Original Research Article

Breeding Strategies in Goat Farming of Southern Tamil Nadu, India

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A B S T R A C T

The research work was carried out to analyse the breeding practices followed by the goat farmers in southern districts of Tamil Nadu. Majority of the goat farmers used own farm bred male animals (38.88 per cent) for breeding purpose followed by purchased the bucks from other goat farmer's herd (25.66 per cent). They maintained the sex ratio of male to female goats as 1:20 (37.22 per cent), 1: 25-30 (42.78 per cent), 1: 1 above 30 (20 per cent) in the study area. Chi-square revealed that there was a highly significant ($P< 0.01$) association was observed between sex ratio of goats in the farmers herds among districts. The age at first mating in Kanniadu, Kodi adu and non-descript breeds of goats were 10.00 ± 0.23, 10.07 ± 0.16 and 10.18 ± 0.09 months, respectively and kidding interval for the above three breeds were 7.50 ± 0.16, 7.35 ± 0.16 and 7.44 ± 0.06 months, respectively. The kidding and twinning per cent was significantly ($P< 0.05$) higher in non-descript goats. Triplets and quadruplets were significantly ($P< 0.01$) higher in Kanniadu. Lifetime use for breeding purpose was significantly higher for Kodi adu goats. Production and supply of superior male germplasm from the research institutes and organized livestock farms is helpful to maintain the breed characteristics of native goats.

Introduction

As per 20th livestock census the total goat population in the country is 148.88 million showing an increase of 10.10 per cent over the previous census. Goat contributes about 27.80 percent in total livestock and 36 per cent of the total meat produced in the country (Report, 2020). Even though India possesses 34 recognised breeds of goats raised for meat, milk and fibre production, more than 60 per cent of the

goats are non-descript due to indiscriminate breeding and intermixing of flocks. Goat production in India varies greatly in different agro-climatic regions. Tamil Nadu is endowed with three recognised breeds of goats viz. Kanni, Kodi and Salem Black goats which are belongs to meat type. There are about 9.89 million goat population reported in Tamil Nadu and out of this 27.74 per cent of the population are found in southern agro-climatic region of Tamil Nadu. These local goat

breeds constitute valuable sources of genetic material because of their adaptation to harsh climatic conditions, their ability to better utilise the limited and poor quality feed resources.Efforts have been made to conserve the indigenous goat breeds for their unique characteristics in their home tracts through in-situ and ex-situ conservation in different agro-climatic regions of India. Due to improper implementation of these programs, there is not much improvement in goat population from last one decade (Jitendar *et al.,* 2018).

Materials and Methods

The study was carried out in 180 goat herds from 60 villages spread in 30 blocks in three districts (Tirunelveli, Thoothukudi and Virudhunagar) by using multi-stage random sampling technique. The villages were selected in consultation with the Department of Animal Husbandry to document the existing breeding practices adopted by goat farmers. Age at sexual maturity, age at first kidding, kidding interval, litter size and sex ratio of the goat herds were collected to know the reproductive performances of the goats by direct enquiry with the farmers as well as by observing the stock position available during the visit.

Results and Discussion

Breeding management practices

Majority of the goat farmers used own farm bred male animals (38.88 per cent) for breeding purpose followed by purchased the bucks from other goat farmer's herd (25.66 per cent) in nearby locality, sandy (25 per cent) and exchange of male animals with other herds (10.56 per cent). Chi-square test revealed that there was a significant (P< 0.05) association observed between the selection of male animals and districts.

In all the three districts, heat detection was done by observing the oestrous symptoms exhibited by the breeding females (28.33 per cent) and the goat farmers allowed their breeding bucks to the females

which were in oestrus (71.67 per cent). There was no significant difference between the detection of heat in goats among districts. Herd mating (48.89 per cent) and pen mating (51.11 per cent) were the two common methods of mating employed by the goat farmers in all the three districts. Highly significant (P< 0.01) relationship was observed between mating methods and districts.

