



Ministry of Agriculture and Livestock Development
State Department for Crop Development
P.O Box 30028, Nairobi



Emergency Locust Response Program
P.O Box 30028,
Nairobi



Kenya Agricultural & Livestock Research Organisation
P.O Box 57811- 00200,
Nairobi



The World Bank
P.O Box 30577-00100
Nairobi

Sustainable Agricultural Livelihood Restoration, Rehabilitation and Resilience in Kenya

Training Manual

2.4.5 SUB-MODULE 5: GOAT PRODUCTION

Meat goats rearing

Meat goat farming is becoming popular in Kenya. This is because goats are hardy and can be kept in dry and marginal areas. Most farmers venture into meat goat rearing as a source of income from the sale of extra kids and culled adults. This is because goats are prolific breeders compared to cows. They have a short gestation period, high chances of twinning and requires less space and feed less than cows. They are also much easier to invest in considering the initial capital investment and time needed to attend to them. They are generally browsers and feed often on fodder trees.

Breeds. These are the common breeds suited for commercial goat farming in Kenya:

- Small East African Goat
- Galla Goat
- Anglo-Nubians
- Kenyan Alpine
- Boer

Housing. A suitable goat house should be constructed as indicated below:

- Adequate space to accommodate each goat with an adult goat being provided an average space of 0.5 - 0.75 square metre,
- Be damp proof and the roof not leaking,
- Free from sharp objects, pests and wild animals,
- Provide for proper ventilation.

The house should be divided into two parts:

Resting or sleeping area - Make the sleeping area comfortable enough for the goats with sufficient ventilation system; soft bedding; proper roof; and well secured with a wall and door.

Feeding area - The feeding area should have water trough, feed trough, slatted floor, feed racks and a rain proof mineral block pack area.

The feed area and feeding places should have sufficient flow of fresh air and light. Since goats are browsers and not grazers, a house 1.5 feet raised off the ground would be appropriate and reduces feed wastage. A house of 1.8 metre * 1.8 metre * 2.5 metre (5.5 ft * 5.5 ft * 8.5 ft) is suitable enough for housing 10 goats.



Ministry of Agriculture and Livestock Development
State Department for Crop Development
P.O. Box 30028, Nairobi



Emergency Locust Response Program
P.O. Box 30028,
Nairobi



Kenya Agricultural & Livestock Research Organisation
P.O. Box 57811- 00200,
Nairobi



The World Bank
P.O. Box 30577-00100
Nairobi

Sustainable Agricultural Livelihood Restoration, Rehabilitation and Resilience in Kenya

Training Manual



Goat housing

Feeding

Meat goats should be fed complementary on fast growing and quick weight gaining food. These include:

Fodder: The fodder mainly Napier grass and green leaves should be chopped into small pieces of size 3 cm. The feed should include energy supplements, molasses, milling by-products like pollard, bran, cereals etc.

Protein supplements: These include calliandra leaves, cotton seed cake, leucaena leaves, desmodium, fish-meal, dairy meal, sweet potato vines etc.

Salt: Hang nutritious salt lick like Maclik Mineral Brick constantly in their cages to lick. This will avoid cases of difficulties in urination and minimize cases of bloody urine.

Water: Ensure goats get sufficient supply of clean and fresh water. An adult goat should take 2 litres of water per day. The goats should be castrated for fast weight gain; ideally at the age of three weeks.

Since feed costs account for up to 70% of the total cost in a meat goat enterprise, costs can be reduced through adequate year-round browsing and/or grazing, with only mineral supplementation. Goat feeds include hay, crop by-products such as maize stalks and forages from leucaena, calliandra, gliricidia, clitoria and centrosema, mango tree leaves and cowpea leaves. Local bran from maize and other grains may be used as energy supplement. Cassava leaves may be fed to goats but only after leaving them under the sun for one day to reduce poisoning;



Ministry of Agriculture and Livestock Development
State Department for Crop Development
P.O Box 30028, Nairobi



