

Goat Farming for Improving Livelihood Security of Farm Women



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Preface

Goats play a crucial role in rural economy for socio economic upliftment of small and marginal farmers. Goat farming is the domain of women and play an important role in employment generation, improving household nutrition and livelihood security of small and marginal farm women. Goat production system in India has been slowly moving from extensive to intensive system of management for commercial production of goats. However, inadequate availability and poor quality of feed resources, high incidence of diseases and inadequate knowledge on appropriate management of small ruminants have been identified as some of the major constraints. Farm women involved in goat farming in rural areas are often constrained by limited access to and control over resource inputs and services, markets, formal knowledge and social networks, decision making power *etc.* These gender based resource constraints affect women's ability to access and use the improved technologies for goat farming or engage in resource intensive enterprises which adversely affect the productivity of their animals. Therefore, many cost effective technologies have been developed in recent times to boost in productivity and food security. The need of the day is to validate and disseminate these technologies to farmers at their door step so that they are encouraged to adopt them. In this bulletin, the authors have included the relevant technologies related to goat farming with their valuable practical reflections and considerations. I appreciate the authors for this bulletin which will be immensely helpful for farmers, students and researchers involved in sustainable goat production for enhanced household income of rural women improving their socio economic status.


S.K. Srivastava
Director

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ROLE OF FARM WOMEN IN SMALL RUMINANT PRODUCTION IN INDIA

Small ruminant production in India contributes to 4.8 and 3.4% of total world meat and milk production. It contributes 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. In this system, goats are among the main meat-producing animals in India, whose meat is one of the choicest meat and has huge domestic demand. Besides meat, goats provide other products like milk, skin, fibre and manure. They provide food and nutritional security to the millions of marginal and small farmers and agricultural labourers. However, the productivity of goats under the prevailing traditional production system is very low as they are maintained under the extensive system of natural vegetation on shrinking degraded common grazing lands and tree lopping. Moreover, adoption of improved production technologies/ management practices in the farmers' flock is very low. Therefore, rearing of goats under intensive and semi-intensive system using improved technologies for commercial production has become imperative not only for realizing their full potential but also to meet the increasing demand of meat in the domestic as well as international markets. Goat production system in India has been slowly moving from extensive to intensive system of management for commercial production. However, inadequate availability and poor quality of feed and fodder, high incidence of diseases and inadequate knowledge on appropriate management of livestock were identified as the major problems in small ruminant production system.

Women play a significant role in animal husbandry especially small ruminant farming and contribute to labour force to the extent of about 90 % irrespective of flock size. Despite the fact that women in India do most of the work in animal production, their work remains mostly invisible. Gender divisions in agriculture are stark, with all activities involving manual labour assigned to women, while all operations involving machinery and drought animals are generally performed by men. Therefore, the challenge is to develop novel mechanism involving all stakeholders (researchers, extension workers, NGOs and farmers) to provide a better environment to enable that developed technologies are need based and women friendly and hence increase the likelihood of adoption by the farm women for their upliftment. A favourable policy environment in terms of access to micro-credit, assured market and veterinary services will have to be provided and socio-economic and technical constraints needs to be addressed along with their remedial measures to enable farm women for their upliftment through entrepreneurship development.

Advantage of goat farming : Goat farming has several advantages over the husbandry of other livestock species.

- Starting a goat farming business requires low initial investment than dairy, piggery and poultry.

- Goat consumes less feed (1/5th of cattle and buffalo).
- No competition with human beings for grains like pig and fowl resulting in lesser feed cost.
- Goat is a prolific animal, produces twin even triple and quadruplet.
- Goat being hardy animal, disease incidence is very less as compared to cattle, pig and fowl and health management cost is lesser.
- Goat milk is easily digestible and has medicinal values. Goats are called the “foster mother of human” as it is the milk for human consumption with less allergic problems.
- Goat milk is rich in certain amino acids i.e. histidine, aspartic acid, phenylalanine, threonine; certain minerals i.e. sodium, iron, copper; certain vitamins i.e., vitamin A, nicotinic acid and choline.
- Goat skin is of high values e.g. Bengal goat skin is of best quality in world.
- Goat meat is very tasty, nutritious and healthy.
- Its' hair e.g. Pashmina and Mohair is valued high in international market.
- Faeces and urine of goat is rich in NPK and is used in field for improving soil fertility.
- No need of a high end housing system for goats and can easily share their living place with their owners and other animals.
- Goats are easily available, comparatively cheaper in price, easy to maintain and capable of adopting themselves with almost all types of agro climatic environments.
- Commercial goat farming business is a great source of employment and income. So unemployed educated people can easily create a great employment and income source through raising goats commercially.

Above mentioned points indicate that goat is potential animal for economic growth and employment generation.

Disadvantage of goat farming:

- If goat farming is practiced in extensive system, it may cause damage of crop and even soil erosion like all grazing animal e. g cattle, buffalo and sheep.
- Consumption of goat milk is less due to bad smell.

SCOPE OF IMPROVED GOAT FARMING IN INDIA

Goats are widely distributed and are of great importance as a major source of livelihood of the small farmer and the landless in rural communities. Their productivity in this system is low and there is ample opportunity for improvement. Several large and progressive farmers have adopted commercial farming which helps in increasing the productivity of goats and bridging the demand-supply gap. However, use of improved technologies, particularly prophylaxis, superior germplasm, low cost feeds and fodder and innovative marketing of the produce would be the prerequisites for successful commercial production. Since goats are very well adapted to harsh environmental conditions, livestock management portfolio can be diversified to decrease their risk in case of adverse climatic conditions. The investment risk in goat farming is their much shorter reproduction cycle that gives them the capability to rebuild population numbers much faster than cattle after any kind of reversal.

During the initial phase of the goat farming, high mortality due to PPR, diarrhoea, pneumonia, tetanus, etc. is a major concern of the farmers due to lack of knowledge about package of practices of improved goat farming, poor prophylaxis, non-availability of vaccines, etc., poor preparedness of the farmers, lack of personal attention of the entrepreneurs and poor access to veterinary doctor with experience of small ruminants. The trade of live animals which is unorganized and is in the hands of a large number of middlemen, traders and butchers, does not favour farmers. The live animals were sold not on the basis of their body weight in the livestock markets resulting in under-estimation of the value of live animals. The availability of institutional credit was relatively easy for large projects, but was another constraint for the small entrepreneurs with projects of 50-100 goats and had limited capital for collateral security. Age at first parturition, parturition interval, litter size and mortality determine lifetime production as well as efficiency of production. All of these effects are clearly related to nutrition, health and management.

Under crop-livestock production conditions, goats compete for the available resources (land, capital, and labour) with the other farm enterprises. Lack of improvement in their productivity is often attributed to the lack of skilled labour. Most of the labour is provided by the family. The person responsible for the day-to-day care varies widely depending on cultural factors, the number of animals, the production system (extensive or intensive) and other reasons. The role of women in goat farming varies considerably depending on the country, region, ethnic groups, etc. In many places, women not only take care of the animals but also own and market them. As production systems become more sophisticated, management skill is considered as one of the most serious constraints in achieving higher production. For starting and maintaining a profitable and successful goat farming through entrepreneurship mode, strategic planning to mitigate the following constraints should be provided.

Constraints of Goat farming in India

The major constraints of goat farming are listed below:

- Lack of sufficient knowledge about goat farming effectively. People are not using modern farming methods in goat rearing business.
- Absence of specially-designed vehicles which are very useful for transporting live goats from one place to another.
- Beginners without any practical goat rearing training faces high mortality rate in goats due to some fatal goat diseases like PPR, pneumonia, diarrhea, tetanus etc. As they lose money during first time, they don't want to start rearing goats again.
- Goat producers can't choose the right breed for production due to lack of knowledge resulting low production and interest in goat farming.
- Non-availability of all vaccines (especially PPR) and veterinary doctor throughout the country.
- In some regions of India, the producers don't get proper price for their farm products, which discourage them in large production.
- Many farm women don't have the ability to buy sufficient number (50-100) of goats for starting the business due to lack of capital. A farm of 50-100 goats can certainly generate a handsome income.

BREED CHARACTERISTICS OF GOATS

Breed selection is the main asset which give farmer's business a boom and a good uplift. Based on the region and climate, pure breed (Jamunapari, Beetal, Barbari, Sirohi, Black Bengal) and cross breed (sirohi and black bengal, Jamunapari and Sirohi, Beetal buck and Black bengal) are best suited. Knowledge on breed characteristics will be helpful for selection of goat breeds for profitable goat farming

Common Indian goat breeds

1. Jamunapari

- Native tract: Uttar Pradesh
- Milch type breed yielding 2 to 2.5 kg of milk per day and 3 to 3.5%.fat content of milk
- Coat colour is white with tan or black markings at neck and ears
- Beard in both sexes, tuft of long hairs in buttocks.
- Largest and most elegant of long-legged goats of India.
- Pronounced roman nose having a tuft of hair with parrot mouth appearance.
- Horns are short, flat and horizontally twisting backward.
- Adult male 90 - 100 cms in height and female, 70 - 80 cms in height.
- Tall and leggy with convex face line and large folded pendulous ears.
- Ears are large and drooped downwards.
- Body weight of adult female; 45-60 kg and an adult male; 65-80 kg.
- Average birth weight is up to 4 kg.
- Average age at first kidding is 20-25 months.
- Large udder and big teats and average lactation yield is 280 kg in 274 days.
- Thrive best under range conditions with plenty of shrubs for browsing.



2. Beetal

- Native tract : Punjab
- Milk and meat type breed
- Coat colour is predominantly black or brown with white spots of distering size
- Average birth weight - 3 kg.
- Body weight of an adult female, 40-50 kg and an adult male, 50-70 kg.



- Age at first kidding is 20-22 months.
- Average lactation yield - 150 kg with ability to produce 1-2 kg milk per day.
- Maximum lactation yield is 591.5 kg in 177 days.