Goat farmers practiced sex ratio of male to female goats as 1:20 (37.22 per cent), 1: 25-30 (42.78 per cent), 1: 1 above 30 (20 per cent) in the study area. Chi-square revealed that there was a highly significant (P< 0.01) association was observed between sex ratio of goats in the farmers herds among districts. Alam *et al.,* (2008) found that the average ratio of breeding buck and females in Beetal goats in Punjab was 1:19.98.Majority of the goat farmers used farm-bred male animals (45 per cent) for breeding purpose. This was followed by purchasing bucks from other goat farmer's herd (17.22 per cent) in nearby locality, shandy (20.56 per cent) and exchange of male animals with other herds (17.22 per cent). Gokhale *et al.,* (2002) stated that 53.68 per cent of the Barbari goat farmers maintained their own bucks for breeding and 25 per cent of them introduced their bucks for breeding before attaining one year while 70 per cent of goat rearers effectively utilised the buck between 1 to 2 years age group in Maharashtra. The goat farming practices in Gowhilwadi goats in Farah district of Uttar Pradesh. The bucks were selected from the own herd, neighbouring herds and also in herds that belonged to relatives of the owner.

Heat detection was done either by observing the oestrus symptoms exhibited by the breeding females (55.56 per cent) or by allowing the breeding bucks to the females which were in oestrus (44.44 per cent). Herd mating (52.78 per cent) and pen mating (47.22 per cent) were the two common methods of mating employed by the goat farmers in the study area. There was no systematic selection of breeding males or females observed in the study area. However, male kids were selected for body weight and size based on visual appearance and some of the

males retained in the herds were mainly sold for religious sacrifice (Jain *et al.,* 2000). In Black Bengal goats, Nandi *et al.,* (2011) reported that up to the age of 12 months, the ratio of male to female goats was almost 1:1. But the proportion of males sharply declined after.1 year of age (1:88) and most of the castrated male goats were sold at the age of 9 to 12 months. Thiruvenkadan *et al.,* (2005) observed that the goat farmers used to exchange breeding bucks from one flock to another in southern districts Tamil Nadu. In this region mating was generally practiced as natural and uncontrolled.

Most of the goat farmers were maintaining their breeding bucks along with the females. Based on the demand for male goats in the market the farmers preferred to sell their bucks at an age of one year.

Most of the male kids were sold and all the females were retained. Aged females and those animals which were unable to walk and reproduce were sold for meat purpose. The same trend has been reported earlier (Report, 2011). Castration of surplus kids was very rare in the present study, whereas earlier works noticed that it was carried out in almost all the herds (Report, 2011). The reasons for reduced trend in castrating the kids might be the belief that the castration reduces the growth and vigour and with an idea that uncastrated kids fetch more price than the castrated one.

Reproductive performance of goats

The overall mean age at first mating (months), weight at first mating (kg), age at first kidding (months), weight at first kidding (kg) in the study area were 10.14 ± 0.08, 19.63 ± 0.10, 14.88 ± 0.07, 21.33 ± 0.10, respectively. In Kanniadu goats the age at first mating was 9.16 months and kidding interval was 6.73 months as reported earlier (Report, 2011) which are lesser than the results obtained in the present study (10 ± 0.23 and 7.50 ± 0.16 months). Similarly, Singh and Rai (2006) observed the age at first kidding and kidding interval of Barbari, Sirohi and non-descript breeds reared in the village conditions of Uttar Pradesh as 11.5 ± 0.7 and

14.0 ± 0.9; 16.3 ± 1.1 and, 7.9 ± 1.0; 8.9 ± 1.1 and 10.6 ± 1.3 months, respectively.

