CHAPTER II

REVIEW OF LITERATURE

Livestock is the integral part of rural economy in Bundelkhand region. The dependence of the people on livestock was reinforced due to poor agricultural productivity on account of large number of small and marginal holdings, poor resource base and low cropping intensity of about 113% (Government of UP, 1991). Average size of land holding is very less and therefore majority of the farmers falls in the category of small and marginal in Bundelkhand region (IGFRI, 1992). Agro-ecological variations influenced regional planing for feed and fodder availability. Feed resource productivity and allocation efficiency have much effect on milk production in Himachal Pradesh (Sharma and Singh, 1993). Tyagi (1997) presented the information on soil, vegetation, and Livestock of Bundelkhand region in an Altus. Lalitpur district of the region has a lot of opportunities for goat rearing due to very potential local breed of goat and availability of large forest area (Mishra and Dwivedi, 1997).
Ramana et al. (2000) studied the mineral content of soil, feed, fodder and blood plasma samples of dairy animals from southern transition zone of Karnataka and reported that more than 50% of the animal screened showed low copper and zinc in blood plasma. It is therefore, supplementation of these mineral is required in the ration of livestock for optimum production.

2.1 Feed resources

Hampaiah R, (1981) discussed the need for forage forestry is in view of the increased population, imbalance in the ecosystem and non availability of good quality fodder in semiarid regions. The concept, scope and management of forage forestry systems are discussed and constraints analyzed. Fodder trees, grasses and legumes suitable for cultivation in semiarid regions of India are listed.

Punj and Devendra (1988) reported that a major gap exists between the requirements and supplies of concentrates and green and dry fodder for feeding livestock in South Asia. To alleviate this shortage, it is essential to increase these feeds by growing more fodders, promoting agroforestry and social forestry, improving the nutritive value of crop residues and utilizing non-conventional feeds. Potentially valuable feeds include rubber (Hevea brasiliensis) seed cake, sal (Shorea robusta) seed meal, spent anatto (Bixa orellana) seeds, tapioca waste, tea waste, babul (Acacia nilotica) seeds, slaughter house byproducts, animal organic wastes (cattle dung, poultry excreta), casia tora (Cassia tora) seeds, mango (Mangifera indica) seed kernels, niger seed cake, karanj (Pongamia pinnata) cake, guar meal, prosopis juliflora pods and cassava leaf meal.
Mudgal et al. (1988) reviewed feed resources in India. Present production provides only 56% concentrates and 64% green fodder for ruminant feeding, and discussed Research programmes on improving feed value and non conventional feeds are outlined and methods of implementing research findings.

Ravindran and Devendra (1988) reviewed the availability and utilization of animal feed resources in Sri Lanka. Sri Lanka is self-sufficient in roughage requirements, but deficient in concentrates. Rice straw is major feed resource available, but only a small proportion is utilized as feed. Other available crop residues and agro-industrial byproducts are under utilized and increasing their utilization represents the challenge for future. The need to develop appropriate feeding systems supported by “on-farm” evaluations has also been highlighted.

Tripathi AK (1991) reviewed the feed resources and nutrients available in the eastern region of India with respect to the requirements for the population of cattle and buffaloes. who indicated a huge deficit of concentrate (86.97%), greens (72.53%), digestible crude protein (74.83%) and total digestible nutrients (42.11%), however, there is a relative surplus of crop residues (19.7%). In this context, the strategies for optimizing crop residue utilisation for improving farmers return from milk are described. Means of improving straw utilization are urea treatment of straw, use of urea molasses, mineral licks and supplementation of straw with 5-10 kg of a legume fodder. For the concentrates, the importance of balanced cattle feed and bypass protein feed is discussed to achieve judicious use of available resources, maximum efficiency of nutrient utilization and increased income from milk.
Grasslands of the Bundelkhand Region, Uttar Pradesh, grasses constituted about 96% of the total forage, with legumes and forbs contributing only 2.5% and 1.8%, respectively (Singh et al., 1995). The major grasses were Bothriochloa pertusa, Apluda mutica, Desmostachya bipinnata, Dichanthium annulatum, Digitaria marginata, Eragrostis gangetica, Echinochloa colonum and Setaria glauca. Monthly forage yields ranged from 681 to 1522 g/m². Dry forage production ranged from 79 g/m² in the summer to 965 g/m² in the rainy season, with a total annual production of 1241 g/m². Forage production potential and nutritive evaluation (crude protein, fat, fibre, ash and carbohydrate) indicted that this grassland community is superior to many others in India.

