Effect of feeding system on feed utilisation and meat yield of selected beef cattle genotypes

Improving productivity of subsistence beef production systems in developing countries to match the increasing demands for foods of animal origin remains a formidable task. Three studies were conducted to evaluate the influence of feeding management and crossbreeding on intensification of beef production systems. In Study 1, two trials were conducted to evaluate the performance of pure Ankole, Ankole-Boran crossbreds; Ankole-Friesian crossbreds, pure Boran and a composite genotype, grazing native heterogeneous pastures supplemented with concentrate under different durations. Data collected and analysed showed that supplementation of grazing with concentrate increased ($P<0.05$) weight gain of all genotypes in all durations except the Ankole x Friesian crossbreds. A growth regression curve showed a linear ($P<0.001$) growth pattern for all genotypes at the 120 days duration of finishing. Concentrate supplementation increased ($P<0.05$) all slaughter characteristics in all durations of finishing in trial 1 but no differences ($P>0.05$) between genotypes. Positive differential gross margins were observed during 60 days finishing duration for A×B and 120 days of finishing for pure Ankole at whole sale of beef. This study demonstrated the similarity between the different genotypes, except for Ankole x Friesian and that the influence of concentrate supplementation on grazing animals is determined by forage characteristics. Study 2 evaluated the performance of bulls from three beef genotypes, Ankole x Holstein Friesian (A×F), pure Boran and a composite genotype when fed under grazing (control) and a total mixed ration in a feedlot for different durations. The TMR comprised a home-made concentrate formulated from agro-industrial by-products and maize stover. Data was collected on feed intake, growth, slaughter and carcass characteristics and gross margins. The crossbreds had higher ($P<0.001$) feed conversion ratio (FCR) than Boran at the feedlot but under grazing Boran had higher ($P<0.01$) FCR. Growth and slaughter characteristics did not vary ($P>0.05$) between genotypes, except carcass quality grade scores, which were higher ($P<0.05$) in the pure Boran and the composite genotypes than in A×F crossbreds. Average daily live weight gain (ADG) in all genotypes was approximately twice under feedlot finishing compared to sole grazing. Carcass quality grade scores and dressing percentage were similar ($P>0.05$) between feedlot and sole grazing at 60 days but higher ($P<0.05$) at the feedlot at 90 to 120 days. Random regression analyses showed a linear relationship between live weight and duration of finishing for all genotypes in both feeding systems. The current results demonstrated the potential of pure Boran and the composite genotypes for beef production under feedlot finishing but the A×F were more efficient under grazing. Study 3 evaluated the influence of feeding systems on rumen environment, degradability and passage kinetics using fistulated Ankole x Friesian crossbred steers. Data collected and analysed showed that rumen pH was lowest ($P<0.001$) at feedlot (5.3) but highest ($P<0.001$) under sole grazing (6.2). Rumen NH_3-N ranged between 62.8 and 120 mg/l and was higher ($P<0.001$) in sole grazing than in grazing supplemented steers and those at the feedlot. Total VFA concentration were higher ($P < 0.05$) in grazing than under feedlot. Higher extent of DM, CP and fibre degradation were observed in grazing steers than the supplemented and feedlot steers. The results of the three studies demonstrate that when grazing and forage conditions are favourable, supplementation of grazing animals with concentrate is not necessary. However, when grazing conditions deteriorate, the pure Ankole respond fastest to concentrate supplementation. Subsequently, duration of finishing in grazing systems is majorly determined by grazing and forage conditions. The pure Boran and the composite genotypes have a greater potential for beef production under feedlot finishing but the A×F is more efficient under grazing. Dietary diversity provided by heterogeneous pastures in grazing systems optimises rumen environment and can be used as a basis for developing sustainable beef production systems.