Session 6: Communal range poster viewing

Early growth performance of dolichos (*Lablab purpureus*) fodder banks for communal dairy cattle in the Eastern Cape Province

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Dolichos bean (*Lablab purpureus)* is a herbaceous and annual legume cultivated as food for humans or as a fodder crop with main effects in biological nitrogen fixation and as ruminant protein source. Communal area dairy businesses are mostly sustained on high quality fodder and Dolichos bean, a versatile and climate smart fodder crop that has potential for closing the nutrient gap. A large proportion of these herds in communal areas experience annual cycles of nutritional stress, low productivity, low numbers of saleable stock, low income, poor cash flow, limited investment into the herd. The aim of the study was to assess germination and early seedling growth of Dolichos beans in frost free, high rainfall (1 075 mm) and warm (32.2 °C summer and 5.8 °C winter) Pondoland-Ugu Sandstone coastal sourveld (CB 4) and a small area of the Eastern Valley Bushveld (SVs 6) of Mngungu villages in Alfred Nzo, Eastern Cape. This area consists of hard, white coarse-grained, siliceous quartz sandstones of the Msikaba Formation of the Devonian Period giving rise to shallow, nutrient-poor skeletal, acidic sandy soils. *Lablab purpureus* seed was inoculated by a *Bradyrhizobium* species bacterial legume inoculant for effective nitrogen fixation. Ten prospective smallholder dairy farmers in a dairy value chain system and with no prior experience in fodder crop production were selected. Ten garden pasture plots of 16 to 110 m^2, one per farm, were prepared by hand implements and soils were sampled for nutrient analyses in January 2015. The Dolichos bean was planted in furrows ~3 – 5cm deep and the rows were 90 cm apart. For fertilization, KCL (50) and Superphosphate (14) were applied. Germination, plant height and plant health and pests were assessed after two months. There was over 60% germination in 50% of the plots; 20% of the plots had germination below 30%. Seedling vigour was observed in only 30% of the plots, which were also weed free. In 40% of the plots seedlings were spindly and less than 20 cm in height, covered by weeds and appeared yellowish. Three plots had crop heights of 15 – 45 cm, and darker leaf material; four plots had height ranges of 10 – 35 cm whilst in one plot germination occurred but seedling vigour was low and differed significantly ($p<.01$) from the other plots. One plot had a high infestation of aphids and also a high occurrence of moles. There was moderate to no pest damage at the rest of the plots. Poor management due to language barriers and poor communication, and the lack of knowledge and skills among the prospective communal dairy farmers impacted negatively on early seedling development. *Lablab purpureus* has potential as fodder crop for the smallholder dairy value chain system and for amelioration of soil nitrogen deficit. Skills development in fodder production is recommended for farmers involved in the dairy value chain system. Further research on growth performance and effects of dolichos bean on soil organic matter and nutrient quality will be conducted.

Keywords: communal dairy, dolichos bean, germination, pests

Early growth performance of spineless cactus pear (*Opuntia* spp.) fodder banks for communal dairy cattle in the Limpopo Province

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Investments in climate smart dryland pasture is critical to the sustainability of the smallholder dairy value chain businesses in the Comprehensive Rural Development Programme (CRDP) nodes of South Africa. The aim of the study was to determine the establishment and seedling performance of exotic spineless varieties grown under semi-arid and moderate-high rainfall conditions. Dryland pasture of the spineless *Opuntia* species was established in two sites i) Semi-arid zone Ward 11 of the Makhuduthamaga Local Municipality and ii) sub-tropical Highveld Njhakajhaka village, Vhembe District, Makado Municipality Ward 8 in the Limpopo Province during September to October 2014. The fallow lands were cleared of weeds and no ground tillage was done. Cladodes weighing 800 g to 1 kg collected from a 10-year-old cactus orchard (Waterkloof) in Bloemfontein were cleaned thoroughly with a disinfectant and hand planted at a spacing of 2.5 x 2.5 m and depth of 10 cm, east/west direction in single rows. No fertilizer or supplementary irrigation was provided. Four varieties and 80 plants were planted on 1 ha on each site. Regular scouting for pests and land clearing was done to control weeds. Six months after planting the plants were assessed for new cladodes, plant height, cladode size and pests. In both sites, all cladodes rooted and no cladode death has occurred. Plant height differed ($p<.05$) ranging from 20 to 80 cm in Ward 11, a semi-arid area while the height range was narrower at 19 to 64 cm in Njhakajhaka. Length of Ward 11 cladodes was 20 to 50 cm and width 11 to 22 cm and larger ($p<.05$) compared to the crop in Njhakajhaka with longest size at 32 cm, about 35% smaller. The width did not vary. The number of new cladodes was also highest ($p<.01$) in Ward 11, with up to 12 new leaves and mode of 6 compared to mode of 4, and median of 5 in Makhado. There was better early growth performance of cactus fodder in the semi-arid zone, which also had less than 1% cochineal infection recorded. Early establishment tended to be slower in the higher rainfall site. Further research will be done to determine site variations in annual biomass yield and fodder value and the effects on milk productivity of dairy cows on smallholder farms.

