitation of the milking box through milkings and passages ran to 66% during the regulated movements. Including additional time for cleaning and servicing, there remained about four hours per day for further passages and milkings.

The change-over from free to regulated movement had no negative effect on milking performance.

The transference of these results onto the group of fresh calvers and heavy milkers was not undertaken because further investigations into the effect of the limited access to the feeding passage on the feed intake of this category seemed important.

Because of the results, the group division and the regulated cow movement were retained in the second milking group.