3. Barbari

- Native tract : Delhi, Uttar Pradesh, Gurgaon, Karnal, Panipat and Rohtak.
- Milk and meat type breed.
- Coat color is white with light brown patches with short haired and erect-horn.
- Body weight of an adult female; 25-35 kg and adult male; 35-45 kg.
- Prolific breeder and kid twice in 12-15 months with 2 to 3 kids in parturition.
- Stall-fed and are reported to yield 0.9-1.25 kg of milk (5% fat) a day in 108 days



4. Tellicherry/ Malabari

- Native tract : Kerala
- Meat type breed
- Coat colour is white, purple and black
- Body weight of adult female; 30-40 kg and adult male; 40-50 kgs.
- Milk producing ability 1-2 kg milk per day.
- Kidding: 2-3 kids in a parturition.



5. Sirohi

- Coat colour is brown, white having typical patches with coarse and short hair
- Compact and medium sized body.
- Tail twisted and carries coarse pointed hair.
- Horns are small and pointed, curved upward and backward.
- Average body weight of buck is 50 and doe is 23 kg.
- Average birth weight is 2.0 kg.
- Kidding is once a year, twins are common.
- Average age at first kidding is 19 months.
- Average lactation yield is 71 kg in 175 days.



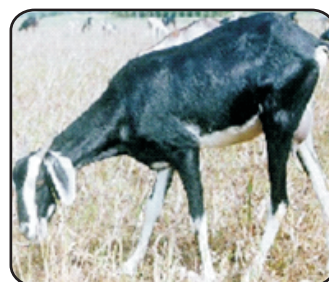
6. Osmanabadi

- Coat colour is predominantly black, white, brown and spotted
- Long and short-haired type with long hair on thighs and hind quarters.
- Tall and large size body and legs.
- Average birth weight is 2.4 kg.
- Kidding is once a year.
- Average age at first kidding is 19-20 months.
- Good yielders produce up to 3.5 kg milk per day.
- Average milk yield 170-180 kg per lactation.



7. Kanniaadu

- Tallest breed found in Tamilnadu
- Black or white spots in the black background are typical characteristics.
- Meat type breed
- Body weight of an adult female; 25-30 kg and an adult male; 35-40 kg.
- Ability to give birth to 2 to 3 kids.
- Grow well in the draught regions.



8. Black Bengal

- Coat colour is predominantly black, brown or grey and white with soft, glossy and short hairs.
- Dwarf in body size, legs short, straight back both sexes are bearded.
- Average live weight of buck is 15 kg and doe is 12 kg.
- Most prolific among the Indian breeds.
- Multiple births are common (2-4 kids are born at a time).
- Kidding is three times in two years. Average litter size is 2.1.
- Average age at first kidding is 9-10 months.
- Average lactation yield is 53 kg in 90 to 120 days.
- Chevon and skin is of great demand for high quality meat and shoe-making.
- Stands well to water logging conditions and thrives well on grass grazing.



9. Chegu

- Coat colour is white but greyish red with mixed colours
- Average live weight of buck is 39 kg and doe is 26 kg.
- Average birth weight is 2.0 kg.
- Kidding is once a year and mostly single.
- Average lactation yield is 69 kg in 187 days.
- Have long hair with under coat of delicate fibre below
- Legs are medium sized, face and muzzle is tapering, ears are Small.
- Horns are bent upward, backward and outward with one or more twists.



10. Changthangi

- Predominantly white & the rest are brown, grey and black.
- Undercoat white/grey, yields warm delicate fibre- Kashmina (pashmin).
- Body & legs are small, have strong body & powerful legs.
- Ears are small, pricked and pointed outwards.
- Horns are large turning outward, upward and inward forming a semicircular ring.
- Average live weight of buck is 20 and doe is 20 kg; average birth weight is 2.1 kg.
- Kidding is once a year, normally single
- Average age at first kidding is 20 months.



11. Ganjam

- Ganjam goats are tall, leggy medium in size
- Predominant colours are brown and black, ears are drooping, pendulous and medium in size
- Head is short, compact and slightly convex
- Horns are flat, twisted and directed upward-backward, curved clock & anti clockwise
- Beard is common in adult males
- Hairs on coat are short, but long in neck and rear thigh region
- Wattles are present in both sexes and more common in females
- Very poor in milk production and mostly used for meat purpose
- Average age at first kidding is 620 days and kidding interval is 300 days.
- Average live weight of buck, 41kg and doe, 37 kg, average birth weight is 2.1 kg
- Annual single kidding, slow growing goat with aggressive grazing habit



BREEDING STRATEGY FOR IMPROVED GOAT FARMING

A good breeding strategy is an integral part of genetic improvement of goats for meat, fibre and milk production. Following criteria should be looked into while formulating the breeding strategy for goat improvement.

- ✓ Adaptability of the breeds in the local agro-climatic condition
- ✓ Socio-economic condition of the farmer
- ✓ Market demands
- ✓ Availability of good quality bucks
- ✓ Conservation of indigenous recognised breeds preventing from rampant genetic dilution

Goat breeding is a very important process for goat farming business. Breed identification, age factor helps to find out a biologically compatible buck for doe. On an average, a doe gain sexual maturity and become suitable for breeding within one year. Doe should not be bred before their first birthday for better quality kids and goat products. Doe must have to be healthy and diseases free. Proper goat breeding plan and selection of compatible buck in nearest goat farm avoiding inbreeding is helpful for producing improved offspring with desired traits. It will be better, if the bucks are separately kept from the herd (except breeding period). The exotic breeds like Alpine, Sannen have been used with indigenous breed to improve milk production. Among indigenous breeds, Jamunapari, Beetal, Barbari, Jhakrana, Sirohi and Surti are the major dairy breeds. Both selective breeding and crossbreeding can be adopted based on the need of the locality, demand for the market, traits under consideration. Since, milk yield traits are medium to high heritable in nature, response to selection will be better. Performance recording and progeny testing programs should be encouraged to select and propagate elite bucks. Nucleus flocks/herds can be established with best performing females and their male progenies can be linked with farmers flock. Artificial insemination with liquid and preferably frozen semen may be adopted to make the progeny testing program more effective. Jamunapari, Beetal, Jakhana and Surti could be used as improved breeds in other regions for boosting up both milk and meat production. Crossing of low producing indigenous breeds and non-descript may be taken up with Sannen goat breeds. Crossing of Sannen exhibited optimal performance in milk production, survivability and reproduction in areas where feed resources are better. Most of the goat breeds maintained at the organizational herd or farmers' fields are meant for chevon production. Meat production traits in goat include body weight at slaughter, efficiency of feed conversion and dressing percentage. Hence breeding strategies should be directed towards improving growth rate, body weight, reproductive efficiency, dressing percentage and to reduce mortality. The optimum body weight for

slaughter is an important factor for consideration, while developing a breeding strategy for improving the meat production. Crossing indigenous breeds with exotic breeds like Anglo-Nubian, Boer goat may be encouraged for improving growth rate and chevon production in areas of good quality feed resources availability or provision of intensive feeding. Since, growth traits are high heritable, response to selection is better.

Difficulty in getting good quality breeding animals is also a major constraint. The best male animals from the traditional flocks were sold for slaughtering to traders resulting in scarcity of good quality breeding animals. Lack of organized efforts for breed improvement has been compounding this problem. Since large flocks of different breeds under commercial production are only few, the entrepreneurs have to select the breeding animals from the available traditional flocks mostly through middlemen resulting prolonged time to establish a good flock. Indiscriminate breeding is usually prevalent in goat rearing. No efforts seem to have made to improve the stock through selective breeding or by introducing high potential breeds. Male goats are taken better care than the female one as these fetch good price to the owners. Many do not like goat milk; hence, less priority is attached to milk traits of the goats. Genetic improvement would be achieved if increased selection pressure is effectively applied. Use of same buck for mating with numerous does at same day should be avoided and artificial insemination should be encouraged. During breeding season, a doe becomes heated frequently (at an interval of about 18-22 days between two heat cycles). For good pregnancy outcomes, it is the best time to undertake goat breeding in the early stage. Usually ovulation takes place within $\frac{1}{2}$ to $1\frac{1}{2}$ days after estrus. Successful fertilization depends on timely mating and delay in breeding reduces the possibility of fertilization. Gestation period of goat stays for about 5 months. During this period, extra care of does in terms of nutritious food with pregnancy allowance should be provided.

FEEDING MANAGEMENT OF GOAT

Nutrition is generally regarded as a significant regulator of optimum production and reproduction performance. Majority of the world's goat population is found in the small holding farming system especially female headed households where nutritional conditions are often sub-optimal. The cost of rearing goats in India is low and the animals are often reared through grazing on wasteland, range grasses and browses and agricultural by-products, at times on garden and kitchen wastes and rarely receive any supplements. Although goats tolerate high temperature and humidity of the tropics, reproductive problems associated with nutritional deficiencies is usually seen particularly from low quality forages. The farmers maintain their flock on community grazing land by employing family labour and negligible marketed input/purchased input and marginal output.

Feeding is the highest expense of any meat goat operation. Profitable meat goat production can only be achieved by optimizing the use of high quality forage, browse and the strategic use of expensive concentrate feed which can be achieved by developing a year round forage programme allowing for as much grazing as possible throughout the year. Goat is not able to digest the cell walls of plants as the retention time of feed in rumen is less. Trees and shrubs, poor quality roughage sources for cattle are considered as high in quality for goats because goats avoid eating the stems, ignoring the taste, ability to detoxify tannins. However, straw rich in lignocelluloses complex and low protein content is used by cattle and may not provide even maintenance needs for goats as goats are unable to utilize the cell wall as efficiently as cattle. In addition, goats must consume a higher quality diet than cattle because their digestive tract size is smaller with regard to their maintenance energy needs. In general, goats are reared in three different systems like extensive, semi-intensive and intensive.

Extensive System :

Goats are generally reared under extensive system in which animals are allowed for grazing in the entire pasture for the whole season. This practice is quite prevalent in migratory, transhumance, free range, pasture and range grazing system. In this method feed cost is very low and goats play only a secondary role to crop or other livestock production. Goats are usually on low plane of nutrition as the rangelands are highly degraded with poor productivity. It is not conducive to making the best use of the whole grasses. So rotational grazing method is preferably practised in which the pasture land should be divided by temporary fences into several sections and the animals are shifted from one section to another section. By the time the entire pasture is grazed, the first section will have sufficient grass coverage to provide second grazing. Parasitic infestations can be controlled to a great extent. Further, it helps to provide quality fodder (immature) for most part of the year. Under this system, it is advisable to graze the kids

first on a section and then bring in does to finish up the feed left by the kids. Intercropping of legume forages such as cowpea in *Cenchrus ciliatus* pasture can increase the biomass yield per unit area by three times. Introduction of *Dolichos lablab* legume improves the nutritive value of forage.