Keywords: communal, dairy, cactus pear, cladodes, fodder

Do nutrients alleviate the negative effect of defoliation on decreaser and increaser grasses?

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The compensatory continuum hypothesis (CCH) predicts plants will be better able to replace tissue lost through defoliation (i.e. compensate) when soil nutrients and other resources are abundant. A pot trial (6 replications) was used to test the effect of nutrients on the compensatory growth of two grasses sensitive to grazing (decreasers) and four species with a higher resistance to grazing (increasers). Plants were severely defoliated to 50 mm five times during the growing season and the accumulated shoot yield and final root mass were used to measure growth performance. Shoot and root growth of increasers, *Sporobolus africanus*, *Eragrostis plana* and especially *E. curvula* (but not *Aristida junciformis*), were stimulated by nutrients more than were roots and shoots of decreasers, *Themeda triandra* and *Tristachya leucothrix*. The mean negative effect of defoliation on shoot yield was: *S. africanus* (-39%), *A. junciformis* (-64%), *T. triandra* (-66%), *E. curvula* (-68%), *T.* leucothrix (-74%) and *E. plana* (-76%). The defoliation effect on top and below-ground growth of all species depended on nutrients (p<.05). Plants were more sensitive to defoliation under high than low nutrients, contrary to the CCH but in accordance with the predictions of the limiting resource model (LRM) of exacerbated defoliation-induced carbon limitation of growth in fertile soils. However, additional nutrients did allow increasers (except *A. junciformis*) but not decreasers to better withstand severe defoliation. This differential alleviation of defoliation stress by nutrients possibly explains the dominance of increaser grasses such as *E. curvula* and particularly *E. plana* and *S. africanus* in continuously heavily stocked communal rangelands, where nutrients are assumed to cycle faster and be more available than in lightly grazed grassland.

Keywords: communal rangelands, compensatory growth, defoliation tolerance, grazing resistance, soil fertility

Practical implications of introducing a rotational rest-based grazing system into a communal area near Matatiele, Eastern Cape

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Rotational resting is seen as a mechanism to restore the vigour of grasslands and compensate for the negative impacts of the defoliation of preferred species. Through a project implemented at Mafube, near Matatiele, by Lima and funded through the Department of Environmental Affairs' (DEA) Land-user Incentives Programme, the practicalities of introducing a grazing system based on rotational resting were explored. The grazing system was based on resting portions of veld for a full growing season (October – May) once every four years. The area was not fenced and the system relied on a combination of strong traditional institutions that support the system and payment of rangers through the project, who complement the traditional system, ensuring that non-herded animals were kept out of the 'closed camps' that were being rested. The community was responsible for deciding on areas to close each year, with guidance provided by the project team. The system has been implemented relatively successfully for two years thus far but some institutional and environmental challenges were encountered which should be shared with others as it may inform application of similar systems elsewhere. The grazing system, as it has been implemented, does not address the issue of grazing pressure being much higher in areas adjacent to settlements and relatively light in the more remote areas. While the system was initially designed so as not to require collective action which requires strong social capital, it became clear that there was a need for more controlled utilisation of the open areas. Other factors that interfered with the implementation of the system include out-of-season burning of rangeland, as well as social conflicts affecting a portion of the grazing area. The implementation of the grazing season has also led to some farmer experimentation focusing on the provision of protein licks that allow for effective utilisation of rested sourveld during the winter months as an incentive to discourage burning of the veld. Lessons that have emerged from the two year implementation period will be shared with other researchers and practitioners to allow for refinement of the system for application elsewhere.

Keywords: communal grazing, rotational resting

The herbaceous yield and soil nutrient content contribution of various leguminous pastures planted in two communal areas of the Eastern Cape Province

