Invited paper

Some comments on livestock research orientation with emphasis on the Sudan

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INTRODUCTION

First of all I feel honoured to be asked to write a small article for the Sudan Journal of Animal production. I feel honoured in particular because I have some commitment to the Journal. On one of my trips to the Sudan I found that I was actually communicating from laboratory to laboratory as to what was going on in each of them. Few countries can afford such lack of communication firstly because it can lead to overlap of effort, but more importantly perhaps the stimulation and challenge to research comes by discussing and even arguing with mind-like colleagues. When I mentioned this to a few of the founding members of your Journal they were already aware of it and if my prodding acted as a catalyst to get things actually moving then this is to me very .rewarding. The hard, painstaking work in maintaining such a Journal has been with you. I salute you for your achievement and persistence and hope you can maintain it.

In the following I would like briefly to address a few comments to problem oriented research and even speculate as to the most pressing problems for Sudan animal production. I may, of

course, easily be wrong since I was only in the country for a few days, but in the process perhaps of dismissing some of my arguments it may lead to new thought. It may even be that I had a point! I have often encountered what can be termed technology-led research in developing countries. That is generally ongoing fashionable research in developed countries as AI, embryo transfer, growth promoter, use of bovine somatotropin for milk production etc. There are generally no problems identified to solve problems facing, for instance, Sudanese animal production. If they were they have a place of course. So where should problems be identified? They are identified from the farming community you are to serve. This may seem obvious, but seldom is the target group consulted. The consultation quite often goes no further than to the occasional large farm or feedlot which represents a very small percentage of farmers. When I had the pleasure of seeing some farms there appeared to be some problems emerging which could do well with a research input which relates both to feed resources and to body composition of livestock. The most important feed resource for nomadic farmers is obviously the pasture with less importance on crop residue which they may obtain occasionally. While it is unlikely that improvement in native grass species can be made, it is possible to conduct research into how to extract the maximum from the pasture consumed. For the settled farmers crop residues e. g. sorghum stover, wheat straw etc. pidys an important role in the feeding of livestock. Research on how to improve the nutritive value of crop residues can have a great impact on livestock production in that sector. Finally, while milk production is important in the Sudan and plays a large role in

the nutrition of both settled and nomadic farmers, I will here concentrate on meat production and address a problem of liveweight loss during long treks from west Sudan, for instance, to the industrial centres in Khartoum and Omdurman.

Extraction of more energy from pasture and crop residues

In an ideal situation in which the rumen environment is optimal, that is where there are no nutrient deficiencies, e. g. N or S, and where there are sufficient numbers of bacteria to invade new substrate as it is consumed, the rate of degradation is limited only by the rate at which substrate can be exposed. This essentially means that the plant itself or the crop residue sets the pattern of degradation. It is truly a characteristic of the plant. Let us assume that is the case for the drawn line A in Fig. (1). It is seen here also that the normal or average rumen retention time of 48 h or thereabouts only about two-thirds of the potential extractable material is being used, the rest is excreted in the faeces. While a small amount may ferment in the large intestine, the rumen is by far the important determinant of extent of fermentation. It can be seen from this simple illustration that fermentability, or what is generally measured the digestibility can vary according to the retention time. In fact Orskov *et al.* (1988) noted in dairy cows that the variability between animals in digestibility accounted for as differences in their rumen retention times. Let us now imagine another feed (B) in which the asymptote was reached much earlier or around 48 h also shown in Fig. I. This implies that if the retention time is the same as before the extraction is more complete. From this it can be reasoned also that the variability

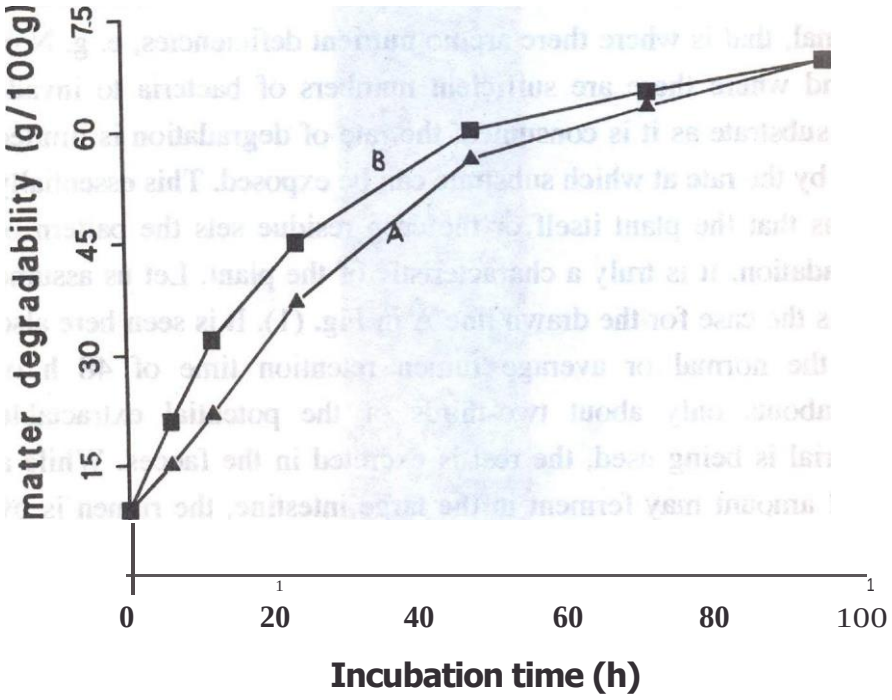

Figure 1 : The effect of rumen environment on digestion of the same sample of a cellulosic roughage source. Note ,be solubility or zero value and the asymptote are similar but the differences are apparent in the degradation rate.

between animals in digestibility will be different with different substrates. In general the greater the degradation rate the smaller the differences between animals in digestibility.