Emergency Locust Response Program
P.O Box 30028,
Nairobi



Kenya Agricultural & Livestock Research Organisation
P.O Box 57811- 00200,
Nairobi



The World Bank
P.O Box 30577-00100
Nairobi

Sustainable Agricultural Livelihood Restoration, Rehabilitation and Resilience in Kenya

Training Manual

Vaccination

Timely vaccination of meat goats is essential for a healthy flock. Vaccination keeps goats free from highly contagious diseases like PPR (Peste des Petits ruminants) plague), CCPP (Contagious Caprine Pleuropneumonia) goat pneumonia, tetanus etc. The following vaccination and disease management schedule should be ensured to maintain a healthy flock:

Vaccination schedule

Age	Vaccinate against	Application	Remarks
1 month and above	CCPP (goat pneumonia)	S/C Annual vaccinations	Only for goats, Sheep are not affected
2 weeks and above	PPR (goat plague)	S/C Properly done once in a lifetime. Newborns should be vaccinated as a routine	Came to Kenya in 2006 - related to rinderpest. If no vaccination the disease can kill all goats and sheep.
2 weeks and above	Sheep and Goat pox	S/C Annual vaccinations	If no vaccination this disease may kill lambs and kids. In serious cases mortality may be high.
2 weeks and above	Enterotoxaemia + tetanus	S/C Every 6-8 months. Disease is common with lush pastures	Pregnant animals should be vaccinated at least a month before giving birth. Vaccination for tetanus should always follow tail docking
1 month and above	Orf	Scarification method. If there is a risk of outbreak or. In endemic areas routine vaccination is recommended	Orf may be more common in goats due to their feeding habits as browsers of thorny bushes. Mortality of young can be high. Repeat vaccination should be done 2-3 months after the initial one. The vaccine is live and can affect people (to HANDLE WITH CARE).
3 month and above	CCPP	S/C Annual vaccinations	Only for goats, Sheep are not affected

Tick control: Tick control involves washing goats with water containing acaricide using a piece of cloth or a hand sprayer, every two weeks. 1.5 litres of the mixed acaricide should be mixed with water for each adult goat. Hand gloves should be worn for protection against the acaricide.



Ministry of Agriculture and Livestock Development
State Department for Crop Development
P.O Box 30028, Nairobi



Emergency Locust Response Program
P.O Box 30028,
Nairobi



Kenya Agricultural & Livestock Research Organisation
P.O Box 57811- 00200,
Nairobi



The World Bank
P.O Box 30577-00100
Nairobi

Sustainable Agricultural Livelihood Restoration, Rehabilitation and Resilience in Kenya

Training Manual

Foot rot and foot abscess: The goats should be walked through a foot bat of 5% Copper Sulphate regularly to prevent foot rot and foot abscess. Overgrown and injured hooves should also be trimmed.

Dairy goat farming

The main dairy goat breeds in Kenya include: Alpine, Saanen and Toggenburg. These breeds can be crossed with the Small East African and Galla goats for improved adaptation. The Dairy Goat Breeders Association of Kenya (DGAK) promotes best breeding practices and dairy goat production programs among dairy goat producers.

Selection of breeding Does

The productivity of a dairy goat flock depends on the quality of does. The following criteria will guide doe selection:-

- High milk production and high fertility rate.
- The doe must be well built and healthy and the legs should be checked for deformities and hooves trimmed.
- Good strong legs are essential for breeding doe.
- Weak bent hind legs are highly heritable factors and females with the condition should not be selected for breeding.
- A female should not be mated unless it is physically fit.
- Emaciated females do not come to heat regularly, they become pregnant and abort or reabsorb the foetus at early stages. Those mated and carry their kid will be unable to rear it satisfactorily.
- It should produce kids every 8-10 months.
- It should produce twins frequently.
- It should produce enough milk to rear the twins and for household consumption
- The udder should be soft to touch with two functional teats, any hardness indicates the female has had a problem e.g. mastitis.
- Long pendulous udder is highly heritable and females with this should not be used for breeding. Big udder is liable to tearing by thorns and kids have difficulty in suckling them and predisposes the doe to mastitis.
- Badly worn teeth indicate old age and females with split, missing or worn out teeth should not be selected for breeding as they are physically unable to browse or graze properly.



