

The effect of feeding rice straw and tree legumes on liveweight maintenance of mature Ongole cows (*Bos indicus*) in Indonesia

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Introduction Improving the productivity and profitability of smallholder cattle enterprises in Indonesia requires greater and more efficient utilization of existing feed resources. Rice straw is often burnt, but could meet the maintenance requirements of a cow if a small amount of extra energy and protein is provided. This could be in the form of green feed such as tree legumes. The aim of this experiment was to measure the amount of rice straw and tree legumes required to maintain the weight of a mature, non-lactating, non-pregnant Ongole cow in Indonesia. This was important in establishing a cow-calf system based on rice straw, the Straw Cow project.

Materials and Methods Thirty-two multiparous, dry Peranakan Ongole cows (318 ± 12 kg (SEM) liveweight) were allocated to one of 4 treatments in a randomised block design, with 8 replicates per treatment. The 4 treatments were (A) rice straw *ad libitum*, (B) rice straw *ad libitum* plus tree legumes (2.5 g DM/kg W.d⁻¹), (C) rice straw *ad libitum* plus tree legumes (5.0 g DM/kg W.d⁻¹), and (D) rice straw *ad libitum* plus tree legumes (10 g DM/kg W.d⁻¹). The tree legumes used were *Gliricidia sepium* and *Leucaena leucocephala*, offered in equal portions on a dry matter basis at the designated treatment levels. The animals were housed in individual pens and had free access to fresh drinking water. Feed intake was determined daily for 20 weeks and liveweight was measured every second week. Digestibility was measured by total faecal collection over 7 consecutive days on 3 separate occasions, during weeks 3, 10 and 20 of the experimental period. Some animals were found to be pregnant during the experiment, and their liveweight was corrected for pregnancy using the equations of Silvey and Haydock (1978). Metabolisable energy (ME) required for maintenance and ME intake from the diets were estimated using the equations in CSIRO (2007). Differences between the treatments were analysed using ANOVA with Tukey's pairwise comparisons in Genstat (13th edition).

Results There was no difference in total feed intake between the 4 treatment groups ($P > 0.05$). Intake of tree legumes was higher when more was offered ($P < 0.05$), but cows did not consume their targeted legume supplement level. Cows substituted tree legumes for rice straw (Table 1). The inclusion of tree legumes in the diet had no significant effect on organic matter digestibility, liveweight gain or estimated energy balance of the cows ($P > 0.05$).

Table 1. Average feed intake, digestibility, liveweight gain and energy balance of mature Ongole cows fed rice straw and tree legumes

Parameter	A	B	C	D	SEM
Rice straw intake (g DM/kg W.d ⁻¹)	17.4 ^a	16.4 ^{ab}	15.3 ^{ab}	13.9 ^b	0.528
Tree legume intake (g DM/kg W.d ⁻¹)	0 ^a	2.1 ^b	3.3 ^c	5.2 ^d	0.350
Total feed intake (g DM/kg W.d ⁻¹)	17.3 ^a	18.2 ^a	18.7 ^a	19.0 ^a	0.498
OM digestibility (g/kg)	531 ^a	535 ^a	546 ^a	556 ^a	4.92
Liveweight gain (kg/d)	-0.11 ^a	-0.07 ^a	0.02 ^a	-0.03 ^a	0.027
Estimated ME maintenance (MJ/kg W.d ⁻¹)	0.11 ^a	0.11 ^a	0.10 ^a	0.10 ^a	0.001
Estimated ME intake (MJ/kg W.d ⁻¹)	0.11 ^a	0.13 ^a	0.13 ^a	0.14 ^a	0.004

Means within each row with different letters are significant ($P < 0.05$)

Conclusions Our results demonstrate that it is possible for a non-pregnant, non-lactating Ongole cow to maintain weight on a rice straw based diet with the addition of a small amount of green feed. The ME requirement for maintenance of cows on treatment C was estimated to be 0.57 MJ/kg W^{0.75}.d⁻¹. Regression of daily weight gain and ME intake for all cows in the experiment also predicted maintenance requirements of 0.57 MJ/kg W^{0.75}.d⁻¹. This is higher than the value published by Chizzotti *et al* (2008) for genotypically similar Nellore cattle in Brazil (0.47 MJ/kg W^{0.75}.d⁻¹) and that estimated using the CSIRO equation for maintenance (0.44 MJ/kg W^{0.75}.d⁻¹; CSIRO 2007). The calculation relies on an estimate of ME content of the diet which was calculated from *in vivo* OM digestibility, but the high ash content of the rice straw (240 g/kg DM) may result in an overestimate of ME content. It may be concluded that cows can maintain weight on rice straw especially if a small amount of tree legume at approximately 3 g DM/kg W.d⁻¹ is included, which would also ensure that adequate N was supplied to rumen microbes.

Although the consumption of up to 5 g DM/kg W.d⁻¹ of tree legumes tended to increase the energy intake and weight gain of cows, this effect was not significant. Across all treatments, none of the cows ate all of the gliricidia or leucaena offered to them, which was unexpected. It appears unlikely that cows will consume enough tree legumes to improve digestibility, energy intake and daily liveweight gain unless rice straw intake is restricted.

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References

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