



## Session 5: Communal range II

Chair: Susi Vetter

Forage seed production and trade as a pathway out of poverty in the smallholder sector: Lessons from the Zimbabwe Crop Livestock Integration for Food Security (ZimCLIFS) Project

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The major challenge to adoption of improved forage technologies in the smallholder farming sector is poor accessibility of seed of improved varieties and inferior quality of seed on the market. Since 2012, the Zimbabwe Crop Livestock Integration for Improved Food Security (ZimCLIFS) project set out to address challenges associated with accessibility of high quality forage seed through research for development initiatives on production and marketing. The main objective of this exercise was to demonstrate the level of improved livestock production that can come out of adopting improved pastures on smallholder farms and the potential viability of pasture seed business for a communal farmer. Over the past three years, adoption of new pastures species in Goromonzi and Murehwa districts of Mashonaland East Province was achieved through lead farmer approach, farmer-to-farmer technology dissemination, innovation platforms and field demonstrations. Snapshot surveys, product mapping and analysis of income sources were used to map forage seed marketing pathways within and outside project areas for the same period. Data for forage seed and fodder production, feeding trial demonstrations, marketing channels and income were collected periodically. Results obtained so far indicate that from 2012/13 season to 2014/15 season, total land area under pasture increased by 121% from 14.6 ha to 32.3 ha. In 2013, *Mucuna pruriens* (Mucuna), *Lablab purpureus* (Lablab) and *Vigna unguiculata* (Cowpea) seed produced was 2 250 kg; 120 kg and 4 450 kg respectively and the following year, yields were 4 450 kg; 1 160 kg and 2 980 kg respectively, showing a total increase of 50%. There was a large diffusion of forage seed within and beyond project boundaries over the past 3 years, with 67 % of mucuna seed (3 000 kg) and 43 % of lablab seed (500 kg) produced in the 2013/14 wet season being distributed outside the project area. Two farmers, one from Murehwa sold 200 kg lablab seed and realised \$800, whilst the other from Goromonzi realised \$750 from sale of 250 kg mucuna seed. It was concluded that there is scope to develop formal pasture seed companies operated by communal area farmers as a way to increase rural industrialization and to provide a pathway out of poverty.

**Keywords:** forage legumes, seed, marketing, income, Zimbabwe



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Rehabilitation of degraded grassland systems through reseeding improved forage legumes using ecologically-sound techniques for enhancing productivity

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In the rangelands of southwestern Uganda, pastoralism is being transformed into an agro-pastoral system. The agro-pastoralists are crossing their indigenous Ankole cattle with Holstein Friesian to obtain hybrids with higher milk production potential. Natural pastures are the main feed resource for livestock. However, their productivity in terms of forage quantity and quality is low due to the nature of the climate and soils in the area. Overgrazing is occurring due to high stocking rates, reduced grazeable areas as a result of increased croplands and lack of well-adapted and persistent forage plants, especially legumes in the system. This has in turn resulted in the loss of grazeable forage species, creation of extensive bare areas leading to increased soil erosion, and consequently to reduced livestock productivity, especially for the Ankole x Friesian crosses which are less adapted to large variations in forage availability and quality. Thus, a study was undertaken to determine the effect of forage legume incorporation into the natural pastures on forage yields and quality. Forage legumes, namely centro, desmodium, siratro and stylo were over-sown in strips dug in the natural pastures using hand hoes on four farms, while stylo was planted on two farms due to lack of enough seed to cover the four farms. Germination of centro, desmodium and siratro on all the four farms was fairly good (60-70%) despite the prolonged dry weather with scanty rainfall that was experienced immediately after planting. Siratro performed best, followed by desmodium and centro. The performance of stylo was good (75%) on both farms where it was planted. Siratro and desmodium showed better persistence and were rated as the best legumes for over-sowing in the natural pastures in the study area. Forage dry matter yields were significantly higher ( $p \leq .001$ ) in the over-sown (improved) pastures as compared with unimproved pastures (control). The crude protein contents of improved pastures were higher ( $p \leq .05$ ) than that of the unimproved pastures.