Ministry of Agriculture and Livestock Development
State Department for Crop Development
P.O Box 30028, Nairobi



Emergency Locust Response Program
P.O Box 30028,
Nairobi



Kenya Agricultural & Livestock Research Organisation
P.O Box 57811- 00200,
Nairobi



The World Bank
P.O Box 30577-00100
Nairobi

Sustainable Agricultural Livelihood Restoration, Rehabilitation and Resilience in Kenya

Training Manual

Selecting of breeding Bucks

The buck must be healthy, strong and should have a well-developed body frame. It must be of productive breed, have normal sexual organs and well developed testicles. The buck must be selected from does that produce a high volume of milk and are prolific.

- Control mating i.e. limit the number of does per male (the recommended ratio is 1male for 35 does)
- The buck must be free of any physical defects e.g. undershot jaws, overshot jaws
- It should have a strong masculine head and neck.
- The buck needs to be noisy, seek out females on heat and mate them.
- A shy and timid buck should be culled.
- Badly worn teeth indicate old age and males with split, missing or worn out teeth should not be selected for breeding as they are physically unable to browse or graze properly.
- Legs should be checked for deformities and hooves trimmed.

Housing

- Provide a house that allows a space of 2 by 2m for every goat.
- The floor should be well drained and easy to clean.
- It should protect them from extreme weather eg cold, wind, etc
- The house should allow space for feed trough, water trough, kid pens, feed store and mineral troughs.

Feeds

Goats require five major classes of feeds namely; Energy, Protein, Vitamins, Water and Mineral salts. Goats consume a wide variety of grasses, weeds and small branches of bushes and trees. They can consume leaves, peelings and roots of vegetables, husks of corn, citrus and banana peelings plus other waste plant residues. Goats are ruminants and therefore chew cud and are able to utilise roughage with high fibre content. They produce protein, vitamin B and K in the rumen. Goats are fastidious feeders as a result they are the last animals to die from drought.

Protein sources include:

- Leucaena, Calliandra, Mulberry, Grevillia, Gliricidia, Sesbania, Tithonia, Lantana camara, Siratro, Sweet potato vine, Clitoria ternatae, Lucerne, Desmodium,



Ministry of Agriculture and Livestock Development
State Department for Crop Development
P.O Box 30028, Nairobi



Emergency Locust Response Program
P.O Box 30028,
Nairobi



Kenya Agricultural & Livestock Research Organisation
P.O Box 57811- 00200,
Nairobi



The World Bank
P.O Box 30577-00100
Nairobi

Sustainable Agricultural Livelihood Restoration, Rehabilitation and Resilience in Kenya

Training Manual

- Most of these herbaceous legumes have anti-nutritional factors (eg tannins and cyanides).
- It is recommended that these should not exceed 25% of the total feed requirement per day. They should be wilted before feeding.
- Groundnut cake, cottonseed cake, sunflower cake can also be good sources of proteins
- Energy sources include
- Rhodes grass, Napier grass, Panicum spp, Cenchrus spp, Sorghum, Bana grass.
- Banana stems and leaves should be fed as a last resort to feed demand.
- Maize, millet, Rice, Wheat, Barley, oats Sorghum others include bean haulms, Sugar cane tops, Sunflower heads.
- Maize germ, maize bran.

Care of pregnant doe (she-goat)

Protein supplements are important during the dry period (non lactating period) since the kids are growing faster at this time.

- Feed should be enriched with high energy feeds (e.g. hay) at least three weeks before kidding to prevent milk fever, in absence of which the doe mobilises its own body stores and prepares for milking.
- Deworm the doe two weeks prior to kidding.
- A goat requires 3% (of its body weight in dry matter approximately 1.5 kg) per day or 5 kg of fresh materials should be available to the doe per day. The complete meal should comprise of both the protein and energy feed.
- Provide the does with salt lick and at least either half a kilo of dairy meal per day or a mixture of pollard and bran
- Provide adequate clean water all the time.

