
Nutrition requirement of goat

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Introduction

In the year 1996 the total goat population in Pakistan was 41166,000 heads, while in Sindh it was 9734,000 heads.

In the year 1999-00 total goat population in the country was 47426,000 heads, while the male population, one year and above was 6010,000 heads, the female one year and above was 25755,000 heads and young stock less than one year was 15661,000 heads.

In the year 1999-00, in Pakistan the gross production for milk from goat was 31,804,000 tonnes, while goat milk consumption was 25,566,000 tonnes.

In the year 1999-00 in Pakistan the goat meat production was 218,000 tonnes/million, goat skin production was 23.3 million No., goat hair production was 18,000 tonnes.

In the year 1999-00 in Pakistan the total fodder production was 2,64,900 hectares out of which in Sindh was 365,700 hectares. The total fodder production in Pakistan was 22.7 per hectare in tonnes, out of which in Sindh, fodder crop production was 25.0 per hectares in tonnes.

General

Goat need food, which provide energy for its daily, body tissues, repair, for it growth, for lactation and to produce healthy off springs. Goat needs balance feed, which consist of protein, minerals, vitamins, water, and roughage. The nutrition requirement of goat depends upon various factors like, age, pregnancy, lactation, health, breed, climate and environment. It is recommended that to feed goat with seasonal feed, it is not only fresh but its provide better nutritional values. The major purposes of goat farming is either for meat or milk production. In both the cases goat not only need a balance diet, but she must have a place to walk, to burns the food and convert into energy. The goat diet plan changes with the supply of fresh green fodder. These are discussed below:

Protein requirements in goat

Goat needed protein for normal rumen function and intake capacity. It is find out that below a minimum of 10% of crude protein in diet dry matter, degradable nitrogen is a limiting factor for rumen fermentation. The protein requirement in the body is varies like protein needed for maintenance is 1.42 - 3.40 g digestible crude protein DCP (crude protein CP)/kg, metabolic body weight ($BW^{0.75}$). These variation in the diet occurs due to variations of the level of nitrogen, its degradability in the diet.

Milk production - energy and protein required per litre of milk.

Fat in milk (%)	Energy			Protein
	SE (g)	TDN (g)	ME (MJ)	DCP (g)
3.0	243	280	4.17	45
4.0	287	330	4.91	51
5.0	330	380	5.66	56
6.0	374	430	6.40	60

Words explanations.

SE- Starch equivalent.

TDN- Total digestible nutrients.

ME- Metabolized energy.

MJ- Megajoules (1 Calorie= 4.184 joules)

DCP- Digestible crude protein.

Growth - energy and protein required per 100g gain.

Live weight (kg)	Energy			Protein
	SE (g)	TDN (g)	ME (MJ)	DCP (g)
20 - 30	165	190	2.83	24
30 - 40	179	206	3.07	26
40 - 50	202	233	3.48	29

Words explanations.

SE- Starch equivalent.

TDN- Total digestible nutrients.

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DCP- Digestible crude protein.

Minerals requirement in goat.

For a healthy development of the goats it needs following major and minor minerals in her diet.

Dietary major mineral requirements of goats. ^a

Item	Ca	P	Mg	Na
Maintenance/kg ^{0.75}	0.19	0.14	0.045	0.045
Lactation/kg milk.	4.3	1.7	0.7	0.5
Maintenance + pregnancy, 1-3 months.	4.0	3.0	1.0	1.0
(60 kg BW), 4-5 months	10.0	4.5	1.5	1.5
Male and female diets/d	3.0 to 3.5	1.5	0.5	0.5

^a Values are expressed as g/d.

Trace mineral allowances for goats. ^a

Element	Deficiency Limit*	Requirements* (standard diet)
Fe	15	30
Cu	7	10
Co	0.07	0.1
I	0.15	0.8
Mn	45	60
Zn	45	45
Se	0.1	0.1
Ni	0.1	1
Mo	0.2	0.2

^a From Lamand (17)

* Values are expressed in mg/kg DM ingested.

Vitamin requirements.

The vitamin A requirement is 1.5 - 3.5 mg/d per animal of 50 kg body weight, vitamin D is 250 - 500 IU, vitamin E is needed 25-50 mg/d.

Water requirement.

Goat maintenance requirements of 145.6 g water/kg body weight BW^{0.75}, milk production requirement of 1.43 kg water/kg milk in dairy goat.

