KVK Bulletin - 2

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1. Introduction

The rearing of small ruminants (goats and sheep) in drylands is very important, since they serve as a lifeline during drought years by providing income and sustenance to the farming community and grazers (Rangnekar 2006). Sale of livestock and their products provide direct and regular cash income to the farmers. The small ruminants contribute 15 to 27 % of family income of smallholders and provide gainful employment of 180 to 330 man-days per annum depending on the size of the flock (Misra *et al* 2000). World Bank study shows that in most of the drylands and hill regions, small ruminants are major player, as more than 70 % of family income is derived from livestock (GOI 2002). Small ruminants are the moving bank and means of investment for many marginal and small farmers. They are closely linked to the social and cultural lives of resource poor farmers for whom animal ownership ensures varying degree of sustainable farming and economic stability (Misra *et al* 2006). Unlike a crop farmer it is rare to hear of a livestock farmers committing suicides in distress.

In Andhra Pradesh, rearing of small ruminants is a major source of livelihood. The number of small ruminants and their distribution vary widely in the different districts, with heavy concentration in some districts like Ananatpur, Nalangonda, Mahabubnagar. The results of the various studies showed that goat rearing is the most sought after enterprise amongst landless and marginal farmers in the drylands. The main reasons indicated for this preference are: minimum investment, good returns and minimum risk. Analyzing the small ruminant production situation in the Andhra Pradesh, Vishwaraj (1997) pointed out the need to strengthen support services (breeding, health, extension and training) and development of village commons to augment feed resources.

In spite of enormous technological advancement efforts made for livestock improvement, the status of small ruminants still remains in its primitive form when compared with the progress in dairy and poultry sector (Misra *et al* 1997). Therefore, there is a felt need for a fresh look at the situation and approach to introspect and find out the reasons of the poor performance of small ruminant sector. Keeping these points in view, the

Central Research Institute for Dryland Agriculture made an effort to assess the traditional small ruminants production systems, their constraints and options for improvement on smallholder production systems.

2. Special feature of small ruminants

Farmers keep small ruminants for many reasons, the major ones being that they are a source of food, fibre, cash and a form of savings. The other special attributes of small ruminants includes:

- Small ruminants are highly adaptable to a broad range of environments
- Small ruminants have short generation cycles and high reproductive rates which leads to high production efficiency
- The efficiency of converting feed into milk is higher in goats than in other dairy animals
- Small ruminants are small enough to be consumed by an average family in day or two hence no refrigeration facilities are needed.

3. Socio-economic status of small ruminant keepers

The majority of sheep and goat keepers are marginal and small farmers, and landless laborers, commonly called "shepherds" and belong to the weaker sections of the society particularly from *Kurma* and *Golla* community in Ranga Reddy district. About 80 % farmers having less than 1.5 ha of land, out of which only 17 % were irrigated through wells and tanks and remaining 83 % were rainfed and not suitable for cultivation (Misra *et al* 2000, Reddy *et al* 2005).

Several studies indicated that the underprivileged families (those from lower socio-economic strata) prefer sheep and goat rearing (Rath 1992, Pant and Sharma 1995, Conroy and Rangnekar 2000, Rangnekar 2006, Misra *et al* 2006). Major reasons for preference of small ruminants by families from lower socio-economic strata and women are: low initial investment, low maintenance cost (main cost is labour and feeding cost is minimal), easy to manage by women, source of small cash for women; easy liquidity and rising market demand, cheap/free source of milk for the family, excellent ability to adopt under varying agro-climatic conditions, even under extreme conditions.

4. Contribution of small ruminants to livelihoods

Rearing of small ruminant is one of the major livelihoods and source of income for small and marginal farmers in semi-arid and arid areas of Andhra Pradesh. More than 5.31 lakh families in Andhra Pradesh are depending on sheep and goat rearing. Livelihood analysis reveals that farmers having only dryland, derive one third to half of their household income from sheep and goat rearing and follow diversified farming as a strategy for risk minimization (Misra et al 2000). Average annual income for a typical shepherds household in Nalgonda district of Andhra Pradesh owning 40-50 sheep and 5-6 goats, from their flock is about Rs. 9000 to 12000. On an average in Andhra Pradesh, small ruminants contributs between 15 to 40% of the total incme, depending on flock size and of the available land for agriculture. The nature of economic contribution by small ruminants showed that the major contribution of small ruminants is through sale of animals (22–26%) followed by sale of milk in case of goats (20%) and manure (1–5%). Reddy *et al* (1990) reported that flock size of 21 to 40 are most viable and with marketing support it can be a good source of self-employment and income for the rural poor in Andhra Pradesh.

Chowdhary *et al* (1995) studied efficiency of various input factors influencing sheep production in Anantpur District of Andhra Pradesh and pointed out the need for developing marketing support, starting with facilities for grading of wool and establishing market yards and also recommended back up of professionals and institutional finance for the benefit of smallholders and marginal farmers. Their findings showed that flock size made the highest contribution to gross returns and hence availability of easy credit and extension support is necessary. Animal health is the second major factor influencing returns from sheep production and improving accessibility and effectiveness of veterinary services are strongly recommended. The study conducted by NABARD in Nalgonda district of Andhra Pradesh shows that the sheep scheme generated an additional income of Rs. 2196 per year for each family. The financial rate of return ranged between 25 to 33%, after adjusting for family labour, and is very favourable, indicating that the scheme is viable for smallholder and landless families.

In general, small ruminants are a mager source of income for the under privileged families and their contribution range between 17 to 24% of family income (Rangekar 2006). The findings suggests that there is scope to improve performance of small ruminants by improving services, i.e feed and fodder resources, availability of crossbred rams and checking mortality.