Care of lactating Doe

At the end of the 5th month, the following signs should be observed and actions taken towards birth;

- Reduced feed intake
- Rapid breathing
- Doe will constantly look back onto her sides as if expecting to see young ones.
- Enlarged udder that may or may not discharging colostrums.
- Swollen vulva with thick mucus discharge.



Ministry of Agriculture and Livestock Development
State Department for Crop Development
P.O. Box 30028, Nairobi



Emergency Locust Response Program
P.O. Box 30028,
Nairobi



Kenya Agricultural & Livestock Research Organisation
P.O. Box 57811- 00200,
Nairobi



The World Bank
P.O. Box 30577-00100
Nairobi

Sustainable Agricultural Livelihood Restoration, Rehabilitation and Resilience in Kenya

Training Manual

- The hair around the tail and rear should be clipped and fresh beddings (straw or grass) provided.
- The kid is born after short labour, in case of difficulty in kidding consult an expert (Vet doctor)

Feeding lactating Doe

- A small quantity of concentrates should be fed to the dry doe in order to build up the body reserves and help in the development of her unborn kid. This is fed in two (2) daily portions
- The amount of concentrates fed should be in proportion to the amount of milk being produced.

Care of kids

- To prevent naval infection, the stump of the umbilical cord should be cleaned and disinfected with iodine, strong salt solution or traditional herbal remedy.
- The new born kid should be placed in a warm area to protect it from strong winds (draft) and cold that may expose it to pneumonia.
- Kids are allowed to suckle the colostrums in the first three days after birth, the colostrum is very important to the health and growth of the kid. Colostrum contains antibodies that protect the new kid against diseases until they are able to protect themselves.
- The kid should be allowed to suckle enough milk so as to have a healthy kid for future breeding stock.
- Fostering is advisable if the mother dies or in case of infection of the udder (mastitis).
- Bottle feeding is an alternative in the absence of the mother.
- Introduce green chop and water after 1 week.
- Kids can be withdrawn from the mother at night so that the doe can be milked in the morning.
- Kids should be weaned at four (4) months. Weaning before this time should be compensated with high protein supplements.

Dairy goat milk production

Dairy goat milk production is an alternative livestock enterprise suitable for many small-scale or part-time livestock operations. Some dairy goat producers have been successful in pasteurizing goat milk and building an on-farm jugging business, while others have ventured into processed milk products for retail distribution, especially for cheeses, yogurt, soap, and lotions production.



Ministry of Agriculture and Livestock Development
State Department for Crop Development
P.O. Box 30028, Nairobi



Emergency Locust Response Program
P.O. Box 30028,
Nairobi



Kenya Agricultural & Livestock Research Organisation
P.O. Box 57811- 00200,
Nairobi



The World Bank
P.O. Box 30577-00100
Nairobi

Sustainable Agricultural Livelihood Restoration, Rehabilitation and Resilience in Kenya

Training Manual

The potential also exists for selling milk to processors. Although fluid milk and processed products are important markets, dairy goat producers should also consider the potential for selling animals to new producers and youth involved in vocational agriculture dairy projects.

In the developing world, goat milk is the primary milk source for humans. Goat milk is often sought for its perceived health benefits and unique taste. Although many health effects have been attributed to consuming goat milk. Goat milk is similar in composition to cow milk (Table 2.56), but some important differences exist in the protein structure. Because of these differences, people who have lactose intolerance and allergies to cow milk can often drink goat milk, and the smaller fat globules in goat milk stay in suspension longer, which leads to the perception of “natural homogenization.” Goats are excellent browsers, which allows them to consume plants containing aromatic or flavor compounds that can impart the smell or flavor to the milk or cheese, thus providing an opportunity to generate unique specialty products.

