

## Implications of land use changes on the yields in dry matter, energy and protein of range and crop fields in Zamfara Reserve, northwestern Nigeria

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**Introduction** The Zamfara reserve is a 235,500 ha grazing land within the Sudan savannah zone (12° 10' - 13° 05' N; 6° 30' - 7° 15' E) of north western Nigeria. Rainfall varies from 500mm in the north to 800mm in the south of the reserve, and is restricted within the months of May - September. The reserve is an important grazing site for the herds of sedentary, transhumant and agro pastoralists. Population growth within the farming communities in the reserve has led to the conversion of more grazing land to croplands. This work was carried out to evaluate the quantity and quality of herbage on the natural range and the croplands, in order to have an insight on the effect of increased cropping activity on biomass availability in the reserve.

**Materials and methods** Total biomass in the range was estimated at intervals of five weeks for one year. Density and leaf mass of trees and shrubs was estimated at the end of the rainy season. These measurements were carried out along 1000m long transects in the north, centre and south of the reserve. Biomass productivity in the crop fields was measured at the end of the rainy season in low, medium and high productivity farms selected in the north, centre and south of the reserve. A diagonal transect of 100m was used in each field and measurements taken at every 10m. Samples of biomass from the range and crop fields were analysed for CP and gas production. The latter was used to calculate ME (Menke *et al.*, 1979).

**Results** Total forage biomass (excluding grains), ME and DCP were higher in the crop lands compared to the range (Table 1). Density of woody plants was however higher in the range. Thus, leaf mass from trees and shrubs was higher in the range compared to the crop fields.

**Conclusion** These results suggest better forage productivity under crop cultivation. However, intensive crop cultivation could have a negative impact on resource conservation and biodiversity. This is clearly indicated by the very low density of the ligneous strata in crop fields, which could have a negative effect on nutrient recycling and soil erosion. Therefore, among others, integration of crop and livestock production should aim to conserve natural woodland to enhance sustainable resource utilisation.

**Table 1** Mean aerial utilizable plant biomass, metabolisable energy and digestible crude protein on natural range and crop fields of Zamfara reserve

	Crop fields	Natural range
Density of woody plants (No./ ha)		
Trees	0.19	18.3
Shrubs	1.41	120.1
Biomass (kg DM /ha)		
Herbaceous mass	-	563.0
Farm weeds	135.1	-
<i>Crop residues from:</i>		
Sorghum	586.7	-
Millet	1721.3	-
Cowpea	260.5	-
Leaf mass (kg DM /ha)		
Trees and shrubs	21.4	105.6
Biomass		
Total forage mass (Kg DM /ha)	2725.0	668.6
Energy (MJ /ha)		
Sorghum	4165.6	-
Millet	13426.1	-
Cowpea	2318.5	-
Farm weeds	1310.5	-
Tree and shrub leaves	128.4	633.6
Herbaceous layer	-	5517.4
Digestible CP (Kg /ha)		
Sorghum	6.5	
Millet	37.9	
Cowpea	20.8	
Farm weeds	7.0	
Tree and shrub leaves	1.7	8.2
Herbaceous layer	-	45.0

### References

Menke K.H., L. Raab, A. Salewski, H. Steingass, D. Fritz & W. Schneider (1979). The estimation of the digestibility and the metabolizable energy content of ruminant feeding stuffs from gas production when they are incubated with rumen liquor *in vitro*. *Journal of Agricultural Science, Cambridge*, 93, 217-222.