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Pasture management in semi-arid tropical woodlands: levels of germinable seeds in soil and faeces of cattle grazing *Stylosanthes* pastures—by John McIvor, on pages 129–139.

Soil seed banks in stylo pastures and native pastures, and the seeds of stylo and other species in faeces of cattle grazing stylo pastures, were measured near Charters Towers. Both total numbers of seeds in the seed banks and the seed banks of the stylos (Verano and Seca) were small. Forbs were the major group in the seed banks. There was little relationship between sward and seed bank composition.

Both Verano and Seca rely on seedling recruitment to persist. There small seed banks mean that these species may be lost if the existing plants die and conditions are unsuitable for establishment. These environments are marginal for stylos and careful management will be needed to ensure that they will continue to contribute. Grazing should be reduced during seed set in as many years as possible to increase the seed banks. This may reduce the immediate benefit but increase persistence.

The small seed banks of perennial grasses are dwarfed by some of forbs which may then dominate seedling populations.

Stylos seeds are well suited to spread in dung, especially Seca which was present throughout the year. The few seeds of perennial grass suggest these are less likely to be spread through dung.

The economic performance of steers grazing black speargrass pastures oversown with legumes in south Queensland, Australia—by Neil Macleod and Sid Cook, on pages 140–153.

The GLASS grazing trial ran from 1989 to 1996 to look at the effect of sowing legumes with the bandseeder into native pastures on beef production and financial gains. Although these years suffered from severe drought and the legumes had to be resown in early 1993, animal production with legumes was higher than from the native grass alone in all except one year. This higher production came from relatively little legume (70-223 kg/ha). An economic model confirmed that oversowing native pastures is a potentially profitable investment. However, it carries definite risks associated with poor establishment, and profitability is highly dependent on the ultimate carrying capacity of the oversown pasture.

Effect of pre-planting seed treatment on dormancy breaking and germination of *Indigofera* accessions—by Abubeker Hassen, P.A. Pieterse and Norman Rethman, on pages 154–157.

Seeds were either untreated or scarified and treated with hot water to break dormancy. Generally scarification was best, but it sometimes killed the seed

Effect of cutting frequency on productivity of five selected herbaceous legumes and five grasses in semi-arid tropical Kenya—by D.M.G. Njarui and F.P. Wandera, on pages 156–166.

Growth and effect of cutting frequency were evaluated on Wynn cassia, Siratro and three stylos and on signal grass, buffel grass, Rhodes grass and setaria over 3 years in the subtropics. Over time, the number of plants of Wynn and Verano increased in numbers while Siratro, Cook and Fitzroy remained fairly stable in most seasons but then declined. Signal and Narok setaria established best, and signal spread to give the best yield of the grasses.

Inter-row planting of legumes to improve the crude protein concentration in *Paspalum atratum* cv. Ubon pastures in north-east Thailand—Michael Hare, I.E. Gruben, P. Tatsapong, A. Lunpha, M. Saengkham and K. Wongpichet, on pages 167–177.

The quality of these pure pasture in Thailand is usually low as few farmers apply fertiliser. Introducing legumes could be a cost-effective way to improve quality. *Stylosanthes* species, CIAT 184, Verano and ATF 3308 were the best legumes to plant in alternate rows with Ubon paspalum and increased total crude protein yields by up to 80%.

Yield and quality of *Digitaria eriantha* and *Eragrostis curvula* with nitrogen fertilization in Argentina—by A.O. Gargano and M.A. Aduriz, on pages 178–185.

The increases in dry matter yield, crude protein and digestibility suggest that fertilising with

nitrogen could be used but the productive and economic advantages need to be evaluated by grazing studies.

Response of lablab varieties to farmyard manure in the northern Guinea Savanna of Nigeria—by J.T. Amodu, I.A. Adeyinka and C.A.M. Lakpini, on pages 186–191.

Poultry manure was applied to three varieties of lablab at rates up to 35 t/ha. The varieties Rongai brown and Rongai white seem most promising for forage and seed production in this region. Forage and seed yields increased linearly with increasing manure.

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Grazing buffalo on flooded pastures in the Brazilian Amazon region: a review—by A.P. Camarao, J.B. Lourenco Jr, S. Datra, J-L. Hornick and Miriam Bastos da Silva, on pages 193–203.