5. Breeds of sheep and goats reared in Andhra Pradesh

The important sheep breeds of southern peninsular region are Deccani, Nellore, Bellari, Mandya and Hassan. The important breeds of goats found in this region are Osmanbadi, Sangamneri and local breed called Palamuru. The animals of Jamunabari, Barbari and Black Bengal breed are also reared in this region. The detailed description of sheep breeds is given in Table 1 and goat's breeds in Table -2.

6. Population of sheep and goats

Small Ruminants, comprising of sheep and goat are important species in the livestock production system. As per 17th Livestock Census, there are 181.88 million small ruminants in the country consisting of 61.78 million sheep and 120.10 million goats (GOI 2005). The sheep and goat population has increased by 6.9 and 1.33 %, respectively during 1997 to 2003.

Andhra Pradesh accounts for 34.8 % of sheep and 5.0 % of goat population of the country. The population of sheep has increased very high by 119.4 % and goat population by 20.41 % in Andhra Pradesh during 1997 to 2003 (Table-3). The steep increase in sheep population compared to goat is due to the state government policies, i.e replace goat with sheep, ban on goat grazing in forests, no goat welfare measures in government programmes (*Janm Bhoomi)*, which inhibits considerably the normal and natural growth of the goat population. Even as on today, the web site of Directorate of Animal Husbandry of Andhra Pradesh made no mention on goats-complete silence despite there being more than six million goats in the state. However, for sheep development, livestock policy states "*Replace Deccani with Red Nellore*" and "*Enhance sheep production through semi-intensive management system*".

Table 1: **Characteristics of sheep breeds reared in Andhra Pradesh**

Breed	Location	Breed description	Characteristics						
			Birth weight, kg	Weaning weight, kg	Adult weight, kg		Weight at slaughter, kg (6 months	Dressing percen-tage	Purpose
					Male	Female			
Deccani	Central Maharashtra, Western Andhra Pradesh, North-Eastern Karnataka	Medium sized, colour varies from black to brown with white spots. Animals are small and hardy.	2.82	13.56	38.48	28.58	20.86-24.40	49.6	Mutton/ Coarse wool (0.45 kg/yr)
Nellore	Nellore district and neighboring areas of Prakasham and Ongole districts of Andhra Pradesh	Tallest breed of sheep in India. Rams are horned and ewes are polled. Three strains are distinguished, primarily on the basis of colour : **Palla**: white or white with light brown spot on head, neck, back and legs. **Jodipi:** white with black spots around the lips, eyes and lower jaw. **Dora:** completely brown	2.74	10.94-11.98	36.69	30.00	18.91-22.72	47.0	Mutton

Breed	Location	Breed description	Characteristics						
			Birth weight, kg	Weaning weight, kg	Adult weight, kg		Weight at slaughter, kg (6 months	Dressing percen-tage	Purpose
					Male	Female			
Bellary	Bellary district of Karnataka and parts of Karnool district in Andhra Pradesh	Medium sized animals, usually black in colour, white and black combination is also common. Rams are horned and ewes are polled.	2.60	11.09	35.39	27.42	16.28/-18.68	48	Mutton/ Coarse wool (0.3kg/ yr)
Mandya	Mandya and Mysore districts of Karanataka	Compact body with a typical reversed U-shaped conformation from the rear. Extremely hairy sheep. Both sexes are polled.	2.09	9.71	34.80	23.50	12.76	45-49	Mutton/ Coarse wool (0.372 kg/yr
Hassan	Hassan district of Karnataka	Small size, white colour body with light brown or black spots. Males are horned and females are usually polled.	-	-	25.78	22.68	-	-	Mutton/ Coarse wool (0.3-.04 kg/yr)

Deccani male

Deccani female

Nellore Jodipi female

Nellore Jodipi male

Nellore Dora male

Nellore Dora female

Bellary female

Bellary male

Hassan female

Hassan male

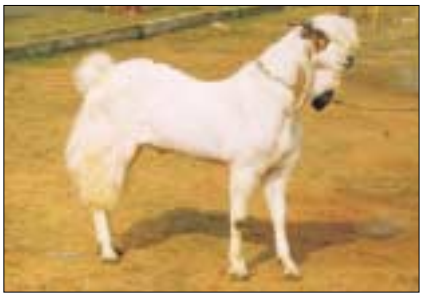
Mandya female

Mandya male

Table 2: Characteristics of goat breeds reared in Andhra Pradesh

Breed	Location	Breed description	Characteristics						
			Birth weight, kg	Weaning weight, kg	Adult weight, kg		Weight at slaughter, kg (12 months	Dressing %	Milk yield
					Male	Female			
Jamunapari	Agra, Mathura and Etawa district of Uttar Pradesh and Bhind and Morena districts of Madhya Pradesh	Most handsome breed of goat in India. Large sized animals with great variation in coat colour. The typical colour is white with small tan patches on head and neck. Highly convex nose line with a tuft of hair, yielding a parrot-mouth appearance. The udder is well developed, round with large conical teats. Both the sexes are horned.	4.27	12.11	44.66	38.03	24.00 at 9 months and 29.65 at 12 months	48.26	202 kg/ lactation of 191 days. 1.75 to 2.15 kg/ day
Sangamneri	Pune and Ahmednagar districts of Maharashtra	Medium sized, colour varies from white to black or brown. Both sexes have horns. Hair coat is extremely coarse and short.	1.86	7.09	38.37	28.97	17.33	46.14	84 kg in 165days 0.82 kg/ day; 0.25-0.3 kg coarse hair/year