Semi-intensive System :

It involves extensive management but usually with controlled grazing of fenced pasture. Goats are allowed to graze on the common property resources or cultivable/fallow land for 8-12 hour/day and then supplemented with concentrates through provision of stall feeding, shelter at night under shed and 3 to 5 hour daily grazing and browsing on pasture and range. Crop residues, green and dry fodders, and tree leaves depending upon the availability are also provided after animals return back from grazing. The level of nutrition is just optimum or low but superior to that under extensive system resulting improvement in kidding rates, milk yield, live weight gains and quantity and quality of meat production. In this method the feed cost is increased. With the increasing grazing pressure and poor productivity of grazing lands, the semi-intensive system is gaining importance.

Advantage :

- Meeting the nutrient requirement both from grazing and stall feeding.
- Managing medium to large flock of 50 to 350 heads and above.
- Utilizing cultivated forage during lean period.
- Harvesting good crop of kids both for meat and milk.
- Making a profitable gain due to less labour input.

Intensive System :

In this system goats are continuously kept under housing in confinement with limited access to land (zero grazing system) and provided with complete stall feeding on cultivated fodders, crop residues and concentrates or compounded feeds. A medium sized herd of 50 to 250 heads oriented towards commercial milk production is suitable. It also includes browsing on developed pastures and/or feeding completely in stalls on cultivated fresh or conserved forages, crop residues and concentrates. Production and consumption of balanced feed mixtures as pellets or blocks based on maximum use of byproducts is beneficial. It requires high labour and capital investment and constitutes less than 5% of the small ruminant production systems. This system is mostly coming up in peri-urban areas driven by better market access to cater the growing demand for meat.

Advantage :

- Helps in close supervision and control over the animals.
- Dung is collected in one place and used as a good fertilizer.
- Less space is sufficient for more number of animals.

Nutritional Requirements

Goats require nutrients for body maintenance, growth, reproduction, pregnancy, and production of products such as meat, milk and hair. Water, energy, protein, minerals and vitamins are major nutrients and the nutrient requirement varies on various stages of development and production. Goats should be grouped according to their nutritional needs to more effectively match feed quality and supply to animal need. Weanlings goats, does in last month of gestation, high lactating does and yearlings should be grouped and fed separately from dry does, bucks, etc. which have lower nutritional requirement. Animals having the highest nutritional requirements should have access to lush, leafy forage or high quality browse if pasture is available. During the winter months, animals should be offered the highest quality hay available. Whether grazed or stall fed, goats should be supplemented with a concentrate feed when forage do not contain the necessary nutrients to cover their nutritional demand. Low quality forages contain 3-4% CP, 40-55% TDN, good quality forages contain 8-10% CP, 55-70% TDN, and concentrate feeds contain 18-20% CP, 70 to 90% TDN

Factors influencing nutrition requirements :

A mature dry doe or a mature wether or buck are examples of animals having maintenance requirements only. Additional requirements above those needed for body maintenance are required for growth, pregnancy, lactation and hair production. More productive goats should be fed high quality feed, especially weaned kids being prepared for market, young replacement doelings and does in late gestation and early lactation. Does nursing twins or triplets have greater nutritional requirements than does nursing a single kid. Goats grazing very hilly pastures will have higher nutritional requirements than goats on plain pastures of the same quality because they will expend more energy to gather feed.

Energy : Energy comes primarily from carbohydrates (sugars, starch and fiber) and fats in the diet. Feed grains that are high in energy are whole cottonseed, corn, wheat middlings, soybean hulls/meal and corn gluten feed. The main sources of grainy goat feed are pulse, wheat, maize, rice, gram, pea, potato, molasses, agricultural byproducts etc. Fat is efficiently used for energy, but usually added fat should be less than 5% of diet as it depresses ruminal fermentation.

Protein : Crude protein is the most important nutrient in view of nutrition and cost. Feed grains that are rich in protein are whole cottonseed, soybean meal, oil cakes like mustard, linseed, ground nut, sesame cake, wheat middlings and corn gluten feed etc. Protein provides nitrogen for the ruminal bacteria and supply amino acids for protein synthesis in the animal's body. Inadequate levels of protein in the diet negatively affect growth rate, milk production, reproduction and disease resistance. Range fed goats that browse on shrub vegetation supplemented with protein show improved performance.

Minerals : Goats require many minerals for basic body function and optimum production. Providing free choice a complete goat mineral or a 50:50 mix of trace mineralized salt and dicalcium phosphate is advisable. Major minerals likely to be deficient in the diet are salt (sodium chloride), calcium, phosphorous and magnesium. Trace minerals likely to be low in the diet are selenium, copper, and zinc. Most forages are relatively high in calcium (grass: >0.5%; legumes: >1.2%), so calcium is low only if high grain diets are fed. Low quality, mature or weathered forages are deficient in phosphorous. Ratio of Ca: P in the diet is important and should be kept about 2:1 to 3:1.

Vitamins : Vitamins are organic compounds required in small quantities for different metabolic functions. Deficiency of a vitamin will either slow or block the metabolic pathway resulting in appearance of typical symptoms. Vitamins B complex and K are formed by microbial habitats in rumen and are not essential. Vitamin C is synthesized in the body tissues in adequate quantities to meet the requirements. Vitamins A and D are most likely to be deficient in the diet. Vitamin A is not contained in forages, but converted in body from carotene found in green, leafy forages. Vitamin D may be deficient in animals raised in confinement barns, especially during the winter time during lack of sunlight. Both vitamin E and Selenium function as anti-oxidants, the requirement of either one being partially met by the other. Vitamin E is commonly supplemented in relatively high amounts in goat diet to prevent from sub-clinical mastitis.

Feeding of Kids

Feeding management of the herd's young goats is critical to the overall success of the farm enterprise, regardless of the production system. Goat kids are raised either as replacement stock or for slaughter. At birth, the digestive system of the young goat is very similar to that of the pig and human (preruminant). During these first stages of milk feeding, the abomasum and small intestine play a relatively important role with respect to digestion and nutrition. Milk protein is rapidly digested in the small intestine, as is lactose. If the oesophageal groove does not close properly, then milk goes into the rumen where it 'ferments', allowing digestive upsets. When the young goats begin to eat solid food (forages and grains), these feeds may stay in the rumen and lead to development of the microbial population, which enables digestion of feed in animals.

Colostrum feeding of kids : Colostrum, the first milk produced after birth contains a high content of immunoglobulins (antibodies), vitamin A, mineral, fat etc. Feeding of colostrum serves as laxative aid in the excretion of the muconium lining of the digestive tract, provides an excellent energy source for the newborn, protect the newborn goat until its own immune system begins functioning about 3 weeks of age through immunoglobulins. Newborn kids get colostrum soon after birth (within 1st hour after birth, and certainly within 1st 6 hours) as percentage of antibodies found in colostrum

decreases rapidly after birth. The ability of the newborn kid to absorb antibodies also decreases rapidly 24 hours after birth. Newborn kids should ingest 10% of their body weight in colostrum or @ 100 ml per kg live weight during the first 12 to 24 hours of life for optimum immunity.

Feeding from birth to 3 months of age : Besides feeding colostrum immediately after birth, the dam and young ones should be kept together upto 3 days of birth for frequent access of milk. After 3 days and up to weaning, the kids should be fed with milk at 2 to 3 times a day. The milk-feeding period lasts from birth to 3 weeks or as long as 5 or 6 months depending on the production system. Feed efficiency appeared to be higher with goat milk especially during the first 30 days. Free choice access to milk is preferred especially with respect to health and less digestive problems. At about 2 weeks of age the young ones should be trained to eat green roughages and at one month of age concentrate mixture (creep feed) can be provided. Weaning can be a stressful period in the young goats' life, and is often characterized by a slow growth rate. Healthy kids experience less of a shock than kids fighting a disease or infection, such as coccidiosis. In early weaning situations, it is advisable to maintain a higher level of protein (19%), As growth and weight increases, the protein level can be reduced in the grain mix. Type of protein can affect growth rate. Fish meal gave the best results right after weaning, followed by soybean meal and field bean meal.

Creep feeding for kids : Creep feed is allowed during 1-3 months of age @50-100 gm/animal/day with the purpose to give more nutrients for their rapid growth. It should contain 22 % protein. Antibiotics like oxytetracycline or chlortetracycline may be mixed at the rate of 15 to 25 mg/kg of feed.

Composition of Ideal creep feed

Ingredients	%
Maize	40
Ground nut cake	30
Wheat bran	10
Deoiled rice bran	12
Molasses	5
Mineral mixture	2
Salt (fortified with vitamins A, B ₂ and D ₃ and antibiotic feed supplements)	1

Feeding schedule for a kid (birth to 90 days)

Age of kids	Doe milk or cow milk (ml)	Creep feed (g)	Forage, green/day (g)
1-3 days	Colostrum-300 ml, 3 feedings	-	-
4-14days		-	-
15-30 days	350 ml, 3 feedings	A little	A little
31-60 days	400 ml, 2 feedings	100-150	Free choice
61-90 days	200 ml, 2 feedings	200-250	Free choice

Feeding schedule for goat (3-12 months of age)

- Grazing in the pasture for about 8 hours per day.
- Concentrate mixture @ 100-200 g/animal/day with protein of 16-18%.
- Dry fodder during night in summer months and during rainy days.

Feeding of breeding does

Supplementation of concentrate mixture may be avoided if sufficient pasture is available. In poor grazing condition animals may be supplemented with concentrate mixture @150 – 350 g / animal/day (16-18% CP) depending up on the age, pregnancy and lactation. Flushing is usually practiced in does in which the level of feed offered to breeding does, mostly energy is increased one month prior to breeding, to increase body weight, ovulation rate and litter size. Increasing the level of energy offered to does should continue throughout the breeding season and for approximately 30 to 40 days after removing the bucks, for adequate implantation of the foetuses in the uterus. Flushing can be accomplished by moving breeding does to a lush nutritious pasture 3 to 4 weeks prior to the introduction of the bucks. Low to medium quality forage (> 10% protein) will meet requirements of dry does and non-breeding bucks. When forage or browse is limited or of low quality (< 10% protein), weanlings and yearlings should be fed concentrate mixture.

