

Grassland management for year-round grazing with regard to organic beef production in the warm regions of Japan

Kiyoshi Hirano^{1,2}, Yuji Nakanishi¹, Atsushi Shoji¹

¹National Agricultural Research Center for Kyusyu Okinawa Region, Nishigoshi, Kumamoto 861-1192, Japan, ²Present address: National Institute of Livestock and Grassland Science, Nasushiobara, Tochigi 329-2793, Japan. E-mail: hirano@affrc.go.jp

Key words: organic farming, year-round grazing, *Panicum maximum*, *Lolium multiflorum*

Introduction Recently, Japan has been producing surplus manure because feed has been imported at 19 million TDN t/year despite the meager amount of manure that has been exported. The technique of using more manure in grasslands along with an appropriate ecosystem comprising the soil-plant-animal cycle is necessary. Organic farming technique is a typical example of such a method that uses only manure to maintain the fertility of farmlands. In this study, we considered the appropriate amounts of cattle and chicken manure that need to be applied in order to achieve productivity similar to that achieved by chemical fertilizer application; grazing grasslands of Guinea grass (*Panicum maximum* Jacq.) and Italian ryegrass (*Lolium multiflorum* Lam.) were studied to evaluate grassland productivity based on the daily gain of steers.

Materials and methods Two fields subjected to organic and conventional grassland treatments were used for the study. The conventional grassland (CG) treatment involved the use of chemical fertilizers and herbicides. For the Guinea grass grassland, chemical fertilizers were applied at rates of 10 kg/10 a and 5 kg/10 a × 2 NPK as basal and supplementary applications, respectively; the rate of basal and supplementary applications for Italian ryegrass was 5 kg/10 a × 4 NPK. The organic grassland (OG) treatment involved the use of cattle and chicken manure but no agrochemicals. Manure was applied at the same rate as that for the CG treatment, and cattle and chicken manure were used for both basal and supplemental applications. Italian ryegrass was sown on 20 Sep. at 6 kg/10 a, and Guinea grass (cv. Natsukomaki), on 20 Apr. at 2 kg/10 a. Two Japanese Black steers and a Japanese Brown steer were grazed on Italian ryegrass from 14 Nov. to 4 Jun. under the rotational grazing method (2–4-week cycles), and on Guinea grass from 4 Jun. to 2 Oct.. Concentrate was fed at approximately 2 kg/head/day through the grazing period. Herbage samples were clipped within a 1 m × 0.5 m frame at a stubble height of 5 cm. The samples were classified based on Guinea grass and dried at 70°C for 48 h for measuring dry matter (DM) weight.

Results and discussion The production and consumption of Italian ryegrass were similar for the OG and CG treatments; however, the production and consumption of Guinea grass was lower as a result of the OG treatment than the CG treatment (Table 1). The daily gain of beef steers that grazed on Italian ryegrass were 1.08 and 1.00 kg/day for the OG and CG treatments, respectively. The daily gain from Guinea grass grazing were 0.87 and 0.75 kg/day for the OG and CG treatments, respectively. Live weight of beef steers that grazed on OG-treated grass was increased from 187 to 509 kg at the end of the year-round grazing period from 14 Nov. to 2 Oct.; the feed was at a concentration at 0.62–0.46% of the body weight. The production of Guinea grass was lower under the OG than the CG treatment; however, the daily gain as a result of grazing on OG-treated grass was higher than that for CG-treated grass. The increase in CP corresponding to the decrease in leaf length from April to July has been reported (Togamura et al). The average plant length of OG-treated Guinea grass was 5.1 cm shorter than that of CG-treated Guinea grass; this was one of the reasons for the higher daily weight gain observed in the case of grazing on OG-treated grass compared to CG-treated grass.

Table 1 Productivity obtained using organic and conventional grassland treatments for Italian ryegrass and Guinea grass.

	Production (gDM/m ²)	Consumption (gDM/m ²)	Daily gain (kg)	Live weight		Feed concentration	
				Initial weight (kg)	Weight on completion of the study (kg)	(kg/head/day)	(% body weight)
Italian ryegrass (14 Nov.–4 Jun.)							
OG treatment	1056.9	997.2	1.08	187	406	1.76	0.62
CG treatment	1094.6	1028.1	1.00	171	375	1.69	0.68
Guinea grass (4 Jun.–2 Oct.)							
OG treatment	1100.8	984.7	0.87	406	509	2.03	0.46
CG treatment	1415.5	1283.4	0.75	375	464	1.99	0.50

Conclusion The productivity based on the daily gain of steers in grasslands treated by the application of cattle and chicken manure was similar to or higher than that in those under the conventional treatment.

Reference

Togamura Y., Ochiai K., Shioya S., (1993). Quality of pasture managed to different leaf length. *Proceedings of the XVII International Grassland Congress*, 900-901.