Forages.

Rye grass enable high intake, produce high yield of milk. Corn silage and legume hay reduce milk production. In feed the level of crude fibre and protein content effects on goat milk production.

Intake level of green forages used as a sole feed in the basal diet .^a

Forage	State of lactation, days	Intake level* g/kg BW ^{0.75}
Italian rye grass	60-160	82 (60-101)
Orchard grass	60-160	65 (59-81)
Fescue.	60-160	68 (62-75)
Alfalfa.	60-160	103 (69-157)
Red clover.	60-160	93 (50-118)
Vetch + oats.	130-150	79 (51-150)
Corn (maize).	160-200	81 (63-99)
Sorghum.	160-200	85 (76-89)

^a From de Simiane (40)

* Tolerated refusals: 25-35%; concentrate intake = 0.7 kg DM.

Goat diet not only supply the protein, minerals, vitamins, water, but also have roughages and concentrates. These are explain as under:

The common feeds and fodder divided into 2 groups:

1. Rough-ages: These are

- a) Tree leaves : Neem, Peepal, Bargad, Golar, Jamun, Angir, Babul, Jharberi, Bhimal, Ber, Mulberry leaves.
- b) Hays: Cowpes hay, berseem hay and oat hay.
- c) Straws: Athar straw, gram, wheat straw and paddy straw.

2. Concentrates: These are:

Babul pods, gram, wheat bran, groundnut cake, sesame cake, arthar grain, maize, jawar, bajra, barley and guar.

Concentrates in goat diets.

Goats consume all of the grains; cereals, proteinaceous grains, as a whole, or in ground form. Pelleting seems to improve the palatability of mixture and reduced waste-ages. By-products like as oil-meals, milling by-products, beet pulp, molasses-citrus pulps or different kinds of hulls also be used to concentrate the mixture for goats, which are generally fed ground or pelleted. Good palatability achieved ground mixtures. Pellets should not be too hard or too crumbly because goats do not like dust from feed stuffs.

These concentrate mixtures can be consumed during milling or in feeders. In all cases it would be better to achieve individual rationing according to the level of milk production. This is not common due to a lack of well-adapted devices or cost of labour.

Effect of amounts of concentrates on milk production of goats in midlactation. ^a

Diet	Concentrate supply	
	High	Low
Total intake, kg DM/d.	2.51	2.25*
Forage intake, kg DM/d	1.38	1.71*
Concentrate intake, kg DM/d.	1.21	0.64***
Milk production, kg/d	3.45	2.91**
Fat content, %	2.73	2.85
Protein content, %	3.01	2.83*
Lactose content, %	3.79	3.65*
Persistency of milk production, % decrease/week.	2.77	3.55*
Energy balance, MJJ/d.	+25.34	+18.8*
Average weight gain, g/d.	+32.1	+20.5*

^a From Sauvant and Morand-Fehr (36)

From wk 9 to wk 27 of lactation, 32 Alpine goats were given alfalfa hay ad lib and concentrates: 350 g/kg milk in diet "high" in concentrates; and 175 g/kg milk in diet "low" in concentrates.

- *P < 0.05 of difference between high and low;
 **P < 0.01 of difference between high and low;
 ***P < 0.001 of difference between high and low.

Availability of crop residues and agro-industrial by products: These are as under

Crops.	Crop residue or by-products
Field Crops.	
Castor.	Castor meal.
Cotton.	Cotton seed meal.
Groundnut.	Groundnut meal.
Linseed.	Linseed meal.
Maize.	Germ meal and stover.
Rape seed.	Bran and meal.

Crops.	Crop residue or by-products
Rice.	Broken, bran, husk and straw.
Sesame.	Sesame cake.
Sorghum.	Stover.
Soya bean.	Soya bean meal.
Sugar cane.	Bagasse, green tops, molasses.
Wheat.	Bran and straw.
Tree crops.	
Dates.	Date cake.
Mango.	Mango pulp and mango skin.

Feeding schedule of goat.

Stock	Concentrate	Green fodder/ Dry feeder
Adult in milk.	400 gm/every litre of milk in addition to 150 gm for maintenance.	Ad lib
Breeding bucks.	0.5 to 1.0 kg.	- do -
Yearling does.	250 gm.	- do -
Pregnant goats.	300-500 gm.	- do -
Lactating does.	300 gm to 400 gm for each litre of milk.	
(A) Kids	The colostrum for 3 days and milk should be fed thrice for 3 days and twice thereafter by bottle water soluble antibiotics should be fed. The milk should be fed at body temperature after boiling.	-do-
(B) Up-to weaning.	0-60 days.	

