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Research Article

TECHNOLOGY ADOPTION REGARDING FEEDING MANAGEMENT OF CROSSBRED CATTLE REARED IN CROP-LIVESTOCK SYSTEM IN CHITTOOR DISTRICT

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ABSTRACT

The present study was aimed to understand the socio-economic conditions, feeding management and technology adoption by the farmers rearing crossbred cattle in Chittoor district of Andhra Pradesh. The study indicated that landless labour (27.1%) and small farmers with low land holdings (36.6%) in Chittoor district were dependant on dairying for their sustenance. On an average, herd size of less than five crossbred animals (74.3%) were reared by these farmers producing up to five liters (48.3%) of milk/animal/ day. Semi-intensive feeding was predominant system for rearing of animals and crop residues formed the major roughage source. Most of the farmers were feeding single or two concentrate ingredients independently or in combination (45%) and few farmers were using commercially available concentrate mixtures (15%). Inclusion of common salt was not a regular practice in the cattle feed while mineral mixture was used occasionally. Technologies related with fodder conservation were not practiced at all. The results envisaged that sustainability of smallholder dairy farming in rural areas can be improved by suitable feed resource management and extension strategies which can bridge the gap between the technology developed and level of adoption by the farmers.

Key words: Dairy farmers, extension strategies, feed resources

In tropical countries livestock sector plays an important role in rural economy and different livestock species are reared under crop-livestock integrated farming system. Indian dairying is characterized by small and scattered milk production which is emerging as an independent agriculture enterprise. Dairying is an important means of income and employment to these households which provides steady income and enabling them to improve their standard of living. One of the unique features of the livestock sector in India is its low productivity (Sagar *et al*., 2013). Limited grazing resources available for livestock due to urbanization, industrialization and use of fallow lands for cultivation, traditional feeding management are some of the impediments in realizing the full production potential of the dairy animals. Research in animal nutrition has yielded a number of technologies, which have not only improved the nutritional quality of feed but also helped in reducing wastage of feed resources (Bharathidasan *et al*., 2007). Studies related to feeding practices traditionally adopted by the farmers and feed resources available with them would help not only in understanding the nutritional status of the animal, but also to find the probable solutions in exploiting the full genetic potentiality of animals to make dairying economically viable enterprise (Chatterjee *et al*., 2007). Hence, the present study was planned to understand the technologies regarding feeding and management practices adopted by the farmers and to suggest suitable interventions in existing feeding system.

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MATERIALS AND METHODS

Location of Study: The present study was taken up in Chittoor district; the second largest milk producer district in Andhra Pradesh with 8,00,000 crossbred population. Chittoor district is situated between 12-37" to 14-8" of Northern latitude and 78-33" to 79-55" of Eastern longitude.

Selection of Farmers: The study was conducted in 66 mandals (administrative units) by selecting one village from each mandal. A stratified random sample with cross-sectional survey of 790 households was conducted by considering a minimum of 10 farmers from each selected village with different land holdings and categorized as landless (without cultivable land), small (1-2 ha), marginal (2-5 ha) and large farmers (>5 ha).

Collection of Data: Data was collected by conducting household interviews using a pre-tested, structured questionnaire. The information regarding family profile, economic aspects, land holding capacity, crops grown, land allocated to growing of food crops (paddy, sorghum, jowar, ragi etc.), cash crops (sugarcane, groundnut, sunflower etc.) and forage crops (Napier, jowar fodder trees etc.), livestock holding, individual animal performance (daily milk yield and productive/reproductive status),

feeds and fodders available, feeding management and technology adoption was elicited from individual farmer.

Statistical Analysis: The data was subjected for descriptive statistics and frequency analysis (Snedecor and Cochran, 1980).

RESULTS AND DISCUSSION

Socio-economic Profile of Farmers: The results (Table 1) indicated that majority of the dairy farmers had less than 5 family members and remaining (45.7%) had the family size of more than 5 members in area under study. It is evident that bigger the family size, larger the scope of participation of family members to share the work load related to dairying. The typical Indian joint family system disintegrated over a period and now nuclear families are in existence.

Literacy: It was evident from the Table 1 that majority of the dairy farmers were illiterate followed by literate (literate means acquiring the ability to read and write) and educated (educated means to acquire knowledge to enhance one's ability to reason and make sound judgement). The development of individual is significantly influenced by education and experience as it brings change in knowledge, skill and attitude (KSA) (Embet and Zeleke, 2008). Most of the dairy farmers were illiterates which might be due to their low socio- economic status. It was interesting to know that considerable number of educated people had dairying as a source of employment. In mixed farming system there is a positive relationship between income and family education status (Kumar *et al.*, 2008) as the educated person better utilize the resources for income generation.

