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RESEARCH ARTICLE

ADVANCES IN GOAT MANAGEMENT TO UP-SCALING PRODUCTION

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ABSTRACT

India is a agrarian country, having 2.4% of land resources, 4.0% of water resources feeding 11.6.% of livestock population and producing 18.5% milk of the world. The fact is that India is highest milk producer (155.50 million tonnes) of the world as well as of goat milk and second-largest producer of chevon in the world, even though country is second in goat population after China. In-spite of these facts, productivity of individual animal is poor, have immense scope of economic gains, if appropriate technological and marketing interventions are applied in the country for rearing these animals (Anonymous, 2016). The increase of goat population from 281.82 million in 1911 (British India) to 1351.73 million in 2012 (India) shows the peoples preference of rearing the species, while there are only 26.97% pure breeds of goats and rest of the population is either graded or non descript, which shall be taken into consideration for future breeding policy in the country. Similarly, average productivity of goat is only 0.45 lit per goat per year, while present productivity of goat is increased 1.5 times over a period of 74 years. However, production potential of selected goat breeds in India is significantly higher (1.06 to 2.50 kg per day) than national average, realized that still we have high potential animals in the country, which shall be exploited for increasing the productivity of the species.

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INTRODUCTION

India is the largest producer of goat milk and second-largest producer of chevon in the world, while productivity of individual animal is poor, have immense scope of economic gains, if appropriate technological and marketing interventions are applied in the country for rearing these animals (Anonymous (2016). The famous pro-verb i.e. *"goat is a poor men's cow"* is also very much appropriate for the species as poor persons can also managed few animals, because management of 5 to 7 goat is easy than management of one cow/buffalo, where cost is almost at par and productivity is not much differ, required almost 25% less space, in-spite of other advantages over buffalo. The preference of goat milk over cow milk and chevon over beef is also other factors favouring the rearing of species, while total human population of world was 7243.80 million providing employment in agriculture to 30.70% population world wide, 38.7% in Asia alone and 47.20% in India during the year 2014

Population status

Being small ruminants, having highest growth rate (3.06%) per year among domestic animals since 1951 shows the prolificacy and preference of people for its rearing. The growth rate of goat among major domestic species is highest (Table-1), whereas population of pack animals like horse, camel etc is declining since long. The population of goat has increased continuously in India since 1911 to 2012 as well as in Gujarat state, where state is having about 3.47 to 4.93 % population of the country (Table-2) and growth rate of goat remains about 3.06% (Table-1) per year during last 60 years. It shows that breed have ability of growing un-interrupted in-spite of frequent draught / floods during the reporting period.

Breed

There are 300 well recognized breeds of goat in the world, while 28 of them belongs to India, where Jamunapari, and Surti are suitable for milk production, while Balck Bengal, Barbari, Osmanabadi and Kannaiadu are suitable for chevon production and rest are suitable for either fibre or milk and meat production (Table-3). The exotic breeds like Alpine and Saanen are also used in India for improving local breeds of goat. However, recent reports of the government of India on breed status of domestic species in the country shows that pure breed of goat in the country are only 26.97%, while pure and graded population of goat is 38.74% and rest of the population is non descript (61.26%) and depicted in Table-4. It shows that these population shall be taken into consideration for breed improvement or increasing the productivity of different breeds of the goat across the country.

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Table 1. Comparative growth rate of goat population (%) in India

S. No.	Year	Population (million)			Increase in Population (%) per year (1951 to 2012)					
		Total livestock	Goat	% goat population of total livestock	Total livestock	Goat	Cattle	Sheep	Buffalo	Human
1	1951	292.9	47.2	16.11						
2	1972	353.2	67.5	19.11						
3	1992	470.9	115.3	24.49	1.23	3.06	0.38	1.09	2.47	3.86
4	2012	512.1	135.2	26.40						
5	2032	553.33*	155.1*	28.03*	---	---	---	---	---	---

Source : Anonymous (2017); * Projected value

Table 2. Status of goat population in Gujarat and India since 1951 to 2012

S. No.	Year	Goat Population (lakh)		
		India	Gujarat	Percent population in Gujarat state
1	1911-12*	281.28	----	----
2	1940	302.12	----	----
3	1951	472.00	23.26	4.93
4	1961	609.00	22.23	3.65
5	1972	675.00	32.10	4.76
6	1982	952.00	33.00	3.47
7	1992	1153.00	42.41	3.68
8	2003	1244.00	45.41	3.65
9	2012	1351.73	49.59	3.67

Source : Desai (1953); * https://naldc.nal.usda.gov/download/IND43843067/PDF

Table 3. Utility classification of goat breeds in India

S. No.	Purpose	Indigenous breeds	Exotic breeds
1	Milk purpose breeds	Jamunapari, Surti	Alpine, Saanen
2	Meat purpose breeds	Black Bengal, Barbari, Osmanabadi, Kannaiadu	----
3	Fiber purpose breeds	Changthangi, Chegu and Gaddi	----
4	Milk and meat purpose breeds	Beetal, Jakharana, Mehsana, Kachchhi, Jhalawadi, Sojat, Sirohi	----

