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Using local knowledge as a basis for planning ruminant diets in the mid hills of Nepal

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Introduction Previously, discussions with farmers have revealed a sophisticated local understanding of tree-crop interactions (Thapa *et al*., 1995) and tree fodder value (Thapa *et al*., 1977) amongst farmers in the mid hills of Nepal. Farmers rank tree fodders in terms of two locally described attributes (*posilopan* and *obhanopan*), which broadly translate to nutritional value and palatability respectively. Ranking of tree species according to these attributes was found to be consistent amongst farmers, for the two descriptors to be independent of each other (Walker *et al*., 1999) and when compared with *in vitro* chemical analyses to relate to protein supply and overall dry matter digestibility, respectively (Thorne *et al*., 1999). Intriguingly, similar local criteria for fodder evaluation have now been reported from ethnically distinct communities in other parts of the world, where similar agroecological conditions pertain (Roothaert and Franzel, 2002). In this paper, we take the analysis of the local knowledge system in Nepal further, by relating farmer knowledge to measurement of the effects of differently described tree fodders on animal productivity in on-farm feeding trials and then use the results to develop decision support tools for feed planning that combine local and scientific knowledge. This provides a useful context for discussion of the roles of local knowledge and scientific research in the improvement of livestock productivity in developing countries.

Material and methods A series of feeding trials including measurements of intake and palatability of tree fodders by cattle, goats and buffalo and productivity of cattle (milk yield) were conducted in the eastern mid hills of Nepal and compared with farmers' ranking of tree fodders in terms of various locally described attributes. Fourteen common tree fodder species (Table 1) were selected for study following a participatory rural appraisal in Dhankuta district. For productivity, 78 lactating cows owned by farmers within 2 hours walk from Agricultural Research Station, Pakhribas, willing to participate in the feeding trial and possessing enough tree fodder of the relevant species were selected. The animals were 2.5 to 10 years of age, and between 28 and 204 days into, from their first to their eighth lactation. Each treatment diet (tree fodder) was supplied at 5% live weight in addition to a basal diet provided by the farmer. The basal diet comprised 1% per kg live weight of rice straw and homemade concentrates (including some seasonal greens and waste). Each fodder type was fed for 22 days (including 1 zero day, to initiate feeding). Milk samples were collected at three-day intervals during the experiment until day 22. Monitoring of feed intake, recording of milk production and laboratory analysis (determination of dry matter of the fodder and other feeds and analysis of butterfat and SNF) was done at three-day intervals. At the end of the experiment, perceptions of the participating farmers on the impact of each supplementary feed were assessed by interview. Response of feeding tree fodders on changes in the levels of milk yield, fat and SNF were analyzed by repeated measures using orthogonal polynomial coefficients (Mead *et al*., 1993). The slopes thus derived for individual animals were compared and the least significance difference of the means for different fodder types used to test for differences. Information from farmers was combined with scientific knowledge in a feed planning decision support tool that is now being field tested in Nepal.

Table 1 Farmer ranking of tree fodders for milk and butterfat production and corresponding animal responses in on-farm feeding trials. Note that farmers distinguish two sub species of *Ficus semicordata*.

Milk		Fat	
Farmers' preference rank order (high to low)	Animal response (% change)*	Farmers' preference rank order (high to low)	Animal response (% change)*
Nebharo *Ficus auriculata*	Badahar (26.8)	Malbans	Khasrekhanyu (15.1)
Badahar *Artocarpus lakoocha*	Ghotli (17.4)	Amliso	Nebharo (12.7)
Malbans *Bamboosa nutans*	Tanki (14.4)	Badahar	Ghotli (12.1)
Kimboo *Morus alba*	Raikhanyu (10.2)	Raikhanyu	Khari (11.9)
Khari *Celtis australis*	Malbans (7.6)	Ghotli	Malbans (11.0)
Amliso *Thysanolaena maxima*	Kimboo (7.4)	Kalobans	Dudhilo (10.3)
Tanki *Bauhinia purpurea*	Nebharo (5.5)	Khasrekhanyu	Tanki (8.1)
Patmiro *Goruga pinnata*	Khasrekhanyu (4.7)	Kimboo	Gogun (7.6)
Kalobans *Bamoosa hookeri*	Gogun (2.2)	Tanki	Amliso (6.0)
Raikhanyu *Ficus semicordata*	Khari (1.3)	Khari	Kimboo (5.8)
Ghotli *Sambucus hookeri*	Dudhilo (-1.7)	Nebharo	Badahar (5.7)
Khasrekhanyu *Ficus semicordata*	Amliso (-7.0)	Gogun	Raikhanyu (4.6)
Dudhilo *Ficus nerrifolia*	Kalobans (-7.6)	Dudhilo	Kalobans (-6.0)
Gogun *Saurauria nepaulensis*	Patmiro (-21.4)		

* Calculated as the percentage of the difference between the 'average production' (average value of the milk yield at days 3, 6, 9, 12, 15, 18 and 21 during experimental feeding) and the pre-experimental feeding at day 0.

Results A large body of data were collected, a few key elements of which are highlighted here. Farmers' rankings were explicable both in terms of chemical analysis of fodder leaves and animal responses to being fed them (Table 1). Interpretation of farmer knowledge was further developed from previous research with the discovery of different evaluations for different animal species and a third descriptor of fodder, '*adilopan*,' referring specifically to the duration for which a fodder will satisfy animal appetite. Results of farmer evaluations of the fodder value of many tree species used locally (typically in excess of 70 species at village level) have been combined with scientific information to produce a decision support tool for feed planning that marshals information about trees in relation to specific agroecological contexts and predicts outcomes of different feeding options (Figure 1).

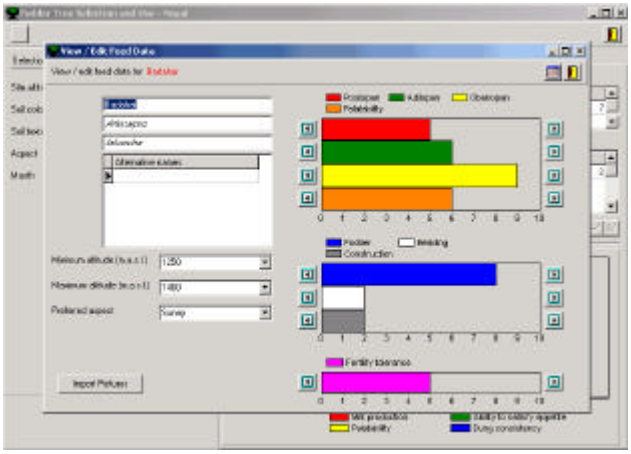

Figure 1 Illustrative output from a decision support tool for feed planning in Nepal showing attributes of a tree fodder (left) and prediction of their impact on animal productivity

Conclusions Combining local and scientific knowledge facilitates effective communication between farmers and researchers and provides a richer basis for decisions on feed planning than could be achieved with either knowledge system alone.

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