Water buffalo, swamp buffalo and the Baio type are superior to cattle in flooded ecosystems because they maintain good productivity (2.5 L/day milk, 0.5 kg/day weight gain and 420 kg live weight at 27 whereas cattle could not survive). The flooded pastures receive plenty of sediment and the native pastures of Aleman grass (*Echinochloa polystachia*), Venezuela grass (*Paspalum fasciculatum*) and water paspalum (*Paspalum repens*) have high feed quality. Buffalo could reduce the need to clear forest for dryland ranching. Integrating flooded native pastures during the dry season with cultivated pasture during the wet season can offer returns eight times higher.

The effect of seedbed treatment, cutting frequency and selective grass defoliation on the production and botanical composition of experimental swards of *Urochloa mosambicensis* and *Bothriochloa pertusa* mixed with *Stylosanthes*—by F.D. Hu and Ray Jones, on pages 204–216.

Yields of Verano and Seca stylo are reduced when sown with Sabi grass or Indian couch. Vera produced three times the yield of Seca.

In the growing season, cattle preferentially graze the grass. In the trial, the whole sward was cut or just the grass. Less frequent cutting gave higher yields. When cut every 3 weeks to simulate heavy grazing, yields of Verano and of grass and legume were higher when growing with Sabi grass than with Indian couch. Over the 20 weeks of the experiment, Verano always produced more with Sabi grass, which reflects the results of grazing at high stocking rates. Indian couch appears to be more competitive than Sabi grass for some nutrients, especially sulphur.

Effect of plant spacing, cutting and nitrogen on establishment and production of *Digitaria milanjiana* cv. Jarra in north-east Thailand—by Michael Hare, P. Tatsapong, A. Lunpha and K. Wongpichet, on pages 217–226.

Jarra digit is a grass with higher than average nutritieve value. It can be established easily by planting stolons into moist soil with 50 cm spacing to give high yields in the first season. Harvesting every 60 days gives higher yields whereas cutting at 30-40 day intervals gives a compromise of large amounts of good quality forage. Applying 20 kg/ha nitrogen fertiliser every 60 days to Jarra on infertile soils gives best yield and quality. Higher applications may not be economical.

Waterlogging tolerance of some tropical pasture grasses—by Michael Hare, M. Saengkham, P. Tatsapong, K. Wongpichet and S. Tudsri, on pages 227–233.

Former rice land subject to waterlogging is increasing being used as pasture land for the expanding dairy and beef industries. *Paspalum plicatulum* remains one grasses most tolerant of waterlogging, but Ubon paspalum (*P. atratum*) has better yields and quality and is becoming more popular. Jarra digit has moderate to good waterlogging tolerance; purple guinea will survive for short periods but with reduced vigour. Both ruzi and signal had low tolerance although signal may survive for short periods.

Harvesting management options for legumes intercropped in napier grass in the central highlands of Kenya—by D.M. Mwangi, G. Cadisch, W. Thorpe and K.E. Giller, on pages 234–244.

Greenleaf desmodium, axillaris and Tinaroo glycine were sown with napier grass. When cutting was at 8 and 16 week intervals, and at ground level and 10 cm, only greenleaf desmodium competed with the grass, reducing its yield but giving the highest total yield. Longer cutting interval increased total forage yield but reduced quality and legume yield. Cutting height did

not affect yield or quality of grass or legume. Greenleaf desmodium performed consistently well with napier grass in central Kenya.

Estimation of genetic variation in *Dichanthium annulatum* genotypes by the RAPD technique—by A. Chandra, R. Saxena, A.K. Roy and P.S. Pathak, on pages 245–252.

High levels of genetic variation in 76 accessions of wildly grown *Dichanthium* were found using random amplified polymorphic DNA markers (RAPD), despite the species being largely apomictic.

Effect of scarification and growing medium on seed germination of *Desmanthus bicornotus*—Edgar Medina-Sanchez and Roberto Lindig-Cisneros, on pages 253-255.

Highest germination was obtained with acid scarification; mechanical scarification was also efficient but depended on conditions of the growth chamber or glasshouse. Acid scarification for less than 10 minutes would seem most appropriate for propagating the species; longer treatment damages the seed.