

Conference Discussion

The conference opened with a *Welcome* from Dr T Fujita, Director Animal Production and Health Division, FAO Rome and Instructions on *How to Participate* from AW Speedy, Oxford. There was also an *Introduction* by R Sansoucy and C. Dalibard (FAO) and a description of *The Development of the FAO Tropical Feeds Information System* by AW Speedy.

The first paper was on *Evaluation of Tropical Feeds* by RA Leng in which he discussed the differences between forage from tropical and temperate regions and the evaluation of forages, with particular reference to the problem of rumen microbial nitrogen status and its effects. This was extended to supplements, including by-pass protein, but also more digestible carbohydrates, minerals and vitamins. He stressed the very limited significance of chemical analysis, especially of ADF and NDF fibre analysis, and of the limitations of rumen degradability coefficients, given the error attached to the intercept estimate, as well as the more practical question of the basal diet mixture. He also noted the interaction between climate and nutrition which was relevant in tropical countries. He concluded that feeding trials, involving supplementation with molasses-urea blocks to optimize rumen fermentation, were most appropriate. Supplementation could then be carried out with small amounts of more digestible feeds and by-pass protein to determine responses.

There was considerable discussion of this paper with support for the tenet of reduced emphasis on feed chemistry from M Hadjipanayiotou (Cyprus), P Colucci (Canada) and a group of postgraduates from Armidale University, Australia. M Sanchez (FAO) noted the problem of limited resources for laboratory establishment in developing countries. P Thorne (NRI, UK) added the dimension of selectivity, e.g. in goats, as a further problem of feed characterization.

Margaret Gill (NRI, UK) criticized the generalizations in R A Leng's paper and noted the joint role of chemical analysis and animal experiments, and the relative importance of pasture and browse. She

further advocated the consideration of feeding systems and strategies (as opposed to the short-term approach) and requested the conference to consider where information was really lacking. Bo Göhl (FAO, Botswana) also supported a more holistic approach.

S Sundstøl (Norway) also expressed surprise concerning the criticism of chemical analysis but supported the attention to molasses-urea blocks and considered that optimization of the rumen environment was indeed possible in the field.

Later in the conference, a paper was received from M Chenost (France) on *Optimizing the use of poor quality roughages through treatments and supplementation in warm climate countries with particular emphasis on urea treatment* and two papers by J-X Liu *et al.* on *The effects of urea-mineral lick blocks on the live weight gain of local yellow cattle and goats in grazing conditions* and *The kinetics of fibre digestion, nutrient digestibility and nitrogen utilization of low quality roughages as influenced by supplementation with urea-mineral lick blocks.*

ER Ørskov (Rowett Institute, UK) presented an alternative view to Professor Leng based on the estimation of feed potential and provided a complete paper on the *Plant factors limiting roughage intake by ruminants*, with equations for the estimation of degradability and intake. This received criticism from L Kahn (Australia) on the basis of the problem of basal feeds and the inaccuracy of the constant in the equation and a more detailed response from Professor Leng who reiterated his points. He also replied to M Gill and stressed the difficulty of dealing effectively with pasture and grazing. R Sansoucy supported the importance of pasture and stressed the effectiveness of molasses-urea blocks in this context.

Generally, the conclusions of this part of the conference support Professor Leng's contention that evaluation of roughages must be carried out with attention to rumen nitrogen supply and the testing of supplements as by-pass nutrients. Chemical analysis, including degradability coefficients, may be included but its limitations must be accepted and greater emphasis should be placed on animal feeding trials, with attention to the wider principles of ruminant nutrition.

Still other contributors noted the special attention needed for legume trees and their evaluation, including the evaluation of anti-nutritional factors, tannins, etc. from M Wanapat (Thailand) and C Lascano (CIAT, Colombia). A Finzi (Italy) contributed some useful description and data on *Cordyla africana* from Somalia, a shrub with 27% protein in leaves, and used for poultry. Other materials had been tested in this area. A Gupta (India) emphasized the importance of drought feeds and the use of indigenous knowledge in this area.

There followed a paper by TR Preston (Vietnam) on *Strategy for sustainable use of natural renewable resources: constraints and opportunities*. This attracted surprising little comment except from RL Meirer on the problems of urban livestock and energetic efficiency. AW Speedy commented on the need to consider natural ecosystems and their modification as the basis for sustainable feeding systems in the future. R A Leng commented again that attention should be paid mainly to available byproducts and the limited feeds available, separating basal forages from roughages, and regarded the proposal of the modification of natural ecosystems as 'back to nature'. However, Speedy commented again that the conference had concentrated on very few feeds (straw, forages, molasses-urea blocks and a limited range of supplements such as cottonseed cake) whereas there was a multitude of alternative feeds available in the tropics and information was seriously lacking. Preston also noted the lack of attention to monogastric animals and this was supported by F Dolberg (Denmark) who noted the absence of interest in this field by the CGIAR Centers. It was a serious criticism of the conference so far that it had been almost entirely concerned with ruminants. There was, however, a paper on *Aquaculture feeds and feeding* by AGJ Tacon.