Preparation of concentrate mixtures:

For feeding to kids, creep mixtures containing high amounts (50 to 60%) of maize, jawar, barley with groundnut cake should be prepared so that they may be adequate in energy and protein having about 18 DCP and 75 TDN. For Example:

A.

	Ingredients	Percentage
*	Maize.	50%
*	Groundnut cake.	20%
*	Molasses.	10%
*	Wheat bran.	7%
*	Fish meal.	10%
*	Mineral mixture.	1%
*	Chalk.	1%
*	Salt.	1%

B. To the above 150 gm TM-5 or aurofac and 25 gm 'vitablend' or 'Ronimix' should be added per quintal of the creep mixture.

	Ingredients	Percentage
*	Gram.	15%
*	Maize.	37%
*	Groundnut Cake.	25%
*	Wheat bran.	20%
*	Mineral mixture.	2.5%
*	Common salt.	0.5%

C. Concentrate mixture at 15 DCP and 65-70 TDN.

	Ingredients	Percentage
*	Wheat bran/rice bran.	45%
*	Groundnut cake/sesame cake.	20%
*	Barley/Maize/Jawar.	12%
*	Molasses.	10%
*	Dal Chunies.	10%
*	Salt.	1%
*	Chalk.	1%

Feeding methods to goat and traditional cure.

- Over feeding of milk causes diarrhoea to kids, in addition to contaminated or under boiled milk, if fed then give lime water to kids.
- Tympony is caused to goats if fresh leguminous fodder is fed at a very young stage to cure it give wilted fodder to goats.
- To save tympony and abnormal fermentation in remain to cure it. Add some energy viz. Molasses not more than 5% of concentrate mixture.
- Under fed goat or poorly managed goat during pregnancy or otherwise cause ketosis in goats to cure provide adequate feed during pregnancy.

Various experiments have done by adding urea in to various diets given to goat, these experiments data and results are shown as under:

[Ref: Conrad et al 1977.]

Table shows urea effect in molasses plus synthetic energy relations.

Ingredient %	Diet-1	Diet-2
Molasses.	58.8	57.4
1, 2-propanediol.	25.4	28.7
Urea.	3.8	4.4
Water.	20.0	9.5
Total	100.0	100.0
Apparent digestibility %		
Crude protein.	77.1	68.4
Organic matter.	79.7	65.4
N-retention (g/day).	1.11	0.93

[Ref: Singhat et al 1981.]

Experiment done by feeding 3 months old male beetal goat diet containing maize, groundnut oil-meal. Diet having 18% crude protein , supplemented by urea or burel, having crude protein 29%.

Diet	Natural crude protein %	Additional urea crude protein %	Additional biuret crude protein %	N-in take g/day	N-retension g/day
1	18	-	-	12.25	5.02
2	18	11	-	17.80	7.00
3	18	-	11	18.60	6.69
4	29	-	-	16.20	5.34

Results:

Digestibility of crude protein was greater in high-protein diet, feed intake, digestibility of other nutrients were not affected. Urinary nitrogen was greater with 29% crude protein than 18% crude protein in the diet.

Various experimental results on diet are as under.

- Goat are sensitive to acidosis, if goat diet rich in corn silage or in grains then we must add buffers such as sodium bicarbonate in it.
- It is found that use of non-protein N sources like urea. It is effective when diet contains enough amount of fermentable energy like as starch, to enable an optimum synthesis of microbial proteins in the rumen. The best way is to use soybean meal as a source of protein.
- It is observed that intra-ruminal infusion of urea and ammonium salt reduced meal length, frequency and rate of eating. In an experiment with control concentration show when 58% of nitrogen in concentrated form was supplied in form of urea, the result was meal size is reduced but meal frequency increase. This shows that protein substitution by NPN sources and cheaper energy feed molasses is highly beneficial.

Sources of feeds and their nutritive values.