Source : Anonymous (2015)

Table 4. Pure breed, graded and non descript population of different species in India (2012)

S. No.	Species	Pure breed population	Pure and Graded population	Non descript population	% population of total livestock	No of breeds included in survey
1	Cattle	11.87	25.10	74.9	37.28	37
2	Buffalo	17.05	56.63	43.37	21.23	13
3	Sheep	38.86	58.92	41.08	12.71	38
4	Goat	26.97	38.74	61.26	26.40	23 (28**)
5	Camel	….	71.78	28.22	0.08	09
6	Horses & Ponies	….	19.58	80.42	0.12	6
7	Mules	….	----	----		
8	Donkeys	….	91.35	8.65*	0.10	2
9	Pig	3.97	26.89	73.11	2.01	6

Source : Anonymous (2013) *Exotic breed ** Actual No of Breed

Breeding policy

The aims of breeding policy are to improve growth, body weight, reproductive efficiency, milk / meat quality and quantity and to reduce mortality. The main focus shall be to produce and distribute good quality bucks of indigenous breeds, which can thrive in different agro-climatic conditions. The flock or assortive mating and individual / pan mating are the common practice of breeding in goat, where breeding policy shall be separate for pure, graded and non descript population. Selective breeding / grading-up for pure breed population, mating of pure breed buck with graded female having more resemblance with the breed of buck and buck having high genetic merit irrespective of breed belongs to either meat or milk shall be allowed for mating with meat or milk purpose non descript population respectively depending upon the characteristics of the animal. It will help us to maintained the pure breed as well as to improve the graded and non descript population, where change of breeding buck after 3 to 4 years must be practice. However, cross-breeding with high yielding buck of exotic breed and low productive native breeds or graded population or non descript population of goats may also be considered to improve the non descript high yielding population.

Performance traits

The average milk yield of goat in India is only 0.45 lit per animal per day (Table-5), while some of the goat breeds like Jamunapari, Kachchhi, Jakhrana and Mehsana produced 1.50 to 2.50, 1.80, 1.06 and 1.32 lit of milk per day, respectively (Table-6), which is almost comparable or even more than non-descript cows. Considering the requirements of a cow is quite higher than a goat. This clearly shows that rearing of a goat is more beneficial than a cow and further multiplication of such animals shall be given priority and different incentives shall also be given to the goat keepers' having animals of high genetic merits on the pattern of cattle breeders. Also, efforts should be made to bring awareness about the quality, characteristics and health benefits of goat milk for human. The reports of different workers depicted in Table-6, shows that performance of some breeds of goat is quite higher (1.06 to 2.50 lit) than overall average daily milk yield of the species (0.45 lit). Similarly, other traits of economic importance are also shows that rearing of goat breeds for milk production is economically viable and shown the scope of improvement for milk production. If these values are taken as base for improvement then certainly in the coming years, productivity of the Indian goat could be improve significantly.

Table 5. Average daily milk production per animal of different species

Year	Average milk yield (kg/day) per animal per day (2015-16)						
	Exotic Cows	Crossbred Cows	Indigenous Cows	Non-Descript Cows	Indigenous Buffalo	Non-Descript Buffalo	Goat
2015	11.21	7.33	3.41	2.16	5.76	3.80	0.45

Source : Anonymous (2017)

Table 6. Performance of selected goat breeds of India

S. No.	Breed	AFK (days)	LMY (kg)	Milk yield / day (kg)	LL (days)	KI (days)	Rearing System
1	Jamunapari	786.00	200.00	1.50 to 2.50	148	390	Extensive
2	Kachchhi	777.5 +20.4	112.56+5.65	1.80	202	464.3+20.9	Village conditions
3	Jakhrana	574.00	121.8+8.8	1.06	115	319	Extensive
4	Mehsana	716.52+19.1	210.2+20.4	1.32	197.2	364.4	Semi-intensive

Source: Kumar *et al* (2015); Anonymous (2017, a); Anonymous (2017,b); Anonymous (2017,c) Anonymous (2017,d); Patel and Pandey (2013)

Table 7. Comparative performance of different species of domestic animals in India

S. No.	Species	Population (million) 1940-41	Milk Yield in 1938-39 (000, ton)	Av milk yield per animal per year (kg)	Population (million) 2012-13	Milk Yield in 2012-13 (million 000,ton)	Av milk yield per animal per year(kg)
1	Cattle	87.07	1073.00	12.32	190.90	74640	39.10
2	Goat	30.21	716.42	23.72	135.20	4665	34.50
3	Sheep	25.18	----	----	65.07	---	---
4	Buffalo	22.42	1105.50	49.31	108.70	76195	70.10
5	Pig	1.96	---	---	10.30	---	---
6	Donkey (@ av of 15000 animals)	1.16	1.56	678 per lactation	----	---	---
7	Camel (@ av of 5000 animals)	0.42	3.39	103.96 per lactation	----	---	---
8	Poultry	61.13	---	----	729.20	---	---

