

## ABSTRACT

This study was conducted to address the problem of inadequate information on the characteristics of drylands' agro-pastoral livestock production systems and how they are adapting to the changing environments (biophysical, social, cultural, economic and technological) under increasing climate variability. The objectives of this study were to; 1) Characterize the agro-pastoral livestock production systems under increasing climate variability, 2) Evaluate the effectiveness and appropriateness of top ranked feed conservation strategies being used by the agro-pastoralists and 3) Formulate and evaluate livestock feed rations from top ranked feed materials. The characteristics of the agro-pastoral production systems were inventoried through a reconnaissance survey while climate information was generated through analyzing long and short term rainfall and temperature data. In evaluating the top ranked feed conservation structures (granary, roof and open wooden racks and tree branches), *Panicum maximum* hay bales were conserved in them and the hay quality monitored over four months period. The nutritive contents, dry matter intake and performance of Small East African Zebu (SEAZ) yearlings were used to rank the top ranked feed materials. Data were analyzed using Participatory Learning and Action Research (PLAR) methods and Statistical Package for the Social Sciences (SPSS) and GenStat tools. Cattle and goats were the most important ruminants with the preference for goats increasing with aridity. The goats were largely kept as a source of household cash income or milk production. The key determinants in the households' choice between keeping cattle or goats were the Agro-Ecological Zone, land tenure and land area owned per adult equivalent. The District is getting drier with the mean decadal temperature for 2003 to 2010 ( $23.7 \pm 0.2^\circ\text{C}$ ) being significantly higher ( $p < 0.05$ ) than that of the 1983 to 1992 decadal ( $23.2 \pm 0.2^\circ\text{C}$ ). The top ranked plants species for livestock feeding were *Cynodon plectostachyus*, *Eragrostis superba*, *Cenchrus ciliaris*, *Panicum maximum*, *Combretum exalatum* and *Duosperma kilimandscharicum* while the top ranked crop residues were from maize (*Zea mays* L. ssp *mays*), pigeon peas (*Cajanus cajan* (L). Millsp) and cow peas (*Vigna unguiculata*). The granary was the most effective feed conservation structure followed by the roofed wooden rack however, mycotoxin producing fungi of the genera *Aspergillus* and *Fusarium* were isolated in the hay conserved in all the structures. The genera *Aspergillus* was eliminated with prolonged storage. Browse based rations at low (15 %) substitution of hay dry matter were superior to legume crop pod with a more than 28 % difference in percent change in intake compared to the basal ration. Though not significantly different ( $p > 0.05$ ), browse based rations had higher mean effects on animal live weight gain than legume pod based rations. Therefore, Southeastern Kenya dry lands are becoming drier where goat production systems with improved marketing strategies, feed conservation and use of indigenous plant species and crop residues in livestock feeding will be central to the agro-pastoralists' capacity to adapt to increasing climate variability.