Feeding of pregnant does

During the first four months of pregnancy

- Pregnant animals should be allowed in good quality pasture 4-5 hours per day.
- Ration must be supplemented with green fodder @ 5 kg per head per day.

During the last one month of pregnancy:

- Fetal growth increases 60–80% until parturition and lack of enough energy in the feed can cause pregnancy toxemia. So during this period animals should be allowed very good quality pasture 4–5 hours per day.
- In addition to grazing, animals should be fed with concentrate mixture @ 250–350 g/animal/day. Ration should be supplemented with available green fodder at the rate of 7 kg per head per day.

Feeding does at kidding time:

The grain allowance should be reduced and dry roughage of good quality is fed free choice as kidding time approaches or immediately after kidding. On the day of parturition, light feed is preferred along with plenty of clean and cool water. Soon after kidding the doe must be given just enough of slightly warm water. After parturition the ration of the doe may be gradually increased to provide the full ration in divided doses 6–7 times in a day. Bulky and laxative feedstuffs may be included in the ration during the first few days. A mixture of wheat bran and barely/oats/maize (1:1) is excellent.

Feeding lactating does

The following rations may be recommended

6–8 hours grazing + 10 kg cultivated green fodder/day

6–8 hours grazing + 400 g of concentrate mixture/day

6–8 hours grazing + 800 g of good quality legume hay/day

Feeding non pregnant does

Dry goats do not need supplemental concentrate mixture if good quality pasture is available. In poor grazing condition animals may be supplemented with 150–200 g of concentrate / animal/day.

Feeding bucks for breeding

Bucks are allowed to graze with does as a common practice and bucks get the same ration as the does. Usually, it meets the nutritional requirements of the buck. Bucks should be given 500g concentrate mixture consisting of three parts oats or barley, one part maize and one part wheat per day along with facilities for separate feeding.

Balanced goat feed is the food which contains all nutrient ingredients in proper ratio and quantity to meet up the demand of goat's body in different stages of production. Every goat needs quality nutritious food for healthy live and better production. If goats are not fed balanced feed, they do not get nutritious ingredients as per their requirement resulting poor productive performance and low quality products. In case of raising

dairy goats, providing sufficient amount of greens and water play a vital role. Following is the composition of ideal concentrate mixture

Composition of Ideal concentrate mixture

Feed Ingredients	Goat kid (%)	Dairy Goat (%)	Meat Goat (%)	Pregnant Goat (%)
Gram	20	15	20	50
Maize/BrokenWheat	22	37	23	20
Sesame/Ground nut cake	35	25	30	20
Rice/Wheat bran	20	20	24	7
Minerals	2.5	2.5	2.5	2.5
Salt	0.5	0.5	0.5	0.5
Total	100	100	100	100

Feeding early-weaned and orphan kids

Kids are usually weaned at 3 months of age. Some kids may be orphaned due to the death of dam or disowning by the mother. Young suckling kids on creep feeding, early-weaners and orphan kids must be well fed. Grains should be cracked before feeding to kids up to 6 weeks age. Then grains can be fed as such except in the case of hard grains, which may be cracked, crimped or rolled. Kids should get good pasture or high quality legume hay preferably in the pelleted form in addition to the grains. If legume hay or good quality pasture is not available, grain ration should be supplemented with a protein cum vitamin supplement with about 18% CP. Complete pelleted ration consisting of roughage and concentrate, both mixed and made into pellets has been found to be advantageous. The pellets are self-fed and the nutrient intake is controlled by varying the composition of the pellets as the capacity of consuming bulk is more or less fixed. Pellets consists of 65 to 70% roughages but decreased gradually to 50% by 10-12 weeks age.

Feeding from weaning to market

Feeding of goats vary with economic and climatic conditions and availability of feeds. Animals are usually allowed to utilize grazing lands, waste lands and aftermath of grain crops as far as possible and supplement whatever is deficient, with harvested good quality fodder, hay or concentrate. An average goat may be fed 225 to 450g of concentrate mixture depending on the grazing conditions. In over-grazed grasslands, 450g of the concentrate mixture with 500 g to 2 kg good quality green fodder may be provided.

Feeding of replacement does

Doe kids needed for replacement should be grazed with their mothers during as much of the milking period as possible and not weaned early. Following weaning, doe kids should be separated from the main herd and have access to high quality forage and receive good nutrition through first kidding at 1-2 years of age, depending on the nutritional plane. Leaving doe kids with the main herd will result in undernourished doelings that are bred too young and too small; these animals will never reach their production potential.

Feeding of young stock

Performance of the adult stock depends on how they are reared when young. Feeding schedule for kids should be such that a weekly growth rate of 0.6 kg is obtained. The kids should be fed 56-112 g of colostrum 4-5 times a day, depending on its birth weight, for 3 days. From the 4th day onwards, they may be fed the following ration schedule:

Body weight (kg)	Milk		Concentrate* mixture per day (gm)	Green fodder (lucerne/berseem) kg
	Morning (ml)	Evening (ml)		
2.5	200	200	-	-
3.0	250	250	-	-
3.5	300	300	-	-
4.0	300	30	-	-
5.0	300	300	50	<i>ad lib.</i>
6.0	350	350	100	<i>ad lib.</i>
7.0	350	350	150	<i>ad lib.</i>
8.0	300	300	200	<i>ad lib.</i>
9.0	250	240	250	<i>ad lib.</i>
10.0	150	150	350	<i>ad lib.</i>
15.0	100	100	350	<i>ad lib.</i>
20.0	-	-	350	<i>ad lib.</i>
25.0	-	-	350	1.5
30.0	-	-	350	2.0
40.0	-	-	350	2.5
50.0	-	-	350	4.0
60.0	-	-	350	5.0
70.0	-	-	350	5.5

*Concentrate mixture (in parts) : gram 20, maize 22, GNC 35, wheat bran 20, mineral mixture 2.5, & common salt 0.5.

Mineral mixture : the requirements of calcium and phosphorous for maintenance are 6.5 and 3.5 g, respectively, per 50 kg body weight. Mineral mixture @2% in the concentrate ration is recommended.

f) Salt : Salt licks or lumps of rock salt of fairly good size is hung up in some suitable place as goats secrete a good amount of sodium and chloride ions in the milk.

g) Vitamins and antibiotics : Goats particularly need vitamins A, D and E. Vitamin A can be supplied by feeding green forage and yellow maize; 1 kg of lush-green fodder will provide 1500 IU. Exposure to sunlight synthesizes Vitamin D. Vitamin E is present in adequate amounts in most normal rations. Feeding of aureomycin or terramycin increases the growth rate of young kids, reduced the incidence of scours and other infectious diseases and improves the general appearance of the kids.

Feed efficiency of goat

Goats generally produce more milk than a cow from the same quantity of nutrients. The nutrient conversion efficiency for the production of milk in goats is 45.7%, whereas a dairy cow averages 38%. It has been observed that goats are 4.04% superior to sheep, 7.9% superior to buffaloes, and 8.6% superior to cows in crude fibre utilization. The goat uses more useless feeds for its maintenance than a cow. The secret of successful feeding is in devising a cheap and efficient ration. While preparing a ration for goats, factors like bulk, palatability, availability, price and digestibility should be considered along with the nutritive quality of the feed.

Nutrient requirements

The nutrients are divided into maintenance, production and pregnancy requirement.

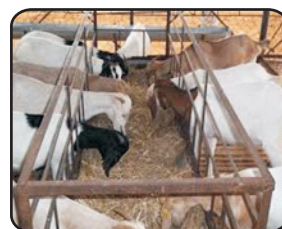
a) **Maintenance ration** : As goats have a higher metabolic rate than cattle, their maintenance requirements are higher. The maintenance requirement is 0.09% DCP and 0.09% TDN. For its size, a goat can consume substantially more feed than cattle or sheep, i.e. 6.5-11% of its body weight in dry matter when compared with 2.5-3% for cattle or sheep. Goat can satisfy its maintenance requirement and produce milk from forage alone.

b) **Production ration** : The nutritional requirement of a goat weighing 50 kg and yielding 2 litres of milk with 4% fat may be met by feeding 400g of concentrate mixture and 5 kg of berseem or lucerne. The ration should have 12-15 % crude protein.

c) **Pregnancy ration** : The foetal growth in the last 2 months of pregnancy is rapid and the metabolic rate of the goat rises rapidly. A week before she kids, the doe should be provided with more succulent type of food. For 3-4 days after kidding, the level of diet should be lowered and made more fibrous.

Feed resource and feeding

Goats are sensitive animals with peculiar feeding habits. By the means of their mobile upper lips and very prehensile tongue, goats are able to graze on very short grass and browse on foliage not normally eaten by other domestic livestock. Unlike sheep, goats relish eating aromatic plants in areas of scarce food supply and hence can penetrate deep into deserts. They are fastidious about cleanliness and like frequent change in the feed. Feeds given must be clean and fresh, since goats eat nothing that is dirty or foul-smelling. They dislike wet, stale or trampled fodder. For this reason, it is advisable to feed them in hay-racks or hang the feed in bundles from a peg in the wall or



Double sided portable hay rack

from a branch of a tree. Double-sided portable hay-racks are the most suitable and convenient for stall feeding. It is preferable to serve them small quantities at a time; as they waste a lot of it by trampling if offered more.

Goats are very fond of leguminous fodders. They do not relish fodder like sorghum/maize silage or straw. Goats do not relish hay prepared from forest grasses, even if cut in early stages, but very much relish hay prepared from leguminous crops. Some of the common green roughages liked by goats are : lucerne, berseem, napier grass, green arhar, cowpea, soybean, cabbage and cauliflower leaves, shaftal, senji, methi, shrubs and weeds of different kinds; and leaves of trees such as babul, neem, ber, tamarind and pipal. The common dry fodders liked by goats are straws of arhar, urid, mung, gram, dry leaves of trees, and lucerne/berseem hays.



