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A feed station for automatic recording of sheep intake

The exact recording of an animal's feed intake is indespensible for efficient nutrition research and for breeding. Feeding trials with individual animals are, however, extremely demanding of work time. Whereas technology for recording individual feed intake through weighing the trough is now available for cattle and pigs it is missing for sheep. The following report, however, introduces a computer controlled feeding station for registering individual feed consumption by sheep.

Scientific feeding trials and objective performance tests in breeding require an exact as possible determination of an aninal's basic feed and concentrate feed intake. In that these types of investigations are very labour intensive (manual weighing of feed before feeding and weighing of leftovers), often only a simplified group-based registration of feed intake is carried out [1,2]. The application of computer controlled systems in this sector can help in the substantial reduction of labour input and the differentiating of results.

Modern processor technology has already entered into agricultural livestock husbandry in a big way [3]. Through its use, it is possible to keep animals in groups but still feed them individually. This enables type-specific group existence with comparatively low labour requirements and automatic registering of individual feeding and behavioural data. In cattle and pig husbandy the computer controlled processor technology is widespread, however hardly known at all in sheep keeping. Even for feeding trials in this sector, no practically-tested solutions are available.

The target, therefore, was the development up to readiness for practical use of an automatic station for feeding lambs enabling the recording of feed intake (amount per trough visit) and the feeding behaviour of individual sheep (time, length of feeding period, number of trough visits) on an individual basis despite group housing as exactly as possible and with miunimum labour input whilst allowing for a variable feeding strategy (ad lib or rationed). As a fundemental in the feeding, not only concentrates should be able to be fed but also types of feed in the form of cobs or short-chopped hay.

Computer controlled feeding station

The developed feed station is presented schematically in *figure 1* and comprises the following main components:
- feeding station with lateral barriers and access from the rear
- variability of feeding station breadth for adjustments according to animal size
- trough suspended on a load cell
- feed hopper, in the case of concentrates and cobs, with a rationing capability
- entrance control for animal admission to the trough
- electronic animal identification via transponder supported by a light beam
- processor for control of all procedures
- PC for service and management operation.

The following describes how feeding and behavioural data is collected during a feeding
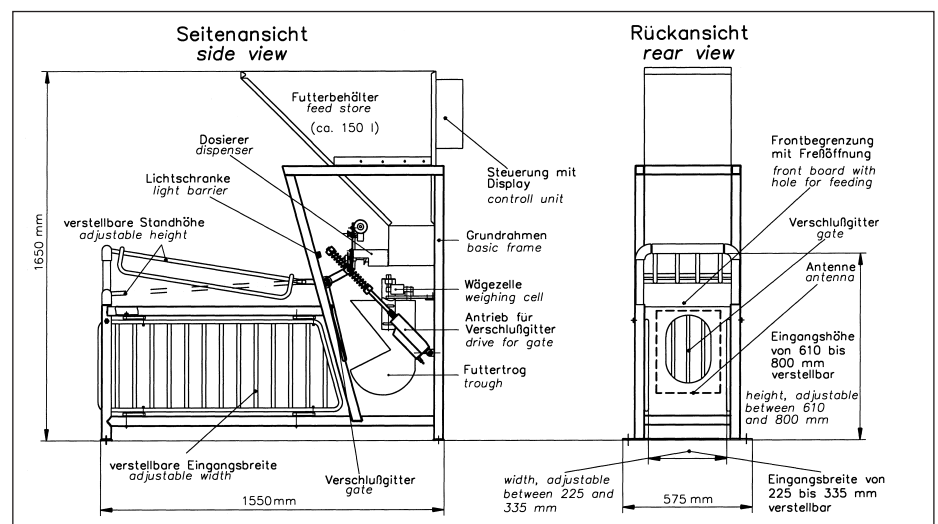
Keywords

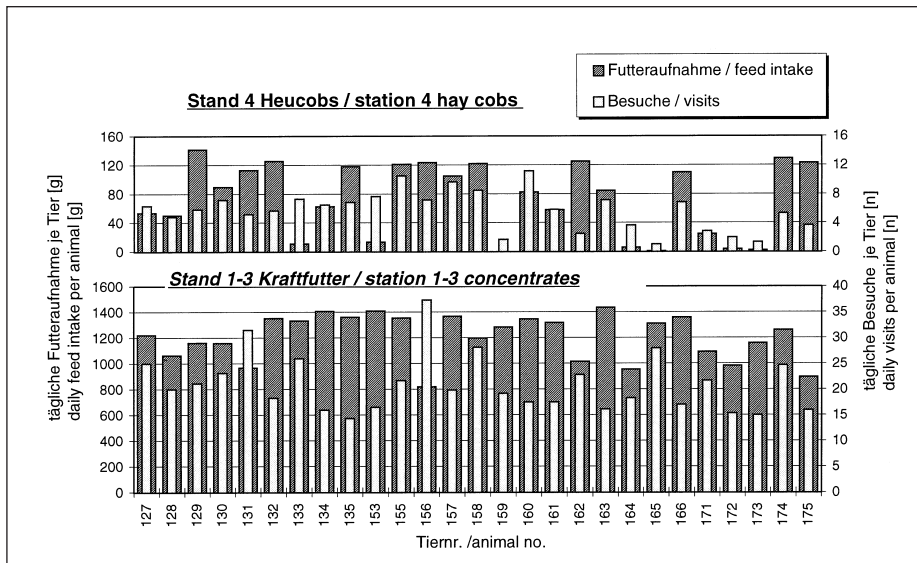Fig. 1: Design of a computer controlled feeding station for sheep