Breed	Location	Breed description	Characteristics						
			Birth weight, kg	Weaning weight, kg	Adult weight, kg		Weight at slaughter, kg (12 months	Dressing %	Milk yield
					Male	Female			
Osmanabadi	Osmanabad district of Maharashtra	Tall animals, usually black in colour, but white, brown and spotted is also found. Males are horned.	2.39	7.34	33.66	32.36	15.12 at 9 months	45.7-50.0	0.5-1.5kg/ day; Lactation length 3-5 months
Barbari	Agra, Mathura, Aligarh, Etah and Etawa district of Uttar Pradesh	Medium sized, wide variation in coat colour but white with small light brown patches is the most typical. Well adopted to stall feeding. Bucks have a large thick beard.	1.78	6.70	37..85	22.56	15.16	-	107 kg in 150 days; 0.76 kg/ day; Twins are common
Black Bengal	Eastern and North Eastern India	Small sized animals. Usually black in colour but brown gray and white are also found. Beard is observed in both the sexes. Both sexes have horns. Known for excellent mutton quality.	1.31	6.09	32.37	20.38	12.6	45.7	58 kg in 118 days



Jamunapari male

Jamunapari female

Barbari male

Barbari female

Black Bengal female

Black Bengal male

Osmanabadi male

Osmanabadi female

Sangamneri female

Sangamneri male

Table 3: Sheep and goat population of Rangareddy District and Andhra Pradesh

in thousands

Year	Rangareddy District		Andhra Prdesh	
	Sheep	Goat	Sheep	Goat
1977	283	175	7064	4364
1983	188	191	7519	5559
1987	180	190	6872	4875
1993	215	232	7787	4329
1999	242	243	9743	5213
2003	647	319	21015	6427

7. Traditional small ruminant production systems

7.1 Production systems

Sheep and goat farming is mostly carried out as an extensive system of rearing with minimum external inputs and remained as a nomadic, crop-livestock mixed type of farming. Three kinds of small ruminants production systems in general are practiced in the Telangana Region of Andhra Pradesh, depending upon the size of flock, purpose of rearing, availability and access of resources, etc. The characteristics of small ruminant production systems are given in Table 4. In general, traditional methods of management are being followed in feeding, breeding and housing. The traditional sheep and goat production systems are designed to be self-sufficient at the household level and based on socio-economic considerations. Outside assistance is virtually non-existent. The general features of sheep and goat production in the dryland areas are:

- as a complement to crop production
- utilization of common and marginal land and non-marketable farm products
- utilization of readily available surplus family labour
- minimal out site assistance and cash inputs
- based on traditional knowledge
- very low degree of economic risk

Table 4: Small ruminant production systems and their characteristics

Sheep	Production system	Characteristics*
	Medium to large sized flocks	Deccani type, partly stationary and partly migratory
	Lamb fattening	Nellore lambs purchased and fattened for a period of 4-6 months by farmers; Number fluctuates from 1 to 30
Goats	Medium to large sized flocks	Villages have few goat herds that utilize the available fodder trees
	Backyard	Maintenance of Buck or a Doe for the purpose of fattening and sale for ready cash

***** Medium size sheep and goat flocks predominantly remains in their villages of origin , while large sheep flocks regularly migrate in search of fodder and water.

7.2 Flock size

Flock size varies from 20-100 sheep and always with a few goats, usually 10 % of the sheep numbers. The most common holding size is 40-50 sheep and some 4-5 goats. Goats produce twins, freshen twice a year and therefore can add 2-4 kids every year to the flock, while sheep do not twin and produce just one lamb per year. Allowed to develop normally, sheep flock size will double in three years, if there is no stock removal for slaughter at 40 % of the flock size, every year (60 % in case of goats). However, in Nalgonda district a shepherd with 40-50 sheep is hardly able to sell 9-10 male lambs annually and holds on to all ewes in the flock, adult as well as new born, in order to maintain his flock size. This clearly indicates large scale, recurring lambs/kid mortality, condemning to shepherds to subsistence. Another reason for stagnated flock size is the inability /unwillingness of shepherds to carry adequate numbers of rams in the flock for breeding. The ideal ratio is 1 ram for every 20-25 ewes, but the current proportion in most flocks is 1:40/50 or even less, some times as low as just 1 Ram in a flock of 70. This too leads to stagnation of flock size, as many ewes are unable to freshen every year and contribute one lamb per year (Ahuja 2006).

7.3 Grazing resources

The small ruminants are primarily maintained on grazing. The sheep and goats usually owned by small farmers and landless labourers are grazed together and tend to be herded over long distances in search of feed and water. Grazing is always scarce, confined to CPRs (common grazing land in villages where available), current fallows and raod /way side green herbage. Shepherds have no grazing rights in forests and in fact are prohibited from using forests as source of fodder/grazing. Shepherds often lease for the season fallows from the private owners in their own and neighboring villages for Rs. 500 per 5 to 6 acres land per season as reserve grazing area. In summer towards the end of march/start of April, shepherds start their migration in better areas and return in July, when the rainy season starts for cultivating their own land. Shepherds often have to face grazing restrictions imposed by the farmers in their villages. Bickering and quarrels with village community on account of grazing is almost a daily routine. In post harvest season, farmers normally allows shepherds to graze fallows and to bed down on the land for getting the benefit of urine and manure and even pay the shepherds a small fee per night of stay.

Grazing on CPRs (Post harvest fields and wastelands)

7.4 Feeding systems

The flocks of sheep and goats are maintained primarily on grazing. The feeding systems of small ruminants are also influenced by social factors, besides resource base of the shepherds. Most goat keepers provide supplementary feeding to pregnant and high milk producing goats.

Supplementary feeding

Whereas, sheep flocks are hardly provided any supplements except young kids and lambs. Goat keepers have their own way of coping with feed scarcity conditions and they adjust the numbers according to resource availability, and migration is resorted to as the last measure (except for nomadic groups). Medium size sheep and goat flock pre-dominantly remains in their villages of origin; while large flocks regularly migrate in search of fodder and water.

