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# Computer-Controlled Automatic Liquid Feed Dispensers in Goat Rearing

## Results of Process-Technological Studies on Motherless Rearing Methods

*So far, only a few goat lambs have been reared without their mothers because high rearing costs and -losses are feared. Therefore, the influence of three rearing methods on feed intake, weight development of goat lambs, and profitability was examined. If both genders were considered, the following values were measured after the 56-day rearing period: automatic ad-libitum liquid feeding system 189 g/d, traditional lamb bar 171 g/d, computer-controlled automatic liquid feeding system 162 g/d. Higher daily weight increase is offset by significantly larger feed expenses so that the computer-controlled automatic liquid feed dispenser may be more profitable if more than 70 lambs are reared per year.*

In practice, there is a wide variety of motives for motherless goat lamb rearing. One frequent reason is the rearing of so-called problem lambs, whose supply with mother's milk is not guaranteed because the dam is lost or does not produce enough milk [1, 2, 3]. However, an increase in rearing performance, goat milk marketing, or the improvement of the herd's health condition may also be reasons for separate lamb rearing [2, 4, 5]. Thus far, the lambs have been fed either using the manual feeding method (traditional lamb bar) or automatic ad-libitum liquid feed dispensers. A technically improved liquid feed dispenser with computer-controlled feeding, which is known from motherless calf rearing, is not yet common on the market for the rearing of sheep- and goat lambs. In addition to animal-physiological advantages of controlled feed dispensing in small portions, which are always freshly prepared and have the optimal temperature, the possibilities of controlling and monitoring the entire nursing phase according to the needs of the individual animals speak in favour of this technology. For this reason, a computer-controlled automatic liquid feed dispenser for calf rearing was adapted to the conditions of motherless goat lamb rearing and compared with both a traditional lamb bar and an automatic ad-libitum liquid feed dispenser.

The following individual aspects of the different techniques were compared:

- liquid and solid feed intake
- weight development and daily weight increase
- worktime requirements for selected kinds of work
- labour-, feed-, and investment costs

### Trials

For the trials, 22 male and 23 female lambs of the goat race „Dahlem-Cashmere“ were reared without their mothers at the experimental station „Oberer Lindenhof“ of Hohenheim University. The animals were kept in three littered group pens (3.50 m • 3.50 m) in the same stall building. Due to the low outdoor temperatures, the stall climate was dry and cool during the entire rearing phase with temperatures ranging between 9°C and 13°C. For all three groups, milk exchanger suitable for sheep and goats was used, which contained 50% skim milk powder.

In the control group, where the traditional lamb bar was used, 14 lambs were fed twice a day using a bucket with 14 feeding nipples (in the first week three times a day). It was made sure that all lambs were able to drink simultaneously and that the weaker animals were not driven away by the stronger ones.

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### Keywords

Goat keeping, lamb rearing, feeding method, weight gain, work time requirements, profitability

Table 1: Weight development versus gender and rearing method

Characteristics	Gender	Rearing method					
		Control		Trial group			
			n	I	n	II	n
Birth weight (kg)	male	3,5 ± 0,7	7	3,2 ± 0,5	6	3,3 ± 0,9	9
	female	2,9 ± 0,9	7	3,0 ± 0,6	7	2,8 ± 0,7	9
Weaning weight (kg)	male	13,6 ± 1,4	7	15,2 ± 2,9	6	13,6 ± 2,3	9
	female	10,9 <sup>a</sup> ± 2,0	7	13,7 <sup>b</sup> ± 2,2	7	10,9 <sup>a</sup> ± 2,0	9
Daily weight increase (g/d) in the nursing period	male	180 ± 18,38	7	214 ± 44,17	6	184 ± 31,06	9
	female	143 <sup>a</sup> ± 21,32	7	191 <sup>b</sup> ± 26,47	7	145 <sup>a</sup> ± 37,13	9
Daily weight increase (g/d) in the nursing period until 14 days after weaning	male	282 <sup>a</sup> ± 93,75	7	147 <sup>b</sup> ± 77,71	6	155 <sup>b</sup> ± 82,39	9
	female	148 ± 99,76	7	164 ± 98,78	7	164 ± 52,73	9
Daily weight increase (g/d) after birth until 14 days after weaning	male	198 ± 22,56	7	196 ± 41,10	6	178 ± 24,90	9
	female	145 <sup>a</sup> ± 24,89	7	183 <sup>b</sup> ± 32,09	7	146 <sup>a</sup> ± 31,39	9

Values within one line featuring different exponent letters differ significantly (p<0.05).

