REPORT ON A VISIT TO THE GAMBIA

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BACKGROUND

1. A major biological constraint to livestock productivity in The Gambia is inadequate nutrition. Fodder availability fluctuates seasonally depending on rainfall, and deficiencies in the dry season are accentuated by burning of the grazing resource.

2. Livestock are managed under traditional systems. In the wet season large and small ruminants are herded away from the crop fields to graze native pastures or are tethered on the edges of fields or along roadsides. In the early dry season, crop residues and weeds are utilised along with the native pasture. Residues from the groundnut crop are most widely used, followed by those from millet, rice and maize. Groundnut residues have a crude protein content of 18% in the leaf and 11% in the stem, compared to 6% crude protein and 3% for maize, respectively. Retention of crude protein depends on the method of storing crop residues. Exposure to wind and sun reduces crude protein levels, and indoor storage is the best method. Cereal residues tend to be grazed *in situ*. In the 20 years since 1971, groundnut hectarages have declined by 20% whilst those for coarse grains have increased by 250%. The area of rice has remained stable. If this trend continues, cereal residues will become more important for animal feed, and the need for supplementation will increase accordingly. Agro-industrial by-products are not used extensively as ruminant feed. The processing of groundnuts is centralised, so costs prohibit the use of groundnut cake in rural areas away from the processing site. Sesame is processed in 16 villages, so sesame cake is more widely available. This by-product is much used in poultry production. Browse is important in the late dry season. For example, the indigenous tree *Pterocarpus erinaceous* is used in the late dry and early wet season for ruminant feed. Priority for supplementation of livestock is given to draught animals and the fattening of rams for religious festivals. The village herds produce milk and manure; there is no fattening of beef cattle. Animals are tethered overnight on cropland for a number of days to deposit their manure.

3. There is considerable potential in The Gambia for improving the availability and use of feed resources.

TERMS OF REFERENCE

4. To review research work conducted on fodder availability, evaluation and use at the International Trypanotolerance Centre (ITC), Banjul, The Gambia.

5. To develop future research work on fodder evaluation and utilisation consistent with the strategy developed for the Fodder Production Problem Area at the Natural Resources Institute (NRI).

PREVIOUS FODDER RESEARCH

6. There is a history of fodder research in The Gambia which pre-dates that at ITC. In the 1980s, a wide range of grasses and herbaceous legumes were evaluated and promising accessions were identified by Dr S Russo on a USAID project. These were either commercial lines selected in Australia or germplasm obtained from the International Livestock Centre for Africa (ILCA). No thought appears to have been given as to how the species would fit into the local livestock systems. Needless to say, in common with most of the rest of sub-Saharan Africa, no adoption took place at farm level. The main reason was

the land tenure system. Rangeland that is owned by the village or villages and communally grazed cannot be subjected to pasture improvement. There is no control of animal numbers and no grazing management is possible; an essential requisite for pasture improvement. Furthermore, smallholders are not prepared to sow perennial legumes on land cultivable for food crop production. Opportunities for improvement of bush-fallows are also declining due to increases in population pressure. The duration of fallowing has been reduced from 5-6 years to 2-3 years, or even eliminated completely in some areas. At the start of any pasture evaluation programme it is essential to be aware of the systems into which new species are to be introduced and the existence of suitable 'entry-points'.

7. Recent research at ITC has focused on leguminous trees. A useful survey of local browse species and their use by farmers has been conducted. It is clear that there is a strong farmer tradition of utilising browse species for livestock feed after the middle of the dry season. Farmers are very knowledgeable as to what species to cut, and there are a range of species used for this purpose. All of the species are native to West Africa and not only to The Gambia.

8. Experimental work on the establishment and management of two exotic woody species, *Leucaena leucocephala* and *Gliricidia sepium*, has been carried out. Results showed that transplanting was superior to direct sowing of seed, a finding that is already well-known and well-documented in the literature! Observations on management i.e. cutting at 25, 50 or 100 cms above ground level are, as yet, inconclusive as the trial is in its first season. However, the justification for such a trial is debatable, as there are myriad references in the literature from similar locations elsewhere on the effects of cutting regimes which could have been extrapolated. This trial is continuing.

