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WORKING PAPERS
INTRODUCTION

The Australian Semi-Arid Tropics (SAT) is predominantly used for cattle production, with limited cropping. The region experiences distinct wet and dry seasons annually, with generally highly erosive rainstorms having potential to cause significant damage to poorly managed lands. Land management practices and strategies therefore, can prove crucial to the sustainable productivity of the land.

To facilitate sustainable development and management of land resources, the dynamics and interactions of soil, plant, water, and climate need to be understood. Computer simulation models provide a tool to enable this. The Land Management Strategies for the Semi-Arid Tropics project in collaboration with Agricultural Production Systems Research Unit is developing such a computer simulation model called APSIM (Dilshad, 1993). One of the modules of the APSIM model will be a pasture productivity model called GRASP (McKeon et al., 1993) developed by Queensland Department of Primary Industries. The parameters required to run GRASP are obtained from a pasture growth trial called SWIFTSYND. The purpose of this poster is to briefly present the results gained from SWIFTSYND studies conducted at Douglas Daly in the Northern Territory.

DESCRIPTION OF EXPERIMENT

Site: The study area was situated on Kandosol soils (Isbell, 1993) at the Douglas Daly Research Farm (DDRF), 250 km south of Darwin. The experimental sites were located on 4 paddocks ranging in size from 4.1 to 7.8 ha, and on slopes of less than 2%. Historic mean annual rainfall for DDRF is 1200 mm. Three paddocks were sown with *Urachloa mosambicensis* (Sabi grass), and one was left as native bush with *Heteropogon contortus* (twisted spear grass) dominant.

Sample Area: Each paddock had two 18m x 13.5m sampling areas inside 20m x 20m fenced areas. Each sampling area had nine 5m x 3.5m blocks pegged out, with walkways in between blocks. In each block, six 1m x 1m quadrats could be placed without overlapping. There were three neutron probe access tubes in each fenced area.

Data Collected: A set of 9 quadrat readings was taken of pasture growth inside each sampling area at specific sampling dates. Data collected included visual estimates of ground cover, soil moisture, dry matter yield and chemical analysis of vegetative matter. Rain gauges were located around the study areas. Other relevant climate data were recorded at a station 2 km west of the experimental sites.

Cover: A 1m x 1m quadrat was used to visually measure percent ground cover (attached, weed, litter), and bare ground. Attached cover is any plant material that is still attached to a growing plant and not classified as a weed. Litter is any unattached plant material on the ground.

Yield: A set of shears was used to harvest plant material (attached, weed) as close as possible to the ground inside the quadrat, whilst litter was collected by hand. Samples were oven dried at 78°C for 48 hours, after which they were weighed.

Soil moisture: Immediately after harvesting a quadrat, gravimetric soil moisture readings were taken within the quadrat for 0-10, 10-20, and 20-30 cm depths. A neutron probe was used to measure soil moisture from 40 cm to 180 cm depth at every 20 cm interval.

Chemical analysis: After each yield was recorded, the sample was ground down as fine as possible to enable macro and micronutrient levels to be determined.

Sampling Times: The fenced areas with improved pastures were mown at the beginning of the trial (Sep. '92) and lightly raked to obtain identical ground cover conditions; native pasture was burnt.
Sampling times were determined by the pasture reaching critical stages in its growth cycle. Initial samples were collected on completion of the site preparation. The second set of samples (Nov. 92) targeted the first flush of growth for the season. The aim of the third set of samples (Dec. 92) was to obtain data at the flowering and seeding stage. The fourth sampling (Mar. 93) was done towards the end of the growing season when the plants were at their highest yield levels. The final set of samples (Aug. 93) was collected at the end of the non-growing season.

RESULTS AND DISCUSSION

Cover: On improved pasture, attached cover increased from 22% in Oct. 92 (47% total plant cover - TPC) to 92% in Mar. 93 (93% TPC). The corresponding figures for native pasture were, 5% (26% TPC) and to 36% (78% TPC).

Yield: Attached: From a base reading near zero (Oct. 92), improved pasture yields increased to 1.2 t/ha (Nov. 92), whilst native pasture increased to 0.13 t/ha. From Nov. 92 to Dec. 92, improved pasture increased to 2.38 t/ha, and native pasture to 0.25 t/ha. Dec. 92 to Mar. 93 experienced an increase in yield to 4.37 t/ha and 1.48 t/ha for improved and native pasture respectively. Over the non-growing season improved pasture yields dropped to 3.83 t/ha. No readings were taken for the native pasture due to a bushfire in early Aug. 93.

Litter: Litter on the improved pasture sites remained between 0.5 and 1.0 t/ha throughout the growing season. Litter on the native pasture ranged from 1.13 t/ha to 1.8 t/ha. In Aug. 93, litter on improved pasture ranged between 2.0 and 3.2 t/ha. No readings were taken for the native pasture due to the bushfire.

Water use: Volumetric moisture content (vmc) for improved pasture did not change considerably during the sampling period for depths of 60cm to 180cm; vmc varied between 22% and 26%. The top 40cm showed marked variations primarily due to climate conditions. Native pasture displayed similar trends.

Chemical analysis: N levels for attached cover at all sites were similar for the trial; Oct. 92 started with levels of 0.2 to 0.5% (1% = 1000ppm) and increased dramatically by Nov. 92 to levels of 1.0 to 1.7%. This was followed by a drop in Dec. 92 to 0.7% and stabilised at 0.6% for the rest of the trial. N levels for litter ranged from 0.5 to 0.9% for the entire trial. Native pasture displayed similar trends.

P levels on improved pasture remained steady at 0.25% during the first part of the trial but increased to approximately 1.75% in Mar. 93. Litter experienced a similar pattern with P levels at 0.2% up to Dec. 92, and increasing to 1.25% by Mar. 93. Native pasture displayed similar trends.

Improved pasture K levels for attached cover followed trends similar to that for N. For improved pasture, K increased from 1.0% in Sep. 92 to 5.0% in Nov. 92. K levels of 3.5% were recorded in Dec. 92, which dropped to 0.25% in Mar. 93. A similar trend, but of a lower degree, was observed for native pasture.

CONCLUSION

The SWIFTSYND trial has identified patterns of pasture growth, chemical movement, and water use over a complete growth cycle for native and improved pasture in the Douglas Daly region of the Northern Territory. This high quality data can now be used to develop parameter files for the GRASP model.

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REFERENCES