Control of retention time

Going back again to Fig. (1) Feed (A), it can also be seen that increasing retention time to, say, 56 h can have a pronounced effect on digestibility of the substrate illustrated and conversely decreasing it to 40 h can seriously reduce digestibility. It is very important to recognise that such differences exist between animals and that it can, in fact, be selected for. It is also important to recognise that animals selected under conditions in which the feeds are highly degradable may be favourable or even superior if their retention time was 40 h only. In fact they are likely to have the smallest rumen and a high killing out percentage and thus be desirable animals under condition of high resource quality. On the other hand if feeds such as the one illustrated first is used, the animals that can accommodate a size of rumen which can allow for retention time of 56 h will have a survival advantage. The animals selected under conditions in which size of rumen and potential retention time were not limiting may show a great variability if they are exposed to conditions when retention time is important. Thus animals can be selected to match the resources they have to consume. This has never been taken into account when so-called upgraded or exotic animals are uncritically imported into areas of lower quality feed resources, as a result there is an animal resource mismatch and there are indeed many examples of this.

Degradation rate is less than optimal

I would now like to discuss another scenario in which the degradation rate is less than optimal for feed A. Let us assume that it is linked to time in Fig. (I), and that the two feeds are the same. It is illustrated that, while the asymptote and solubility is the same, the degradation rate is reduced so the asymptote is reached later. Here the rumen environment is such that the extraction rate of the substrate is reduced which, on the whole has the combined effect that retention time is increased so that both intake and digestibility are reduced. The extent of deficiency will of course. determine the extent to which intake and digestibility is reduced. I include this here because I believe that recognition of this is extremely important for pasturalists in the Sudan. It is particularly important in determining optimal strategies for supplementation. First of all, how can the periods of deficiency be identified experimentally? It is quite possible now to use a standard cellulosic feed, e. g. hay or straw, to determine the degradation rate at maybe- 2- weekly intervals in a couple of years perhaps following movement by nomadic people.

Fistulated animals can graze normally with the herd and periodically the degradation rate is determined. If during part of the year or in some defined areas degradation rate is reduced then use of supplements to correct the deficiency can be very cost effective in so far that the supplement not only serve as a source of nutrients in their own right, they increase greatly the value of pasture consumed. Some high quality fibrous feeds such as brans and even cotton seed meal could supply N and increase number of cellulolytic bacteria at the same time.

This could be a very rewarding research area and could have lasting benefit for pasturalists.

Loss of live weight during trekking

From my limited experience in the Sudan it is quite clear that animals lose a lot of weight on the road from range to the slaughterhouse. From available evidence on microbial protein supply a lot of the live weight loss is tissue protein which is being lost when the feed supply to the animal provide less than their energy maintenance need. This has the consequence that the animals will show a very rapid compensatory growth when feed is given. This has no doubt been noted by feeders near slaughterhouses who can get very efficient feed utilisation which is in effect partly due to body fat being used to fuel protein deposition.

How can liveweight loss be reduced during trekking?

Obviously if the loss is tissue; Fiotein then liveweight loss can be reduced by increasing the protein supply. To increase microbial protein supply may not be so easy and undegraded protein is the obvious candidate. However this may be easier to accomplish in a feedlot near the slaughterhouse as indeed is being practised, but more experiments are required to ascertain how rapid this compensation can take place and also whether cottonseed or similar available products can be treated so as to make it a more effective supply of undegraded proteins. It can, of course, be said that the cheap compensatory growth achieved after trekking *„gives* **direct profit to the feedlot owners and not to the**

pasturalists. If, however, this was seen to be too great then I am sure the pasturalists would themselves organise feedlots.

I have the greatest respect for the commercial abilities of pasturalists and I believ'e that a better understanding of how to control liveweight kiss and gain will eventually benefit the suppliers of cattle.

Selection for better quality of crop residues

In many areas of the Sudan crop residues, e. g. sorghum stover and wheat straw, play a dominant role as feed for ruminants. This is particularly so in settled areas. it is important to recognise that crop residues may vary enormously in nutritive value. For spring barely digestibility has varied from less than 40 to *60%* or more. For wheat straw and maize stover also large differences have been observed in our laboratory. Relatively little is known about variability between sorghum varieties except that the palatability of bird resistant varieties is apparently poor. Given the importance of crop residues a study into the variability in quality could be extremely fruitful area of research. A change of 10% in digestibility of crop residues can have an enormous impact on animal production, not only because of the greater amount of energy extracted from the same biomass, but also because the animal can normally consume much more and therefore a higher performance can be achieved with less use of expensive supplements. Tools like the nylon bag technique is very robust and reliable and can be used to test the differences observed in the varieties grown today so that in the future breeders of cereal varieties can take into account also the nutritive value of the crop

residues. From the experience so far there is no correlation between grain yield and nutritive value of the straw or stovers so that it can be selected for without sacrificing yield 'or cereals.

CONCLUSION

There is therefore, I believe, much to be gained for Sudanese animal production both in improving the quality of feeds by genetic selection and ensuring an optimal rumen ecology and by improving the ability of animals to consume roughages. robust tools are now available with which to examine these aspects which could be very important for resource use in animal production in general.

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