Calculation of Nutrient Requirements and Formulation of Ration for Goat

The DMI varies from 3 % (Meat goat) to 4-6 % (Dairy goat) in different breeds of India and it is higher than of large farm animals. Adult body weight of goats may vary from 15 to 45 kg in different breeds. There are also does and bucks that weight up to 60 kg. NR may be calculated using following formulae:

DM (g/d) = 76 g / $W_{kg}^{0.75}$

DCP (g/d) = 3 g/ $W_{kg}^{0.75}$

TDN (g/d) = 30 g/ $W_{kg}^{0.75}$

Table 1: Nutrient requirements for maintenance of adult goat (ICAR, 1998)

Body Wt. (kg)	DM (g)	DCP (g)	TDN (g)	ME (Mcal)	Ca (g)	P (g)
15	500	23	240	0.86	1.1	0.7
20	615	29	295	1.07	1.3	0.9
25	730	34	350	1.26	1.6	1.1
30	830	39	400	1.45	1.8	1.2
35	940	44	450	1.62	2.1	1.4
40	1040	48	500	1.79	2.3	1.5
45	1125	53	540	1.96	2.5	1.7
50	1230	57	590	2.12	2.7	1.8
55	1315	62	630	2.28	2.9	1.9
60	1410	66	675	2.43	3.1	2.1

Table 2: Nutrient requirements for maintenance of pregnant does (ICAR, 1998)

Body Wt. (kg)	DM (g)	DCP (g)	TDN (g)	ME (Mcal)	Ca (g)	P (g)
15	700	42	385	1.38	2.1	1.4
20	865	52	475	1.72	2.6	1.7
25	1025	62	564	2.03	3.1	2.1
30	1170	71	645	2.33	3.5	2.3
35	1320	80	725	2.62	4.0	2.7
40	1460	88	802	2.89	4.4	2.9
45	1590	96	875	3.16	4.8	3.2
50	1725	104	984	3.42	5.2	3.5
55	1850	112	1018	3.67	5.5	3.7
60	1975	120	1086	3.92	5.9	3.9

Table 3: Nutrient requirements for lactating does (ICAR, 1998)

Body Wt. (kg)	Milk yield (kg)	DM (g)	DCP (g)	TDN (g)	ME (Mcal)	Ca (g)	P (g)
20	0.5	865	51	468	1.69	4.3	2.9
	1.0	1185	74	640	2.31	5.9	3.9
25	0.5	968	56	523	1.89	4.8	3.2
	1.0	1290	79	695	2.51	6.4	4.3
30	0.5	1060	61	573	2.07	5.3	3.5
	1.0	1380	84	745	2.69	6.9	4.6
35	0.5	1155	66	623	2.25	5.8	3.9
	1.0	1470	89	795	2.87	7.3	4.9
40	0.5	1245	70	673	2.43	6.2	4.1
	1.0	1565	93	845	3.05	7.8	5.2
45	0.5	1320	75	713	2.57	6.6	4.4
	1.0	1640	98	885	3.19	8.2	5.3
50	0.5	1410	79	763	2.75	7.0	4.7
	1.0	1730	102	935	3.32	8.6	5.7
55	0.5	1490	84	803	2.90	7.4	4.9
	1.0	1805	107	975	3.52	9.0	6.0
60	0.5	1570	88	848	3.06	7.8	5.2
	1.0	1890	111	1020	3.68	9.4	6.3

45 g DCP and 345 g TDN per kg of 4 % FCM is needed over and above the maintenance requirement

Table 4: Nutrient requirements for growing kids (ICAR, 1998)

Body Wt. (kg)	Rate of gain (g/d)	DM (g)	DCP (g)	TDN (g)	ME (Mcal)	Ca (g)	P (g)
10	50	380	27	265	0.96	2.0	1.4
	100	510	37	355	1.28	2.7	1.8
	150	635	47	445	1.60	3.4	2.3
15	50	510	33	330	1.19	2.7	1.8
	100	645	43	420	1.51	3.5	2.3
	150	785	53	510	1.84	4.2	2.8
20	50	640	39	385	1.39	3.3	2.2
	100	790	49	475	1.71	4.1	2.7
	150	985	59	590	2.13	5.1	3.4
25	50	760	44	440	1.59	3.8	2.5
	100	915	54	530	1.91	4.6	3.0
	150	1070	64	620	2.24	5.3	3.6