**Keywords:** agro-pastoralism, crude protein, degraded rangelands, forage legumes, natural pastures, rehabilitation



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Voluntary intake and palatability indices of Pedi goats fed different levels of  
*Acacia karroo* leaf meal by the cafeteria method

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*Acacia karroo* is regarded as a multipurpose tree with high potential for increasing goat productivity and can be considered as a cheap source of protein in communal goat production despite the presence of condensed tannins in the leaves. A study was conducted to determine preference intake and relative palatability indices of *A. karroo* fed to 5 growing male Pedi goats with an average body weight of  $19.81 \pm 1.83$  kg. Five feeding troughs were provided to each goat and each animal was exposed to all the experimental diets. A cafeteria feeding approach was used, thus, permitting goats free access to the diet of their choice. The position of the troughs was randomized each day to avoid "habit reflex". *Acacia karroo* (K) was offered in a mixture with *Setaria verticillata* (S) hay at five different levels: Diet 1: S80K20, Diet 2: S75K25, Diet 3: S70K30, Diet 4: S60K40 and Diet 5: S50K50, for a period of 23 days. The daily relative palatability indexes (RPI) obtained for each diet were subjected to analysis of variance with feeds as treatments and individual animals as replicates in a completely randomized design. Significant differences ( $p < .05$ ) in RPI among the diets were observed. Preference rankings for the diets produced the following order: Diet 5 > Diet 4 > Diet 3 > Diet 2 > Diet 1. Diet 5 appeared to be the most preferred by goats with an RPI of 96.91%. Palatability indices were positively and significantly ( $p < .05$ ) predicted from dry matter intake of goats ( $R^2 = 0.71$ ). Similarly, intake and palatability indices of the diets related positively ( $p < .05$ ) with the nutrient and tannin contents. Results of this study indicate that tannin-rich *A. karroo* leaves when fed as a mixed diet can influence preference and intake by Pedi goats. Palatability studies could be used in designing supplemental feeding programs for ruminant livestock during the dry season.

**Keywords:** *Acacia karroo*, goats, palatability index, preference, cafeteria method



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Apparent digestibility, microbial protein supply and nutrient supply kinetics of selected forage legumes in goats

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The study examined the effects of feeding forage legumes as protein supplements to poor quality natural pasture (veld) hay offered to goats on microbial protein yield and nitrogen metabolism. Four indigenous Nguni type goats were used in a 4 x 4 Latin cross-over design experiment. The goats were randomly allocated to four dietary treatments comprising commercial goat feed alone (GF), veld hay supplemented with either Cowpea (CW), Velvet bean (VB) or silverleaf desmodium (SD). Microbial protein yield was determined using the purine derivatives technique and nitrogen retention was calculated from the difference between nitrogen intake and nitrogen excreted. Total nitrogen (N) intake was significantly high in the GF followed by CW, SD and VB respectively ( $p < .05$ ). Microbial protein supply, the calculated microbial true protein and the digestible microbial true protein were all affected ( $p < .05$ ) by legume supplementation. Animals on poor quality forages tended to show the most efficient microbial protein synthesis. However, supplementation of poor quality veld hay failed to meet the maintenance requirements of the animal as evidenced by negative nitrogen balances in VB and SD. The efficiency of utilization of the nitrogen in the supplements could have been limited by unavailable fermentable metabolisable energy in the diets. Therefore, poor quality veld hay can be supplemented with forage legumes to improve utilisation and these forage legumes could help the communal farmers provide feed for their goats mainly in the dry season.