Occupation: The study indicated that majority of the farmers had agriculture as main occupation while dairying was the secondary occupation. In small scale farming systems animal production is integrated with crop production. It is interesting to know that persons involved in government or other services were also showing interest in dairying. The study revealed that 27.1% farmers were landless farmers and 36.6% farmers were small with landholdings less than 2 hectares. This clearly indicated that farmers (63.7%) with limited land possession (landless and small farmers) were involved in dairying. Generally small and marginal farmers prefer milch cattle depending on their need and utilize agriculture by products available with them. The results of present study are in accordance with those of Thammi Raju *et al*. (2006).

Livestock Holding and Milk Production Profile of Animals: Majority (74.3%) of the farmers had less than five animals (Table 2). Small farm holdings have been reported to be the significant feature of Indian farming system (Thammi Raju *et al*., 2006). Majority of the farmers belonged to landless labour and small farmers' categories (27.1 and 36.6%, respectively); poor economic conditions of landless labour and small farmers with limited resources could be the reason for less number of livestock kept by them. In mixed farming system there is a positive relationship between income and herd size, land holding and natural resources, which is a common finding in consonance with the results of Kumar *et al*. (2008).

Chittoor district is known for its highest crossbred cattle population. The data reflects that the dominant dairy cattle breed across all the farmer categories was Jersey cross (76.0%). Few farmers maintained Friesian cross cattle whereas, nondescript cattle were quite negligible (Table 2). More than 90% cattle population in surveyed area was crossbred. Majority of the farmers (68.2%) possessed less than two milch cattle. Very few farmers (20.8% and 11.0%) possessed 2-4 and more than 4 animals, respectively. This was attributed to their socio-economic condition as most of the farmers belonged to either landless labour or small farmer category. Studies of Thammi Raju *et al*. (2006) also revealed that average herd size had two milch cattle.

Most of the farmers (48.4% and 37.3%) maintained animals with milk production upto 10 L (day/animal) (Table 2). Very limited farmers possessed animals with high productivity. There are several reasons which can be attributed to low milk production by the crossbred cattle; the nutritional status remains the single largest factor responsible for poor milk production (Sharma *et al*., 2007) as also observed in the present study.

Table 1
Socio-economic profile of farmers

Attribute	Type	Total (%)
Family size	Less than five members	360 (54.3)
	More than five members	430 (45.7)
Literacy (%)	Illiterate	336 (42.5)
	Literate	269 (34.1)
	Educated	185 (23.4)
Occupation (%)	Dairy	243 (30.8)
	Agriculture	382 (48.3)
	Govt. services	71 (9.0)
	Other services	94 (12.0)
Farmers' category	Land less	214 (27.1)
	Small (1-2 hectares)	289 (36.6)
	Marginal (2-5 hectares)	136 (17.2)
	Large (>5 hectares)	151 (19.1)

Table 2
Livestock holding and milk production profile of animals

Attribute	Type	Total (%)
Herd size (nos.)	Small (<5)	587 (74.3)
	Medium (6-9)	187 (23.7)
	Large (>10)	16 (2.0)
Breed	Jersey cross	600 (76.0)
	Holstein Friesian cross	182 (23.0)
	Non- descript	8 (1.0)
Milch animals (nos.)	2	539 (68.2)
	3-4	164 (20.8)
	>4	87 (11.0)
Milk production (L/day/animal)	Up to 5	382 (48.4)
	6-10	295 (37.3)
	>10	113 (14.3)
Milk production (L/day/family)	Up to 10	283 (35.8)
	11-15	209 (26.4)
	16-20	186 (23.5)
	>20	112 (14.3)

Milk production was less than 10L/d from the animals maintained by 35.8% of the families and about 49.9% of the families were producing between 10 to 20L/d (Table 2). This may be due to the reason that most of the animals maintained by the farmers were moderate (5-10L) milk producers. In addition, a large number of farmers had few (2-4) animals per family that might have resulted in the moderate milk production.

Feeding Management: Feeding systems are primarily based on grazing of animals on native pastures. It is evident from Table 3 that semi-intensive feeding system was the most predominant system followed by intensive system with common and individual stall feeding, whereas, a small fraction of farmers were adopting extensive system. The feeding system adopted by the farmer predominantly depends on the available feeding resources.

Animals were stall fed in majority of the situations (84.0%) and group feeding was less preferred (Table 3). Unproductive animals maintained under semi intensive management were fed only once a day with crop residues alone. Supplementation of concentrates was not a practice except for productive animals. It was observed that only lactating animals were given cereal byproducts and concentrate feeds (oil cakes, brans, pulse chunies etc.) since farmers received immediate returns. Most or part of the feed requirements were met through grazing on natural grasslands and partly supplemented with grass or crop residues (straws/stovers). No concentrate was given to growing, pregnant or dry animals. Similar observations have been recorded earlier (Emebet and Zeleke, 2008).