Feeding of dry fodder in feeder

Goats were maintained on grazing in harvested fields, along the roadside and on other uncultivated/ barren lands. The natural ability of goat to eat a wide variety of vegetation and waste has been, in fact, a big motivating factor for small, marginal and landless labourers to rear few goats. Stall-feeding in goats is very limited. So an integration of forage legumes into the cropping system of small stock owners would go a long way to improve the productivity of their animals. By introduction of legumes like Siratro (*Macroptelium atropurpureum*), *Stylosanthes hamata*, *S. scabra*, *Glycine javanica*, *Dolichos auxilaris*, *Desmodium spp* and *Centrosema pubescens* etc., the quantity as well as quality of herbage production can be substantially increased. Indigenous legumes such as clovers (*Trifolium pratens*, *T. repens*), *Medicago denticulata*, *Melilotus alba*, white clover, red clover have proved successful apart from Lucerne and Berseem. *Leucaena leucocephala* and even perennial pigeon pea etc. are pruned frequently to provide leaf fodder to get better crop production. She goats are given kitchen waste and the males are given inferior quality grains and grams for fattening purposes. Goats eat 4-5 times than that of their body weight. They eat more of tree fodder and hence 40-50% of green fodder should contain tree leaf fodder in roughages.

HOUSING MANAGEMENT OF GOAT

Housing instinct is widely prevalent in the animal kingdom and goats are no exception. The site having great source of fresh and clean water supply, availability of all types of equipment, easily available food source, fertile field for crop, grasses and other green plant production should be selected for housing of goat. House should be neat, clean, dry with proper ventilation and drainage system inside facilitated with good transportation and veterinary service along with proper marketing facility. Goats do not thrive on marshy or swampy ground. Goats should be provided with a dry, comfortable, safe and secure place, free from worms and affording protection from excessive heat and inclement weather. A market near the farm land is also required to sell products easily and buy necessary commodities.

Type of shed

Mud floor shed

Deep litter shed

Elevated floor shed

Concrete House

Normally goat do not require elaborate housing facility, but minimum provisions for protection against inclement weather conditions (sun, rain, winds) should be facilitated. Shed could be built along the wall of the house. Protection with gunny bags/thatched material and bamboos may be temporarily provided. The roof should be made of asbestos sheet supported by tubular or angular steel. The wooden rafters and thatching material could also be used.

Orientation of shed

- Sheds with long axis running East-West provide a cooler environment underneath than the one with a North - South orientation.
- The latter keeps the shed dry and promotes sanitation (because the sun rays falling inside the shed for longer period) though this orientation may impose a greater stress on the animals, if left inside the shed during daytime in hot arid climate.
- A North - East to South-West orientation is expected to give maximum comfort in hot arid environment.

Ventilation

The efficiency of ventilation is greatly affected by the summer and winter directions of the prevailing wind at any place. In tropics, the long sides of the goat shed should not be provided with solid wall above 1m from the floor. The open area should be kept uncovered when the ambient climatic condition is warm – humid or hot- humid and should be partially covered when it is hot dry. Protection

from hot-winds in the hot-arid zone needs special consideration. During the winter in temperate zone, the sides may be closed but cross ventilation space is left at the roof height.

Height and shape of roof

The height at centre in 'A' shaped roof is suggested to vary from 3 to 3.5 m. A height of less than 3m interferes with proper ventilation resulting in reduced convective heat loss from animals. The heat loss through radiation from goats to cool sky is curtailed in low roof sheds. 'A' shaped roof is better for hot climatic regions because one side of 'A' shaped roof saves the other half from direct solar radiation by casting its shadow. It helps in cutting down heat gain from the roof of the shelter. Double roof with both roofs of same or different materials are effective in reducing the heat.

Floor type and space

- Animal lies on the floor may potentially be a source of thermal and physical discomfort, injury, and infectious diseases.
- Ideal bed needs to be hygienic, dry, resilient and reasonably temperature resistant.
- Deep, clean, dry straw can provide an ideal bed for weaners and growers during cold but a thin layer of straw is more suitable during warm weather.
- In tropical climate, huddling is disadvantageous for health and productivity of the animal.

Type of animals	Minimum floor space per animal (m ²)
Buck in groups	1.8
Buck individual	3.2
Kids in group	0.4
Weaner in groups	0.8
Yearling or goatlings	0.9
Doe in groups	1.0
Doe with kid	1.5

House space requirement

In accordance with increasing the body size and weight of goats, goats require more space. A house of 1.8 meter x 1.8 meter x 2.5 meter (5.5 ft x 5.5 ft x 8.5 ft) is suitable enough for housing 10 small goats. The nursing and pregnant goats should be kept separately. However, every goat needs their required space for proper growing and better production.

Type of animals	Minimum floor space per animal (m ²)
Adult goat	0.75 X 4.5 X 4.8
Billy goat	2.4 X 1.8
Goat kid	0.3 X 0.3

Doe shed

- Shed should be 15 m x 4 m x 3 m. to accommodate 60 does used for breeding.
- Stalls for keeping milking does may be arranged in two rows with a passage in between them.
- The dimensions of each stall meant to keep a single milking doe may be 1.2 m wide and 1.4 m long.
- Partitions separating one stall from the other should be there.
- Racks for hay and greens may be provided in the shed.

Buck shed

- Shed with dimension of 4 m x 2.5 m x 3 m high can accommodate about 3 bucks.
- Shed should be partitioned lengthwise to form 3 equal compartments.
- Partition between each animal should not exceed 1m.
- Partitions made of either wooden planks or half-cut ballis to divide the shed into two equal compartments for housing two bucks.
- The buck shed shall be away from the milk room and the kidding shed.

Kidding shed

- It is the shed used as maternity room for does. Individual spacious pens are essential to house does in late pregnancy.
- Movable hurdles can also be used for preparing kidding pens.
- Individual kidding pens are contaminated very quickly, and need frequent cleaning and disinfection otherwise they may constitute an important source of naval infection to kids.

- The pens for kidding should be at the warmest part of the goat house complex if the kidding is expected in cool weather.
- The protection of kids from low temperature is essential to reduce the kid mortality.
- Dimension of 1.5 x 1.2 x 3.0 m high along with a manger for holding feed and hay and a bucket for keeping water should be provided.

Kid shed

- A shed with a dimension of 7.5m x 4m x 3m high can accommodate 75 kids.
- Shed should be partitioned breadth wise dividing into 2 compartments.
- The compartment having dimension of 5m x 4m x 3m high should be used to keep the unweaned animals and other compartment with dimension of 2.5 x 4 m should be used for keeping the weaned animals.

Sick animal shed

- Sick animal shed with a dimension of 3 x 2 x 3m high is suitable for segregating ailing and diseased animal.

Shearing room / Store room

- This may consist of 2 compartments with a dividing wall. One room may be exclusively for storing the wool and shearing equipment, and the other for keeping the feed and medicine. The room may be with a dimension of 6m x 3.5m x 3m situated in the front side.

Essential appliances required in goat house

Feeders : The contamination of feed wastage and with faeces and urine are the major problem in existing feeders. The rectangular and hexagonal feeder has been developed with provision of feeding green roughages, straws as well as concentrates. For goats it is better to feed the stall fed animals above ground level. Feed racks can be used for this purpose, which can also minimize the feed wastage also.



Water troughs : Contaminated water is major source of infection. Water tanks or troughs should be covered and need regular cleaning. Water troughs of 3-4cm in length per goat, when raised in groups are sufficient. Water tanks with flat valves may be suitable for large-scale intensive goat production.

Type of animals	Space per animal (cm)	Width of manger / water trough (cm)	Depth of manger/ water trough (cm)	Height of inner wall of manger/ water trough (cm)
Adult goat	40-50	50	30	35
Kid	30-35	50	20	25

Before building house for goats, following points need to be attended

- Select a dry and higher place to keep the goats safe from flood.
- Keep the floor of the house dry always.
- Always ensure the huge flow of light and air inside the house.
- Make house in suitable for controlling temperature and moisture.
- Always keep the house free from damp as it is responsible for various diseases.
- Make the wall of the house with concrete or by using bamboo poles.
- House must be strong and comfortable.
- Keep enough space inside the house for taking rest.
- House must have the facilities of cleaning well regularly.
- Goats are affected easily by cold and water. Extra care is required in rainy and winter season to prevent from pneumonia.
- Sheds require seasonal spraying to protect the flock from ectoparasites and disinfection particularly prior to kidding.
- Replace earthen floors in every 3 months besides disinfection with carbolic acid to protect from snakes and reptiles.
- Annual white washing with lime prior to winter are suggested. Painting of sheds is recommended prior to monsoon
- Application of thatch panels to control the excessive airflow during summer and winter through the sheds in the hot-arid environment is expected to improve the shed microclimate.

Construction details of Goat shed

Floor : The floor may be either made of cement concrete or of movable or immovable slatted wooden platform raised 45 cm above the ground. The floor shall have a slope of 2.5 cm for every one metre. For each row of stalls, there shall be a brick masonry drain 30 - 40 cm wide and 7.5 cm deep.

Walls : The walls may be of brick in cement mortar up to 1.2 m in height and the rest of the portion shall be covered with wire - netting supported by angle irons of size 5 x 5 x 6 cm section or wooden posts of suitable section. The walls of the stalls adjoining the passage shall be 1.5 m high and they shall be of brick in cement mortar.

Roof : The roof may be of lean to type, gabled type and it may be made of plain or corrugated asbestos cement sheets or galvanized steel sheets or aluminium sheets and where the rainfall is not heavy it may be of thatch.

Partitions : The partitions separating one stall from the other may be either simple wooden plank, galvanized steel or asbestos sheets. The partition shall be at least 15 cm above the floor level.



Ideal low cost sheds of raised bed platform for hygienic housing

GENERAL MANAGEMENT PRACTICES

Determination of Age

The age of a goat is judged from its front teeth (incisors) on the lower jaw. There are no teeth on the upper jaw. The kid at birth, or shortly afterwards, has teeth on the lower jaw called as suckling teeth are small and sharp. At 12 to 14 months old age, the central pair is shed and is replaced by two large permanent teeth; when 24 to 26 months old, two more small teeth are shed and are replaced by two large teeth, one on each side of the first pair; when 36 to 38 months old there are six permanent teeth; and when 48 to 50 months old a complete set of four pairs of permanent teeth are present. Goat may have all its permanent teeth by 3 years old age. The teeth start wearing four to six weeks after eruption. Age of eruption of teeth serves as a reasonable and dependable guide for judging maturity.