Rations for Goat

NR for Growing Goat (BW 10 kg, BW gain @ 100g/d)	DM (% BW)	DM (g/d)	DCP (g/d)	TDN (g/d)	Ca (g/d)	P (g/d)
	5	**500**	**37**	**355**	**2.7**	**1.8**
	Ration I					
Mango leaves (DCP 10%, TDN 60%)		350	35.0	210.0	-	-
Maize grain (DCP 7 %, TDN 85 %)		150	10.5	127.5	-	-
Total		**500**	**45.5**	**337.5**		
	Ration II					
Arhar Chuni (DCP 10%, TDN 65%)		350	35.0	227.5		
Maize grain (DCP 7 %, TDN 85 %)		150	10.5	127.5		
Total		**500**	**45.5**	**355.0**		
NR for Adult Goat (BW 25 kg)	**DM (% BW)**	**DM (g/d)**	**DCP (g/d)**	**TDN (g/d)**	**Ca (g/d)**	**P (g/d)**
	3	**750**	**34**	**350**	**1.6**	**1.1**
	Ration I					
Peepal /banyan leaves (DCP 7 %, TDN 38%)		600	42.0	228.0	-	-
Maize grain (DCP 7 %, TDN 85 %)		150	10.5	127.5	-	-
Total		**750**	**52.5**	**355.5**		
	Ration II					
Gram straw (DCP 3 %, TDN 45%)		500	15.0	225.0	-	-
Mango leaves (DCP 10 %, TDN 60 %)		250	25.0	150.0	-	-
Total		**750**	**40.0**	**375.0**		
	Ration III					
Wheat straw (DCP 0 %, TDN 40%)		400	00.0	160.0	-	-
Mango leaves (DCP 10 %, TDN 60 %)		350	35.0	210.0	-	-
Total		**750**	**35.0**	**370.0**		

Note: 1. Nutritive value of the above feed stuffs are on DM basis and average DM in Dry feeds i.e. Straw, Hay, Pulse chunnies and Con. Mix is 90 % while consider 30- 35 % DM in Mango/banyan leaves. Therefore, using these figures of DM calculate as such quantities of different feed stuffs to be fed.

2. In addition to above ration offer 10-15 g mineral mix and 10 gm salt per head /d, specially when dry feed are given. Also give appropriate vitamin supplement,when no green leaves are fed

NR for Pregnant Goat (BW 25 kg)	DM (% BW)	DM (g/d)	DCP (g/d)	TDN (g/d)	Ca (g/d)	P (g/d)
	4	**1000**	**62**	**564**	**3.1**	**2.1**
	Ration I					
Gram straw (DCP 3 %, TDN 45%)		650	19.5	292.5	-	-
Con. Mix. (DCP 16 %, TDN 77 %)		350	56.0	269.5	-	-
Total		**1000**	**75.5**	**562.5**		
	Ration II					
Wheat straw (DCP 0%, TDN 40%)		600	0.00	240.0	-	-
Con. Mix. (DCP 16 %, TDN 77 %)		400	64.0	308.0	-	-
Total		**1000**	**64.0**	**548.0**		
	Ration III					
Wheat straw (DCP 0%, TDN 40%)		400	0.00	160.0	-	-
Peepal /banyan leaves (DCP 7 %, TDN 38%)		200	14.0	76.0	-	-
Con. Mix.* (DCP 16 %, TDN 77 %)		400	64.0	308.0	-	-
Total		**1000**	**78.0**	**544.0**		
NR for Lactating Goat (BW 25 kg, milk 1 kg/day)	**5.2**	**1300**	**79**	**695**	**6.4**	**4.3**
	Ration I					
Gram straw (DCP 3 %, TDN 45%)		600	18.0	270.0	-	-
Mango leaves/ Berseem hay (DCP 10 %, TDN 60 %)		200	20.0	120.0	-	-
Pulse chuni (gram/ arhar) (DCP 10 %, TDN 65 %)		500	50.0	325.0	-	-
Total		**1300**	**88.0**	**715.0**		
	Ration II					
Wheat straw (DCP 0 %, TDN 40%)		700	0.00	280.0	-	-
Mango leaves/Berseem hay (DCP 10 %, TDN 60 %)		200	20.0	120.0	-	-
Con. Mix.** (DCP 15 %, TDN 75 %)		400	60.0	300.0		
Total		**1300**	**80.0**	**700.0**		