Animals were allowed to graze and browse on common village grazing lands, forest areas, and uncultivated revenue land, privately owned fallow lands, along field boundaries, road side vegetation, on hill slopes and to much lesser extent on orchards. The grazing time varies with flock size and season ranging from 6-9 hours. In general, grazing was avoided in very early hours and during summer the hottest part of the day was avoided for grazing. In Ranga Reddy district, about 93 % of the flocks were recorded as stationary and only few families reported that their flocks move to neighboring districts. In general, farmers grazed their animals during the day and got them back to the home in the evening. About 60 % of the flocks were penned in enclosures near the house, the remainder being penned in open fields.

7.5 Breeding

Sheep and goats were bred by natural services in almost all the cases. Farmers used their own bucks/rams for breeding and the mating was usually uncontrolled. Breeding coincides with the two seasons: April to July and September to December, and the lambing and kidding lasts from September to February. Immediately after the rain, there is good

natural vegetation available which helps to flush and bring the animals in to oestrus. Rams born in same flock are used for breeding, leading to inbreeding. Farmer reported the shortage of breeding rams for this. The *Deccani* breed is disappearing rapidly because of indescriminate breeding. Shepherds are breeding indiscriminately Deccani ewes with Red Nellore Rams to get good mutton.

7.6 Housing

Small ruminants are housed in a separate place near the shepherds' house to protect the animals from predators and theft. The sheds are having good drains to carry away urine but some times get congested and overcrowded due to limitation of space in or near the human habitation. Kids and lambs during the first months of their lives are either kept inside the house or under upturned big baskets called "*gampa" to* prevent them from straying. Often twigs of fodder trees such as *Neem, Imali, Ulenta*, etc are tied inside the shed or to basket so that the young lambs and kids can feed off this. These baskets are inverted on the kids/ lambs and food is kept within their reach. During the pre-agricultural season shepherds commonly pen their flocks on the fields of the farmers.

Sheep penning for mauring of fields

Shepherds who own more than 40 animals regularly pen their animals in the open in corals. The pen is constructed of twigs of Pegion pea. The sheep and goats are kept inside this during night. The pen is moved to different parts of the filed and the field is manured. Farmers pay the shepherds for the manure. Pen/corals are cleaned regularly. (Ramdas and Ghotge 2005)

7.7 Watering

In general animals are watered thrice a day-once in the morning at home and then at mid day and in the evening on their way to grazing. Major source of water for small ruminants is ponds/tanks. Access to drinking water for animals is however one of the major problem shepherds face during summer months.

7.8 Diseases

The Animal Husbandry Department seldom serves shepherds routinely. Shepherdsy have to call the Doctors in need, except for the some occasions like vaccination or deworming during government programmes like *Janmabhoomi*, or occurrence of some epidemic disease. However, small ruminants have routine health problems like ecto/endo-parasites, foot rot, entero-toximea and pox; and epidemics like *Peste-dis Petits Ruminants* (PPR) and Blue tongue. Deworming and spraying are seldom practiced as a standard management measures by shepherds. The most serious health hazards to sheep and goats in the traditional systems are internal parasites. The principal cause of mortality was gastro-intestinal parasitism, enterotoximea, sheep pox, blue tongue, and foot and mouth disease. Occurrence of PPR was the major cause of mortality in the recent years. The flock's mortality at farmers field ranges from 18-20 %. Farmers reported that the Nellore crosses are prone to diseases and have high lambs mortality compared to *Deccani* breed.

7.9 Shearing

Sheep are in general shorn twice at the end of rainy season and in the beginning of summer. The Kurma community does shearing in Telangana. The shepherds prefer traditional scissors as the uneven cutting makes the sheep disease resistant. Sheep are washed a day before shearing. Cost of shearing has increased from Rs.0.25 to Rs.4 in the last 7 years. The annual yield of wool varies from 300 to 600 g/year/sheep.

7.10 Marketing

Traders come to villages throughout the year, but major season for sale is during festivals like *Eidh, Bakaridh* and *Dasehara*. Majority of the small

ruminants are traded to middlemen visiting the villages or in the nearby mandal mandies. Now some villages in Telangana have sheep breeders' cooperative society, although the society is not involved in the marketing of live animals. Male lambs and kid around 4 months of age with average body weight of 10 kg are the most common age for sale and fetches Rs. 1000/ per lamb/kid. Female among the breeding stock are sold at culling age of six years and fetch Rs. 600-700 per animal. The preferred age of slaughter of sheep and goat in AP is 12-14 months, when shepherds can get some of Rs. 2000-2500 per head of animal depending on growth and body weight of individual animals. The inability of the shepherds to hold on to lambs till they are prime meat animals undermines his viability long term.

8. Farmers' perception regarding small ruminants

The objective of sheep and goat keeping differed with socio-economic and socio-cultural conditions. More than 2/3rd farmers opined that sale of live animals for meat market was the main purpose of keeping sheep and goats. Another important purpose for goat keeping was to produce milk for family consumption and droppings for crop production. The farmers having higher social status but economically poor keep few sheep and goats as a source of supplementary income. Majority of farmers expressed their views that sheep and goats rearing are least risky, needs minimum investment and provide cash as and when it is needed. Women consider it as a cheap source of milk for family and cash during emergency. Farmers considered goat farming more remunerative than sheep, though goat rearing is discouraged by the Government and development planners, primarily due to misconception of the role in ecological degradation. Distribution of work shows that feeding; milking and cleaning were attended by female folk of the family, while either male children or old persons carry grazing. Thus, sheep and goat husbandry posses a great potential to provide both inter-year and intra-year stability in the level of income and employment to the resource poor farmers and landless labourers of the rural community. Besides this, they also provide nutritional value of the food at the household levels.