	D.M.%	C.P.%	TDN %	Phos. %	Ca%
Crains (Energy conc)					
Barley.	90	12	75	0.4	0.09
Sorghum.	90	10	80	0.35	0.05
Maize.	90	9	80	0.35	0.02
Meals.	90	Varies	65	0.4	0.6
Oats.	90	8	75	0.35	0.05
Protein conc.					
Meat meal No.1	90	55	65	14	30
Cottonseed meal.	90	40	75	0.73	0.15
Peanut meal.	90	45	75	0.62	0.18
Hays. (Bulk and fibre)					
Quality lucerne.	90	16-20	50-55	0.24	1.32
Grassy lucerne.	90	8-12	45-50	0.2	0.8
Grasses.					
Paspalum. (Early growth).	20	12	60	0.3	0.4

TDN- Total digestible nutrients.

DM- Dry matter.

CP- Crude Protein.

The factors which should be consider while formulating the rations are:

- (i) Body weight of the goat.
- (ii) Milk yield and its fat percentage.
- (iii) Weather conditions.
- (iv) Stage of gestation.
- (v) Availability of forages and their feeding values.
- (vi) Cost of feed.
- (vii) The body weight and milk reduce in winter due to drainage of energy. So extra ration is needed to protect the body against winter.

Daily nutritional requirement of an adult goat.

S.No.	Item of Diet	Daily requirement
1.	Dry matter.	Intake of Dry matter/100 kg body wt.
		Maintenance 2.5 - 3.0 kg.
		Growth 3.5 - 4.0 kg.
		Pregnancy 3.0 - 3.5 kg.
		Lactation 3.5 - 5.5 kg.
		Meat and hair 2.5 - 3.5 kg.
2.	Energy.	For maintenance 360 gm S.e./50 kg body wt.
		For live weight gain 3 gm. S.e./gm wt.
		For milk production 350 gm S.e./kg of wt.
		15% more energy for males.
3.	Protein.	For maintenance 20-30 gm Dep/50 kg body wt.
		For milk production 60-70 g/kg of milk.
4.	Water.	450-700 gm/day for a goat weighing 19-20 kg.

The feeding schedule to the goats at various ages are as under:

Age of kids	No. of feeding	Dam's milk or cow milk	Green feed	Starter feed
1-7 days.	With the dam	Dam's	-	-
8-42 days.	4	100	Ad lib	Creep feed* Ad lib
43-60 days	3	100	Ad lib	- do -

*The creep feed should have 12 - 18% of DCP and 2 - 5 to 2.9 metal ME per kg. Feed. Jawar, Bajra, may be used to substitute 1/3rd cereal parts. Mixture of maize, barley/oat, groundnut cake and wheat bran, should be used. Linseed cake, sesame cake, or mustard cake may be used to replace groundnut cake and rice bran.

1 kg of T.D.N./day/100 gm body weight and D.C.P. requirement for maintenance for milk are 45 - 64 gm/100 kg live weight and 70 gm/litre of milk. Calcium and phosphorus requirement is 147 and 723 mg/kg live weight respectively.

Daily feed required by goat.

- Intake of dry matter. Dry matter (D.M) is plant feed without moisture. The intake of dry feed required by bucks and dry does, and lactating does according to live weight. For every 9 kg body weight intake increases by general practice is 0.3 kg D.M.
- Crude protein. For milking does, crude protein (C.P) should be 13% of the dry matter. Dry goats need only about 10% C.P. for maintaining body weight. Kids need greater than 17% C.P. for muscles to grow.
- Fibre. Feed should contain 18-30% fibre on D.M. basis.
- Energy. A 50 kg live-weight, adult goat needs:

	T.D.N
For maintenance of body.	0.6 kg
For milk production (1.5 L)	0.5 kg
Total	1.1 kg

TDN- Total digestible nutrients.

General practice is for 1% of body weight is required as energy for maintenance.

And for every 600 mL of milk, goats require 0.1 kg energy.

- Minerals.
 - Phosphorus (P) 0.4% of diet (D.M).
 - Calcium (ca) 0.4 -0.8% of diet (D.).
 - P:Ca ratio should be between 1:1 and 1:2.

Conclusion.

The goat farming economic depends upon the less input and better returns. The nutritional must prepare a goat feeds charts very carefully. The diet ingredients must be cheap and nutritionally balanced. The healthy produce good meat more milk and healthy off-springs. At the same time due to strong health goat suffer with less attacks of diseases. If we consider above factors. This brings a very profitable goat business nationally and internationally.

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