

Feeding systems based on the traditional use of trees for feeding livestock

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INTRODUCTION

The critical role of trees and shrubs in livestock production in developing countries is now well recognised by the scientific community, (Nagar-cenkar, 1983; Devendra, 1989; Swaminathan, 1989). A large number of species have been evaluated and work in India has been reviewed by Singh (1984).

Trees and shrubs have acquired a special place in semi-arid and rainfed areas due to their better tolerance of unfavourable soil-moisture conditions. We find species of *Prosopis*, *Acacia*, *Salvadora*, etc., remaining green during long dry spells, as well as withstanding several weeks of flooding.

Rajasthan, Madhya Pradesh and Gujarat states, where the studies under discussion were carried out, are bordered by a range of hills with forest cover (most of which is denuded) on one side and large semi-arid areas on the North western side, with high salinity and alkalinity. The hilly areas are inhabited by tribal people described in colonial times as "sons of forest". This community used to sustain itself on the forest products in the past and the people have a strong affinity for trees, which have provided them with shelter, fuel, fodder, food and fruits. Many parts of north Gujarat and west Rajasthan have large semi-arid areas where there is a large population of traditional cattle breeders, comparable to pastoralists in other countries. They keep large herds of cattle or goat and sheep and many are typically nomadic. Crop production is not reliable due to frequent rain failures. Farmers also keep larger herds maintained on crop residues, trees and bushes. Amongst the tree species only a few species thrive.

It is no wonder that trees have a special place in the socio-cultural

structure of our society, besides being an important resource. The teachings in our ancient scripts, like Upanishadas (Ishavasya or the Dashavaikalika Sutra of Jains), emphasise the importance of trees. During the Indus valley period, from 4000-3000 B.C., we find official seals showing the worship of tree divinities. Reverence for trees is expressed in various observances, which involve the worship of trees of *Ficus* species (*religiosa* and *bengalensis*). The trees have also been linked with penance, education and religious activity. Trees feature predominantly in paintings of Gods like Shiva, Krishna and of Buddha. The story of Bishnois, from the plains of Rajasthan, resisting the felling of *Prosopis cineraria* by the king is famous in India. The tribal people from the hills of Gujarat, Madhya Pradesh and Maharashtra States will not cut *Bassia latifolia* (local name Mahuva). Linking anything useful with religion is typical of Indian culture.

TRADITIONAL PRACTICES AND FARMER-ORIENTED DEVELOPMENT PROGRAMMES

Livestock development is one of the major rural development programmes in India. However, many have pointed out that its impact in underdeveloped areas and with backward communities have been very limited (Mishra and Sharma, 1990; Vaidyanathan, 1989). Such communities change slowly, since cannot afford to take risks, subsistence is their priority and they have strong faith in traditional methods, which have been tested over time. Crop scientists have already realised the need to study and understand traditional methods and farmer perceptions but very limited efforts have been made by animal scientists in this regard. McCorkle *et al.* (1989) and Nolan *et al.* (1989) have reported useful studies of indigenous knowledge and traditional practices in development and extension programmes.

Through various development programmes, more productive livestock are being provided or the existing livestock changed by cross-breeding. There is a need to develop farmer-friendly and beneficial extension and training programmes in order to help livestock owners to get best out of the improved animals. It was therefore decided to critically study the

following aspects to obtain a clearer understanding of the overall situation:

1. Traditional management and feeding systems for dairy animals.
2. Productivity of dairy animals.
3. Involvement of women in dairy production.
4. Farmer perceptions, views, indigenous knowledge and real objectives regarding livestock.
5. Feed resources.

The traditional feeding systems, particularly in tribal areas, make maximum use of local resources like crop residues, tree leaves, pods, seeds, etc. (Pradhan *et al.*, 1991). Milking animals are provided with somewhat better quality feeds. Feed mixtures are usually offered after soaking or cooking. Feeding of animals is invariably by women and they are well aware of the habits of each animal (Rangnekar S.D. *et al.*, 1991a and b). The farmers have identified feed materials which are claimed to be beneficial for improving the quantity and quality of milk. Farmers classify feed as very good, average or bad, on the basis of its palatability and visible effects on quality and quantity of milk, unlike researchers who look mainly at chemical analysis (Rangnekar, 1991). The traditionally preferred materials like cotton seed, cotton seed cake and coconut cake are now recognised as sources of undegradable protein. Thus some of the traditional systems are comparable to the so-called modern approaches of strategic supplementation, rumen manipulation, etc. (Rangnekar D.V. *et al.*, 1991).

Animal owners traditionally use tree leaves, bushes and creepers for feeding animals. Besides the leaves, they make extensive use of the flowers, pods and seeds of some trees as feed supplements. The use varies with season, depending on availability. In some cases the choice of tree varies with species of animal (see Tables 1 and 2).