**Keywords:** apparent digestibility, microbial protein, nutrient supply kinetics, forage legumes



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## The effect of herbage conditioning and natural aeration methods on rate of moisture loss and crude protein content of *Lablab purpureus* herbage during hay-making

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The objective of this on-farm study was to develop an effective way to cure *Lablab purpureus* cv. Rongai that is harvested for hay-making at early bloom. It normally takes 4-6 weeks to sun-dry fully matured Lablab forage to hay of 20% moisture content. The study was conducted in Ward 11 (31°29'E; 17°29'S) of Goromonzi District, in Zimbabwe, between 2013 and 2014. A pilot experiment conducted over 28 days in 2013 indicated that conditioning of the forage by laceration and pressing tended to increase drying rate much more than aerating the herbage on wooden tripod (TP) or dry ground (DG). In 2014 the main experiment was conducted to test three conditioning treatments *viz.*, pressing with plain 200ltr steel drum filled with water (PD); pressing with 200 l steel drum filled with water and covered with 14 gauge wire mesh (WD); unconditioned (UC) and three natural aeration methods *viz.*, A-frame (AF); raised platform (RP); dry ground (DG). The experiment had a randomised complete block design with a factorial arrangement of treatments and four replications. Lablab herbage for the trial was harvested 150 days after sowing and spread to a swath density of 25 kg.m<sup>-2</sup> to cover 3 m<sup>2</sup> per treatment. Dry matter and crude protein content of the different forage treatments was determined at days 1, 2, 3, 7, 14, 21 and 28. The latter experiment again showed that conditioning of forage was significantly ( $p < .01$ ) effective in improving drying rate. Aeration treatments did not have any significant effect ( $p < .05$ ). Laceration and pressing (WD) and M5 were equally most effective but significantly superior to UC, which had the least mean DM of 54.9 compared 59.4 and 57.8% respectively for the former treatments (s.e. 0.531). In general, moisture loss was most rapid in the initial 7 days (-4.1% per day) and progressively lower in the subsequent weeks, at an average of -1.92%, -1.51% and -0.79% day<sup>-1</sup>, respectively. Leaves under WD dried faster ( $p < .01$ ) and reached 20% moisture within the first 8-9 days of curing, compared to stems that took about 25 days. Crude protein content was not affected by treatment ( $p > .05$ ). Therefore, laceration and pressing or chopping are recommended as conditioning methods for mature Lablab forage.

**Keywords:** Hay-making, conditioning, moisture, laceration

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## Fine-scale modelling and mapping of soil functional characteristics and vegetation across landscapes: A case study from communal lands of Bushbuckridge

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High-resolution data on key ecological traits at the landscape scale are important for spatially-explicit assessment of rangeland health. However, sampling intensity and spatial extent of field-based ecosystem assessments usually preclude extrapolation to the landscape scale. This study utilized field-based inventories to develop statistical predictions of ecosystem health indicators across landscapes. A spatially balanced sampling design was applied to survey two 100 km<sup>2</sup> landscapes in the communal rangelands of Bushbuckridge, Mpumalanga in 2013. Indicators of ecosystem health included soil organic carbon, herbaceous cover, tree and shrub densities, soil erosion, root depth restrictions, land-use history, and infiltration capacity. A total of 320 composite topsoil samples (0-20 cm) and 318 composite sub-soil samples (20-50 cm) were collected. Mean organic soil organic carbon was 12.2 and 8.1 g.kg<sup>-1</sup> in top and sub-soil, respectively. Mean soil pH values were 6.5 and 6.7 for top and sub-soil, respectively. Fine resolution maps (~5 m) of soil organic carbon, pH and soil erosion were produced using RapidEye imagery from 2013. Validation results for land degradation indicators were 80% ( $\kappa = 0.58$ ) for erosion prevalence and 79% ( $\kappa = 0.52$ ) for root depth restrictions. Validation results for the soil property maps were:  $R^2 = 0.83$  for soil organic carbon and  $R^2 = 0.78$  for pH. These results can be used to inform strategic land management decisions on rangelands and protected areas.

**Keywords:** ecosystem health; soil; vegetation; modelling; fine spatial resolution