FEEDING SYSTEMS AND PROBLEMS IN THE INDO-GANGES PLAIN: CASE STUDY

by

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India has the largest bovine population in the world, with 191 million cattle and 69 million buffaloes, of which 80-85% of animals are nondescript. The numbers of milch animals are 50.7 million cattle and 28.3 millions buffaloes (Livestock Census, 1982). The National Commission on Agriculture, in its report in 1976, mentioned an annual milk yield of 157 kg and 504 kg from cows and buffaloes respectively. The low productivity of Indian animals is attributed to inadequate availability of feeds and fodders. The annual requirement of feeds and fodder are estimated to be 25.4 million tonnes concentrates, 353.0 million tonnes dry fodder and 308.1 million tonnes green fodder. However, only 16.5 million tonnes concentrates, 300.5 million tonnes straw and 261.0 million tonnes green fodder are available. The gap between availability and requirement of feedstuffs is wide, resulting in a large scale shortage. The occurrence of drought and flood has become a constant feature in most parts of the country. This creates serious problems with respect to livestock feeds.

In spite of all these problems, milk production in the country is showing an increasing trend. Currently, milk is the second most important agricultural commodity after rice. A decade ago milk production was hardly 30 million tonnes, while it reached 43.9 million tonnes in 1986-87. It is expected to exceed 50 million tonnes by 1990. The target set for 2000 AD is 65 million tonnes (Tables 1 and 2) (Chatterjee and Acharya, 1987). The increase in production is due to a massive cross-breeding programme, especially in cattle, and the use of improved quality feed and fodder. The population of crossbred cattle is estimated to be 12-13 millions, of which more than half would be breeding females with 1800-2400 kg milk production per lactation.

CURRENT PATTERN OF UTILIZATION OF FEED RESOURCES

Crop residues

Crop residues and other cellulosic materials are staple feeds for dairy animals in India. The most abundant residues are cereal straws, sugarcane tops, sugarcane bagasse, pulse straws, millet straws, etc. According to Singh and Rangnekar (1986), the availability of dry fodder/straw from grain and groundnut crops is estimated to be 302.39 million tonnes (Table 3). These feeds are unable to meet the maintenance requirement of animals because of the low digestibility, influenced by high fibre, lignin and silica content.

Table 1. Trends in milk production, *per capita* availability, processing and milch animal population since 1951 and projected to 2000 AD.

YEAR	HUMAN POPULATION (IN MILLIONS)	MILCH ANIMALS PRODUCTION (IN MILLIONS)		MILK PRODUCTION (MILLION TONNES)	PER CAPITA AVAILABILITY (GRAM /DAY)
		COW	BUFFALOES		
1951	361	46.37	21.01	17.4	132
1961	439	51.01	24.24	20.4	127
1971-72	546	53.41	28.61	22.5	112
1981-82	685	54.37	28.65	34.5	136
1983-84	720	-	-	37.1	141
1985-86	751	55.45	33.07	42.3	154
1986-87	766	-	-	43.9	157
1989-90 (Projected)	812	-	-	51.0	172
2000 AD (Projected)	986	51.25	30.59	65.0	180

Source: Dairy India (1987).

Table 2. Trends in milk production by region in Sixth and Seventh Plans (production in million tonnes)

Region	1984-85		1986-87	1987-88	1989-90
	Target	Achieved	Anticipated achievement	Target	Target (%)
1.Northern Region	18.17	17.77	19.53	20.56	22.96 (44.8)
2.Central and Eastern Region	7.69	8.43	9.42	9.79	11.27 (22.0)
3.Western Region	4.73	5.48	5.73	5.94	6.23 (12.16)
4.Southern Region	7.61	8.49	9.22	9.64	10.79 (21.04)
Total	38.20	40.17	43.90	45.93	51.25 (100)

Source: Dairy India (1987).

Regions referred to in Table 2.

Northern Region: Harayana, Himachal Pradesh, Jammu and Kashmir, Punjab, Rajastan and Uttar Pradesh.

Central and Eastern Region: Arunachal Pradesh, Meghalaya, Sikkim, Mizoram, Nagaland, Madhya Pradesh, Bihar, Orissa, West Bengal, Assam, Manipur, Tripura.

Western Region: Goa, Gujarath and Maharashtra.

Southern Region: Andhra Pradesh, Karnataka, Kerala, Pondicherry, Tamilnadu, Andaman and Nicobar.

Table 3. Estimated availability of dry fodders/straw from grain and groundnut crops in India in the year 1983-84.