Identification

Each goat in a herd should be marked by using some identification mark such as tattooing, ear-tags or notching of the ears. The tattooing system is used almost universally.



Tagging for Identification

Disbudding and Dehorning

It is practiced when the male kid is 2-5 days old and the female kid is up to 12 days old. The hair should be clipped from around the horn-bud, and this area covered with petroleum jelly to protect it from caustic soda or potash, which should be thoroughly rubbed on the bud until the horn-bud is well blistered. Caustic soda should not come into contact with the eyes. An electric dehorner can also be used safely. The kid should be muzzled gently so that it can breathe freely; otherwise partial suffocation may occur. Mature goats can be dehorned by sawing off the horns close to the head with a meat saw usually done in winter when flies are not troublesome.



Disbudding and Dehorning

Castration

Male goats are raised mainly for meat and not for breeding. Males are castrated with an emasculator, or torsion forceps. The best time for castrating bucks at six months old with the Burdizzo castrator which avoids all risks of infection. Castration improves the flesh of the adult buck and castrated male is called a wether.



Castration by farm women

Exercise

Exercise of goats maintain them in a good condition. Stock on range receive sufficient exercise while grazing. Stall-fed goats should be let loose in a large paddock for at least 3-4 hours a day. Goats should not be let loose in the paddock or sent out for grazing until the dew has dried up, i.e. not until one to two hours after sunrise. Grazing on wet grass with dew is likely to result in tympanites and intestinal inflammation.

Hoof Trimming

Hoof trimming is necessary for the well-being of goats. If neglected it can weaken legs, rain feet and lower milk production. Sharp pen-knives or curved hand-pruning shears can be used effectively.



Hoof trimming

Selection of Doe

An outstanding doe is the nucleus of a productive herd. Selection of a doe is required with great care. Good body development is essential for high milk production. The doe should be well grown, healthy in appearance, and stand squarely on her feet and not down on the pastern. It should be truly feminine in appearance and mild in temperament.

Salient features of a good milch goat :

Head: It should be long, narrow and of moderate width, with a full and well-developed muzzle and prominent nostrils, naturally hornless or disbudded bearing a feminine appearance. Eyes should be large and bright, set well apart indicating docility.



Ideal Doe

Neck and shoulders: The neck should be long and thin, good depth, with the tassels, if present, evenly hung. The withers and the shoulders should be fine in appearance and connect the neck with the body with little break in continuity. A considerable thickness in the shoulders or a drop immediately between the shoulder blades is undesirable.

Chest: Moderately deep and of good width, appearing without coarseness.

Forelegs: Forelegs should be straight, strong and possess good bone.

Feet: Animal should stand well on its legs without the tendency to 'turn toes' or 'walk on heels'.

Body: It should be wedge-shaped and sharp at the withers, dropped in gradual curve from the point where the abdomen unites with the chest i.e. a little way behind the

forelegs, and then rise slightly again to meet the udder. The back should be level from the shoulders to the hips and then drop slightly at the tail region. Hips are often slightly higher than the shoulders, but this need not be regarded as a defect. An excessive dip in the back, however, is highly undesirable. Plenty of length from the head to the tail is a desirable feature.

Ribs : Ribs should be well sprung so as to give a barrel effect; flat sides are a common fault. The abdomen should not be protruding beyond the width of the ribs, so that its roundness is not affected.

Hind-quarters: Sufficient width across the hips and the rump, and between the pin-bone and the hocks is desirable. Hind-legs should face straight forward and not outward; the latter tendency is one of the common defects in goats resulting 'cow- hocks'. There should be a slight rise from the back to the hips and a gradual drop from the rump to the tail. A sharp drop from the hips to the tail is regarded as a defect.

Hind-legs : Bones should give the appearance of strength with the hocks slightly bent. The pastern should be short, its joint showing no sign of weakness that might result in dropped pastern. The thighs should provide plenty of room for a round, well-attached udder of fair size.

Udder and teats: Udder should be carried well under the body. When viewed from the side it should be in front of the hind-legs. It should be large, but its size should be proportional to the size of the goat. The teats should be pointed slightly forward. The udder in a freshly milked goat should have a collapsed appearance. The skin of the udder is usually covered partly with fine hair, soft and pliable rather than meaty. The texture of the udder should be reasonably soft. Milk ducts and teats should be entirely free from hard lumps. The teats should be quite separate from the udder with a distinct line of demarcation, point downward and slightly forward, and be of moderate length and of suitable size to be conveniently held in hand during milking. Large milk-veins should be present under the belly and lead the udder. These veins, although usually better developed in old goats, indicate superior milch quality.

Skin and hair : Skin should be loose, pliable and free from dryness. The coat varies in different breeds, but generally glossy and with fine hair. Poor condition of flesh may be an indication of a good milker, while a poor milker may be in good flesh.

Selecting the Buck

The buck should have a strong, well-developed frame, and good conformation and breed characters. Good depth of ribs is essential. Legs should be straight and well placed under the body. Buck should be healthy and free from external and internal parasites. It should be chosen from a good milking strain and should be the progeny of dams having good performance record. A well- grown buck kid may be bred to 5-6 does

during his first season at an approximate age of 6 months. At the age of 18- 24 months old, buck is allowed to serve 25 - 30 does, and when fully mature 50 to 60 does in a breeding season and causing early kidding. The buck, to be in good condition and well suited for breeding should be kept on range, and made to cover 3 to 5 km each day. A buck is very active during the breeding season. The buck's hooves should be regularly attended otherwise foot-rot or lameness may develop. Bucks should always be kept separate from the does to avoid unduly restive or excited.



Ideal Buck

Breeding of Doe

Does are more or less continuous breeders. The signs of heat in the doe usually are uneasiness, tail shaking, pink and swollen genitalia, frequent urination, restlessness, bleating and a little mucous discharge for one to three days. The period between heats varies from 18 to 21 days. It is better to inseminate the doe on the second day of the heat period. The sperms survive in the female genital tract for 22 to 42 hours. Mating should be so timed that the kids are born in a season when mortality among them is at its lowest and an adequate amount of food is available for their nourishment and growth. Hence breeding seasons vary with breed, locality and climate.

Does may be mated when she is 10-15 months old so that they kid at the age of 15 to 20 months. But as a rule a goat should not be mated until it is one year old. Average gestation period is 151 + 3 days. It is better to breed the female once a year. Some goats can be made to kid twice in 18 months. The goats reach their maximum efficiency at the age of 5-7 years. A well- maintained doe may continue to be milked until a month before she is expected to kid again. A doe in good condition will produce strong lively kids, so does must be fed well, allowed liberal exercise and protected from rain and cold.

Goats in Kid

A temporary increase in milk yield after mating is considered to be an indication of pregnancy, but the first sign that a doe is in kid is the cessation of the periodical return of oestrus. During the first 3 months of pregnancy there is little alteration in the shape of the in-kid does. Head of the kid can sometimes be felt from 6-8 weeks. 6-8 weeks before kidding, young does commence to show udder development. Goats are known to give birth to as many as 5 kids at a time, but birth of such large numbers affects the health of the goat. The incidence of twinning varies with the breeder environment and number of kiddings.

Care of Kids

Immediately after birth, the nose of the kid should be cleared of any entangling membranes or mucus to prevent suffocation, and the navel should be swabbed with tincture of iodine. The kid, if healthy and strong, would stand on its legs and make for its mother's teats. The kid should be taken away from its mother at birth. Colostrum should be the first food to be given to kids, it clears the stomach and develops immunity. The kids should be placed on either pan or bottle-feeding. Use of baby bottles and nipples or baby feeders that lessen air swallowing would be better. Nipples and bottles should be kept thoroughly cleaned. Pan-feeding is fast and efficient. Lukewarm milk (95°F/36°C) should be placed in a shallow pan and the lip of the kid slowly dipped into it.

Milking and collection of clean milk

Efficiency in milking can be acquired by practice. The milk harvesting should be drawn quickly and also completely. Milking is done either stripping or by full-hand milking. Both the teats should be uniformly milked, otherwise it may lead to disparity in their size. One may milk by sitting either at the rear or at the right side of the goat. The latter is more convenient and cleaner. The most suitable position is to sit on a low stool with the goat standing on a raised platform, about 0-6 m from the ground. Before milking, one should wash one's hands with clean water, preferably using soap. The udder and teats should then be cleaned by wrapping with a damp piece of cloth dipped in antiseptic solution. Milk absorbs taints and odours very rapidly. So it should be collected and stored under cool and hygienic conditions.

DISEASES OF GOAT AND CONTROL MEASURES

Awareness of common diseases of goats and their control methods is required for successful goat farming. In many cases, intensive goat farming leads to spreading of many diseases which results high mortality. If goat farmers are not aware of common goat diseases and their prevention, there may be a chance of getting losses in goat farming business. Hence, it's very important to identify the symptoms and apply preventive care. The followings are types of diseases found in most of the goat breeds in India.

Bacterial Diseases

1. Mastitis

Symptoms: Generally, this causes swelling of the udder and there may be change in colour of the goat milk.

Control : Maintain the hygiene in the goat shed or house and clean the goat udders with disinfect solutions.



2. Enterotoxaemia

It is an acute disease of goat of all ages, but primarily of young ones. It affects animals in a high state of nutrition on a lush feed, grass or grain. Morbidity rates seldom exceed 10% but mortality rate approximates 100%. It is caused by *Clostridium perfringens* type D inhabited in the alimentary tract.

Symptoms: Green, pasty diarrhea, staggering, recumbency, opisthotonus, and acute, clonic convulsions with frothing at the mouth Sudden death in young goat kids along with mucous diarrhea.

Control: Avoid feeding young green grass and carry out recommended yearly vaccination just before rainy season.



3. Pneumonia

Symptoms: Frequent coughing and fever are common

Control : Make sure to provide clean water and keep the shed always clean and dry. Well ventilation is also required to avoid such kind of disease in goats.



4. Brucellosis

Symptoms: Infertility problems and abortion during late pregnancy and joint swelling are common.