Table 2.56. Comparison of average milk composition

Nutrient	Human	Cow	Goat
Energy (kcal/100 ml)	68.00	69.00	70.00
Lactose (%)	7.30	4.70	4.10
Protein (%)	1.10	3.50	3.20
Fat (%)	4.00	3.60	3.80
Cholesterol (mg/100 ml)	20.00	15.00	12.00
Ash (%)	0.20	0.70	0.80
Calcium (%)	0.04	0.18	0.19
Phosphorus (%)	0.06	0.23	0.27
Iron (%)	0.20	0.06	0.07
Vitamin A (IU/g fat)	32.00	21.00	39.00
Vitamin D (IU/g fat)	0.30	0.70	0.70
Vitamin C (mg/100 ml)	3.00	2.00	2.00
Thiamin (µg/100 ml)	17.00	45.00	68.00
Riboflavin (µg/100 ml)	26.00	159.00	210.00

kcal/100 ml is a measure of energy content. 1 kcal = 1,000 calories; IU = international unit, a measure of vitamin potency; µg = microgram, 1/1000 milligram



Ministry of Agriculture and Livestock Development
State Department for Crop Development
P.O Box 30028, Nairobi



Emergency Locust Response Program
P.O Box 30028,
Nairobi



Kenya Agricultural & Livestock Research Organisation
P.O Box 57811- 00200,
Nairobi



The World Bank
P.O Box 30577-00100
Nairobi

Sustainable Agricultural Livelihood Restoration, Rehabilitation and Resilience in Kenya

Training Manual

Marketing

The main marketing issue for prospective dairy goat producers is market entry for their products. There are few commercial processors to whom raw goat milk can be shipped, so many dairy goat producers build on-farm processing units to for products such as pasteurized milk, yoghurt, ice cream and cheese. Selling processed products directly on the farm or in the store does require additional management and marketing skills; however, profit margins tend to be higher per unit sold compared to selling to a commercial processor. Some alternative uses for goat milk include creating health care products such as soap and lotion or as an on-farm substitute for milk replacer in lamb, veal, and pig diets.

Dairy goat producers must also realize that income from the kid goat crop as breeding stock is important. In addition to marketing the milk, the producer must also have a breeding goat marketing strategy. It may be beneficial to raise kid goats to different market weights for different market seasons. Producers must be aware of the desired weights and times when demand is greatest in such markets.

Production

The major milk producing dairy goat breeds in Kenya are the Saanen, Toggenburg, and the Kenyan Alpine which are of exotic origin but have been crossed with local ecotypes to improve on adaptation. The lactation period for dairy goats averages 284 days, with peak production usually occurring four to six weeks after kidding. Representative production data for the various breeds is shown Table 2.57. Volume and composition of milk produced are primarily controlled by the goat's genetics, but they are also greatly influenced by the diet consumed. The Gallo goat which is native to Kenya and Ethiopia. It is locally adapted and can produce close to 2.5 liters per day on natural browse.

Table 2.57. Milk production by dairy goat breed

Breed	Milk production Average (kg)	Lactation Range (kg) (%)	Milk fat (%)	Milk protein (%)
Alpine	1,220	338-2574	3.3	2.9
Anglo Nubian	908	230-1728	4.9	3.8
Oberhasli	899	504-1375	3.7	3.0
Saanen	1215	414-2192	3.3	2.9
Toggenburg	1005	490-1730	3.1	2.9



Ministry of Agriculture and Livestock Development
State Department for Crop Development
P.O. Box 30028, Nairobi



Emergency Locust Response Program
P.O. Box 30028,
Nairobi



Kenya Agricultural & Livestock Research Organisation
P.O. Box 57811- 00200,
Nairobi



The World Bank
P.O. Box 30577-00100
Nairobi

Sustainable Agricultural Livelihood Restoration, Rehabilitation and Resilience in Kenya