Crops	Area million ha.	Production million tonnes	Ratio Grain/straw	Estimated dry fodder, million tonnes
Paddy	40.99	89.57	1:1.5	134.35
Wheat	24.39	45.14	1:1.5	67.71
Sorghum	16.26	11.93	1:3	35.79
Pearl millet	11.81	7.62	1:3	22.86
Finger millet	2.60	2.99	1:3	8.97
Small millet	3.61	1.71	1:3	5.13
Maize	5.88	7.92	1:2	15.84
Barley	1.37	1.78	1:1	1.78
Pulses	23.41	12.65	1:0.5	6.32
Groundnut	7.64	7.28	1:0.5	3.64
Total				302.39

Source:- Singh & Rangnekar (1986).

As feed supplies to the animals are closely tied to the local cropping pattern, variation in feeding regimes are observed from region to region. In the Northern part of the country, wheat straw (bhusa) is more intensively utilised, while feeding paddy straw is common in Eastern and Southern regions and part of the Western region, particularly in coastal areas. Sorghum stovers are fed in the Central and Western regions and in parts of the Southern region. Feeding millet and pulse straw is also observed in certain localities.

In sugarcane growing areas of the country (part of Uttar Pradesh, Maharashtra and Gujarat), sugarcane tops are extensively fed to dairy animals during the harvesting season from October to May. During the summer months, they constitute the bulk of green material available to animals in these regions. A survey was conducted with farmers of different size categories and in three different seasons in three villages from Western Maharashtra which showed seasonal variation in the feeding of cane tops (Table 4). Maximum use of cane tops (up to 52% of total dry matter) was observed with small farmers in the summer season (Thole *et al*., 1988).

Table 4. Seasonal changes in forage availability (%) in different farmer categories (dry basis)

Farm size	Large			Average			Small		
Season	Summer	Rainy	Winter	Summer	Rainy	Winter	Summer	Rainy	Winter
MAIZE	4	7	1	19	19	6	14	1	0
SORGHUM	7	21	9	15	41	23	7	36	6
CANE TOPS	21	9	17	31	9	33	52	11	34
LUCERNE	17	15	11	21	15	10	4	4	2
GRASS	7	13	11	2	3	2	2	16	11
DRY	13	15	8	8	8	8	19	30	44

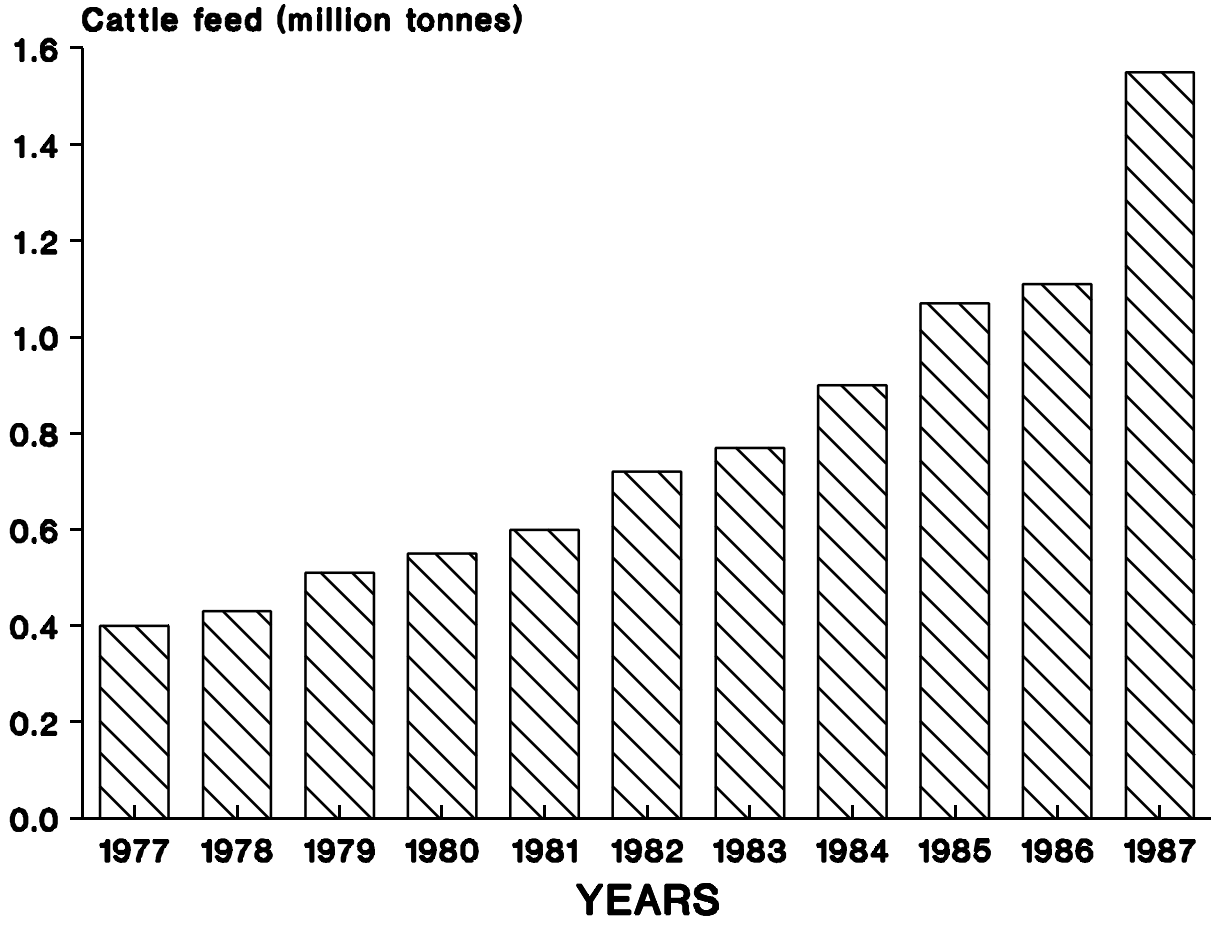
Source: Thole *et al*., (1988).