9. Constraints to sheep and goat production

Several studies reported the major constraints for smallholder farmers and landless small ruminant's keepers are: low productivity of most flocks, health problems and high mortality in new borne, poor accessibility of health services, lack of organizational support and extension services, lack of feed and fodder resources and absence of appropriate development programmes. Similarly the productivity of sheep and goats were lower in the Telangana area because of several factors. The main constraints identified during PRA in Ranga Reddy district are:

1. Shortage of feed and fodder resources
2. Reduction in grazing area and pasture
3. Lack of marketing infrastructure
4. High mortality and lack of veterinary facilities
5. Lack of credit facilities
6. Poor extension services
7. Lack of water
8. Non-availability of good quality forage seeds/saplings

The matrix ranking showed major concern for feed and fodder resource availability in the grazing lands, followed by high mortality, lack of credit facilities, etc.

10. Strategies for improving productivity of small ruminants

Availability of forage resources in grazing lands, both in terms of quantity and quality are limited by spatial and seasonal variability of rainfall and are the major constraint to productivity. Every third to fourth year is a drought year, when feed scarcity becomes particularly acute, and animals loose weight as feed available is inadequate to fulfill their requirements. Weakened animals are easily susceptible to disease. Alleviation of this seasonal feed shortage could help to increase the production of meat and milk for home consumption and sale, and decreasing mortality could enable farmers to sell more animals to generate income. Therefore, there is an urgent need to augment the production potential of small ruminants utilizing the available existing resources. Potentially important

technologies that can make a significant increase in productivity of both crops and animals with in the system should be adapted. The following strategies may be implemented adopting watershed or community based approach:

10.1 Feed resources augmentation

Low productivity of sheep and goats is mainly due to poor nutrition and management. Therefore, there is an urgent need for increasing feed availability both in terms of quantity and quality. The major traditional feed and fodder resources available for feeding to sheep and goats are given in Table -5. The shortage of feed can be alleviated through:

10.1.1 Pasture improvement and management

The improvement of pasture lands is possible by protecting them from the biotic factors, grubbing unwanted bushes and weeds, preserving good natural grasses and legumes. Research conducted at this institute have shown that a good pasture of Anjan (*Cenchrus ciliaris*) and Stylo (*Stylosanthes hamata*) may provide sufficient grazing for 6 adult sheep / ha while a protected grazing land may stock 2-3 sheep / ha per year as compared to the unprotected range lands which may hardly be sufficient for one sheep / ha throughout the year. The efforts to improve and manage the village common grazing lands through reseeding with good quality grasses and range legumes like, *Stylosanthus hamata, Clitoria ternata* and *Dolichos lablab*, to restore and increase their productivity by establishment or strengthening of grass root community/user groups should be made, who would bear responsibility for the management of common property resources.

Sheep grazing on improved pasture

Table-5 : Feed and Fodder resources for small ruminants

Green fodders	
Natural grasses	*Cenchrus ciliaris, Cenchrus. setigerus, Chrysopogon fulvus, Dichanthium annulatum, Themeda Sp., Cynodon dactylon, Sehima nervosum, Lasiurus sindicus, Urochloa mutica*
Cultivated grasses	*Pennisetum purpureum, Panicum maximum, Brachiaria decumbens, Hybrid Napier, Stylosenthes hamata, Phaseolus trilobata*
Natural tree leaves, shrubs and creepers	*Azardiracta indica, Acacia leucophloea, Acacia tortilis, Albizia amara, Albizia libbek, Prosopis cinerari, Tectona grandis Zizypus nummularia, Zizypus jujuba, Mangifera indica, Bassia latifolia, Ficus racemosa, Morus alba, Ficus religosa, Tamarindus indica, Hardwickea pinnata, Ficus benghalensis, Bambusa arundibacea, Acacia nilotica, Artocarpus hetrophyllus, Tinospora cordifolia, Moringa oleifera, Mimosa hamata*
Cultivated trees	*Sesbania grandiflora, Morus alba, Leucaena leucocephala*
Cultivated fodders	*Trifolium alexandrinum, Medicago sativa, Avena sativa, Pannesetum purpureum, Sorghum Vulgare, Zea mays, Trigonell foenumgraecum, etc.*
Dry fodders	
Cereal crop residues	Sorghum, Fox tail millet, Pearl millet, Maize, Paddy, etc.
Pulse crop residues	Pigeon pea, Cow pea, Chick pea, Horse gram, Moong, Cluster beans.
Oil seed crop residues	Groundnut, Cotton stalks, Safflower, Sesame, Castor stalks
Concentrates	
Oilcakes	Groundnut cake, Safflower cake, Coconut cake, Cotton seed cake, sesame cake
Brans/husks	Brans/husks of different pulses, broken rice,
Pulses	Horse gram, Cow pea
Cereal grains	Finger millet, Pearl millet, sorghum, maize

10.1.2 Development of silvipastoral system

The development of three-tier silvipastoral system in the wasteland, which is presently being used for uncontrolled grazing, is the key to sustain the productivity. The strategy for the scientific utilization of wasteland for fodder production, however, is dependent on solving important issues related to ownership and right for grazing. Involvement of the people in the initial raising, maintaining and protection of three-tier plantation are essential. The mode of lopping and distribution of fodder amongst the participants of afforestation programme and beneficiaries is to be resolved consciously. The selection of specific trees, shrubs, bush, grass species, etc should be made carefully keeping in mind the needs of farmers, their social status and topography of the area. In a well established pasture about 30 fodder tree per hectare have been recommended. The common fodder trees which can be planted are P*rosopis cineraria*, *Ailanthus excelsa, Gymnosporia spinosa*, *Acacia arabica*, *Azadirachta indica*, *Leucaena leucocephal, Gliricidea sepium,* etc. The sheep and goat keepers should be motivated to plant these fodder trees in their private lands also. The saplings of these trees should also be made available at subsidized rates to the interested farmers.