Deoghare P R (1997) conducted a survey of availability of resources, and the income and employment potential of a sample of 451 goat raising households in Mathura District, Uttar Pradesh, India, in 1990-91. The main occupation of households was agriculture (68.51%) dairy (10.20%), goat keeping (20.40%), and sheep farming (0.89%). The number of family members and farm workers increased as land holding size increased. Average net income per household per year from livestock farming was 26.69% and from crop farming, 73.31%. Average labor employment per household per year from goat, sheep, buffalo and crop farming was 23.34%, 1.96%, 33.17% and 41.53%, respectively.

Gomez et al. (1998) estimated deficit of fodder requirement ranging from 6% in Tikamgarh district to 66% in rich rainfed zone comprising of Datia, Jalaun,
Hamirpur, Banda. Tyagi et al. (1997) estimated forage deficit of 38.95 in UP part and 27.99 in MP part in lakh tones. The area under fodder is about 1% only.

Saran et al. (2000) conducted a survey in UP part of Bundelkhand region during 1996-97. It revealed that crop residues constituted the major feed resources for the domesticated livestock population. The land and livestock holding patterns revealed that large farmers and farmers with big family size kept more livestock compared to small farmers. Berseem as green fodder, wheat and pea straws (dry fodder) constituted over 41%, 40% and 13% respectively of the total livestock feed availability from cultivated sources during rabi. Sorghum (green) contributed about 58 % of total kharif availability of livestock feed from cultivated sources followed by crop residues of Soybean (21.63%) and black gram (16.68%). More than 88% of annual availability of dry fodder and 86% green fodder was obtained during rabi season itself. Anna Pratha, a system of leaving the livestock tree for grazing was commonly practiced during lean seasons as also during rainy season. Soaked oil cakes and concentrates mixed with dry fodder (wheat and peas, straw) were also offered to the milch animals during the periods of green fodder scarcity.

2.2 Livestock feeding

Pandey et al. (1980) used multistage stratified sampling design in the selection of 120 farming households with at least one dairy cow or buffalo. Data on feed, milk output, lactation and season were analyzed to establish input-output relationships. Dairy input (i.e. fodder, concentrates, labor and other cash expenditure) and lactation were responsible for 40-85% of the variation in milk yield. Fodder was
the most significant production factor, followed by concentrates. Manipulation of feed levels had more effect on yield in the rainy season for cows but in the winter season for buffaloes. It is recommended that dairy farmers should be educated on the rational use of feed, labor etc.

ICAR (1985) published the feeding requirements of ruminants on the basis of their body weight. Feeding standard published by NRC (1988) and Pathak (1998) were also referred.

Desai et al. (1988) surveyed the feeding practices and types of feed given to dairy cattle and buffaloes in both tribal and non-tribal areas of Valsad, India, during summer, monsoon and winter of 1984-85. Samples of the 56 different types of feeds were analyzed and the chemical composition is given in tables. In tribal areas, forest tree leaves such as asan, bivla, sisam and dhatirva are given at about 3-5 kg in the summer, but in monsoon the animals maintained their body weight on pasture alone. In non-tribal areas, rice straw, rice polishing, guar seeds, guar meal, husk and concentrates were given. In coastal areas, unconventional feeds such as aal grass and tuavar leaves are given at 10-15 kg daily.