The overall mean age at second kidding (month), weight at second kidding (kg), kidding interval (month), gestation period (days), post partum heat period (days), oestrous cycle length (days), duration of oestrous (h) were 22.32 ± 0.09, 27.80 ± 0.09, 7.43 ± 0.06, 149.61 ± 0.21, 53.87 ± 0.22, 20.02 ± 0.10, 22.57 ± 0.09, respectively. The overall mean kidding (per cent), type of birth as single, twins, triplets and quadruplets in the goats were 88.77 ± 0.35, 65.79 ± 0.70, 31.36 ± 0.65, 2.36 ± 0.31 and 0.48 ± 0.12 per cent, respectively. The mean litter size per kidding and life time kids production in the female goats in the study area were 1.34 ± 0.01, 6.71 ± 0.04, respectively. The average age at first kidding, kidding interval, twinning recorded in Konkan Kalyan goats reared under range conditions were 545.82 days, 239.85 days and 34.67 per cent, respectively (Verma *et al.,* 2012).

Age at first kidding in Marwari and Parbatsar breed of goats were 559.4 ± 36.5 and 577.6 ± 36.20 days and kidding interval observed was 253.7 ± 10.47 and 324.0 ± 27.70 days, respectively. Single birth reported was 81.3 and 95.18 per cent and twins 18.7 ± 42.0 and 10.7 ± 41.0 per cent breeds, respectively (Patel *et al.,* 1999). The mean overall age at first mating (months), and lifetime use for breeding purpose (years) in the study area were 10.88 ± 0.12, 3.64 ± 0.06, respectively. The kidding and twinning per cent was significantly ($P< 0.05$) higher in non-descript goats. Triplets and quadruplets were significantly ($P< 0.01$) higher in Kanniadu. Lifetime use for breeding purpose was significantly higher for Kodi adu goats.

The overall kidding and twinning percentage were 88.77 ± 0.35 and 31.36 ± 0.65, respectively. Saharae *et al.,* (2009) reported a lower kidding and twinning per cent for adult Osmanabadi goats as 55.87 ± 4.26 and 10.52 ± 1.98 per cent, respectively. In Tamil Nadu higher twinning percentage both in Kanniadu (46.50 percent) and Kodi adu goats (38.91 per cent) was recorded (Report, 2011).

In Kodi adu goats, Jain *et al.,* (2000) reported that the kidding interval was about 8 to10 months and age at first kidding ranged from 15 to 18 months. The primiparous does generally gave birth to single whereas twinning was common in the pluriparous does and triplets were also seen in does depending upon herd size, care taken by the grazier and feed supplements. The mean age at first mating in Kanniadu, Kodi adu and non-descript breeds of goats in the study area were 10.35 ± 0.42, 10.13 ± 0.22, and 11.14 ± 0.13 months and life time use for breeding were 3.63 ± 0.16, 3.37 ± 0.12 and 3.70 ±

0.07 years, respectively.

Goat rearing is mainly focusedon good quality meat and skin production in Tamil Nadu. Production and supply of superior male germplasm from the research institutes and organized livestock farms to the farming community is useful to maintain the breed characteristics of goats. Even though practical difficulties in the adoption of Artificial insemination, it is considered as best method of breed conservation programme in goats.

Table.1 Breeding management practices (per cent)in goat rearing

Characters	Category	Tirunelveli	Thoothukudi	Virudhunagar	Overall	Chi-square
Source of buck for breeding use	Farm bred	25.00 (15)	46.67(28)	45.00 (27)	38.88 (70)	**13.39**[*]
	Purchased from other herd	26.67 (16)	30.00 (18)	20.00 (12)	25.56 (46)	
	Purchased from sandy	30.00 (18)	16.67 (10)	28.33 (17)	25.00 (45)	
	Exchange with other herd	18.33 (11)	6.67 (4)	6.67 (4)	10.56 (19)	
Selection of buck	Body size	60.00 (36)	41.67 (25)	35.00 (21)	45.56 (82)	**8.11**[*]
	Growth rate	40.00 (24)	58.33 (35)	65.00 (39)	54.44 (98)	
Selection of doe	Birth type	30.00 (18)	56.67 (34)	38.33 (23)	47.22 (85)	**9.19**[*]
	Body size	70.00 (42)	43.33 (26)	71.67 (37)	52.78 (95)	
Heat detection	By farmer	25.00 (15)	20.00 (12)	23.33 (14)	28.33 (51)	**0.75**[NS]
	By breeding buck	75.00 (45)	40.00 (48)	76.67 (46)	71.67 (129)	
System of mating	Herd mating	31.67 (19)	63.33 (38)	51.67 (31)	48.89 (88)	**12.32**[**]
	Pen mating	68.33 (41)	36.67 (22)	48.33 (29)	51.11 (92)	
Sex ratio	1: 20	23.33 (14)	46.67 (28)	41.67 (25)	37.22 (67)	**14.62**[**]
	1: 25-30	61.67 (37)	35.00 (21)	31.67 (19)	42.78 (77)	
	1: above 30	15.00 (9)	18.33 (11)	26.67 (16)	20.00 (36)	