Sheep grazing on silvipastoral system

10.1.3 Introduction of fodder crops

The fodder crops like cowpea, lucerne, oats, napier, M.P. chari etc. should be popularized in the villages. Inter cropping of legumes like Dolichos, Cowpea, etc. should be promoted in line souwn cercal crops-sorghum, bajra, maize, etc. under rainfid conditions. The good quality seeds of these fodder crops may be provided to the interested farmers.

10.1.4 Fodder conservation and utilization

The sheep and goat keepers should be motivated to conserve the surplus fodders as hay and silage during the period of abundance and to be fed during scarcity periods. To utilize the crop residue and cultivated fodders effectively, the farmers should be motivated to feed these fodders after chaffing. Urea treatment, strategic supplementation of concentrate, or urea molasses mineral blocks or tree foliage, etc should be introduced for enhanced utilization of low quality roughages.

10.2 Feeding of small ruminants

Feeding is the most important aspect of sheep and goat farming. Small ruminants thrive well on natural grasses, herbs and farm waste. Basically the goats are browsers and sheep are grazer. Although goats prefer to pluck the tender parts of the tree, pods, etc but they may consume any part of small plant. Goats differ markedly from other ruminants in their sensitivity to sweet, salty, bitter and sour taste in accepting or rejecting the feeds. They are more tolerant of eating feeds containing bitter substances. They generally refuse any feed, which has been soiled or trampled by other animals.

Energy tends to be the limiting factor under grazing conditions during summer months. Mating, late pregnancy and lactation are the most critical times for nutrition. At the time of mating, it is more important that ewes/does are in good body condition and needs to be given some concentrate. This process is called "Flushing". Flushing the animals will start the heat period earlier, which is an advantageous to the shepherds. For flushing the ewes, good quality legume hay or 200-250 gm concentrate may be given daily for each animal for 15 to 30 days. The feeding of animals in late pregnancy should ideally be adjusted to take account of foetus growth. Milk yield during lactation is closely associated with feeding level. A good feeding regime therefore, provides *ad libitum* feeding for 6-8 week after lambing/kidding according to the nutrient requirements. The feed provided must be rich in energy, protein, minerals and vitamins and must be palatable and acceptable to the animals.

Small ruminants need combination of green and dry fodder. Improper feeding can lead to diseases. Too much feeding of green fodder during

monsoons leads to bloat and diarrhea and too much of dry fodder and concentrate during summer months results in problems like constipation/ indigestion and vitamin A deficiency related conjunctivitis. Therefore, always mix some green fodder or tree leaves/shrubs with dry fodder to increase the palatability and taste. Chaff the fodder to reduce wastage and maximize feed intake. Try to feed dry fodder during night time. It is better to sprinkle salty water on dry fodder to make it more palatable. Always feed some dry fodder during monsoon season. Whenever there is shortage of green fodder, it is important that animals should be provided some concentrate. The concentrate should be prepared from the locally available ingredients. The broad guideline for preparation of concentrate is given below:

Any millet/cereals (sorghum, pearl millet, foxtail millet)	:	40 parts
Rice bran (or any other brans/ broken grains)	:	32 parts
Any oil cake	:	25 parts
Salt	:	1 parts
Mineral mixture	:	2 parts

Some more examples of concentrate mixture are given for ready reference in Table 6, which can be modified based on the availability of the ingredients.

Table 6 : Examples of concentrate mixture

Feed	Parts	Feed	Parts
Rice bran	30	Any millet	35
Wheat bran	20	Groundnut flour	25
Groundnut flour	30	Rice bran	15
Sesame flour	20	Red gram husk	25
Feed	**Parts**	**Feed**	**Parts**
Rice bran	30	Any millet	20
Cotton cake	25	Groundnut cake	20
Red gram husk	25	Rice bran/wheat bran	30
Wheat bran	20	Red gram husk	30

The studies conducted at CRIDA, CIRG and CSWRI indicated that in addition to free grazing or common pasture lands, limited amount of concentrates @ 1.0 to 1.5% of body weight would provide 25 to 30 kg finishing weight at 6 and 9 months of age, respectively. Feeding experiments conducted at CRIDA, Hyderabad showed that *Leucaena leucocephal* and *Gliricidea sepium* is a good source of supplements for improving small rumments productivity both under stall-fid and grazing conditions.

10.3 Flock management

Animals perform well only when comfortable environment is available. Poor flock management, in spite of the availability of good quality feed, fodder and other resources cannot exploit the desired production potential of animals. Therefore, the concept, knowledge and awareness of day-to-day management are most important aspect of small ruminant production. The following points may be considered important for day-to-day management of animals:

- Select systems, which are appropriate to particular farms or the local situation.
- While selecting a suitable breed of sheep or goats, social acceptability and adaptability to local environment, prolificacy, more market weight etc. have to be given due consideration. It is always better to select a breed having desirable level of productivity and known adaptability to prevailing conditions.
- Pay more attention to grower and older stock in extreme cold as they are more susceptible to cold and there is chance to get infection of pneumonia.
- During summer, flock should be grazed early in the morning and late in evening (allow to take rest during day). As for as possible do grazing near the water source so that they may get water easily. Small ruminants do not like to graze on same pasture continuously. A good practice is to adopt rotational grazing.
- During critical physiological stages (growth, pregnancy and lactation), animals should be grazed on fresh pasture and supplementary feeding of concentrate or with lopings of locally available tress should be provided.