Rai et al. (1993) conducted a survey on goats at 2 villages. For farmers with small and marginal farms, and for landless farmers, flock size averaged 4.7, 4.2 and 3.5 respectively. On the 3 categories of farm, 75.0, 33.3 and 61.1% of goats were of the Barbari breed, the remainder being of the desi type. On the small and marginal farms, 25.0 and 16.5% respectively of goats were kept intensively.
Roggero *et al.* (1996) reviewed and defined the feeding system and the meaning that can be attached to the concept of sustainability and examined its application to existing systems. The attributes of sustainability are derived from an analysis of time-tested systems in Mediterranean and tropical regions. Farm organization, animal feed intake and product quality are considered to mean more than mere correspondence between feed requirements and crop production patterns. The rational management of rangeland and forestry systems was taken as an example of organization and planning of the use of renewable local resources. The multiple use of a specific feed resource and the development of a mixed pasture-cropping systems, with possible inclusion of fodder trees and shrubs, were considered as example of diversification and exploitation of local resources. The integration and fractionizing of diverse feed resources and the combination of different activities in a given area, are intended to constitute a global approach to land use aimed at reducing off-farm inputs whilst enhancing natural resources and nutrient recycling. This approach should facilitate the development of mixed and diversified systems, with alternative yield objectives, low environmental impact and reduced economic hazards. Examples are reported on the intercropping of forage, food and fuel sources in the tropics, and for cereal and livestock production in the Mediterranean basin. Flexibility of ruminant production and complementarities between animal species are also described as examples of integration and multiple uses of local feed resources. The possible roles of fodder species and the need to combine several activities into dynamic agricultural systems are discussed. Attention is also drawn to the vital links between farmers and
the wide rural community through coordinated actions that are appropriate to a mosaic of local conditions.

Ranjhan (1997) reported that goat farming is predominant in semi-arid regions of the country including Bundelkhand and plays an important role in contributing livestock outputs, enhancing rural livelihoods, providing stability to the farmers and its feeding habits suited to rain fed farming system. Badal and Dhaka (1998) analyzed feeding pattern of livestock in Bihar and concluded that green fodder intake was adjusted according to its seasonal availability.

Gomez et al. (1998) indicated that free range grazing and managed feeding were not mutually exclusive practices, but often coexisted, both at zonal, village and herd level. However, the relative importance of the two systems varied between zones, villages in each zone and households in each village.

Ranjhan (1999) reported that crop residues are the major feed resources and about 50 to 60 percent of DMI in large ruminants come through crop residues only. Pachauri et al. (1999) reported that goats potential is not often exploited fully due to lack of appropriate feeding systems.

Singh et al. (2001) reported that the agrarian economy of Jhansi district can be improve through forage based livestock production system. Grazing lands are main source of forage which is used for grazing. Owing to heavy grazing pressure and biophysical factors, grazing lands are in the different stages of degradation and the rate of deterioration is upwards and within a decade more than 6% moderately grazing
lands turned into ravines. The total forage deficit in the Jhansi district was estimated as 466588 DM ton/year which is about 45.96% of the estimated forage production.

Singh et al. (2001) assessed forest cover and impact of forest grazing by the application of remote sensing and GIS techniques and a plan of restoration of degraded forest of Jhansi district through appropriate grazing management suggested.

Yadav P.S. (2002) studied the feeding pattern of buffaloes in Panipat district of Haryana state and noticed that animals need dietary supplementation specially during lean period. Mahanta S.K. (2002) conducted an on farm experiment in Jhansi district and reported that concentrate supplement @ 1.0% of the body weight to grazing goats appears to be profitable under field conditions.

Sajjan Sihag et al. (2002) conducted survey for locally available feeds and feeding practices and socio-economic status of farmers in cotton growing area of Haryana. The farmers were classified according to land holding ie. Small farmers (2-5 acres), medium (5-10 acres) and large (>10 acres). The number of buffalo per family was higher in large farmers compared to others. Availability of desi cattle was higher in small farmer and lowest with large farmer. Number of milch buffalo and cattle, milk yield of cattle and buffalo and average milk yield per animal was significantly higher in the animals of large farmers than other categories.

Patange et al. (2002) studied nutrient availability to milch Marathwadi buffaloes reared by different categories of farmers in Marathwada region of Maharashtra State. Overall ration of milch buffaloes consisted of 5.41, 5.09 and 2.16 kg of green fodder, dry fodder and concentrate, respectively. Maximum green fodder (6.6
kg/h/d) was supplied during winter season, whereas, maximum dry fodder (6.01 kg) and concentrate (2.25 kg/h/d) were supplied during summer season. The nutrient supplied to the buffaloes varied significantly between the categories of farmers.

2.3 Chemical composition and nutritional status

Skarpe and Bergstrom (1986) reported that dry matter degradability is related to nutrient composition and varies widely among tree and shrubs species. A range of 38-78 percent DM degradability was observed in shrub and tree species.

Majumdar et al, (1988) reported high CP contents in all the browse species possessed throughout the year. In the monsoon or post monsoon season the CP content was on higher side and declined with maturity of the leaves.

