INFLUENCE OF EXPERIMENTAL DESIGN IN MEASURING THE VOLUNTARY INTAKE OF GRAZING SHEEP

M. J. ULYATT

DSIR, Applied Biochemistry Division, Palmerston North

SUMMARY

Using data from grazing experiments it was calculated that to detect differences in food intake between treatments of 15%, six plots per treatment and three sheep per plot would be required. It is logistically almost impossible to detect differences in intake of 10% in grazing experiments.

THERE is considerable inherent variation in voluntary intake between sheep of similar physiological status and nutritional history. For example, Heaney *et al.* (1968) found coefficients of variation in intake per animal of the order of 10 to 15% in sheep penned indoors, while Lambourne and Reardon (1963) reported 23% with grazing sheep. From such information it can be calculated that in indoor trials 10 to 15 sheep would be required to detect intake differences of 10% between treatments. More sheep per treatment would obviously be required in field trials.

In the work reported here the intake of grazing sheep was measured in two experiments where the feeding values of two ryegrasses and white clover were compared (Ulyatt, 1971). The sheep were bagged to measure faecal output and digestibility was estimated as the *in vitro* digestibility of either hand cut or oesophageal fistula herbage samples.

TABLE 1: NUMBER OF ANIMALS REQUIRED PER PLOT TO DETECT TREATMENT DIFFERENCES ($P < 0.05$) IN ORGANIC MATTER INTAKE

No. Plots per Treatment	*% Difference in Intake* 10	15	20	30
2	∞	36	10	2
4	∞	7	2	1
6	36	3	1	1
8	9	2	1	1
10	5	1	1	1
20	2	1	1	1

From these experiments it was possible to estimate the numbers of sheep and plots required to design a statistically acceptable experiment that would detect biologically significant differences in voluntary intake in the field. Table 1 shows the number of animals required per plot to detect intake differences ($P < 0.05$) for various numbers of plots. As in most experiments of this nature it was clearly better to have more plots per treatment than animals per plot for the same number of animals over all. To detect differences in intake between treatments of the order of 15% the optimum design would be either 6 plots and 3 animals per plot, or 8 plots and 2 animals per plot.

It is interesting to note the numbers required to detect a 10% difference in intake. This is clearly 20 plots and 2 sheep per plot, *i.e.*, at least 40 sheep per treatment. Such requirements make it very difficult to detect intake differences of 10% in the field with current intake measurement techniques, unless the experimenter has many assistants. In addition, interpretation might be difficult on agronomic grounds because one could question the validity of extrapolating from such necessarily very small plots to the usual farm situation. Yet differences in intake of 10% can be very significant nutritionally.

The statistical advice of V. J. Thomas was greatly appreciated.

REFERENCES

Heaney, D. P.; Pritchard, G. I.; Pigden, W. J., 1968: *J. Anim. Sci., 27*: 159.

Lambourne, L. J.; Reardon, T. F., 1963: *Aust. J. agric. Res., 14*: 257.

Ulyatt, M. J., 1971: *N.Z. Jl agric. Res., 14*: 352.