To encourage further contributions on feeds, recent articles on *Azolla*, *Molasses*, *Blocks*, *Gliricidia* and *Prosopis juliflora* were circulated.

As further examples, a list of *Useful plants from Colombia* by Zoraida Calle was circulated and a paper by Komwihanglio, Goromela and Bwire (Tanzania) on *Tanzanian forage species* was included. A substantial paper was also provided by JE Benavides

(Costa Rica) on *Research on forage trees*, including details of a large number of species and methods of testing including animal responses.

Turning attention to palms, a paper was contributed by A Ocampo (Colombia) entitled: *The African palm, strategic resources on integrated systems of tropical production* in which he considered novel ways of incorporating palm fruits and oil in rations for pigs within different systems of production from small- to large-scale.

Additional information on palms was provided by the coordinator from published literature by AA Atchley (1984), *Nutritional value of palms*, JF Morton (1988) on *Borassus flabellifer* (Palmyra or Toddy Palm) and MJ Balick and SN Gershoff (1981) on *Jessenia batana*, as well as further papers on *Caesalpinia paraguarensis* by J Aronson and CS Toledo (1992) and *Opuntia* spp. by CE Russell and P Feller (1987).

However, the conclusion must be reached that there was rather little information on the large range of alternative species and systems applicable in the tropics. The conference had concentrated mainly on the use of low quality roughages for ruminants, supplementation with molasses-urea blocks and other treatments, and a very small range of supplementary feeds. Despite this, there are indications of a considerable number of candidate species and an important need to increase the scope of Tropical Feeds to include new feeding systems, especially those applicable to the ruminant AND to the monogastric species, taking advantage of their complementarity.

Critical assessment

The Electronic Conference operated for 5 months and reached a very large number of people, compared to a conventional Expert Consultation. There were some technical difficulties, most notable that the original list was devised by the Coordinators and the e-mail addresses set up by them. This led to some errors and a problem with certain systems not recognizing the 'errors to' command in the message headers. This led to error messages being circulated to all participants and duplication of material, with a consequent cost,

especially to participants in developing countries with high communication charges. This is regretted but was difficult to predict as it was a fault at the remote computer and not at the server. This will be solved in future by sending a single message to participants asking them to register personally with their correct e-mail address.

It was also difficult to encourage regular and widespread participation, probably because of the remote nature of the conference and the fact that participants were involved in other work or travelling at certain times. The Coordinators could have done more to encourage participation and perhaps provided more regular summaries to assist participants.

At a technical level, it has already been stated that the conference was mainly limited to the question of forage evaluation for ruminants and stimulated less interest in the wider range of species and in systems for monogastric animals. This reflects real deficiencies in the international research and development strategy in animal nutrition and feeds. There should be a serious reconsideration of the balance of effort and Tropical Feeds should be expanded to include a much wider range of alternatives, particularly where these relate to more sustainable technologies and higher overall biomass production.

However, despite these technical issues and limitations, the Electronic Conference did much to demonstrate the possibilities of this medium and, in the degree of participation, was far more effective than a single Expert Consultation. Furthermore, it was achieved at a small fraction of the cost. It should serve as the basis for on-going communication and information dissemination on feed resources and feeding systems and there is good case to continue to maintain the list in the future. There is also good evidence of the need to continue the Tropical Feeds and Feeding Information System project and to further expand the database of information.

Appendix 1. List of Participants' Countries*Developing Countries (37):*

Barbados,
Bangladesh,
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Bolivia,
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Brazil,
Chile,
China,
Colombia,
Costa Rica,
Cyprus,
Dominican Republic,
Egypt,
Ethiopia,
Guatemala,
Honduras,
India,
Indonesia,
Kenya,
Laos,
Malaysia,
Mali,
Mexico,
Morocco,
Niger,
Nigeria,
Peru,
Philippines,
Senegal,
Sri Lanka,
Thailand,
Turkey,
Tunisia,

Uruguay,
Venezuela,
Vietnam,
Zimbabwe.

Developed Countries (12):

Australia,
Belgium,
Canada,
Denmark,
France
(+Guadeloupe),
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Netherlands,
Spain,
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USA.

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