

## Abstract

Primary energy extraction patterns by livestock under agropastoralism and ranching were investigated by the bite count method in semiarid south-eastern Kenya. Sward biomass for optimal energy intake by cattle was derived using intake-digestibility constraint curves and realised livestock productivity from the systems compared. Cattle and sheep, and goats primarily consumed herbaceous and woody plants, respectively. *Enteropogon macrostachyus* and *Panicum maximum*, *E. macrostachyus* and *Blepharis integrifolia*, and *Combretum exalatum* and *Duosperma kilimandscharica* accounted for 33.5% and 9.9%, 16.6% and 10.3%, and 11.7% and 10.7% of cattle, sheep and goats' total energy intake, respectively. Cattle optimised energy intake at 370-610g<sup>m</sup><sup>-2</sup> of sward biomass and 55.5-64.3% organic matter digestibility. *Panicum maximum* yielded the highest optimal sward biomass. The energy expenditure of the animals was generally lower under agropastoralism across seasons. During the dry season, more animals (33-50%) lost weight under ranching. Agropastoralism was an efficient system as animals were moved across quality grazing microenvironments that minimised feeding costs and enhanced energy intake. Therefore, mobile grazing strategies, plant diversity and complementary trophic interactions stabilise energy extraction patterns and enhance livestock productivity under agropastoralism. However, human activities that affect plant diversity and mobility will undermine sustainable livestock production in such environments.