Note: 1 & 2 (Same as above)

Composition of the above Concentrate Mixtures

***Concentrate Mixture (DCP 16 %; TDN 77 %)**

Ingredients	**Quantity (Kg)**	**DCP (%)**	**TDN (%)**
Maize (DCP 7 %; TDN 80 %)	60.0	4.20	48.0
Wheat bran (DCP 10 %; TDN 65 %)	15.0	1.20	9.75
Soya-DOC (DCP 42 %; TDN 75 %)	25.0	10.50	18.75
Total	**100.0**	**15.90**	**76.5**

****Concentratre Mixture (DCP 15 %; TDN 75 %)**

Ingredients	**Quantity (Kg)**	**DCP (%)**	**TDN (%)**
Maize (DCP 7 %; TDN 80 %)	50.0	3.50	40.0
Wheat bran (DCP 10 %; TDN 65 %)	30.0	3.00	17.5
Soya-DOC (DCP 42 %; TDN 75 %)	20.0	8.40	15.0
Total	**100.0**	**14.90**	**74.5**

Calculation of Nutrient Requirement and Formulation of ration for Sheep

Indian breeds of sheep have much lower adult body weight (30-40 kg) and growth rate in comparison to many foreign breeds (70 kg). Hence the requirements are lesser than foreign breeds.

A. Calculation of Nutrient requirements

I. **Nutrient Requirements for Maintenance:** Maintenance requirement may be calculated by using following formulae (Table 1).

DCP (g/d) = 2.97 g/$W^{0.75}$

TDN (g/d) = 27.3 g/$W^{0.75}$

ME (Kcal/d) = 98 kcal/$W^{0.75}$

II. **Nutrient Requirements for wool production:** Requirements for wool production is little bit different than for other purposes as there will be special demand for sulphur. It is a constituent of wool and contribute about 4 % in the composition of wool (Table 2).

III. **Nutrient Requirements for Pregnancy and lactation:** Sheep are mainly raised for lambs and wool, not for milk. However, high lactation performance is essential for the nutrition of the lamb during age. This becomes more important if twins are nursed by the ewe. Pregnancy and lactation requirements are relevant to last 6 weeks of pregnancy and first two months of the lactation, respectively. During third month of lactation, the prescribed requirement can be reduced by 25 %. The lactation requirements during the first two months are approximately twice the requirements for maintenance at the corresponding body weight, which gets reduced up to 1.5 times the maintenance during the remaining period (Table 3 & 4).

Table 1: Nutrient requirements for maintenance of adult sheep (ICAR, 1998)

Body Wt. (kg)	DM (g)	DCP (g)	TDN (g)	ME (Mcal)	Ca (g)	P (g)
20	575	28	258	0.93	1.1	0.8
25	678	33	305	1.10	1.3	0.9
30	775	38	350	1.26	1.5	1.0
35	873	43	393	1.42	1.7	1.2
40	964	48	434	1.56	1.9	1.3
45	1055	53	475	1.85	2.3	1.5
50	1140	56	513	1.92	2.3	1.5
55	1225	60	551	1.98	2.4	1.6
60	1310	65	588	2.12	2.6	1.7

Per 5 kg increase in wt., increase in requirements of DM app. 85-100 g; DCP 5 g;TDN 37-47 g; Ca 0.2 g and P 0.1g

