

Rapid Evaluation of Poor Quality Roughages and Forage Mixtures

In order to develop improved ruminant feeding systems based on poor quality roughages a rapid means of assessment is important. STIR (short-term intake rate) predicts longer-term intake and provides a cheap alternative to the traditional laboratory-based methods and long-term feeding trials.

Background

In developing countries, one of the main constraints to the improved use of ruminant feeds, which are often based on poor quality roughages, is their limited intake. In order to develop new feeding strategies to improve animal production and efficiency, it is important to be able to characterise the feeds adequately. This will enable prediction of the likely effects of feeding single forages and combinations, and an understanding of the factors controlling feed intake.

Analysis of conventional feeds in laboratories often cannot predict how much an animal will consume. It is therefore difficult to assess the probable level of animal production. Conventional feeding trials tend to be a time-consuming and expensive alternative. There is need for an animal-based method, suitable for use



Poor people rely upon low quality roughages to feed livestock.

Experiments to assess the robustness of STIR showed that the method is sensitive to the size of the feed particles; cattle and sheep rank feeds differently but consistently; and mixed diets can be effectively evaluated only where the feed particle size is the same for all the feeds in the mixture.

in developing countries, that can rapidly and reliably evaluate feeds.

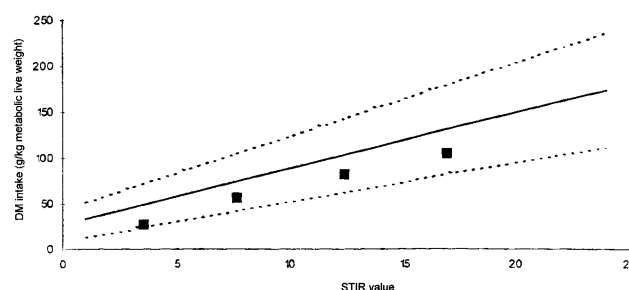
Supplementing low quality roughages with small quantities of higher quality feeds can improve intake and utilisation of the roughage, leading to better animal performance. Although many smallholders cannot afford to buy concentrate feeds they may have access to higher quality forages to supplement poor quality roughages.

Research highlights

A rapid method has been developed by which animals can be used to evaluate roughages; it is called STIR (short-term intake rate). This is a useful method for predicting actual (i.e. long-term) intake rate which, in turn, dictates the level of animal production obtained from a particular diet. STIR was also shown to be strongly correlated with digestibility. The technique simply involves measuring the amount of feed consumed by an animal and the time actively spent eating over a five-minute period.

However, the order of presenting feeds did not affect the STIR value.

Mixtures of high quality forages (e.g. chopped alfalfa) and poor quality roughages (e.g. straw) were also looked at to provide information on factors influencing animal intake responses to mixed diets. This complementary study showed that although feeding a forage supplement improves overall diet digestibility, animals prefer to eat more of the supplement and less of the basal roughage. If the supplement is fibrous, it fills the gut and prevents the animal eating more of the basal ration. This is deemed counter-productive where the objective is to maximise the consumption of poor quality roughages.



STIR value is a good predictor of longer-term intake rates (DM = dry matter).

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Uptake

These findings highlight the greater value of *in vivo* assessment of the quality of tropical roughage over currently available laboratory-based methods. The main reasons for this are the complex interactions between the physical nature of a feed and its nutrient composition, and animal feeding behaviour and its ingestive capacity. Hence, STIR provides a cheap, *in vivo* alternative to the traditional (long-term) feeding trial that can be used for rapid screening of feeds.

STIR has been promoted to the international research community through published articles and presentations at scientific meetings. Interest in the technique has been shown by a number of research organisations overseas – most notably the International Livestock Research Institute (ILRI) and the University of Reading. In recognition of the limitations of STIR, work at these centres has focused on improving the methodology. It is anticipated that improvements in STIR methodology by these organisations, together with associated estimates of intake, rate of passage and digestibility will strengthen the capacity to predict animal performance from roughages. This information will provide the basis for extension recommendations on best use of low quality roughages.

Linkages

Effective feed evaluation cannot rely on single estimates of feed value. The most effective use of STIR will, therefore, be in conjunction with other techniques. The ultimate objective of

further research should be to develop a system which uses a combination of STIR and other laboratory-based methods for rapidly assessing feed quality. This will permit development of low-cost diets that will enable farmers to fulfil their animal production objectives.

The project continues to promote the development and use of STIR through collaborative research with International Agricultural Research Centres (IARCs) and National Agricultural Research Organisations (NAROs). The outputs of Livestock Production Programme (LPP) Project R6340: Optimising the use of poor quality forage by ruminants are relevant to this project.

Relevance to sustainable livelihoods

Under-nutrition is the most widely occurring primary constraint to livestock production by poor people. The availability of feed to poor livestock keepers exhibits wide fluctuations from day to day as well as from season to season. This may in part be due to seasonal climatic changes but is also strongly affected by changing rights of access to feed resources (e.g. common property fodder). It is critical that households make best use of the feed resources that are available to them to achieve diverse livelihood objectives. Ensuring that animals make optimal use of feed available at any time requires knowledge of how much of a fodder will be consumed. STIR is intended to help national R&D organisations evaluate local feeds, thus providing the scientific basis upon which practical feeding advice can be developed.

Selected project publications

- Romney, D.L. and Gill, M. (1998) Measurement of short-term intake rate (STIR) to predict *in vivo* parameters in sheep. p. 98. In: *Proceedings of the British Society of Animal Science, 1998*. BSAS, Edinburgh, UK. [abstract]
- Harrison, S., Romney, D.L., Phipps, R.H. and Owen, E. (1998) Short-term intake (STIR) as a method of ranking the intake potential of forage mixtures by dairy cows. p. 193. In: *Proceedings of the British Society of Animal Science, 1998*. BSAS, Edinburgh, UK. [abstract]
- Romney, D.L., Cadario, F.C., Owen, E. and Murray, A.H. (1998) Comparison of parameters from the Theodorou gas production technique using nitrogen-free and nitrogen-rich media as predictors of DM intake and digestibility. pp. 172–174. In: *In vitro Techniques for Measuring Nutrient Supply to Ruminants. Proceedings of International Symposium of the British Society of Animal Science, University of Reading, 8–10 July 1997*. BSAS Occasional Publication no. 22. Deaville, E.R., Owen, E., Adesogan, A.T., Rymer, C., Huntingdon, J.A. and Lawrence, T.L.J. (Eds.). British Society of Animal Science, Edinburgh, UK.
- Hurst, D., Romney, D.L. and Murray, A.H. (1999) Evaluation of the potential of short-term intake rate (STIR) to predict effects of chop length on *in vivo* parameters in sheep. p. 105. In: *Proceedings of the British Society of Animal Science, 1999*. BSAS, Edinburgh, UK. [abstract]

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