Handa and Gill (1989) studies nutritional status of dairy animals kept by different categories of farmers in Punjab and observed that maximum amount of concentrate was fed during spring (March-May).

Albrecht and Broderick (1990) reported that digestibility was associated with higher NDF and ADF content. Ruminant livestock require fibre for normal rumen function but fibre also limits feed intake and degradability. Effect of lignin on digestibility of feeds were also described by various workers that lignin is the component most negatively correlated with degradability (Lapierre, 1993; Buxton and Fales, 1994; Dzowela et al, 1995).

Pradhan (1994) observed the deficit of the nutrients as DCP and TDN, when animals were fed on poor quality roughage based diet. Whereas Lal et al (1995)
observed nutritional status of lactating buffaloes in Hisar and emphasized the need to increase the nutrient supply to support the production potential of these buffaloes.

Singh et al (1998) reported nutritional status of buffaloes in rural area of Azamgarh district of Uttar Pradesh. Farmers maintaining low to medium yielding buffaloes require augmenting the nutrient supply by providing more of greens, concentrate and dry roughage to get the optimum production.

Singh AK et al. (1998) reported rumen degradability of the DM, organic matter (OM) and N of leaves of 5 fodder tree species, anjan (Hardwickia binata), bubul (Acacia nilotica), Kardhaie (Anogeissus latifolia), Mahaneem (Melia azedarach) and siris (Albizia lebbeck), was examined. In sacco studies were conducted using 45 nylon bags in 3 fistulated cattle maintained on mixed grass hay and green berseem. CP content differed between the species ranging from 10.34% (A. nilotica) to 16.52% (A. lebbeck). Higher ( P<0.05) DM, OM and N disappearance was observed in M. azedarach leaves: A. lebbeck leaves had the lowest values. The results suggest that the tree leaves studied are a good source of nutrients for ruminants and suitable for use as supplements.

Singh et al. (1999) reported seasonal variation in DM and nutrient content of leaf samples from anjan (Hardwickia binata), babool (Acacia nilotica), Kardhaie (Anogeissus latifolia), mahaneem (Melia azedarach) and siris (Albizia lebbeck) was evaluated. Leaves obtained during March- June were found to be suitable for feeding livestock. CP content in tree leaves was highest in the rainy season (16.94%) followed by summer (15.02%) and winter (13.63%).
Ramana et al. (2000) evaluated ten multipurpose tree and shrub species grown at NRC Agroforestry, Jhansi for their chemical composition and insacco degradation. The CP ranged from 7.6 to 29.2 percent on dry matter basis. Organic matter was as high as 95.13 and as low as 84.2 percent DM. A wide variation was observed in the insacco degradation values of different chemical constituents. Chemical composition and ISD of the MPTS leaf materials indicated that most species had potential to be used as protein source to supplement with grasses or crop residues in dry season.

Udeybie et al. (2000) analyzed the comparative dry matter intake and nutrient utilization efficiency in growing cattle and Buffaloes based on the results obtained from growth trials conducted in India. The DMI was higher in growing cattle than in growing buffaloes but buffalo calves utilized dry matter, energy and protein more efficiently for growth than cattle calves.

Negi et al. (2003) assessed eight browse species of Bundelkhand region for their proximate constituents. Crude protein varied from 8.9 – 25.2 percent in these shrubs in different seasons. There was less variation in cell wall constituents round the year. These shrub species may be used as source of forage during lean period.

2.4 Livestock production and economics

Tripathi et al. (1986) analyzed economics of production of cows’ and buffaloes’ milk during 1977-78 for 100 farms divided into 5 size groups ranging from<1 to >4 ha. Per cow and buffalo, resp. Lactation averaged 210 and 70 days, maintenance cost Rs. 637.09 and Rs. 1004.03, milk yield 507.65 and 620.15 l, milk production cost Rs. 1.17 and Rs.1.53/l, and farm business income Rs. 306.82 and Rs.
For both species, input/output ratio averaged 1:1.31 and net farm income averaged Rs. 323.35, tending to increase with farm size. Cobb-Douglas production functions showed that farmers of 2-3 ha used resources (roughages, concentrates and labor) most efficiently. Concentrates was the resource which had highest marginal value productivity, followed by roughage. This suggested that net income could be increased by higher expenditure on feeding.