Control : By using hand gloves, dispose dead fetus and placenta of animal.

5. Anthrax

Symptoms: High fever and may cause sudden death. You may even notice blood flowing from nose and other outlets.

Control : Affected animals (died) should be buried to stop further spread in the flock.



6. Haemorrhagic Septicemia

It usually occurs in pneumonic form. Morbidity and mortality rates may be as high as 40%. Transmission occurs by the inhalation or ingestion of the infected material. Animals should not be sent out for grazing for 2-3 days.

Symptoms: High fever along with intestinal inflammation. mucopurulent discharge from the eyes and nose, coughing, depression and anorexia.

Control : Vaccinate all the goats in shed once in year just before rainy season starts.

7. Foot Rot

Symptoms: Usually wounds in the goat foot are seen.

Control : Ensure dry condition in goat shed.

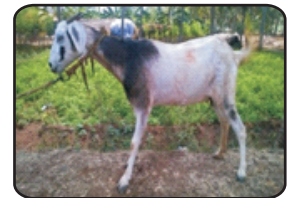


8. Tetanus

It is an acute, infectious disease manifested by tonic convulsions of the voluntary muscles. Usually followed through routine operations such as castration and even vaccination.

Symptoms: Stiffness of limbs, lock jaw, opisthotonus, followed by death due to asphyxiation.

Control: Tetanus antitoxin is usually administered but is of little value when the signs have appeared



Viral Diseases

9. Goat Pox

It is a highly contagious viral disease characterized by development of vesicles and pustules on the skin and internal lesions. Spread may be by contact with infected animals and contaminated articles, or by inhalation.

Symptoms: Fever, nasal mucous discharge and respiratory distress. Apart from this, Pox lesion on lips, thighs, and udder is seen in the affected goats.

Control : Vaccination once in a year.



10. PPR- Peste Des Petits Ruminants

PPR is a severe, fast-spreading disease caused by peste des petits ruminants virus (PPRV).

Symptoms: sudden onset of depression, fever, nasal mucous discharge, sores in the mouth and respiratory distress, disturbed breathing and cough, foul-smelling diarrhoea and death

Control : Affected goats should be separated from the flock and vaccinated once in a year.



11. FMD – Foot and Mouth Disease

It is an extremely contagious, acute viral disease characterized by development of vesicles in the oral cavity and in the interdigital space.

Symptoms: High fever, wounds in foot and mouth, increased salivary secretion, difficulty in walking.

Control : Ensure all goats are properly vaccinated. First vaccination should be done in third month and subsequently once in 5 to 6 months interval.



12. Contagious ecthyma

It is a viral characterized by the formation of papules and pustules and the piling up of thick crusts on the lesions.

Symptoms : Lesions are mostly found on the commissures of the lips and are covered by scabs. The course of the disease is 1-4 weeks.

Control: Antibiotics are recommended to check secondary infections.



13. Blue tongue

It is an infectious but non-contagious, exotic disease of sheep & goats. Natural transmission takes place through insect vectors viz. *Culicoides* and *Aedes* species

Symptoms : Pyrexia upto 106°F is the common initial symptom. The disease has three clinical forms : abortive, acute and sub-acute. The abortive form mostly goes unnoticed. In the acute form, there is fever lasting for 5-6 days with nasal discharge, frothing, marked salivation, highly congested and cyanotic nasal and oral mucosa, epithelial excoriation in the oral cavity and purplish discolouration of the interdigital space, pasterns and coronets. Morbidity rate may be 50% or more whereas mortality rates vary widely.

Control: Antibiotics are recommended to check secondary infections.



Endo-Parasitic Diseases

14. Tape worm

Symptoms: Fever, slow growth of animals and goat kid mortality.

Control : Periodic deworming for all goats in the shed.

15. Round worm

Symptoms: Fever, slow rate of animal growth, anemia and edema in lower jaws of goats.

Control : Periodic deworming for all goats in the shed.



16. Round worm

Coccidiosis:

Symptoms: Blood motions (diarrhea), sudden death of goat kids and anemia.

Control: Clean the shed regularly. Spraying of 10% ammonia solution, as per veterinary doctor advice use any anticoccidial drugs.

17. Fluke infection

Symptoms: Anemia, emaciation and edema in lower jaw.

Control : Deworming should be done in regular intervals. Grazing in early mornings and late evenings should be avoided.

Ecto-Parasitic Infestation

18. Lice and Tick

Symptoms: Skin allergy, slow growth in growing animals.

Control : Clean the goat house regularly and keep the floor always dry.



Other General Problems in Goats

19. Bloat: Generally, Bloat occurs when goats feed on young leaves and grasses, unknown weeds, easily digestible cereals, rotten vegetables and fruits. Bloat is followed by diarrhea leading to death. Veterinary doctor's help is urgent need to control bloat. Avoid Feeding of potatoes, brinjal, beans which can form gas should be avoided.

20. Indigestion: Low quality feed, bad water, toxic plants, fungal contaminated feed and change of feed may result in indigestion of animals. Avoid such conditions to prevent goats from indigestion.

21. Pregnancy Disease : Pregnancy toxemia and abortions are common problems. It occurs in late pregnancy especially in last 2 weeks in goats carrying multiple kids when nutritional requirements are as high as they are during lactation. During this period, not only are extra nutrients needed by the developing foetuses, but they also crowd the abdominal cavity and reduce ruminal volume resulting inadequate intake of feed.

Because of this, does fed a poor quality diet (especially if they are fat) can develop ketosis and die due to inadequate energy intake. Grain and protein meal and to a lesser extent whole cottonseed are the preferred feeds to overcome this problem. Abortions in pregnant goats are caused by nutritional problems and infectious problems.



Prevention and control of diseases

Since goat production is only a fringe activity for most of the farmers, the health problems of goats were hardly paid any attention. However, goats suffered mainly from parasitic infestation, mange, mineral deficiency, anorexia, contagious ecthyma, diarrhea, mastitis etc. Viral diseases like PPR, goat pox, foot and mouth diseases and bacterial diseases like anthrax, brucellosis etc. are very harmful for goats. Proper scheduled vaccination is must to prevent this type of diseases to overcome the mortality rate in goats. The does not vaccinated with PPR, goat pox, brucellosis vaccines previously should be vaccinated at the 5th month of gestation. Kids should be vaccinated with PPR vaccine at 5 months of age.

Vaccination Schedule for Goats

Diseases	Vaccine	Dose	Immunity	Primary vaccination (Age)	Regular vaccination
PPR	PPR	1 ml S/C	3 year	3 months & above	Once in 3 years
Foot & mouth disease (F.M.D.)	Polyvalent FMD vaccine	3 ml S/C	1 year	4 months & above	Twice in a year (Feb. & Dec./ Sept & Mar)
Anthrax	Anthrax spore vaccine	3 ml S/C	1 year	4 months & above	Once Annually (May- June) (in affected area only)
Enterotoxaemia	ET vaccine	5 ml S/C	1 year	4 months (If dam is vaccinated)	Before monsoon (Preferably in May). Booster vaccination after 15 days of 1st vaccination
				4 months (If dam is vaccinated)	
Haemorrhagic Septicemia(H.S)	HS vaccine	-	1 year	6 months & above	Once Annually (before monsoon)
Black Quarter (B.Q)	BQ vaccine	-	1 year	6 months & above	Once Annually (before monsoon)
Goat Pox	Pox vaccine	-	1 year	3 months & above	Once Annually (Dec. month)
C.C.P.P	IVRI vaccine	0.2 ml S/C	1 year	3 months & above	Once Annually (Jan. month)
Rabies	Rabies post bite vaccine	1 ml S/C	1 year		0,3,7,14,28,90 days

*Before vaccination, deworming should be ensured to get better results

Vaccinating the herd/flock can provide some insurance against specific common diseases. However, each vaccination programme must be tailored to an individual operation. Vaccination should be economic justified for specific diseases. The clostridial vaccines are the only ones that can be recommended on a blanket basis for almost all originals. All other vaccination programs need to be developed specific to a herd/flock. Goats should be vaccinated for enterotoxaemia and tetanus at appropriate times. Combination vaccines (7 way) are also available against other clostridial diseases, such as blackleg and malignant edema. These vaccines are inexpensive, and when used properly, are very effective in preventing losses. When handling vaccinations, it is important to follow label directions, as vaccines must be stored, handled, and administered properly. Only healthy livestock should be vaccinated.

Helminthiasis and ectoparasitosis are widespread in tropical countries and adversely affect the productivity. Helminthiasis occurs at the end of the rainy season while ectoparasitosis inflicts heavy damage during the rains to early dry season. Vaccination programme is more viable in the pastoral and agro-pastoral regions. An efficient, well-planned animal health service is a pre-requisite for increasing production. Any improvement in animal health services must go hand in hand with an adequate improvement in the provision of feed to achieve expected improvements in productivity.

ECONOMICS OF GOAT PRODUCTION

Assumptions:-

- **Farmer** has own land for constructing goat shed and for fodder cultivation /grazing for 60 goats (50 females and 10 males).
- **Black bengal /Ganjam** are considered as parental stock. Cost of buck and doe was considered as Rs. 2000 and Rs.1500, respectively.
- Goats are purchased at the age of 9-10 months and after rearing 3 - 4 m selective mating will be practiced.
- **In semi intensive system** goat are allowed for grazing for 5-6 hours and sheltered in house during night time.
- Labour paid by farmer himself for daily routine work, so labour cost is not included in calculation
- Concentrate feed @ 100, 150 and 200 g is given to grower, adult and nursing mother daily. The cost was considered @ Rs 2000 / Qt.
- Locally available materials are used to construct shed and rate was considered @ Rs 50/ft².
- Space requirement for adult was considered @ 20 ft² and for growers @ 10 ft².

So, total space requirement is 2700 ft².