*Figures in parentheses indicate number of observations * Significant (P<0.05) ** Highly significant (P<0.01) [NS] Non-significant*

Table.2 Least-squares means (± SE) of system wise reproductive performance in goats

Parameters	Systems of production			
	Extensive	Semi-intensive	Intensive	Overall
No. of observations (herds)	60	114	6	180
Female				
Age at first mating (month)	10.31 ± 0.15	10.03 ± 0.09	10.50 ± 0.18	10.14 ± 0.08
Weight at first mating (kg)	19.50 ± 0.18	19.66 ± 0.13	20.33 ± 0.49	19.63 ± 0.10
Age at first kidding (month)	14.82 ± 0.12	14.89 ± 0.08	15.17 ± 0.31	14.88 ± 0.07
Weight at first kidding (kg)	21.08 ± 0.21	21.44 ± 0.10	21.67 ± 0.61	21.33 ± 0.10
Age at second kidding (month)	22.20 ± 0.16	22.37 ± 0.11	22.67 ± 0.49	22.32 ± 0.09
Weight at second kidding (kg)	27.48 ± 0.15	27.99 ± 0.10	27.57 ± 0.85	27.80 ± 0.09
Kidding interval (month)	7.38 ± 0.09	7.46 ± 0.07	7.50 ± 0.34	7.43 ± 0.06
Gestation period (days)	149.12 ± 0.34	149.76 ± 0.27	151.50 ± 0.85	149.61 ± 0.21
Postpartum heat period (days)	53.57 ± 0.34	53.98 ± 0.30	54.67 ± 0.49	53.87 ± 0.22
Oestrous cycle length (days)	20.00 ± 0.17	20.03 ± 0.13	20.00 ± 0.58	20.02 ± 0.10
Oestrous duration (hours)	22.48 ± 0.14	22.58 ±0.11	23.33 ± 0.42	22.57 ± 0.09
Kidding per cent	88.19 ± 0.68	88.94 ± 0.24	91.27 ± 2.12	88.77 ± 0.35
Type of birth (per cent)				
Single	64.53 ± 1.24	66.26 ± 0.87	69.40 ± 4.64	65.79 ± 0.70
Twins	32.58 ± 1.17	30.89 ± 0.79	28.10 ± 4.29	31.36 ± 0.65
Triplets	2.26 ± 0.54	2.45 ± 0.41	1.67 ± 1.05	2.36 ± 0.31
Quadruplets	0.57 ± 0.23	0.41 ± 0.14	0.83 ± 0.53	0.48 ± 0.12
Litter size/ kidding	1.35 ± 0.01	1.34 ± 0.01	1.31 ± 0.05	1.34 ± 0.01
Life time number of kid production	6.77 ± 0.06	6.69 ± 0.04	6.53 ± 0.23	6.71 ± 0.04
Weaning age for Male kids	2.71 ± 0.05	2.72 ± 0.05	2.33 ± 0.17	2.71 ± 0.05
Female kids	3.36 ± 0.05	3.37 ± 0.05	3.50 ± 0.32	3.36 ± 0.05
Male				
Age at first mating (months)	11.06 ± 0.21	10.87 ± 0.14	9.25 ± 0.31	10.88 ± 0.12
Lifetime use for breeding (years)	3.75 ± 0.11	3.57 ± 0.06	3.83 ± 0.31	3.64 ± 0.06