9. Two supplementation trials have been conducted. In the first, rams grazing native pasture were supplemented with groundnut hay, *Leucaena* or *Gliricidia*. There were initial palatability problems with the latter, and this treatment was terminated prematurely as the *Gliricidia* ran out. The gains in the *Leucaena* treatment were the same as those in rams fed groundnut hay. In the second trial, *Leucaena* and *Gliricidia* were compared with sesame cake and fed to rams over 84 days at two levels, 50g or 25g crude protein. Groundnut hay was supplied *ad libitum* to the animals. Treatment differences were not statistically significant indicating that foliage from the two legume species could be used to replace a more expensive processed protein source when fed at the same levels. It seems a waste to feed good quality groundnut hay *ad libitum* as a roughage. It is clear, depending on storage method, that the residue can be fed as a protein source only. If the groundnut area continues to decline they may not be able to afford the luxury of using it in this way, and more use will have to be made of cereal residues supplemented with a protein source.

10. A major problem for forage research at ITC is the lack of access to the literature. This was clear from the nature of some of the work established and the way the work was reported. Mr O N'Jai has two publications ready for submission to journals, and it is clear that key references are missing. I have sent him a number of reprints, and I will write to ILCA to see if he can be included in some way in their documentation network. Mr N'Jai was unsure of which journals to publish the papers. 'Agroforestry Now' was suggested for the browse survey, and 'Agroforestry Systems' for the two supplementation trials (included as one paper). I have sent him details of instructions to authors from these journals. If Mr N'Jai attends the Nitrogen Fixing Tree Association (NFTA) meeting next March in Pune,

India, it will be useful for him to become affiliated to NFTA who produce regular reviews on multi-purpose trees. Perhaps he could also spend time at the NRI library en route to India. In my experience, one of the reasons for poor quality research in developing countries is the lack of access to documentation prior to establishing the trials.

RECOMMENDATIONS FOR FUTURE FODDER RESEARCH AT ITC

11. Enough research has been conducted in The Gambia and elsewhere in sub-Saharan Africa on the evaluation of grasses and herbaceous legume germplasm. Any attempt to introduce improved species into communally-grazed rangeland should also be avoided. It is interesting to note that a UNDP Rangeland Project was recently terminated in the country. Some 1000 hectares of rangeland have been fenced, provided with water-holes and partly sown with the improved grasses *Andropogon gayanus* and *Cenchrus ciliaris*, in consultation with villagers in the region. The area was handed to a village management committee which is receiving advice from the Department of Livestock Services. The project area is presently suffering from a serious regeneration of unpalatable woody species and a corresponding increase in tsetse challenge. There has been a loss of grazing control and the sown grasses are disappearing. A familiar pattern of degeneration, associated with the end of an outside aid programme, seems to be developing.

12. Research on the evaluation of multi-purpose trees should be expanded to include indigenous species known to be used by farmers together with more germplasm of the exotic species *Leucaena* and *Gliricidia*. From the pest and disease viewpoint, it is always dangerous to expand the area of only one genotype of a given species. The psyllid that destroyed *Leucaena* in Asia and Oceania has reached East Africa and, no doubt, will eventually find its way to West Africa. The genotype at ITC has no resistance to the psyllid. ILCA and the Oxford Forestry Institute (OFI) have a wide range of provenances of the two genera. It would not be necessary to evaluate large numbers of germplasm as there is information on adaptation to environment from field trials already conducted. Accessions of *Faidherbia* and *Acacia* from the OFI collection should also be tested. Nutritive value would be monitored as part of the study. As previously mentioned, farmers are familiar with the feeding of browse and, from interviews, have indicated that they would be prepared to plant new species. The enclosed backyards in the villages would be suitable 'entry-points' for multi-purpose trees. Some of these are as large as 40m^2. Trees can be planted around the fence-line, which is protected from small ruminants, and in rows within the backyard. Where vegetables are grown in the dry season, the rows of trees could alternate with the beds in an alley-cropping system. In the backyard location, there would be no land tenure problems. The foliage from the trees could be used to supplement cereal crop residues. One villager has already planted some *Leucaena*, and Mr N'Jai intends to expand this operation.