Feeding concentrates

The use of agro-Industrial by-products, either as individual concentrates or as a part of balanced concentrate mixture, is a widely observed practice all over the country. In places, farmers mix by-products with conventional feed ingredients like brans and oilcakes, sprinkle some water on the mixture and feed animals at the time of milking. Salt or mineral mixture are often added to such feeds. It has been generally observed that concentrates are fed only to lactating animals.

With the increasing popularity of dairying, compound feeds are being adopted. Because of organised milk collection through dairy cooperatives, the supply of inputs to farmers has been made possible. In 1977, total compound feed production was 400,000 tonnes and this had increased to 1.56 million tonnes in 1987 (Figure 1). Today, there are 71 feed mills in the private sector and 44 under dairy cooperatives, with a total capacity of 2.7 million tonnes/annum. In Operation Flood III, Programme 10, additional cattle feed plants with 100 tonnes/day capacity will be installed. To keep the cost of compounded feed down, the technique of least cost formulation needs to be adopted widely.

Figure 1. Trends in cattle feed production in India.



Feeding green forage

Although forage based feeding systems help lower feed costs, the scope for such systems is limited in India because of the need to give priority to food crops. The average cultivated area under fodder crops is estimated as 4.4%. In areas with better irrigation facilities, intensive fodder production is practised and in the

Northern Region, particularly Punjab and Haryana, 10% of the irrigated land is allocated to fodder cultivation. The major part of the ration of dairy animals in this region consists of lucerne, berseem, maize, oat, sorghum, etc. In other parts of the country, although the area under fodder crops has not increased, the technique of a mixed cropping system of forages with other cash crops like vegetables and sugarcane is widely adopted by farmers. Growing maize with sugarcane, brinjal, cabbage, etc., is a common practice in irrigated tracts of Maharashtra. Table 5 shows the crop rotation in different agro-climatic zones of India.

Table 5. Intensive fodder crop rotations for different agro- climatic zones of India.

ZONES	CROP ROTATION	GREEN FODDER YIELD T/ha/annum
NORTHERN	Hybrid napier intercropped with berseem	211.7
	Hybrid napier + lucerne	176.0
	Berseem + Japan rape - Jowar + cowpea	170.5
	Maize + Cowpea-Maize + Cowpea - Turnip-Oat	190.0
CENTRAL & WESTERN	Hybrid napier + cowpea-berseem + mustard	286.3
	Maize + cowpea-M.P.Chari-berseem + mustard	197.2
	M.P.Chari-turnip-oat	192.3
	M.P.Chari + cowpea-berseem + mustard-Jowar + cowpea	168.6
	Maize + cowpea- maize + cowpea-oat-maize + cowpea	168.5
EASTERN	Maize + cowpea-oat-bajra + cowpea	102.6
	Jowar + cowpea-berseem + mustard-maize + cowpea	96.0
	Maize + ricebean-berseem + mustard	111.5
	Hybrid napier alone	144.2
SOUTHERN	Sorghum + cowpea-maize + cowpea-maize + cowpea	110.7
	Maize + cowpea-maize + cowpea-maize + cowpea	106.0
	Guineagrass round the year	93.5

Source: Lal M. and Tripathi S.N. (1987)

Growing short duration forages in the gap period of the prevalent crop sequence is a standard practice in irrigated areas. For example in the wheat-sorghum-maize-bajra sequence, a gap period exists between April and June which is utilized for growing forage crop mixtures like maize + cowpea, sorghum + cowpea or bajra + cowpea with a yield of 35-40 tonnes/ha, without affecting main crop.