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Legume plants are plants which belong to the Fabacae or Leguminosae family with a special ability to fix atmospheric nitrogen. Nitrogen fixation takes place in the nodules which are small swellings on the roots of leguminous plants in association with bacteria known as *rhizobia. Rhizobia* are Gram negative bacteria, which fix nitrogen by forming nodules on the roots of plant and they belong to genera which include *Rhizobium, Bradyrhizobium, Sinorhizobium* and *Azorhizobium* which are symbiotic nitrogen fixers that can be found in the roots of legume plants. Atmospheric nitrogen fixation is estimated to contribute about 10% of the total annual yield of fixed nitrogen. The study investigated the total dry matter (TDM) production and the soil organic carbon contribution of the four forage leguminous pasture species. These legume species were *Lotus corniculatus, Lespedeza cuneata, Trifolium repens and Trifolium vesiculosum.* These legumes were planted in the old lands at Dudumashe and Lushington communal areas. Dudumashe and Lushington communal areas wherein the study was conducted are located at 32°12'S; 27°56'E and 26°82'S; 32°64'E at an altitude of 874 m and 846 m, respectively, in the Eastern Cape province of South Africa. Both communal areas are situated in the Döhne sourveld and receive mean annual rainfall of 600 – 700 mm. The soils in both communal areas are categorized as the Wesley soil form. The study was done at a one hectare area that had not been planted at least for the previous five years in both communal areas. In each one hectare area, there were a total of 30 plots measuring 5 x 0.2 m with 2.5 m interspacing planted to legumes and areas without legumes which were used as control plots. Fourteen legume species were planted and replicated twice in a randomised complete block design (RCBD). Data collection was done over four seasons which are: spring (November) 2013, summer (February) 2014 and autumn (March) 2014 and winter (May) 2014. All data were analysed using analysis of variance (ANOVA) of the Generalised linear model of procedure of SAS (2001) statistical program. Preliminary results depicted that the highest overall TDM yield production ($p<.05$) was reached in the *L. cuneata, T. vesiculosum* and *L. corniculatus* plots while the control plot had significantly lower TDM yield production ($p>.05$) than all other plots. The soil organic carbon content was significantly highest in the *L. cuneata* and control plots ($p<.05$) during the first season. The *T. vesiculosum* plot had a significantly lower soil organic carbon content ($p>.05$) than all other plots. These results show that legume introduction had a positive impact on the overall TDM yield as the yield had increased in the plots where legumes were planted.

Keywords: legumes, nitrogen, biological nitrogen fixation, total dry matter, soil organic carbon and old lands.

Community leadership enhances rural development

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The leadership hierarchy in communal lands is under tribal authority and SANCO. Community leaders work hand in hand with extension advisory services. The more proactive the extension services, the more enthusiastic the community leaders become. The objective of the study was to compare leadership ability at a community level using a scoring system. The study observed approaches to projects that involved a participatory learning method. The strengths of community leadership were evaluated in three projects namely: Biogas project in Machubeni, Eastern Cape Communal Arable Lands (ECCAL) project in six communities, and livestock survey project in the Qutsa Community. The qualitative data collected was ranked in scores of 1 to 3, 3 being the best score and 1 the lowest score. The score 3 means that the traditional leaders work proactively to ensure development occurs in the community, and evidence of this is seen through youth involvement and projects implemented. Under the ECCAL project, the six communities rankings are: Nyandeni 3, Allanwaters 3, Rockliff 3, Roxeni 3, Dudumashe 2 and Lushington 1. In the Qutsa livestock survey project, Taleni and Shweni both scored 1; neither traditional leaders nor ward councillors make changes, only individuals make a contribution, and there is no partnership between our department and the leaders. The Biogas project had four communities involved and scored: Tshamazimba 2, Boomplaas 1, Nkenkulu 1 and Platkop 1. It is therefore concluded that leaders that prioritize peoples' interests become famous, due to evidence seen on the ground. All the communities with a score of 3 generally did not focus just on agricultural projects, but also on sanitation and electricity projects, and community projects like hatcheries, bakeries and water provision. It is therefore concluded that most communities with strong leadership are more successful, because their patriotic behaviour attracts more development facilitators and funders. This is why they enhance development where they live.

Keywords: rural development, livestock

Veld condition assessment of the grazing areas used by emerging farmers in the Gauteng province, South Africa

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Little information is known on livestock grazing systems practiced by the emerging farmers in the Gauteng Province. This inhibits development and/or adoption of suitable grazing systems that improve livestock productivity without negatively affecting rangeland condition. We randomly selected farms in the province and assessed their current grazing capacity, stocking rate, veld condition score, species composition and species basal cover, using the ecological index method. Since the farms that were surveyed used different grazing systems (i.e., continuous, herding, and rotational), we also compared these systems on basis of the measured vegetation parameters. Although no information was available on the historical grazing systems, starting conditions and duration of treatment, there were significant differences between farms that used different grazing systems. For example, species composition ($p<.046$), veld condition score ($p<.001$) and basal cover ($p<.036$) of grazing areas under different grazing systems significantly differed. The number of species were significantly higher for farms that use herding (8.27±0.69) compared to those that use rotational grazing (6.32±0.49). Interestingly, species composition for farms that use continuous grazing was not significantly different from the herding and rotational grazing systems ($p>.05$). There were significant differences among herding (47.7± 5.28%), rotational (37.28±3.26%) and continuous (25.00±1.88%) grazing systems on veld condition score. Rotational (21.71±1.64%) and herding (20.93±1.38%) systems showed significantly higher basal cover than the continuous system (16.35±1.44%). Under herding grazing management system, overall veld ratings were higher. Rotational and continuous management systems have not resulted in improved species composition, veld condition score and basal cover. Although more research that will incorporates historical data or experimentally compare different grazing systems is still warranted, our results indicate that herding grazing management system might have a positive effect on the veld condition of grazing areas in the Gauteng province.

Keywords: emerging farmers, grazing systems, herding, livestock production, species composition