TABLE 1. Relatively uncommon plant species traditionally used by livestock owners in tribal and semiarid belt in north east and north of Gujarat.

| Plant species | Area | Nature of plant | Parts used | Crude Protein content (% DM basis) |
|------------------------------|---------------|----------------------|-------------------------------|------------------------------------|
| <i>Ailanthus excelsa</i> | North Gujarat | Large tree | Leaves | 16 to 19 |
| <i>Alangium salvifolium</i> | East Gujarat | Medium size tree | Leaves | 20 to 22 |
| <i>Anogeissus latifolia</i> | East Gujarat | Medium size tree | Leaves | 9 to 11 |
| <i>Bassia latifolia</i> | East Gujarat | Large tree | Leaves, flower & fruit cover. | 8 to 10 |
| <i>Dichrostachys cinerea</i> | East Gujarat | Medium size tree | Leaves to cattle | 17.0 |
| <i>Diospyros melanoxylon</i> | East Gujarat | Medium size tree | Leaves | 7.8 to 8.0 |
| <i>Maytenus emerginata</i> | East Gujarat | Medium size tree | Leaves | 7.8 |
| <i>Morinda tomentosa</i> | East Gujarat | Evergreen large tree | Leaves | 22.9 |
| <i>Salvadora oleoides</i> | North Gujarat | Large tree | Leaves | 10.0 |
| <i>Salvadora persica</i> | North Gujarat | Large tree | Leaves | 11.0 |
| <i>Tinosperma cordifolia</i> | East Gujarat | Creeper | Leaves Stem | 8.5 |
| <i>Ventilago denticulata</i> | East Gujarat | Creeper | Leaves | 12.0 |

(Well known species of *Acacia*, *Albizia*, *Azadirachta*, *Prosopis*, etc. not included)

Many tree leaves, flowers and pods are identified as useful for improving milk production, milk fat, body condition and for the induction of oestrus. Table 2 lists such material and only such claims as made by a large number of farmers from many villages are considered. These have been observed and recorded by extension staff over a period of 2-3 years. Some of these approaches are comparable to strategic supplementation recommended by Devendra (1988).

TABLE 2. Use of uncommon plant species in traditional feeding: season of use and benefits claimed for livestock production.

| Plant species | Season of maximum use | Type of Animal | Benefit claimed |
|--|-----------------------|---------------------------|------------------------------------|
| <i>Ailanthus excelsa</i> | All year round | Goat Cattle | Improvement in milk production |
| <i>Alangium salvifolium</i> | December to June | Cattle Buffalo | Improvement in milk yield & fat% |
| <i>Bassia latifolia</i> (flower) | April to June | Cattle Goat | Improves milk yield |
| <i>Morinda tomentosa</i> | November to June | Cattle Buffalo | Improves milk yield |
| <i>Maytenus emerginata</i> | February to June | Cattle Buffalo | Improves fat % in milk |
| <i>Prosopis cineraria</i> (leaves & pods) | Whole of the year | Cattle Buffalo Goat | Improves/maintains milk production |
| <i>Tinosperma cordifolia</i> (creeper) | July to November | Cattle Buffalo | Improves milk production |
| <i>Ventilago denticulata</i> (creeper) | July to November | Cattle Buffalo | Improves milk production |

In some areas of Rajasthan and Gujarat, there is an established tradition of preparing leaf meal from *Prosopis cineraria* and conserving it for use in summer. Flowers of *Bassia latifolia*, commonly known as Mahuva, are dried and stored for feeding bullocks and milk producing animals. These flowers are rich in energy and are also used as human food in times of scarcity. Conservation methods are adopted by farmers wherever they are found useful.

Two creepers, *Ventilago denticulata* and *Tinosperma cordifolia* were found to have widespread popularity because of their beneficial effect on milk production. They are specially gathered and sold in small towns for use as supplements for milk producing animals.

Pods and seeds of trees species of *Prosopis* and *Acacia*, are used as supplements or as part of concentrate mixtures. The pods are known to be rich in protein and energy.

DEVELOPING FEEDING SYSTEMS

Conventional approaches of advising livestock owners to use balanced concentrates, cultivate high quality fodder crops and feed according to recommended standards have not been very successful. We learnt through experience and various studies that small changes in traditional systems, using familiar materials and methods are more readily acceptable. Traditions are based on long experience and farmers have more confidence on their own experience. It was therefore decided to try to develop feeding systems on the basis of what we learnt from farmers, taking a participatory approach and studying their methods whenever necessary. Some of the aspects have been reported earlier by Rangnekar *et al.* (1991). The steps can be described as:

- i) Detailed study of the system (already described above).
- ii) Identification of beneficial material (Table 1 and 2) and selection after validation of claims.
- iii) Literature search for available information and study material (including favourable and anti-nutritional factors) which may be scanty or lacking.