TECHNOLOGY OPTIONS AVAILABLE TO THE FARMERS

Supplementation

Supplementation of crop residues with fresh grasses and legumes or concentrate feeds significantly improves feed intake and the performance of animals. Feeding wheat straw with berseem or lucerne is common practice in the Northern region of the country. In dryland farming systems where forages are scarce, crop residues are supplemented with concentrate feeds. Supplementation of the basal diet with good quality forage or concentrates helps to overcome the problem of low palatability. The role of agro-forestry systems in augmenting the supply of green forage needs to be emphasized to farmers.

Urea treatment

Treating crop residues with 4 percent urea and 45-50 percent moisture improves the nutritive value by increasing digestibility, palatability and crude protein content. The process is simple and can easily be practised by the farmers. Feeding treated wheat straw supplemented with berseem (90:10 mixture on a dry matter basis) *ad lib*. was shown to support a milk production level of 6 kg/head/day without concentrates (Agarwal *et al*., 1988). However urea treatment is not yet used on a wide scale by farmers because of inadequate extension efforts to popularise the technology and the limited availability of liquid cash for farmers to purchase urea.

Steam treatment

According to Rangnekar *et al*. (1982, 1986), steaming under high pressure has been found to be effective for improving palatability as well as digestibility of sugarcane bagasse. It has been demonstrated that it is possible to utilise this process in sugar factories, since steam can be made available at a very low cost. Field trials with steam treated material have shown good results and acceptance by the farmers. In some areas, this material has been used as an alternative roughage source during feed scarcity to maintain animals while, in other areas, it has been used in complete feeds for lactating cattle.

Urea-molasses blocks

Urea-molasses blocks provide nitrogen to the micro-organisms in the rumen and thus improve the digestion of straw. They can also supply amino acids which can by-pass rumen fermentation and be absorbed in the lower gut of the animal. Cattle and buffaloes fed these supplements showed improved body condition, increased conception rates and increased milk yield. The National Dairy Development Board (NDDB) has launched a programme to popularise the feeding of urea-molasses blocks.

FUTURE DEVELOPMENT

In India, nutrition research should emphasize the development of feeding systems based on existing feed resources, under farm conditions.

A feed security system for animals needs to be developed to meet the requirements of livestock in famine and flood prone areas.

Evolving new varieties of cultivated fodders which have high yields, respond to inputs and are disease resistant is also a priority.

The identification of non-conventional feeds for livestock and developing processes for improving their nutritive values needs to be undertaken on large scale.

REFERENCES

Agarwal I.S., Verma M.L., Singh A.K. and Pandey Y.C. Studies on the
1988 effect of urea treated straw on milk production and feeding cost. *Indian J. Anim. Nutrition*. In press.

Chatterjee A.K. and Acharya R.M. Dairy Industry in India, a profile.
1987 In: Dairy India. pp. 3-19.

Lal Menshi and Tripathi S.N. Strategies and Technologies to maximise
1987 fodder production. *Indian Farming*, November 1987. p. 16.

Rangnekar D.V., Badve V.C., Kharat S.T., Sobale B.N. and Joshi A.L.
1982 Effect of high pressure steam treatment on chemical composition on and digestibility in vitro of roughages. *Animal Feed Sci. Technol*., 7:61-70.

Rangnekar D.V., Joshi A.L., Badve V.C. and Thile N.S. Studies on
1986 steam treatment of sugarcane bagasse for feeding dairy cattle: a review. Proceeding of International Workshop on rice straw and related feeds in ruminant rations, Eds. Ibrahim M.N.M. and Schiere J.B. Publ. Straw Utilization Project, No. 2, Kandy, Sri Lanka. pp. 192-200.

Singh K and Rangnekar D.V. Fibrous crop residues as Animal Feeds in
1986 India. In Rice straw and related feeds in Ruminants ration. Proceedings of an International Workshop held in Kandy, Sri Lanka 24-28 March, 1986. pp. 111-116.

Thole N.S., Joshi A.L. and Rangnekar D.V. Feed availability and
1988 Nutritional status of dairy animals in Western Maharashtra India A paper presented in "Workshop on Bioconversion of Crop Residues" held at Bangalore, 27-29 October, 1988.