Shalader et al, (1994) selected 120 milk producing households from six villages in Mathura district of Uttar Pradesh during 1991-92. The sample comprised of 21 landless, 49 small (<2.0 ha), 28 medium (2.01 to 4.0 ha) and 22 large farmers (>4.0 ha); data on input/output and other factors were collected for cows and buffaloes. Production function analysis was carried out using multiple linear regression and marginal value products of various feed resources were calculated to examine resource use efficiency. Green fodder and concentrates contributed positively and significantly to the milk yield both for cows (linear milk yield functions: 0.2096 and 0.6242) and buffaloes (0.0884 and 0.5755) on all farms except landless and medium, respectively. The stage of lactation had a negative and significant impact on the milk yield of buffaloes (-0.3616). The elasticity of production (potential of milk production) of feeds and fodder were positive for all milk producing households. The marginal value products of concentrates were positive and significantly greater than unity for cows (2.8089) and buffaloes (2.8775) on all farms, whereas the marginal value products of green fodder (0.9432 and 0.4420 for cows and buffaloes, respectively) and dry odder
(0.3525 and 0.1110, respectively) were positive but less than unity indicating excessive use.

The factor-product relationship in the use of resources for milk production by Murrah, graded Murrah and local buffaloes was studied in Bulandshahar district of Uttar Pradesh during 1980-90 (Deepak Shah et al, 1995). The Cobb-Douglas production function revealed that concentrate was the most significant input influencing milk output. Green and dry fodder inputs also influenced milk production positively in almost all seasons. The stage of lactation had a negative effect on milk yield while the value of the animal was positively associated with milk production. The marginal product value of concentrate for milk production showed that in almost all cases it was used efficiently by Murrah buffaloes. However, the use of green fodder input was efficient only in the rainy season and only by local buffaloes. It is suggested that a reallocation of feed resources will increase milk production by buffaloes.

Lee Keejong et al. (1996) studied 40 dairy farms in the process of increasing their herd size in order to propose a model for establishing a competent family dairy farm in the Korea Republic. Although the average expansion target of 24 family farms was to increase herd size to 50 milking cows from the current 23, a herd size of 50 cows (comprising about 40 milking cows) was recommended, when factors such as the need to improve cow performance, higher dairy standards, and tightening environmental regulations in the future were considered. For a 50-cow enterprise on a family (1.5 labor units) farm, a new cattle barn, an automated concentrate feeding
system, a milking parlor, a labor saving manure handling system and mechanized forage production were fundamental prerequisites. It was estimated that an additional investment of won 200 million was needed to achieve this. As it will take about seven years to increase herd size from 25 to 50 cows with on-farm breeding only, under reasonable reproduction and replacement rates, it is recommended that farmers begin to increase young stock two year before the completion of construction of a new barn. When the proposed herd size of 50 cows is attained, expected annual income is about won 60 to 70 million.

Jansen et al. (1997) used a capital budgeting model to determine the economic profitability of pasture improvement for livestock production using a mixture of Brachiaria brizantha and Arachis pintoi (BA) vs. B. brizantha with Erythrina berteroana (Silvopastoral system, SPS). A supplementary feeding system (SFS) for unimproved pastures is also evaluated as an alternative to increase meat production. Present values of incremental returns and internal rates of return on capital invested are calculated for all 3 systems. With the given meat prices, profitability of the BA and SPS greatly depends on the stocking rate and the length of the investment period considered. Financial benefits of the SPS are significantly lower than those of the BA system. However, the non-monetary benefits of incorporating trees in pastures are of difficult to evaluate and were not included in the financial analysis. Profitability of the SFS is lower than that of the BA system, but exceeded returns of the SPS, although it may prove unsustainable in the long run. Nevertheless, SPF constitutes an attractive
option for soils where the BA and /or SPS are difficult to established and for farmers without access to sufficient capital.

Paul et al. (2001) assessed the growth performance and economics of rearing Nil-Ravi buffalo male calves on different feeding regimes and concluded that rearing male calves on grazing with limited supplementation was more economical than stall feeding.

From the above review it is clear that there are regional variations in feed resources availability, feeding practices and problems related to free range grazing or Anna pratha. But on-farm evaluation is still required to quantify the nutrient requirement fulfilled and how much need to be supplemented for optimum livestock production in the region. The cost benefit analysis of both the feeding systems also need to be carried out. So that farmers can get better return from their limited resources.