Supplementation of Cattle with Rock Phosphate and Urea Treated Straw to Improve Manure Quality and Crop Yields in the Sahel Zone of Senegal

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Introduction Mineral deficiencies are a major constraint in improving animal production and crop yield in the Sahel zone (Cissé *et al*., 1996). Millet (*Pennisetum glaucum*) and groundnut (*Arachis hypogaea*) are two major food and cash crops in this zone. The purpose of this study was to assess effects of supplementing grazing cattle with rock phosphate and nitrogen enriched diets on animal performances, and the effects of the application of their manure on crop yield in a pearl millet-groundnut rotational system located in N Senegal.

Material and methods The study was conducted with 12 farmers. Sixty Gobra cattle, 52 females and 8 males, were equally allotted to a control (group 1) and to 3 other groups which received, during the dry season, concentrates based on phosphorus or/and nitrogen supply after pasture grazing. Cattle received 75 g/animal per day of Thiès rock phosphate in 30 l of water in group 2, 500 g of 4% urea-treated millet stover and 1 kg of peanut cake and 800 g of millet bran/animal per day in group 3, and combining the diet offered in the groups 3 and 2 for group 4. Cattle body condition was scored monthly (Cissé *et al*., 2003) and manure produced during nights was recorded daily, collected and sun dried. The farm experiment was a millet (*var.* souna 3) groundnut (*var.* Fleur 11) rotational cropping system with 5 treatments: control (no manure), manure from unsupplemented animals (group 1), and manure from cattle group 2, 3, and 4, respectively. During the rainy season, manure was applied at 4 t/ha to millet. Groundnut was planted in the following year without renewing manure application. Plant growth and yield were measured at 24, 52 days and at harvest.

Results and discussion There were important changes in body condition score (BCS) according to the supplement given to cattle. Controls lost ($p<0.05$) 0.9 points in BCS (3.6 *vs* 2.7) while cattle supplemented with rock phosphate mixed in water maintained their BCS at 3.5 points. Animals from groups 3 and 4 gained ($p<0.01$), respectively, 0.7 (2.8 *vs* 3.5) and 0.9 points (3.1 *vs* 4) of BCS; this being in part due to the high energy content of their diet. After 28 days' growth and at harvest, millet and groundnut plant populations were not significantly influenced by manure application. At 52 days, manured plants were slightly taller than the controls. Enriching manure resulted in positive response in groundnut plant leaf number and height (Table 1). Millet grain yield increased by 24 to 68% depending on the diet offered to animals. The control without manure provided the lowest yield and the highest production was obtained with additional supply of P and N by manure. However, compared with the production from plots manured by control animals, the gain in millet grain yield due to manure enriched in P and N (i.e., 264 kg/ha) was higher than the sum of the gains due to supplementation either in P (73 kg/ha) or in N only (92 kg/ha). The residual effect of manure on groundnut yield resulted in an increase of 11 to 25% over the yield from the unmanured plots.

Table 1 Effect of manure on number of leaves/plant 52 days after planting, on plant height and on grain yield

Treatment	Direct effect on millet		Residual effect on groundnut			
	Grain yield, kg/ha	% increase	Number of leaves	Plant height, cm	Grain yield, kg / ha	% increase
Control	599c	-	51.93a	19.09a	683b	-
Manure from group 1	744b	24	51.80a	20.79c	742ab	9
Manure from group 2	817b	36	52.56a	20.16b	756ab	11
Manure from group 3	836b	39	57.55b	20.27b	842ab	23
Manure from group 4	1008a	68	58.75b	21.24d	857a	25

Means followed by different letters in the same column are different at $p< 0.05$

Conclusions This trial demonstrated advantages of supplementation. However, better response in crop yields could be gained if animals were stabled in fields, because of increases in nutrient cycling from faeces and urine.

References

Cissé M., H. Guérin & E. Prince (1996). Les carences minérales existent au Sénégal. Comment corriger ce déficit nutritionnel en élevage? Etudes et documents*, ISRA (ed.), vol.7, no. 1, 33 p.*

Cissé M., A. Korréa, I. Ly & D. Richard (2003). Change in body condition of zebu cattle under different level of feeding. Relationship with body lipids and energy. *Journal of Animal Feed Science, 12, 485-495*.