- Fertility rate is considered 90 %. It is assumed that 50 % doe deliver single and 50 % doe deliver twin .
- Mortality is considered as 5 %,
- Cost of feeder / waterer is @ Rs 20 each
- Insurance premium @ 4 % of animal cost.
- Selling price of parental stock @ 1500 per goat, adult goat of 16 m old @ 2000 per goat and grower goat of 8 m old @ Rs 1200. and weaner kit @ Rs 500 each

Non recurring Expenditure :-

1. Cost of animal 10 males x Rs 2000/- = R s 20,000/-
Cost of animal 50 females x Rs 1500/- = Rs 75,000/-
2. Cost of Housing 2700 ft² x Rs 50 / ft² = Rs 1,35,000/-
Total =Rs 2, 30,000/-

Recurring Expenditure

1. Feed 140 Qt x Rs 2000/- per Qt = R s 2,80,000/-
2. Medicine = Rs 10,000/-
4. Feeder and waterer 200 x Rs 20/- each = Rs 4,000/-
6. Insurance premium 4 % x Rs 95,000/- = R s 3,800/-
7. Interest of loan Rs 2,30,000/- x 12 % x 1 yr = R s 27,600/-
Total=Rs. 3,25,400/-

Income :

1. Sale of parental stock 57 no x Rs 3500/- = R s 1,99500/-
2. Sale of goat of 12 m old 65no x Rs 3000/- = Rs 1,95,000/-
3. Sale of goat of 6 m old 65no x Rs 1800/- = Rs 1,17,000/-
4. Sale of weaner of 2-3 m old 65 no x Rs 800/- = Rs 52,000/-
4. Sale of gunny bag = Rs 2,000/-
5. Sale of goat litter (150 Qt x Rs 200 /Qt) = R s 30,000/-
Total = Rs. 5,95,500/-

Net Profit in 2 years from 60 goats = Rs 5,95,500 – Rs 3, 25,400) = Rs. 2,70,100/-

Net Profit / goat / year = R s. 2250/-

ENGENDERING GOAT FARMING FOR IMPROVING LIVELIHOOD SECURITY OF FARM WOMEN

Gender refers to culturally based expectations of the roles and behaviour of women and men. It distinguishes the socially constructed from the biologically determined aspects of being male and female. Gender issues focus not only on women, but on the relationship between men and women, their roles, access to and control over resources, and division of labour and needs. Gender relations determine household security, well-being of the family, planning, production and many other aspects of life. Women's typical role within a livestock production system is different from region to region, and the distribution of ownership of livestock between men and women is strongly related to social, cultural and economic factors. Generally, small animals i.e. goats and sheep kept near the house, are more a woman's domain. When the rearing of small animals becomes a more important source of family income, ownership, management and control are often turned over to the man. Women play an important role in livestock management, processing and marketing, acting as care providers, feed gatherers, and birth attendants. Identifying and supporting women's roles as animal owners, processors and users of animal products while strengthening their decision-making power and capabilities, are key aspects in promoting women's economic and social empowerment and consequently provides a way to enable rural women to break the cycle of poverty.

Women are typically responsible for milking goats, processing and selling milk products, providing feed/fodder and water, caring for newborn kids and sick animals. Young girls are also involved in the grazing of goats, whereas married and young women are responsible for household activities. Typical male tasks include herding, cutting branches for home feeding and administering modern medicines. Wool-shearing, giving traditional vaccines and castration are exclusively the domain of men for socio-religious reasons. Most of the work and decision-making by women takes place at the household level, while men take goats for grazing and participate in public meetings related to goat husbandry. Almost all important decisions are taken jointly by both the man and the woman heading the household. These decisions include which animals to sell and at what price, disease diagnosis and treatment of sick animals, and goat selection. Despite their considerable involvement and contribution, women's role in livestock production has often been underestimated, if not ignored. Gender-blindness is the result partly of a paternalistic bias, and partly due to the attitudes of the women themselves, who may be conditioned by their culture and society to underestimate the value of their work. In addition, women's work is rarely reflected in national statistics. Access, control and management of goats, grazing areas and feed resources empower women and lead to an overall positive impact on the welfare of the household.

Major benefits for women in goat farming

- **Decision-making and empowerment:** Animal ownership is increasing woman's decision-making and economic power within both the household and the community. It is also a source of cash and can open up access to credit by sale of small animals which can provide an emergency source of cash for medical treatment or school fees, while daily milk provides a regular flow of cash income being used to purchase household items.
- **Household welfare:** The management, processing and marketing of animal products generate more income than most of the activities women tend to be involved in, and bring benefits for the whole family increasing food security at the household level. Goats provide food products such as milk, butter, cheese and meat are a source of protein, minerals and vitamins.
- **Income generation:** Animals provide raw material such as milk, meat, wool, skins used by women for home consumption and for sale. Processing of these materials can be an important source of additional employment and income for poor rural women.
- **Self-esteem:** Owning, controlling and benefiting from goat production increases women's self-esteem and strengthen their role as producers and income generators within the household and in the community.
- **Access to credit:** Livestock ownership increases gaining access to credit.

Obstacles and constraints of women in goat farming

- ❖ **Insecurity of land tenure for women:** Apart from private ownership, security of land tenure can take a variety of forms such as leased public land or user rights to communal property. Limitations on access to or use of land inhibit agricultural productivity and consequently affect rural women's income.
- ❖ **Lack of access by women to capital and knowledge and lack of control over assets:** The obstacles faced by women in gaining access to basic assets constrain their socio-economic empowerment and overall economic growth and poverty reduction.
- ❖ **Ownership of different livestock species:** Milking, processing and marketing of milk and meat products, does not necessarily mean that women can control decisions regarding livestock or own it.
- ❖ **Women's control over income-generating activities:** Women are often not in charge of selling milk and other livestock products and/or do not have access to the income gained from the sale.

There is substantial gender asymmetries remain between women and men in particular with regard to :

- ❖ **Access to markets** and distribution of risks and gains along with steps of goat value chains varies according to the gender of
 - (i) producers (e.g. rights to income generated from livestock)
 - (ii) processors (access to processing technologies and information)
 - (iii) market agents (access to transportation, safe market spaces and overnight accommodation, risk of sexual harassment and abuse)
 - (iv) economies of scale (bringing women to improve market position).
- ❖ **Risk and vulnerability:** Women and men have different experiences and capacities to face:
 - (i) Goat sector trends (policy biases and changes, “supermarketization”, lengthening goat value chains, vertical integration)
 - (ii) regional shocks affecting livestock (climate/ecosystem change, drought, flooding, disease, demographic changes, conflict)
 - (iii) household shocks (illness or death of family member; “distress sales” of animals to pay for medical treatment, property or asset grabbing).
- ❖ **Access to information and organization**, specifically to
 - (i) Extension and veterinary information and services; artificial insemination services; participation in development programmes and policies (e.g. vaccination, culling and restocking programmes)
 - (ii) Emerging technologies (e.g. fodder, breeding, disease prevention, livelihood decision-making tools)
 - (iii) Training and involvement as community animal health workers and para veterinarians or Goat scouts

The following issues have to be considered for improving livelihood security of farm women involved in goat farming:

Ownership of land: Security of tenure is an important precondition for women's empowerment with the purpose of guaranteeing and expanding women's access to, and control over, land.

Access to capital and knowledge: Women generally lack collateral, decision-making power in the household and control over loans. Ensuring women's access to extension services, knowledge, credit and technologies is very important. Credit lines for women should be made transparent and adapted to the cultural and social reality.

Ownership of livestock: For women, purchase or receipt of animals does not necessarily imply ownership. Analysis of the specific conditions and target households and monitoring of change are important to formulate and achieve realistic goals.

Responsibilities and division of labour: Women are indirectly benefited by involving

them in farming activities. Periodic analysis of labour, with corresponding adjustments to the time spent by women on the different tasks, or introduction of labour-reducing measures could diminish the risk of workload.

Role of livestock in household nutrition: Increases in men's earnings from livestock-related activities may not be necessarily translated into improved household nutrition, whereas women tend to prioritize household well-being. Higher income of small farmers should be accompanied with nutritional and social needs of vulnerable groups through special programmes.

Influence of processing and marketing of livestock products on household economy: The division of work between men and women in processing and marketing needs to be analysed time to time before adapting the activities.

Role of farmers' organizations : An important function of well-organized farmers' groups is to represent the interests of their members. Therefore, specific measures should be included at design to guarantee women's participation in such organizations

Information and relevant indicators: Livestock production systems and types of animals; crop-animal linkages; availability and quality of land, availability of inputs; management of natural resources; use of technology; relationship between livestock and other activities; gender disaggregated seasonal occupations and sources of income should be examined from a gender perspective.

The importance of goats in income generation and households' social and financial security are well established. The small size of goats has distinct economic, managerial, and biological advantages. Higher the educational status and higher the flock size of respondents is correlated with income generation because education enhances adoption of better management practices that can boost productivity and sales of farm produce. Thus, enhanced income is assumed to be a precursor of being able to meet household financial obligations. Goats described as the 'village bank' are of economic importance to small-holder farmers and especially women. Women are better managers of household resources than men. Thus, an improvement in the financial security of rural women through goat rearing would be inevitably translated to better living conditions for households.

Some policy and support services are required to ensure improvement of livelihood security of farm women are:

- ✓ Intensification in capacity building of farm women through education for better adoption of technology that will invariably enhance output and increase revenue.
- ✓ Governments should encourage women in cooperative activities by providing the initial take-off capital and enabling environment to thrive.
- ✓ Provision of more extension personnel and accessible of women and giving them all necessary incentives.

- ✓ Village based institutions should be enabled to handle the term loans for livestock production. In addition, women self help groups as institutions for cash/micro credit for goat production should be promoted.
- ✓ Extension approach should be need-based with problem-solving dimensions and participatory in nature. The exposure visits and training were essentially aimed at strengthening the human capital of the individuals.
- ✓ A massive campaign required to launch capacity building and empowerment of village communities that will act as the harbinger of change and technology adoption and to establish the foundation for a farmer-to-farmer livestock extension mechanism and need for the Government to continue to protect the interests of livestock producers.

Conclusion

Goat farming as a source of supplementing household income is getting increasing attention especially among the landless agricultural laborers and small and marginal farmers. Women are increasingly finding it as a potential source of earning cash income to meet their personal requirements. The tradition bound communities currently not rearing goat though economically poor should be motivated through educational and incentive based developmental interventions to take up goat husbandry in entrepreneurship mode for their upliftment. Education through training on improved practices of goat farming may develop access to resources, skill and marketing channel, improve decision making ability and women empowerment which in turn improve socio economic status, self sufficiency, welfare of farm women.