- Fresh clean water is essential for small ruminants to maintain good health. Unless forced to drink from stagnated pools, small ruminants will prefer clean water for drinking. Provision of water trough in shed will greatly assist in keeping the flock healthy.
- Breeding should be planned in such a way that lambing and kidding may not occur in peak summer and winter to avoid kid/lamb mortality.
- Late stage of pregnancy and lactation should always coincide with sufficient grazing materials. Poorly fed ewes may results into abortion, parturition complexity, poor health and low birth weight of offsprings.
- Synchronization of oestrus with hormones need to be done in order to obtain the desired number of lambs and kids ready for sale during the times of festivals.
- Stunted and underweight ewes/does should not be allowed to breed.
- Sufficient bedding materials should be provided in the pen during lambing/kidding.
- Pregnant animals expected to lambing with in 3-4 days, should not be sent for grazing at longer distance, to avoid any kind of risk.
- During breeding and lambing period the surroundings genital parts should be cleaned by cutting the hairs to ensure successful mating and lambing without any interruption.
- Newborn kids/lambs should be protected from adverse climatic conditions to avoid the risk of high mortality. Special care should be given to kids/lambs born with low birth weight and with multiple births.

10.4 Shelter for good health

The shelter in which small ruminants are housed is an important consideration for sound flock management. Inappropriate shelter can lead to many problems ranging from poor health and parasitic infestation to accidental deaths. The shelter requirement of small ruminants may vary from region to region in design, materials used and location but fundamental principal remains the same. The following points needs to consider while designing for small ruminants shelter.

- It should protect the small ruminants from bad weather and predators
- It should be easy to clean
- It should be adequately ventilated
- It should be of appropriate size so that animals are comfortable
- It should have space for comfortable handling of animals
- It should be built of locally available material, inexpensive and appropriate to the area.

Always remember that unclean shelter invite diseases. Many diseases are caused by unclean surroundings and shelter. Some of the examples are foot rot and maggot wounds. Diseases like pneumonia in small ruminants spread faster if animals are overcrowded. The problem of ecto-parasites also increases if shelter is not kept clean. Therefore, it is better to ensure that shelter is regularly cleaned. Young suckling and their mothers should be housed separately. This prevents the young kids/lambs from getting trampled upon by other animals in the flock. Pregnant sheep and goats in last month of pregnancy should be housed separately to prevent them from getting injured. Injuries may trigger off abortions. Sick animals should also be housed separately otherwise the disease can spread to healthy animals.

10.5 Genetic improvement

There is need to evolve area specific breeding policy. Encourage ram lamb rearing to over come shortage of breeding rams. Government farms should supply elite breeding rams to the farmer's associations/groups to control inbreeding. Introduction of open nucleus breeding concept is needed to select the good quality rams. Therefore, genetic up gradation of local sheep and goats to improve productivity and feed efficiency can be achieved through:

- Replace breeding rams once in 2 years
- Maintain proper ratio of ewes and ram (25-35:1)
- Supply of improved Rams/Bucks of superior breeds on community basis

- Removal of low-grade Rams/Bucks through castration and slaughter
- Herd recording for knowing production worth of animals
- Creation of village based selection schemes using the local breeds and their propagation

10.6 Veterinary services

In addition to proper feeding and management, livestock health services are critical in achieving the production potential of animals. Diseases of small ruminants are best tackled through prevention rather than cure. It is possible to control the disease problems by improving flock management. The treatments of individual sick animals have lesser importance in small ruminant production. Emphasis should be given for prophylaxis of economically important diseases and therapeutic cover for identified diseases. Health management calendar for control of diseases given in Table-7 may be adopted. Health control measures will not only check the economic losses but also improve the overall production efficiency.

Shepherds consider access to veterinary services as an essential pre-requisite for success in small ruminant rearing. They are themselves willing to promote a village based, decentralized, community managed sustainable service delivery mechanism with the help of Annual Husbundry Department (AHD). Therefore, there is a need to shift the State's focus towards creation of field level animal health services like: vaccination and deworming, and their specific treatment to increase the availability and access to services.

Vaccination against PPR is now available at Rs 1.50 per dose (50% subsidy from the AHD), but seldom in adequate quantities and in time; there is no vaccine available for Blue Tongue and treatment with antibiotics though successful is extremely expensive (may cost up to Rs 300 for a full course per affected animal). Young youth among the shepherds community should be trained as small ruminant health workers and home delivering minor veterinary services: deworming and vaccination, one in each village cluster should be promoted. On time vaccination, periodic deworming

and spraying for ecto-parasites will cut down avoidable loss of stock, increase the growth rate/weight gain and reduce finishing time for the market.

Table 7 : Preventive health calender for small ruminants

Month	Deworming and Vaccination
January	Deworming and CCPP (Contagious caprine pleuropneumonia)
March	Haemorrhagic septecaemia
April	Deworming and Sheep pox & - Foot and Mouth Disease
June	PPR (peste des petits ruminants) (got plague)
July	Deworming and Black Quartar
August	Foot and Mouth Disease
September	Entero toxemia
October	Deworming

Vaccination of goats

11. Integration of small ruminant with orchards/ tree plantation

In most of the dryland regions of the Andhra Pradesh, the area under tree crops and orchards is increasing, which offers great potential for integration.

Integration of sheep in mango orchards

However, integration of small ruminants with tree plantations raises a number of issues. For example sheep can easily be integrated with mango orchards whereas precautions and care needs to be taken in introducing goats in initial years of establishment, as it may possible to damage bark of the mango plants. Time of introduction of small ruminants for grazing in orchards is also critical factor needs to be considered. For example, the optimum time for introduction of goat in orchards of Mango is 4-5 years of age to avoid the damage to the leaves and bark, whereas sheep can be introduced after one year of establishment.