Table.3 Least-squares means (± SE) of breed-wise reproductive performances in goats

Parameters	Goat breeds			
	Kanniadu	Kodi adu	Non descript	Overall
No. of observations (herds)	24	27	129	180
Female				
Age at first mating (month)	10.00 ± 0.23	10.07 ± 0.16	10.18 ± 0.09	10.14 ± 0.08
Weight at first mating (kg)	19.13 ± 0.26	19.89 ± 0.26	19.67 ± 0.12	19.63 ± 0.10
Age at first kidding (month)	15.13 ± 0.18	14.89 ± 0.15	14.83 ± 0.08	14.88 ± 0.07
Weight at first kidding (kg)	21.35 ± 0.23	21.50 ± 0.23	21.29 ± 0.12	21.33 ± 0.10
Age at second kidding (month)	22.63 ± 0.26	22.24 ± 0.21	22.28 ± 0.10	22.32 ± 0.09
Weight at second kidding (kg)	27.68 ± 0.22	28.13 ± 0.20	27.76 ± 0.11	27.80 ± 0.09
Kidding interval (month)	7.50 ± 0.16	7.35 ± 0.16	7.44 ± 0.06	7.43 ± 0.06
Gestation period (days)	149.46 ± 0.49	150.96 ± 0.43	149.35 ± 0.26	149.61 ± 0.21
Postpartum heat period (days)	55.54 ± 0.91	53.41 ± 0.30	53.65 ± 0.25	53.87 ± 0.22
Oestrous cycle length (days)	20.00 ± 0.23	19.67 ± 0.28	20.09 ± 0.12	20.02 ± 0.10
Oestrous duration (hours)	22.71 ± 0.15	22.48 ± 0.17	22.57 ± 0.11	22.57 ± 0.09
Kidding (per cent)	88.66 ± 0.80	87.84 ± 0.77	88.98 ± 0.44	88.77 ± 0.35
Type of birth (per cent)				
Single	62.40 ± 1.74	67.79 ± 2.02	66.02± 0.82	65.79 ± 0.70
Twins	33.40 ± 1.39	28.83 ± 1.87	31.51± 0.77	31.36 ± 0.65
Triplets	3.30 ± 0.73	2.62 ± 0.64	2.13 ± 0.39	2.37 ± 0.31
Quadruplets	0.90 ± 0.43	0.76 ± 0.38	0.34 ± 0.11	0.48 ± 0.12
Litter size/ kidding	1.38 ± 0.02	1.32 ± 0.02	1.34 ± 0.01	1.34 ± 0.01
Life time number of kid production	6.88 ± 0.09	6.61 ± 0.10	6.70 ± 0.04	6.71 ± 0.04
Weaning age for male kids	2.54 ± 0.10	2.65 ± 0.11	2.75 ± 0.04	2.71 ± 0.04
Female kids	3.44 ± 0.09	3.37 ± 0.12	3.36 ± 0.04	3.37 ± 0.04
Male				
Age at first mating (months)	10.35 ± 0.42	10.13 ± 0.22	11.14 ± 0.13	10.88 ± 0.12
Lifetime use for breeding (years)	3.63 ± 0.16	3.37 ± 0.12	3.70 ± 0.07	3.64 ± 0.06

Cross-breeding with high yielding exotic and other native breeds of goats should not be encouraged. Scientific technologies on the importance of breeding strategies may be communicated to the farmers through mobile applications and conducting on campus training programmes.

Naturally available fodders and foliages, traditional grazing methods, proper health care and farmer's own interest to conserve the local recognized goat breeds are the possible ways of conserve the germplasm.

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