13. Research should be initiated to investigate the undersowing of cereal crops with annual forage legumes. As mentioned earlier, farmers are not going to establish perennial forage legumes on land that can be cultivated for food crops, whilst the gradual disappearance of the bush-fallow eliminates the opportunities in these areas. There is some tradition of intercropping cereals with groundnuts and cowpeas in The Gambia. If it could be demonstrated that self-regenerating annual legumes can be established under millet, maize and sorghum without reducing grain yield and causing problems in labour availability, then intercropping would be a suitable 'entry-point' for forage legumes that

would not interfere with food crop production or complicate the land tenure situation. In fact, legumes could benefit the cropping system by providing symbiotic nitrogen and ground cover, reducing the need for extra weed control. After grain harvest, the legumes would be available for grazing *in situ* and improve the quality of the cereal crop residue. It would not be necessary to sow the legume in subsequent cereal crops as sufficient soil seed reserves should be built up. The effects on subsequent crops would need to be evaluated as part of the research work. Three annual legumes have already been selected for West Africa by ILCA. These are *Chamaecrista rotundifolia* cv. Wynn, *Centrosema pascuorum* cv. Cavalcade and *Stylosanthes hamata* cv. Verano. All three are adapted to the environment in The Gambia. It is interesting to note that, in Malawi in the 1970s, D Thomas and A Bennett successfully established perennial grasses and legumes under maize in a similar rainfall regime to The Gambia and at a similar latitude south of the equator. No decreases in maize yield were noted as a consequence of undersowing. A detailed experimental design for the work was discussed with Mr N'Jai and the Director-General of ITC, who is a quantitative geneticist and biometrician.

14. Both research proposals concur with the strategy developed for the Fodder Production Problem Area at NRI, which emphasises multi-purpose tree evaluation and crop-livestock systems. The results from this work would have a regional application in West Africa. The ideas were favourably received by ITC staff when they were discussed at the end of a seminar I was asked to give at short notice entitled "A Review of Fodder Development in Australia, Latin America and Sub-Saharan Africa: Implications for West Africa".

15. The evaluation of woody species would be conducted at the Keneba Research Station of ITC, some 120km south of Banjul. Intercropping studies, which require more management, would be established on the ITC campus. Rainfall at both sites is 750-800mm annually, and soils are not too dissimilar. A tentative budget has been drawn up.

ITINERARY

AM	Bournemouth - London (coach). London - Brussels (Sabena Airlines).
PM	Brussels - Banjul (Sabena Airlines).
AM	Attendance at monthly meeting of ITC staff and seminar by Dr R Mattioli (ITC) on "Effects of Trypanosomiasis on Tick Susceptibility in N'Dama and Zebu Cattle".
	Discussions with Mr O N'Jai (ITC) on previous and future fodder research at ITC.
PM	Continued discussions with Mr O N'Jai and tour of ITC campus.
July 6:	Field visit to Kenaba and villages en route.

July 7:	AM	Discussions with Mr J Bennison (NRI) on research work in the area of disease - nutrition interactions in draught animals.
		Visit to villages around Banjul.
	PM	Discussions with Professor L Dempfle (Director-General, ITC) and other staff members.
July 8:	AM	Visit to Redville Farm, near Banjul with Mr D Clifford (ITC).
		Final discussions with Mr O N'Jai.
		Departure for airport.
		Banjul - Bamako - Brussels (Sabena Airlines).
July 9:	AM	Brussels - London (Sabena Airlines). London - Bournemouth (coach).