The animals were fed twice in a day (56.5%) before and after allowing for grazing as semi- intensive feeding adopted by majority of the farmers**.** From management point of view, optimum feeding of two or three times a day has been reported to be sufficient and economical (Thomas and Sastry, 1991), though, increased frequency of feeding might be beneficial for better utilization of nutrients.

In majority of the occasions (96.7%), farmers did not maintain proper ratio between roughage and concentrate (Table 3). Nutrition is one of the important aspects of livestock production. The adequate proportion of ingredient to be added in diet is also equally important. Most of the farmers (78.5%) were not aware of providing concentrate mixtures to the pregnant animals (Table 3). The respondents were not aware of the importance of feeding practices that should be adopted not only for the animal welfare but also for sustainability of the enterprise. Feeding system for lactating and non-lactating cows should be based on their physiological status, as the feed requirements vary with their status. These findings are in accordance with those of Emebet and Zeleke (2008) who also reported that farmers were not providing proper nourishment to pregnant animals.

Only lactating animals were taken care of as 81% of the farmers were feeding the lactating animals at the time of milking (Table 3). Most of the farmers did not know the quantity of concentrate mixture to be given. In majority of the occasions quantity offered was not at all sufficient to meet the requirement of the animals. A concentrate mixture with at least 20% crude protein and 70% total digestible nutrients can be provided @ 1Kg for every 2.5 Kg of milk produced in milch cows. A small fraction of farmers (15.1%) offered small quantity of rice

Table 3
Feeding management adopted by the farmers

Attribute	Type	Total (%)
Feeding system adopted	Intensive	308 (39.0)
	Semi Intensive	375 (47.5)
	Extensive	107 (13.5)
Type of animal feeding followed	Individual	664 (84.0)
	Group	126 (16.0)
Frequency of feeding	Once daily	284 (36.0)
	Twice daily	446 (56.5)
	Thrice daily	60 (7.5)
Proper ratio of roughage:concentrate	Followed	26 (3.3)
	Not followed	764 (96.7)
Special feeding during pregnancy	Followed	170 (21.5)
	Not followed	620 (78.5)
Offering concentrate/mixture for milch cattle (At the time of milking)	Followed	640 (81.0)
	Not followed	150 (19.0)
Feeding of calves	Followed	120 (15.1)
	Not followed	670 (84.9)

Table 4
Technology adopted by the farmers in feeding management

Attribute	Type	Total (%)
Type of green fodder	Local grazing grass	174 (22)
	Improved fodder varieties	252 (32)
	Legume fodders	21 (3)
	Tree leaves	47 (6)
	Combination (local grass with improved fodder)	279 (35)
	Land used for fodder production (%)	14 (2)
Chopping of green fodder	Hand chopping	182 (23)
	Machine chopping	31 (4)
	Offering un chopped	577 (73)
Procurement of dry roughage	Grown in own fields	356 (45)
	Purchased	150 (19)
	Combination	284 (36)
Feeding of concentrate feed	Single ingredient	340 (43)
	Two ingredients	387 (49)
	Three or more	63 (8)
Type of concentrate mixtures	Home made	356 (45)
	Purchased	119 (15)
	Combination	315 (40)
Use of common salt	Not using	624 (79)
	Occasionally	40 (5)
	Regularly	126 (16)
Use of mineral mixture	Not used	774 (98)
	Occasionally	16 (2)
	Regularly	0 (0)
Enrichment of straw with urea	Known	0 (0)
	Not known	790 (100)
Hay making	Known	190 (24)
	Not known	600 (76)
Silage making	Known	0 (0)
	Not known	790 (100)
Use of unconventional roughages	Known	95 (12)
	Not known	695 (88)
Use of unconventional concentrates	Known	71 (9)
	Not known	719 (91)

bran to calves. Feeding of concentrate mixture to calves was not practiced. Extension agencies should strive hard to change the attitude of the farmers and encourage them to adopt best feeding management practices. Similar findings were also reported by Meena *et al.* (2008). An in depth under-standing of feeding practices of dairy animals would help not only in getting a comprehensive account of level of dairy farming development in study area, but also in planning and taking up corrective measures.