12. Animal insurance services

Taking into consideration last year's experience (2005), when lakhs of sheep died due to blue tongue disease in 12 districts of Andhra Pradesh, the government decided to devise a system to get the population insured. The Central government has launched a first ever-insurance scheme in the entire country for sheep and goats in the Andhra Pradesh state at Akulamylaram village of Kandukur mandal in Ranga Reddy district on 31st May 2006. The scheme is expected to cover 2.10 crore sheep and goat and bring relief to more than 5 lakh families dependent on sheep rearing. The insurance premium would be Rs.32 per sheep plus Rs.4

towards service tax. The beneficiary would have to meet 50% of the total amount of Rs.36. The Insurance would apply even to the sheep aged between 4 to 12 months. Under the scheme Rs.1,000 for the big sheep(1-7 yrs. old) and Rs.500 for small sheep (4-12 months old) would be paid as compensation, if the sheep dies either of any disease or in an accident.

13. Extension services

Formal extension agencies usually focus on large ruminants and are concentrated in high potential areas. Therefore, small ruminant farming is largely without any extension support. Since livelihood of a large population of disadvantaged people depends on small ruminants, it is necessary to provide them with extension services aiming at:

- Organisation of farmers into breeder's association/self helps groups/ producers' co-operatives for the purpose of empowerment and elimination of middleman.
- On-farm demonstration/propagation of technology concerning productivity enhancement, value addition of products, processing and marketing to improve the returns as well as quality of products.
- Creation of a formal interface among Government Institutions, farming community dependent on small ruminants and other stakeholders.

14. Recognizing sheep and goat as a viable option for poverty alleviation

Livestock based poverty alleviation programmes are heavily tilted towards dairying, which is water intensive and dependent on irrigated fodder. Sheep and goats provide an alternative in water deficient areas and such diversification may be supported and promoted in general and particularly in arid and semi-arid regions. Therefore, government should consider steps for augmentation of nutritional inputs, pasture development and grazing management with people's participation.

Keeping in view the popularity of goat meat in the domestic market, export prospects of sheep and goat meat and the fact that wool production

in sheep is limited to temperate Himalayas and northwest India, it is necessary to shift the focus of sheep production from wool to mutton. This implies that each state should review its sheep and goat breeding policy, particularly with reference to choice of breeds, so that institutional capacities are geared up to production of desired genotypes.

Sheep and goat meat export is registering a growth of 5%. They form 4.9% in quantity terms and 9.7% in value terms of total meat exports. The country produces about 0.7 million tonns of sheep and goat meat. Preliminary estimates indicate that additional cost of chilling and transportation from rural abattoirs comes to Rs. 2.18/kg for sheep and goat as compared to additional cost of Rs. 4.03/kg when the same meat is produced in city abattoirs. Therefore, setting up rural abattoirs for sheep and goat is likely to provide forward marketing linkage for the farmers. Prospects of setting up the same for the benefit of farmers as well as consumers may be explored.

Sheep and goat rearing is complimentary to crop production in dryland areas. They perform very important function in supplementing both the farmer's poor diets and income. Increasing production from sheep and goats require overcoming constraints at the farmer's level. Careful consideration of socio-economic factors should be undertaken before innovations be extended and tested. Two important areas that require immediate attention are growing forage legumes on fallow and pasture lands and adopting a suitable agroforestry system. The other areas such as nutrition, improved flock management practices, support services (marketing, health, etc.) and policy deserve special attention.

15. Sources of availability of sheep and goats

SHEEP	
Breeds	Availability source
Deccani	Sheep and Goat Farm, Tuljapur, Osmanabad, Maharastra Sheep and Goat Farm, Ambajogai, Beed, Maharastra Sheep and Goat Farm, Mudkhed, Nanded, Maharastra Sheep and Goat Farm, Chitradurg, Karnataka Sheep and Goat Farm, Challakere, Chitradurg, Karnataka Central Research Institute for Dryland Agriculture, Hyderabad, Andhra Pradesh Exotic Sheep Breeding Centre, Dodda Ulavarthy, Taluka-Challakere, dist.- Chitradurg, Karnataka
Nellore	Livistock Research Station, Palamaneru, Chittor, Andhra Pradesh Ram Breeding Farm, Siddirampuram, Ananatpur, Andhra Pradesh Govt Livestock Farm, Mamnoor, Warangal, Andhra Pradesh Composite Livestock Farm, Chintaladevi, Nellore, Andhra Pradesh Sheep Breeding Farm, Penukonda, Ananatpur, Andhra Pradesh
Mandya	Sheep and Goat Farm, Debiwad, Satara, Maharastra Bandur Sheep Breeding Centre, Malavalli, Mandya, Karnataka Sheep Breeding Farm, Angawadi, bagalkota, Karnataka District Livestock Farm, Hosur, Dharmapuri District Livestock Farm, Hosur, Tamilnadu
CB sheep	Sheep and Goat Farm, Ranjani, Sangali, Maharastra District Livestock Farm, Hosur, Dharmapuri Sheep Breeding Farm, Penukonda, Ananatpur, Andhra Pradesh Sheep Breeding and Training Centre, Kudhapura, Chitradurg, Karnataka
GOATS	
Sangamneri	Sheep and Goat Farm, Ranjani, Sangali, Maharastra
Osmanabadi	Sheep and Goat Farm, Tuljapur, Osmanabad, Maharastra
Jamunabari, Barbari	Central Institute for Research on Goats, Makhdoom, Mathura, Uttar Pradesh
Black Bengal	Central Sheep and Wool Research Institute, Avikanagar, Tonk, Rajasthan

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