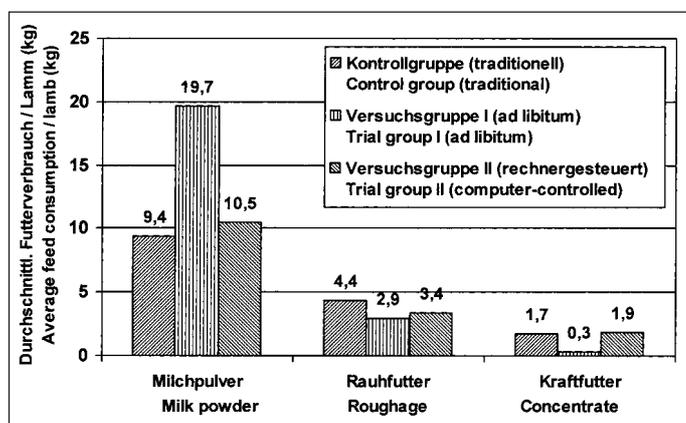


Fig. 1: Average feed consumption during the 8-week feeding period

The liquid feed quantity taken in as well as the worktime requirements for preparation, feeding duration, and cleaning were recorded after each feeding. In trial group I, which was reared using the automatic ad-libitum liquid feed dispenser (type EZ1, company Förster-Technik), 13 lambs shared one feeding nipple. Trial group II, which was fed with the aid of the computer-controlled automatic liquid feed dispenser (type: SA 2 Plus, company Förster-Technik), was assigned 18 lambs. When entering the feeding box, the goat lambs were identified using a transponder attached to a collar and an antenna. If the animal was entitled to a feeding, a feed portion of 0.25 l was metered out. The worktime required for necessary routine work at the two automatic liquid feed dispensers (filling of the milk exchanger container, cleaning, calibration) was recorded as well. In addition, the training time required for the individual feeding system was determined in all three groups. In the „traditional“ and „computer-controlled“ groups, the same feeding plan was applied. As of trial week 2, all lambs were offered hay (second cut), pelleted feed concentrate, and fresh water for free feeding. The daily weight increase determined based on the weekly weighings of the individual animals were related to three time periods: nursing phase (56 days), transitional phase (14 days after weaning), and total rearing period (70 days). The profitability calculations consider the average expenses for the required worktime, the feedstuff, and the feeding technique (depreciation and maintenance) of the three rearing techniques.

## Results

The liquid and solid feed intake showed the expected process-typical results. With regard to feed intake, trial group I (ad libitum) differs significantly from the two other rearing groups (fig. 1). It consumed approximately twice as much milk exchanger (19.7 kg), but less roughage (2.9 kg) and significantly less feed concentrate (0.3 kg). The solid and liquid feed intake of the control group and trial group II (computer-controlled), however, was comparable. Animal development largely reflects the intake of liquid and solid feed. In this respect, pronounced gender-

specific differences can always be observed. Until weaning, trial group I (ad libitum) reached the highest average daily weight increase of 214 g (male animals) and 191 g (female animals), whereas growth performance in the two other groups was at the same level (table 1). In the transitional phase, the daily increase of the animals fed ad libitum exhibited a sharp decline. Especially the male lambs of this group, but also those of the computer-controlled group showed a pronounced growth slump. If considered over the entire rearing period, the ad-libitum technology allows the highest growth performance to be achieved (significant only for female animals). At 109 labour minutes/lamb (as well as a number of 40 lambs produced per year and an eight-week rearing period), the worktime requirements and, hence, the labour costs in the control group are (traditionally) clearly higher than in the two trial groups (table 2). This is caused by liquid feed preparation, the nursing phase, and cleaning.

The question of the profitability of the individual rearing systems requires a farm-specific answer. Thus, it must be taken into account why the lambs are intended to be raised without their mothers. In addition, the number of lambs to be produced per year must be estimated. Ultimately, the costs for feed and worktime must also be calculated in a farm-specific manner. If one assumes, for example, a number of 40 lambs produced per year and the worktime and -costs listed in table 2, as well as average feed expenses (feed concentrate € 28.80/dt; hay € 7.50/dt; milk exchanger € 197.20/dt), the total costs of motherless rearing with the traditional lamb bar are lower than the expenses for the computer-controlled or ad-libitum automatic liquid feed dispenser. At 120 lambs produced per year, however, the total costs of the

computer-controlled liquid feed dispenser range significantly below traditional rearing or rearing with the ad-libitum liquid feed dispenser. From further calculations, it can be deduced that, given the assumptions made, computer-controlled lamb rearing is profitable as of approximately 70 lambs produced per year.

## Conclusions

In principle, all three rearing techniques employed are suitable for motherless goat lamb rearing. If the figures for the genders are merged, the following daily weight increase was reached during the entire rearing period: automatic ad-libitum liquid feed dispenser 189 g, traditional lamb bar 171 g, computer-controlled automatic liquid feed dispenser 162 g. The traditional rearing technique with the lamb bar may result in lower feed costs. The worktime requirements, however, are substantial. The ad-libitum liquid feeding technology provides high weight increase performance combined with high feed costs. The performance of the computer-controlled liquid feeding system is comparable with that of traditional technology. Investment costs, however, are higher. At the same time, animal control and herd monitoring are facilitated and improved. In order to be able to choose the suitable rearing technology for a farm, the consideration of the farm-specific feed- and labour costs as well as the number of goat lambs reared per year play a decisive role.

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Table 2: Work time requirements and labour costs per lamb during the 8-week rearing period

Lambs prod. per year	Control		Trial group I		Trial group II	
	Duration (AKmin)	Labour costs (12,50 €/Akh)	Duration (AKmin)	Labour costs (12,50 €/Akh)	Duration (AKmin)	Labour costs (12,50 €/Akh)
40	109	22,70	13	2,70	17	3,54
120	105	21,87	9	1,87	14	2,92