Technology Adoption in Feeding Management: Perusal of data (Table 4) revealed that the farmers were using local grazing resources since they were rearing cattle under semi- intensive feeding system. Farmers were aware of growing improved fodder varieties. But a limited (2.0%) cultivable land was allocated for growing these fodders varieties which was not adequate to meet the requirements of their livestock. The animals were offered with green fodders like local grass and cultivated fodder of their own farm produce depending upon the availability. Scarcity of quality green fodder was a major constraint observed in feeding of cattle. This observation is similar to that reported by Sharma *et al.* (2007). Sugarcane tops were also given as source of green fodder during the harvesting season. Supplementation of legume forages was not practiced. Feeding of top feeds like Subabul (*Luecaena lucocephala*), Avisa (*Sesbania sesban*) and Mulberry (*Morus alba*) to the livestock was followed by very few farmers (6%). The farmers were not aware about importance of feeding legume crops as some farmers cited the availability of seeds and shortage of land as a factor which constrain the use of these forages.

Majority of the farmers were not chopping the fodders (73%) before feeding (Table 4). Only few farmers (23%) were following hand chopping while very limited farmers had machines for chopping. The chopping of green fodders will prevent selective consumption and avoid wastage of fodder to the extent of 25-30%. In addition, the loss of biological energy of animal spent in chewing unchopped material can be minimized.

The commonest crop residue used was paddy straw in variable quantity, followed by groundnut straw (Table 4). Sorghum/maize stovers and sugarcane tops were used to a limited extent depending on the availability. The roughage was procured from the own fields by majority (45%) of the farmers. Some landless farmers (19%) even purchased the dry roughages. In the study area farmers offered concentrates (either cereal grains or oilcakes depending on the availability) to their animals and farmers relied more on mill byproducts (rice bran/ pulse chuni/ wheat bran) and homemade concentrate mixtures. The farmers were using either single (43%) or two ingredients (49%) in majority of the occasions for feeding of animals.

Some farmers used rice bran/ pulse chuni in combination with groundnut cake in the form of homemade concentrate mixture for their animals. The proportion of the ingredients was not constant and varied a coh. The use of ready mix concentrate mixtures was not a common practice. Commercial available concentrate mixtures were purchased but it was limited to progressive farmers. The major constraint for use of concentrate supplement was found to be poor economical status of the farmer.

Feeding of common salt was not a common practice among the farmers (79%; Table 4). Similar

finding has been reported by Sharma *et al*. (2007). None of the farmers used mineral mixture regularly except on veterinarian's prescription as also opined by Garg *et al*. (2005). The reason for non-adoption of feeding mineral mixture to the animals was probably due to lack of knowledge of dairy farmers. Some farmers revealed high cost of mineral mixture to be the main reason for its non-use. Most of the reports in the literature (Chatterjee *et al*., 2007; Gowda *et al*., 2008) also revealed that use of common salt or mineral mixture was not a common practice in different states in the country. Minerals have lot of significance in animal nutrition with regard to growth, production and reproduction.

Hay making was adopted by the farmers to a limited extent (24%) when forages were available in abundance (Table 4). Silage making was not at all practiced by the farmers. Seasonal feed deficits can be reduced considerably through conservation and storage of green forages for use during the lean periods. During monsoon, plenty of green forage is available in fields, bunds, road sides and under forest covers as well as sugarcane tops available in plenty during harvest season. These fodder sources can be effectively used for animal feeding throughout the year by converting them into silage. Feeding of ensiled fodder could be more economical than supplementation with concentrates.

Agro industrial by products and crop residues represent a vast animal feed resource, which is still largely unexploited. No single farmer was implementing the technology like enrichment of straw with urea (Table 4). Some sort of processing or treatment of roughages particularly crop residues have positive effects on improving on intake/or digestibility of crop residues there by results in efficient utilization. Urea treatment offers better economical returns to the farmer and may help in reducing land area required for green fodder production. Major bottle-neck for the application was farmer's lack of knowledge about the uses and advantages of these methods. It seems that the benefits of the research have not really percolated down to the field level as also opined by Bharathidasan *et al*. (2007).

Inclusion of unconventional roughages and concentrates was adopted by a very limited fraction of farmers. The district is having considerable fruit and vegetable production. Lot of byproducts like tomato, mango, guava, papaya wastes are available from fruit canning industry and market yards. Farmers are not fully aware of utilizing such unconventional feeds for livestock. In some of the areas, horticulture is practiced. Hence lot of mulberry waste available can be utilized for cattle feeding. Inclusion of unconventional feeds will not only reduce the cost of feeding but can also reduce the scarcity of feeds. Sustainable animal production is dependent on the choice and application of appropriate technologies.

This study indicated that the dairy farmers rely on semi-intensive rearing system, without full control of feed resources. In order to exploit full potential from crossbred dairy cows, appropriate extension strategies are to be formulated to train the farmers for economic production as well as to adopt technologies in nutritional management.

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