

Artificial insemination:

a potential technique for doubling goat farmers' income

R Ranjan¹, M K Singh² and A K Dixit³

Central Institute for Research on Goats, Makhdoom, Farah (Uttar Pradesh) 281 122

India's 72.2% of populations is living in 0.638 million villages, mostly dependent upon agriculture and livestock for their livelihood. Out of the 138 million Indian rural households, 33.01 million (24%) are maintaining goats. Households cultivating less than 2.0 ha of land (marginal-and small-farmers) are the custodian of more than 76% of the total goats in the country. Goat has been playing multiple role in livelihood of the rural people by providing income, employment, nutrition, supporting crop production and risk aversion in case of crop failure.

Key words: Artificial insemination, Goat farmers, Income, Technique

GOAT farming has huge opportunity in rural development as goat has potential for export of products, capital storage, household income, employment and nutritional security. Goat farming is women friendly and could be used as important tool for rural women empowerment. It could be the important means of doubling of goat owners' income by 2022. The foundation of sustainable productivity is improvement in the genetic potential of large number of low productive/non-descript goats along with promotion of scientific/strategic input breed goat farming.

Goat population and dynamics

There is significant growth in population of goat in India between 1982 and 2007. Maximum increase (16%) was recorded from 1982 to 1987 followed by 13% between 2003 and 2007. The goat population however, has declined by 3.82% over the previous census, attributed to high rate of slaughter, effect of consumer shift and shrinking grazing lands. However, in long-term, it may have bad consequence as shortage of goat meat may increase the prices of meat. Major reason of steady increase in goat population was increase in



demand for chevon in urban areas as compared to other food groups due to increased income. However, average productivity (carcass and milk yield) remained stagnant over these periods.

Development of genetic stock by supply of high potential pure-bred bucks

Selection of breeds adaptable to the existing agro-climatic conditions that can thrive well on un conventional feed and fodder resources should be given top priority in goat-based rural development-cum breeding programme. There is need to encourage the farmers to breed local non-descript goat with improver breed suitable for that particular agro-climatic conditions. Upgrading of goats through elite pure bred bucks should be seriously implemented along with prophylactic support. Establishment of kids-nursery farm of improver breeds in

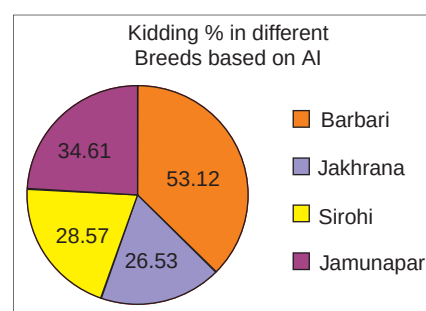
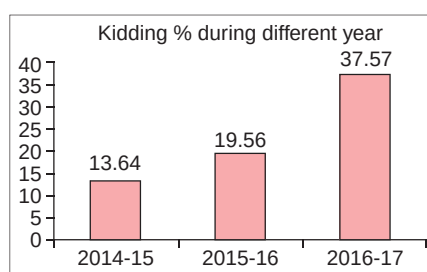


home tract of all important and high potential breed for regular supply of breeding bucks to goat keepers for improvement in genetic potential of goats. Progenies born out from superior bucks yielded 40 to 75% more production and also fetched 25 to 40% higher price in market as breed premium.

Artificial insemination

Human population will be reach to 1.7 billion and goat population 216 million by 2050. Therefore to meet requirement of milk, meat and associated by products of ever

increasing human population, it is imperative increase goat productivity. It could be possible by increasing high productive descript (33%) goat population and reducing non-descript (67%) and less productive goats by promoting scientific goat-farming. Artificial Insemination (AI), is the first generation of reproductive biotechnology by which we can replace the non-descript and less productive goats with productive goat population. AI and semen cryo-preservation represents a pivotal tool for the long-term *ex-situ in vitro* conservation, exchange of valuable germplasm of livestock and endangered species. Jamunapari goat is one of the largest-sized and widely known for high milk production among goat breeds in India (Accession number: INDIA_GOAT_2000_Jamunapari_06011). This breed has been extensively used for upgradation of local goats in India and in many South Asian countries. However, population and productivity of Jamunapari goat is declining and deteriorating and is mainly due to indiscriminate breeding on account of extreme scarcity of quality and pure-bred bucks. Likewise other goat breeds viz. Barbari, Jakhrana, Surti, Beetal are in endangered category due to decreasing population in their respective home tract. Conservation of these breeds will definitely increase the national economy more particularly of the poor farmers who possess few goats and are dependent on the production from them. There are 71 million breed able does and 17 million breeding bucks available in



India as per XII *Livestock Census Report*. One buck by natural mating can cover maximum 50 does/year, but by stored frozen semen 3,000 does can be covered in a year. Therefore, to cover 71 million breed able does, we need 1.5 to 2 million bucks as compared to only 50,000 buck needed for Frozen Semen AI Technology. The absence of a perfect universal protocol and the low survival and conception rates represent the major hurdles for widespread use of semen cryo-preservation for improvement in animal production. Semen freezing of goats has not produced comparable results that of bovines in our country. The Central Institute for Research on Goats needs to take up detailed studies on these lines and take a lead in this direction. The freezability of goat semen is comparatively than to other farm species. Artificial Insemination has not attained the large-scale adoption in our country. Attempts are to be made to find out the reason behind this and improve the quality and quantity of semen.

