

# The Change of the Height of the Ration on Trough in a Free-Stall Barn

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Cow management in a free-stall barn is generally based on the free access to Total Mixed Ration (TMR) on a flat type trough. When a cow eats TMR, cows push, pull and toss the ration. The shape of the ration was changed by these activities and the ration move out of reach of the cows. In a free-stall barn, cow's eating has to be guaranteed every time. Thus, enough TMR has to be in the area that the cow can reach it. The information about the movement of ration was not enough. Shimada et al. (2007; 2008) reported that the farthest end of ration form was related to the frequency of tossing behavior of cows. Pushing up is the operation for pushing TMR near the cow's side between ration offering time. By suitable pushing up of the ration, the cow is able to access the ration, continuously. Automatic pushing up machine has been installed in commercial dairy farm. The objective of this study was to determine the change of the ration shape and to examine the effect of automatic pushing up machine on the ration shape on trough in free-stall barn.

## Materials and Methods

A device for measuring the height of ration without contact was used. The device had an arm (2.1 m) with 16 laser sensors and a data recorder (Morita et al. 2008). The device measured and recorded the distances between the arm and ration surface in 10 cm intervals. Data was analyzed using Kruskal-Wallis analysis.

In manual pushing up barn (manual barn), twenty Holstein cows (3.2 parity, 148 days after calving, 34.7 milk yield kg/day) were kept in a free-stall barn with an automatic milking system. The trough was a flat-type and the barrier of feeding space was a self-locking stanchion type. The cows were offered a total mixed ration once daily at 10.30 hour. Pushing up operation was done 4 times daily at 11.30 hour, 13.00 hour, 17.00 hour and 05.30 hour by manual labor. From 13.00 to 17.00 hour, the ration height was measured at 10 cm intervals from the trough wall to 150 cm away (15 points) in parallel 6 lines, every 30 minutes. In automatic pushing up

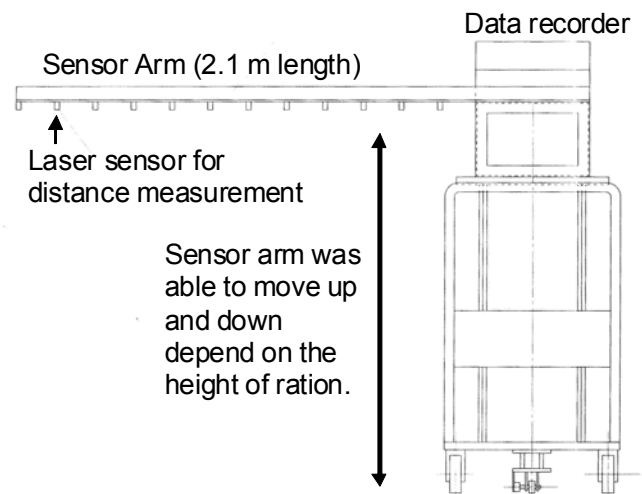


Figure 1. A device for measuring the height of the ration (JTF-FS12). The device had the arm (2.1 m) locating 16 laser sensors (GP2Y0A02YK) in 10 cm interval, and the data recorder. The height of the arm was variable.

barn (automatic barn), 52 Holstein cows (2.7 parity, 121 days after calving, 38.8 milk yield kg/day) were kept. The trough was a flat-type and the barrier of feeding space was a post-rail type. The cows were offered a TMR twice daily at 5.30 and 10.00 hour. Pushing up operation was done by automatic machine (Lely Juno), 9 times daily at 08.00 hour, 09.30, 11.30, 14.30, 19.00, 16.30, 21.00, 00.05, 03.00 hour the following day. From 14.10 hour to 19.10, the ration height was measured in parallel 6 lines, every 30 minutes.

### Results and Discussion

In manual barn, the length from the trough wall to the top of the ration at the end of the experiment (80 cm position, 17.00) was greater than that at start of experiment (10 cm, 13.00). In the first 2-hour-period of experiment, the height of ration nearer 40 cm position was decreased, and the height of ration from 60 to 90cm position was increased. In other 2-hour-period, the amount of ration nearer 70 cm position was decreased. The ration was piled up high on the position from 80 to 100 cm, and cow

needed some effort (lengthened their neck and/or tongue) for eating. The change of the ration shape in automatic pushing up barn was smaller than the manual barn. The remarkable peak of ration on the trough disappeared by the frequent operation of automatic pushing up machine.

### References

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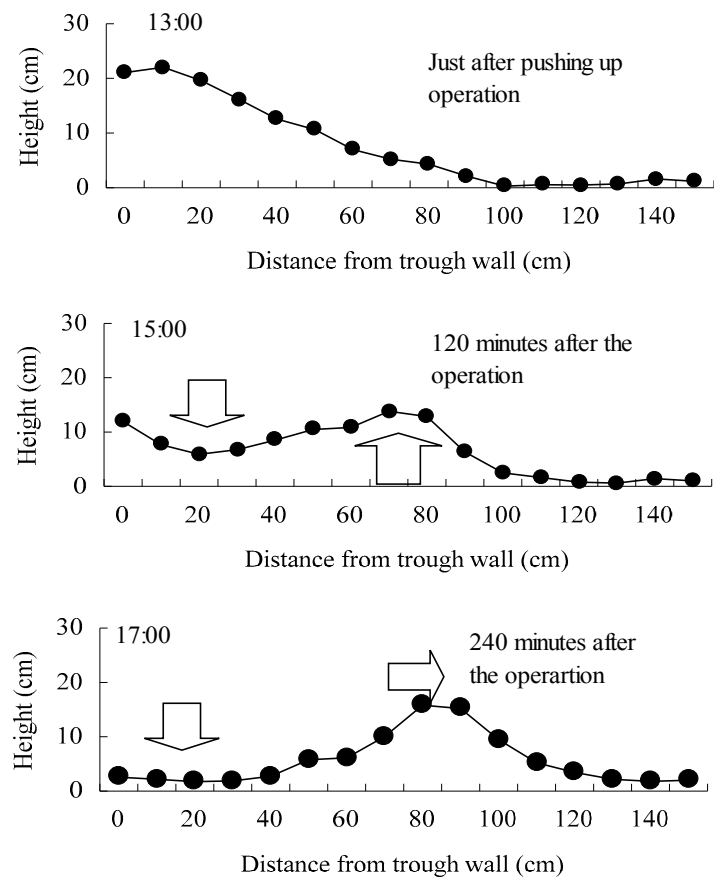


Figure 2. The height of ration (ration shape) in 10 cm interval on trough in manual pushing up barn in 0, 120 and 240 minutes after the pushing up operations