Training Manual

Dairy goats reach sexual maturity at four to five months of age. Young does should be bred at a body weight ranging from 30 to 36 kg, which is usually at an age of seven to 10 months. The gestation period ranges from 145 to 155 days with an average length of 149 days. Does normally produce between one and three kids per year (single-born kids weigh approximately 3 Kg at birth). Birth weights generally decline with multiple births. Quality of nutrition during pregnancy influences birth weight and kid survivability. Pregnancy nutrition becomes an important part of good management as twin births are desired in an effort to improve reproductive efficiency. Does giving birth to twins produce more milk and have greater total kid weight per maintenance doe unit. Daily weight gains after birth range from 50 to 150 grams per day, but meat goat crosses can exceed 250 grams per day. Rate of gain will be determined by diet and the end product desired (e.g., replacement doeing or various weights depending on the meat market).

The three most important management recommendations to ensure efficiency and productivity of a dairy goat enterprise are as follows:

- Manage young does to have them ready for breeding at seven months of age. This increases the total lifetime herd production of milk and meat and reduces the number of nonproducing animals in the herd at any one time.
- Encourage freshening (replacement of does) of the does over as wide a time span as possible. This provides your customers with a year-round source of milk.
- Cull animals to eliminate low producers. This can increase the herd productivity if animals are culled on the basis of their for genetic potential.

Nutrition

To maintain milk production and good health, goats should be fed a diet balanced for energy, protein, minerals, and vitamins based on their requirements. To reduce costs, forages such as hay, silage, and pasture should constitute most of the daily diet. Goats are efficient browsers and can select a high-quality diet from lower-quality forages, especially when consuming nontraditional pasture plants (e.g., weeds, shrubs). Available forages should be evaluated based on plant species and maturity. The highest-quality forages should be reserved for pregnant, lactating, and growing animals.

Supplementing the diet with grain mixes to provide additional energy and protein is important, especially during lactation. Grain mixes may also contain supplemental minerals and vitamins. Feeding grain should be limited because a high-grain diet with low fiber intake can lead to rumen health problems (e.g., indigestion, acidosis) and lower milk quality. Availability of dietary energy



Ministry of Agriculture and Livestock Development
State Department for Crop Development
P.O Box 30028, Nairobi



Emergency Locust Response Program
P.O Box 30028,
Nairobi



Kenya Agricultural & Livestock Research Organisation
P.O Box 57811- 00200,
Nairobi



The World Bank
P.O Box 30577-00100
Nairobi

Sustainable Agricultural Livelihood Restoration, Rehabilitation and Resilience in Kenya

Training Manual

is important for high milk yields, while protein and fiber affect milk quality. High-producing does require quality forages and supplemental grain e.g. at a rate of 0.5 kg per 1.5 kg of milk.

Forages generally do not contain sufficient minerals to meet dietary requirements, so supplements are usually required. Mineral mixes of salt with calcium, phosphorus, and trace minerals are typically used. Legume forages (e.g. Lucerne/ alfalfa, clover) contain sufficient calcium and will only require phosphorus with a trace mineral supplement.

If pasture is the predominant source of forage, then vitamin supplements are not critical. If only hay or silage is used, then supplemental vitamins A, D, and E will be required. Vitamins can be supplied in a free-choice mineral source or the grain mix. Commercial cow rations or custom grain mixes varying from 14 to 20 percent protein can be fed to goats. Most products formulated for sheep will not contain enough copper for goats.

It is important to routinely use “body condition scoring” to evaluate the adequacy of the nutritional program you use. Body condition scoring categorizes animals in scores from 1 (emaciated) to 5 (obese) based on the amount of palpable subcutaneous fat over the loin, ribs, and sternum. Does should have suitable (score 3) body reserves in late pregnancy as they enter lactation. High-producing does lose significant body condition during early lactation, but they should regain it during late lactation and early pregnancy.

Record keeping

The farmer should keep simple records to support decision making and calculation of profits and losses. Records should include; Birth dates; Birth weights; Sire and dam; Milk records; Treatment records; and Service dates.