There is an increasing awareness of the benefits that frozen semen technology offers to the controlled animal breeding and husbandry. Frozen semen technology can provide a consistent year round supply of

male gametes of known content and potential and can aid in genetic manipulation, breed selection, transport of gametes and economical utilization of males. Besides frozen semen permits off-season use of spermatozoa and increase fertilization success by allowing the addition of a known number of spermatozoa to eggs at an optimum rate. The ultimate goal of frozen semen technology is to maintain indefinitely the quality and inherent fertility of freshly ejaculated spermatozoa, until spermatozoa swim out of their preservation medium into the milieu of the female reproductive tract. Regardless of species the process of cryo-preservation of spermatozoa is associated with considerable cell loss and almost 50% cells are either rendered immotile or dead due to freezing-thawing stresses.

Moreover, the surviving population of the sperm show variable impairment of function and structure which leads to impairment of fertility or reduced fertility. Thus, there is considerable scope for further improvement and this is necessary, if cryopreserve spermatozoa has to play its full potential in reproductive biotechnology.





Doubling income by using AI technique using liquid semen

Artificial Insemination is the well tested technique by which non-descript and less productive goats could be transformed with least cost productive goat. One of the biggest problems prevailing goat production is huge scarcity of pure bred high genetic merit buck, as almost all high merit males are either castrated or sold up to 9 months of age (90%). Moreover, most of the farmers kept 2 to 5 adults female and keeping buck for such small number of females is not cost effective under such circumstances. AI with semen of proven buck not only important for bringing genetic potential improvement in goats but also necessary to improve breeding efficiency (kidding rate, generation interval). AI is only alternate under prevailing goat production system. The insemination cost per goat is ₹ 7, so for 200 goats it will be ₹ 1,400 and maintenance cost of two breedable bucks will be ₹ 10,000 and depreciation cost of instrument assumed ₹ 5,000 and training cost will be ₹ 10,000. The total cost of AI by using liquid semen will be ₹ 26,400. To cover 200 breedable

farmer can save ₹ 50,000/year by using liquid semen Artificial Insemination of flock size of 200 breedable does. Economic value of Artificial Insemination in goat farming, especially by small- and marginal-farmers, has hardly been realized. It is a cost effective technique. The extra cost of ₹ 76,000 which mainly includes maintenance of additional 8 bucks can be otherwise saved by using liquid semen through Artificial Insemination technique. It is a net saving of ₹ 50,000/year as 2 bucks are suffices the demand for 200 breedable does which total cost of Artificial Insemination by using liquid semen estimated to be ₹ 26,400. Thus goat keepers of India may double their income within 1-2 years by adopting improved management practices, low-cost innovative technologies of Artificial Insemination and smart marketing of goat and value addition of goat products.

Artificial insemination at CIRG using frozen semen

Artificial Insemination by using frozen semen straws having above



female, two buck is sufficient for liquid semen AI but for natural mating it will be require 10 breedable bucks. The extra cost of rearing and their maintenance of 8 bucks will be ₹ 76,000/year. So,

mentioned post-thaw motility was carried out in 2016-17. In two major breeding seasons (May-June and October-November) 181 goats of different breeds (Barbari, Jakhrana, Jamunapari and Sirohi) including 35 goats in villages were inseminated with frozen semen in natural estrous condition. The insemination was carried out 12 hr after detection of estrous and repeated after 12 hr of first insemination. A total 68 goat conceived by using frozen semen AI technology and total 121 kids (65 female and 56 male) were born through this technology. The kidding percentage in Barbari, Jamunapari, Jakhrana and Sirohi were $53.12 \pm 2.40\%$, $34.61 \pm 1.96\%$, $26.53 \pm 2.12\%$ and $28.57 \pm 2.32\%$ respectively. Overall, a success rate of 37.57% was recorded on the basis of actual kidding rate irrespective of goat breed maintained at this Institute under Semi-Intensive Management System.

SUMMARY

Artificial Insemination has not attained the large-scale adoption in our country. Attempts were made to find out the reason behind this and improved the quality and quantity of semen. There is an increasing awareness of the benefits that frozen semen technology offers to the controlled animal breeding and husbandry.

¹Scientist, AP&R Division, ²Principal Scientist, AGB, Division, and ³Senior Scientist, EE&SE Section, Corresponding authors' e mail: dr_raviranjam@yahoo.com.in

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