Source ; Desai (1953); Anonymous (2016-17)

Table 8. Production performance of Indigenous goat under different countries

Sr No	Breed	Year	Country	Performance
1	Jamunapari	1903	Indinesia, Malasia	Milk yield : upto 900 kg in 300 days with 5.2% fat
2	Jamunapari	1918 1931	----do----	Av milk yield : 158 – 202 kg; LL (days) : 225 with 4.85% butter fat
3	Kashmiri	1908 1927	Indonesia	Used for crossbreeding to improve the local Indonesian goats
4	Barberi	1994	Vietnam	Milk yield : 1.3 lit / day; Lactation length: 155days; Age at first kidding : 350 days; Kidding interval : 281 days
5	Jamunapari	1994	----do----	Milk yield : 2.1 lit/ day, LL (days) : 179, AFK (days) : 350; kidding interval (days) : 316
6	Beetal	1994	----do----	Milk yield : 1.9 lit / day; Lactation length : 186days; Age at first kidding : 435days; Kidding interval : 312 days

Source : Van and Lin (2002); Valerie et al. (2002).

Further, it is realized from the Table-7 that productivity of cattle is increased almost three times in 74 years as compare to the productivity of other species like buffalo 1.5 times and goat 1.5 times after 1938-39 to 2012. In-spite of these facts, we could assume that species have scope for its improvement. Similarly, breeds exported to different countries during different years were managed very well under their environmental conditions and found that performance of these breeds like Jamunapari, Barberi, Beetal etc was excellent in Indonesia, Malasia and Vietnam (Table-8). These results shows that Indigenous breeds of goat have potential to perform well and species have scope of improvement.

Feeding

Goat is a browsing animal preferred variety of herbs / shrubs / tree leaves, twigs etc and consume more dry matter (4 to 6%) than cow (2.5 to 3.0%). The species have some specific feeding behavioral characteristics, which protect it from the toxicity of some compounds. Its salivary glands are bigger and saliva contain compounds to limit the negative action of tannins and toxins, hence have the ability to cope up with anti nutritional factors. The feedstuffs consume by a cow / buffalo is sufficient for rearing about 6 to 7 goats even though it is poor convertor of cellulose / hemicelluloses than bovine.

Production of GHG and climate change

GHG emission from agriculture in the environment is main issue of consideration during the era of climate change, where we were second (during 2012-13) in the world after China in GHG emission and current surface temperature is now 0.6 ^{0}C higher than the average of last century. This increase might be due to rise in Co_2 and CH_4 level due to human activities (Anonymous, 2015). It is also true that enteric methane emission from livestock is the major source of GHG, which accounts 85.6% of total GHG from total livestock of the world during the year 2010, where cattle alone accounted for about three-fourth (73.7%) of the total enteric methane emission, followed by buffalo (11.3%), sheep (6.36%), goat (4.86%), camel (1.17%), swine (1.14%), horse (1.11%) and other livestock (Patra, 2014). According to 19th Livestock Census of India, there were about 512 million livestock in the country, which contributes about 9.56 Teragram (Tg) or (9.56 million tonnes) methane per year in the air, whereas contribution of goat in methane emission was 0.30 x 10^9 kg in 1961 and it will be 1.11 x 10^9 kg in 2050 (Arpita, 2017).

Housing management

Shelter management is very important factor for rearing the goat. A adult animal required 10 to 15 sq ft sleeping area and

about 20 to 30 sq ft open area for exercise (if goat are not allowing for browsing). In addition to this each goat required at least 4ft x 5ft kidding space on the farm. However, under rural area some of the goat breeders provide shelter under tree shades or under thatch roof during night hours only and rest of the time (day hours) allow their animals for browsing in the farmers field after harvesting the crops / waste land / forest land / road side shrubs / herbs.

Health management

It is surprise for us that still 10.8% human population is undernourished in the world, while in Asia it is 12.1% (2014-16) and India is having such population highest in the Asian countries (Anonymous, 2015,a). Therefore, maintaining the proper health of the human as well as of goats, shall be given priority for producing the quality milk. Therefore, regular deworming and vaccination shall be carried out in the flocks either managed on the organized farm or on the farmers field.

Conclusion

It is fact that goats are reared either on the organized farm or by the farmers having poor resources, but population of the species as well as productivity is improving, is possible due to continue efforts of the goat breeders and scientists involved in the process, while preference of the people for the species and nutritional / medicinal value of the milk is also another factor for the same. Further, it is stated that strategies for conservation and improvement of the species shall be formulated after consideration of the pure breed, graded and non descript population in the country, where feed resources and housing facilities shall be improved. It will help to reduce the emission of GHG as well as of better quality products.

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