Fig. 2: Daily feed intake and number of visits in feeding stations (mean of 6 days)

visit to the station. In the basic mode, the entrance to the trough is blocked by a moveable grating. Such blocking of access to the feed trough is required, on the one hand, so that an exact as possible weighing of the trough can be carried out without influence of animals and, on the other, also to allow regulated feeding times with a feed-on-demand system which can be variably programmed. Additionally, through pressing back the animals, the grid can also allow a feeding period to be purposely broken-off. In the basic mode with blocked access to the trough, the trough is weighed by the load cell and the initial weight recorded. If a sheep enters the feeding station it is identified by an earmark transponder. The computer then checks if the animal should have access to feed. If the check is positive the grating is opened and the animal can start feeding. After feeding and exiting the trough area, the trough grating is once again closed and the end weight of the trough recorded. Feed intake is then calculated from the difference of the initial and end weights. In the case of concentrates and cobs, the rationed feed amount can be deposited in the trough for the next feed. Additionally, the electronic animal identification allows the recording of the individual entrance and exit times. A light beam emitted at the front of the station serves on the one hand to give warning, independently of the electronic identification system, if an animal is in the feeding position and, on the other, as a security measure to help avoid the possible clamping of an animal's head by the grating. Should the process computer give the command to close the grating, but the light beam signifies the presence of an animal's head still in the feeding opening, the grating is then momentarily opened again to allow the

animal to free its head. Only then would access to the trough be once again closed.

At every feeding visit the processor records or calculates:
• animal number
• station number
• date and time of feed visit begin and end
• runnning total of visits per day
• initial and final weights of trough
• feed intake

This data is temporarily stored by the processor before being cyclically transferrred to a PC which is responsible for the control and monitoring of the entire system as well as long term data storage and data evaluation. A 24-hour operation of the PC is not necessary in that the processor at the feeding station can independently carry out all control tasks on the spot. This ensures a high security against system failures for the whole complex when several feeding stations are in use.

Examples of evaluation results

In order to demonstrated data automatically collected by the feeding station, results were taken from a research flock belonging to Weihenstephan Technical High School. The research herd of 27 lambs with average liveweight of around 30 kg had access to four feeding stations (three feeding stations for concentrates in the form of pellets, one feeding station for cobs). As examples, resultant feed intake and behavioural data will be related.

The most important parameter for feeding trials is the feed intake. *Figure 2* shows the average daily intake of concentrates and cobs for 27 lambs as well as the frequency of feeding station visits. On average the sheep eat 1206 g concentrates and 74 g cobs, al-

though the intake between the individual sheep varied substantially. The intake of cobs varied more strongly than that of concentrates (the difference with cobs ranged between 0 and 140 g, that of concentrates between 820 and 1430 g). Also an indivual preference for one particular feed product showed itself clearly. For instance, sheep 156 had the smallest concentrate intale with 820 g and a very high cob intake of 120 g. The opposite was observed with sheep number 165. Large differences were also registered for the number of visits to the feeding station. On average, the lambs visited the station for concentrates 21 times per day (maximum 35, minimum 15 visits). The cob station was markedly less frequented. Here the average for daily visits was around 5. Additionally, one can see from figure 2 that the feed intake per visit of individual sheep is very different. Some sheep required substantially less visits for daily feeding compared with other flock members (sheep 134 and 156).

With the recorded visit data, further interesting analyses on feeding behaviour are possible.

Conclusion

The developed feeding station presents suitable technology for the carrying out of feeding trials or of performance tests in sheep husbandry through the registration of individual feed intakes. Alongside an ample sufficiency of data relating to individual animals regarding feed intake, data on feeding behaviour can be collected without any mentionable extra manual effort. This also allows a computer-supported individual animal surveyance to be carried out. The feeding station presented here has been further developed in the meantime so that two separated animal groups can be fed from the one station. Initially this technique has been introduced for ram lamb performance trials in Grub, Bavaria.

Literature

Books are signified with •

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[2] *Bellof, G., P. Mayer* und *P. Freudenreich*: Der Einsatz von fettreichen Rapsprodukten in der Lämmermast. Züchtungskunde 70 (1998), H. 2, S. 141 – 151

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