Table 2: Nutrient Requirements of sheep for Wool production (ICAR, 1998)

Body Wt. (kg)	DM (g)	DCP (g)	TDN (g)	ME (Mcal)	Ca (g)	P (g)	S (g)
20	730	40	330	1.19	1.5	1.0	1.7
25	870	47	390	1.41	1.7	1.1	2.1
30	1000	54	450	1.62	2.0	1.3	2.4
35	1100	60	500	1.80	2.2	1.5	2.6
40	1230	67	555	2.00	2.5	1.6	2.9
45	1359	73	610	2.20	2.7	1.8	3.2
50	1470	80	660	2.38	2.9	1.9	3.5
55	1580	85	710	2.56	3.2	2.1	3.8
60	1680	90	755	2.72	3.4	2.2	4.0

Table 3: Nutrient Requirements for Pregnant ewes (ICAR, 1998)

Body Wt. (kg)	DM (g)	DCP (g)	TDN (g)	ME (Mcal)	Ca (g)	P (g)
25	1120	80	580	2.10	3.4	2.4
30	1280	90	665	2.40	3.8	2.7
35	1440	105	750	2.71	4.3	3.1
40	1590	115	827	2.98	5.2	3.7
45	1740	125	903	3.23	5.6	4.0
50	1880	135	978	3.53	5.6	4.3
55	2020	145	1050	3.97	6.1	4/3
60	2160	155	1121	4.04	6.5	4.6

Table 4: Nutrient Requirements for lactating ewes (ICAR, 1998)

Body Wt. (kg)	DM (g)	DCP (g)	TDN (g)	ME (Mcal)	Ca (g)	P (g)
25	1230	95	665	2.40	6.1	4.1
30	1410	108	760	2.74	7.0	4.7
35	1580	120	855	3.08	7.9	5.3
40	1750	135	945	3.41	8.7	5.8
45	1910	150	1030	3.72	9.5	6.3
50	2070	160	1120	4.04	10.3	6.9
55	2220	170	1200	4.33	11.1	7.4
60	2372	185	1280	4.62	11.8	7.9

Nutrient requirements for growing lambs: The growth rate up to 200 g/day has been obtained in some experiments, hence the data are tabulated up to growth rate of 200 g/day. The weaning weight of lambs varies from 10 to 25 kg, depending upon the breed and feeding regimen during pre-weaning period. Therefore, the growth requirements have been given for lambs ranging in body weight from 10 to 30 kg (Table 5).

Table 5: Nutrient Requirements for growing lambs (ICAR, 1998)

Body Wt. (kg)	Rate of gain (g/d)	DM (g)	DCP (g)	TDN (g)	ME (Mcal)	Ca (g)	P (g)
10	50	300	32	195	0.54	1.5	1.0
	100	340	37	220	0.72	1.7	1.1
	150	385	42	250	0.90	1.9	1.3
15	50	450	48	290	0.81	2.2	1.5
	100	510	55	330	1.08	2.5	1.7
	150	580	60	375	1.35	2.9	1.9
	200	690	75	450	1,62	3.4	2.3
20	50	600	55	360	1.08	3.0	2.0
	100	680	63	410	1.44	3.4	2.3
	150	830	77	500	1.80	4.1	2.8
	200	1000	92	600	2.16	5.0	3.3
25	50	750	65	450	1.35	3.7	2.5
	100	850	73	510	1.80	4.2	2.8
	150	1040	89	625	2.25	5.2	3.5
	200	1250	107	750	2.71	6.2	4.2
30	50	900	74	520	1.62	4.5	3.0
	100	1035	86	600	2.16	5.2	3.4
	150	1290	107	750	2.71	6.4	4.3
	200	1550	128	900	3.25	7.7	5.2

B. Formulation of ration

1. **Feed stuffs used for formulation of ration for various physiological stages in goat can also be used for sheep.**
2. **Ration formulation depends upon nutrient requirement of the animal and nutritive value, availability and cost of feed stuffs.**