A technique for measurement of cattle form using a trail 3D digital camera

Tamaki Kida [A], Shigeki Tejima [A], Toshitaka Uchino [B] and Fumihiko Tanaka [B]

[A] National Institute of Livestock and Grassland Science, Japan, www.naro.affrc.go.jp
[B] Faculty of Agriculture, Kyushu University, Japan, www.agr.kyushu-u.ac.jp
Contact email: kida@affrc.go.jp

Keywords: 3D digital camera, trail camera, image analysis, body measurement.

Introduction

Measurement of weight and form are important for the management of grazing cattle; however, form measurement is seldom carried out. Recently, use of 3D digital cameras has been increasing, and 3D-technology for reconstruction of 3D pictures has been developed. The measurement of withers and hip height of cattle from 3D pictures using the image-analysis technique has been reported (Kida et al. 2012). However, time and effort are required to obtain 3D images of grazing cattle in pastures.

Here, we examined an automatic photographic technique using a sensor camera.

Method

The trail 3D digital camera system consisted of a 3D digital camera (FinePix REAL 3DW3; FujiFilm, Japan), a 3D reconstruction program (Star Pict Measure; Sakurai, Japan), a waterproof sensor unit (Magical Finger; HOGA, Japan), a solar panel, and a battery (Fig. 1). This camera system was installed near the water source in a pasture. When cattle visit the water source, the camera automatically takes a picture. 3D reconstruction program applied the template matching technique from 3D picture, and analyzed three-dimensional restoration.

Measurements were conducted from June to July, 2012. The trail 3D camera was installed to take a side picture of cattle at a location approximately 4 m away from the water source, and to take a downward view of the animals' backs approximately 2.3 m above the water source. The grazed pasture area was 2 ha, and the cattle included 7 Japanese black beef cows.

Results

We succeeded in obtaining automatic photographs of all grazing cattle using the trail 3D digital camera. We analyzed wither and hip height from the 3D side view, and hip width from the 3D downward view (Fig. 2).

The average value of difference in withers height obtained from the 3D reconstructions and the measured body was 5.1 cm (s.d 2.0). The analyzed values tended to be smaller than the actual measurements.

Observation of the drinking behavior of grazing cattle was possible using the trail system. However, the quality of 3D pictures obtained at night using a flash was poor as pixel information deteriorated, and 3D reconstruction analyses were not made for these images.

One problem we encountered was that the recognition of individual cattle from 3D pictures was difficult. It may therefore be necessary to mark the cattle to discriminate among individuals using 3D imaging.

It is known that a correlation exists between cattle weight, height of withers, and hip width (Tomizawa 1989). Combining side and top views from 3D photographic imaging may enable application of this technology for weight estimation.

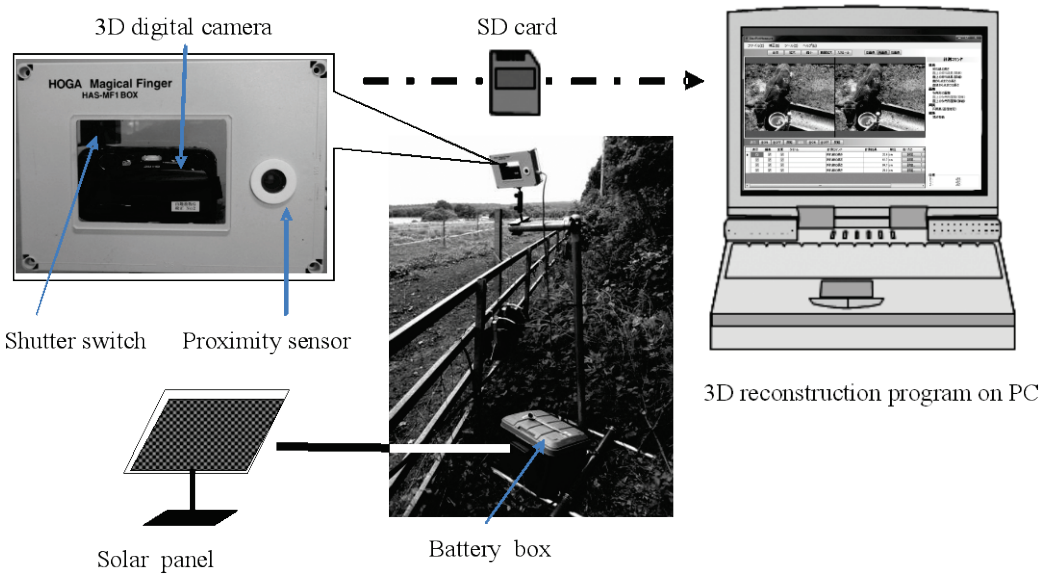

Figure 1. The trail 3D digital camera unit installed near the pasture water sources.

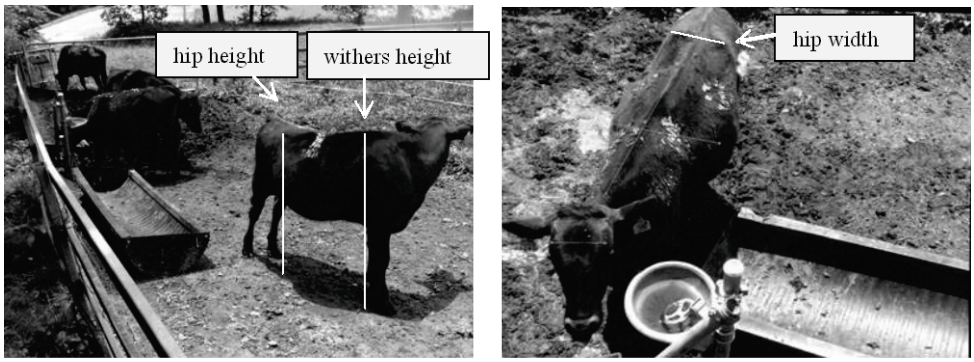

Figure 2. Examples of digital 3D pictures taken with the trail camera analysed with a 3D reconstruction program.

Conclusions

Installation of a trail 3D digital camera near the water source in a pasture was succeeded in capturing automatic images of grazing cattle. Morphological information (withers height, hip height, and hip width) on grazing cattle can be analyzed from the 3D pictures.

References

Kida T, Tejima S, Nagai T, Nagawa Y, Horizawa J (2013) The cow body measurement technique using a 3D digital camera.. *Japanese Journal of Grassland Science* **59** appendix: 38 (Japanese)

Tomizawa M (1989) Field application of indicators of grazing effect. *Grassland Research Institute* **42**, 98-101. (Japanese)