- iv) Study of feed resources - home grown, community resource, purchase and quantities fed and animal productivity.
- v) Work out nutritional status on the basis of information gathered.
- vi) Suggest changes in feeding on basis of the finding giving preference to local material and in consultation with farmer.

Initial results of the attempts at developing farmer friendly and farmer beneficial feeding system. The results of studies in different districts are summarised in Table 3. They indicate protein availability to be the major constraint.

TABLE 3. Intake and availability of nutrients.

| Centre | Season | Marginal | | Small | | | |
|----------|--------|----------------|--------------|----------------|--------------|----------------|--------------|
| | | CP | TDN | CP | TDN | | |
| Asind | M | 1.0 (1.1) | 7.0 (5.1) | 0.96 (0.94) | 6.5 (4.6) | | |
| | S | 0.7 (1.0) | 5.1 (5.0) | 0.79 (1.05) | 5.1 (5.0) | | |
| | W | 0.69 (1.00) | 4.8 (4.9) | 0.72 (0.99) | 4.8 (4.8) | | |
| Shahpura | | B | | S | | M | |
| | | CP | TDN | CP | TDN | CP | TDN |
| | M | 1.1 (1.3) | 5.3 (5.6) | 1.1 (0.96) | 5.2 (4.6) | 0.69 (0.72) | 4.6 (3.7) |
| | S | 1.1 (1.4) | 4.9 (5.9) | 0.81 (0.98) | 4.8 (4.7) | 0.61 (0.70) | 4.4 (3.6) |
| | W | 0.79 (0.90) | 6.3 (4.4) | 0.70 (0.79) | 4.8 (4.0) | 0.66 (0.67) | 4.7 (3.5) |

M = Monsoon, S = Summer, W = Winter

Source: Rangnekar *et al.* (1991).

The protein deficiency is marginal for low producing nondescript cows during 8 to 9 months of the year and for crossbreds during 4 months of rainy season. In such cases additional feeding of protein rich tree leaves (*Alangium* or *Morinda* spp.) is recommended. Majority of animal owners do not feed tree leaves in the rainy season, since grass is available. In

some cases, urea addition by spraying on roughage, treating straw or through feed mixtures is being tried in addition to use of tree leaves.

TREE PLANTING PROGRAMMES

Agroforestry has been promoted through the introduction of selected species (*Alangium*, *Morinda*, *Acacia* and *Leucaena* spp). Trees with large canopies are to be avoided and lucerne and *Leucaena* hedges have been introduced to augment the leguminous resources.

Some of native species are not generally included in tree planting programmes (e.g., *Prosopis cineraria*, *Bassia latifolia* and *Morinda tomentosa*). It took some time to persuade the authorities concerned to agree to include these along with other tree species. They would help to augment the feed resources, particularly during dry spells.

ON-FARM RESULTS

Initial results from some centres, involving more than 150 families, indicate immediate beneficial effects on milk production in all the cases (milk recording is carried out with 50 families only). The response is better in the case of crossbreds (about 2 litres/day), as expected. Acceptance is better in villages where milk fetches a good price and where trees are available nearby.

Table 4 summarizes various observations made before and after intervention. Pre-experimental observations are based on an average of four weekly records and the post-experimental results are from 6 weekly records. Animals were mostly in the 2nd or 3rd month of lactation. Observations on reproduction and health are being made and are yet to be analyzed.

TABLE 4. On-farm results of introducing tree forage.

| Centre Nos. | Type of cow | Nos. | Average milk yield per day(l) Initial period | Type of Intervention | Post experimental milk yield/day (l) |
|-------------|-------------------------|------|--|-----------------------|--------------------------------------|
| 1 | Nondescript & crossbred | 12 | 3.5 | Tree leaves & creeper | 4.25 |
| | | 8 | 7.0 | | 9.5 |
| 2 | Nondescript & crossbred | 16 | 4.0 | Tree leaves & creeper | 4.5 |
| | | 5 | 7.5 | | 9.0 |
| 3 | Nondescript & crossbred | 15 | 5.0 | Tree leaves + Urea | 6.0 |
| | | 12 | 8.5 | | 10.0 |
| 4 | Nondescript & crossbred | 8 | 4.5 | Tree leaves + Urea | 6.0 |
| | | 10 | 8.0 | | 10.0 |

ACKNOWLEDGEMENTS

The approach was developed and carried out with colleagues at Urulikanchan and field centres in Gujarat and Rajasthan. The support of Dr. Manibhai, President of BAIF and of IDRC, Canada and ICAR, through the Indo-Dutch project is gratefully acknowledged.

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