

THE EFFECTS OF GRAZING MANAGEMENT AND SULFUR FERTILIZER
ON PASTURE AND ANIMAL PRODUCTIVITY IN THE WET TROPICS

by

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SUMMARY

An experiment was carried out over a three-year period in South Sulawesi, Indonesia, to investigate the effects of stocking rate and the application of sulfur fertilizer on productivity of beef cattle grazing native and oversown pastures. At the native site two fertilizer treatments were imposed (0 or 30 kg S ha⁻¹ yr⁻¹ applied as elemental S) in conjunction with two stocking rates (0.5 or 1.0 A.U. ha⁻¹, where A.U. represents a heifer of 110-150 kg body weight), while at the oversown site four fertilizer treatments (annual applications 0 kg ha⁻¹ or 15 or 30 or 30 year 1, 15 year 2 and 15 year 3) were used in conjunction with stocking rates of 1.0 or 2.0 A.U. ha⁻¹. A basal application of triple superphosphate (TSP) was applied to all treatments at the beginning of the third year.

Soil samples taken at the commencement of the experiment showed that N and P levels were low, but all other nutrients were adequate. However, sulfur was only slightly above the level regarded as adequate. Over the three year period, soil P increased at both sites, largely as a result of the TSP application at the start of the third year. Nitrogen values also increased from 0.4 to 17.1 ppm (native) and 0.6 to 22.0 ppm (oversown) but SO₄-S levels remained stable. Other nutrients, K, Ca, Mg, Na, Cl, declined at both sites but were still adequate at the end of the third year.

At the native site the quantity of feed on offer was generally greater at the lower stocking rate while the S-fertilizer treatment had little effect. At both stocking rates the native grasses decreased markedly after twelve months with a concomitant rise in the Imperata

and weed components. The percentage of weeds continued to increase over the next two years. Legumes formed only a small component of the feed on offer but were generally more prominent at the lower stocking rate. Similar trends were evident at the oversown site, in that Imperata and weeds increased over the three year period and a reduction in native grasses occurred. However, the most marked change was observed in the legume component which declined from 26% at the start of the experiment to approximately 5% after twelve months and to less than 2% at the end of the third year.

Chemical analyses of the legume, Imperata and native grass components revealed that nutrient levels (N, P, K, S, Na, Ca and Mg) were generally highest in the legume and lowest in the Imperata at both sites. Stocking rate and S-fertilizer had only small effects on chemical composition but the application of TSP at the start of the third year led to a marked increase in the P concentration of all pasture components at both sites.

There was no liveweight response to stocking rate or S-fertilizer at the native site in the first year. Similarly, liveweight gain (lwg) $\text{hd}^{-1} \text{ day}^{-1}$ and $\text{lwg} \text{ hd}^{-1} \text{ yr}^{-1}$ were unaffected but $\text{lwg} \text{ ha}^{-1} \text{ yr}^{-1}$ was significantly increased at the higher stocking rate. Similar results were obtained in the second and third years. Differences in $\text{lwg} \text{ hd}^{-1} \text{ day}^{-1}$ were recorded between weighing periods during the second and third years and this appeared related to variations in rainfall and consequent effects on the quantity of feed on offer.

At the oversown site there was a small but significant decrease in $\text{lwg} \text{ hd}^{-1} \text{ day}^{-1}$ and $\text{lwg} \text{ hd}^{-1} \text{ yr}^{-1}$ at the higher

stocking rate during the first year, although $\text{lwg ha}^{-1} \text{ yr}^{-1}$ was lower at the lower stocking rate. In the second year no consistent trend was observed between stocking rate or S-fertilizer treatments and $\text{lwg hd}^{-1} \text{ day}^{-1}$ and $\text{lwg hd}^{-1} \text{ yr}^{-1}$. Generally, $\text{lwg ha}^{-1} \text{ yr}^{-1}$ was increased at the higher stocking rate. During the third year $\text{lwg hd}^{-1} \text{ day}^{-1}$ and $\text{lwg hd}^{-1} \text{ yr}^{-1}$ were increased by the highest rates of S-fertilizer at the lower stocking rate. Again $\text{lwg ha}^{-1} \text{ yr}^{-1}$ was higher at the higher stocking rate. As at the native site differences in $\text{lwg hd}^{-1} \text{ day}^{-1}$ were observed between weighing periods and related to differences in rainfall and consequent effects on feed on offer.

Neither stocking rate or S-fertilizer had any apparent effect on reproductive performance.

The results demonstrate that the quality and to a lesser extent the quantity of feed on offer are the major factors restricting animal productivity in the wet tropics. Attempts to manipulate feed quality in this experiment through fertilizer application were unsuccessful due to the rapid disappearance of the legume component. Sulfur fertilizer failed to suppress the Imperata population because only a small amount of legume existed in the pasture and this was not competitive enough. The selective behaviour of the experimental animals further reduced the availability of the legume. Variations in liveweight gains were also related to changes in the quantity of feed on offer and this, in turn, could be related to variations in rainfall. It is suggested that more competitive legumes need to be identified and tested under grazing situations similar to the present experiment.

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