International Journal of Genetics
ISSN: 0975-2862 & E-ISSN: 0975-9158, Volume 9, Issue 2, 2017, pp.-244-247.
Available online at http://www.bioinfopublication.org/jouarchive.php?opt=&jouid=BPJ0000226

Research Article

CONSERVATION MODELS ADOPTED FOR SHEEP AND GOAT IN INDIA

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Received: October 16, 2016; Revised: February 15, 2017; Accepted: February 16, 2017; Published: February 28, 2017

Abstract- Domestication process occurred thousand years ago for sheep and goat genetic resources. In India, 42 breeds of sheep and 21 breeds of goat genetic resources is rich, diverse and locally adapted in its breeding tract. It plays very important role in agrarian economy and livelihood security for small, marginal farmers and landless laborers. Many breeds of sheep and goat are under threatened condition so immediate steps must be taken to avoid irreparable loss. Urgent need should be taken and initiate immediate steps for conservation of valuable indigenous sheep and goat and various governmental and non-governmental agencies involved in conservation of indigenous sheep and goat breeds. The main aim is to enlightened available genetic resources, conservation tools, management strategies and ideal conservation models which is adopted in developing countries as a part of conservation of animal biodiversity.

Keywords- Domestication, Genetic resources, Sheep, Goat, Conservation.

Citation: Chaudhari Arth, et al., (2017) Conservation Models Adopted for Sheep and Goat in India. International Journal of Genetics, ISSN: 0975- 2862 & E-ISSN: 0975-9158, Volume 9, Issue 2, pp.-244-247.

Academic Editor / Reviewer: Dr Mahendrakumar Makwana, Dr D.V. Chaudhari

Introduction

Many livestock populations locally adapted and emergence of breed concept. Sheep and goat domesticated around 10,000 years ago and spread out of domestication centres in Europe, Asia and African continents [1]. Intensive selection and reproduction among breeds seriously reduced fragmentation of initial gene pool. The genetic resources of many extinct sheep and goat breeds are under endangered status so urgent conservation measures must be taken to avoid an irremediable loss. Conservation genetics emerged with application of genetic concepts and tools to conservation problems for long-term conservation, development of management system (genetic variability of existing livestock resources) and continuous improvement in productivity and adaptability of livestock resources. The aim is to obtain better knowledge of FAnGR (those animal species that are used, or may be used, for the production of food and agriculture, and the populations within each of them) of their present and potential future uses for food and agriculture in defined environments, and their current state as distinct breed populations [2]. National-level breed characterization comprises for the identification of breed, understanding their status, trends and the associated risks. Breed diversity means genetic ability of a breed or a population adapting to human demand variation. The main objective of this review is to highlight the available genetic resources, conservation tools, management strategies and ideal conservation models employs that could be fit for developing countries situations. The review enlightened current available approaches and tools used for characterization and conservation of sheep and goat genetic resources.

Origin of sheep and goat

Osteometry and morphometry evidences in archaeological sites and by extensive genetic study using modern and ancient samples confirmed that sheep and goat first domesticated [3]. Archaeological and genetic data spots domestication centre in eastern Anatolia and west Iran. Extensive mitochondrial and nuclear DNA survey including all taxa of genus Ovis has carried out [4] and confirmed seven monophyletic clades.

Dispersal from domestic centre

Successive founder effect during spread of agriculture, decrease in genetic diversity with increasing distance to domestication centre, nuclear DNA polymorphism based on microsatellite still relatively high in between two species and compared to what found in wild species [5]. Large effective population size during most of period since colonizes.

Influence of breed concept on genetic diversity

Farmers controlled reproduction of sheep and goat by favouring reproduction of individuals with better phenotypes. Sheep and Goat slowly adapted to local environments and fulfilled needs of farmers in a sustainable way. Gene flow among different phenotypes results in relatively, high effective population size preventing genetic drift at regional scale. Emergence of breed concept has derived after strong selection in local populations followed by standardization of morphology and performance [6].

Sheep and goat breeds in India

Genetic resources of 42 breeds of Sheep and 21 breeds of goat available in India and it is characterized by high degree of endemism and variations in agro-climatic conditions led to development of various breeds and synthetic strains. Breeds named after their place of origin and some based on their prominent characteristics. Few breeds evolved from the base populations created by crossing native and exotic breeds. Indigenous breeds contribute greatly to

agrarian economy and play an important role in livelihood of a large proportion of small, marginal farmers and landless labourers. Intermixing of nearby breeds, introduction of exotic breeds and change in farming system resulted in decline in purebred population and dilution of genetic merit.

Main causes of decline indigenous animal biodiversity

(i) Unchecked increase causing continuing deterioration due to inadequate inputs.
(ii) Dilution of breeds by uncontrolled inter-mixing and infusion of exotic germplasm.
(iii) Absence of planned strategies for conservation of indigenous breeds.
(iv) Loss of breeds due to geographical reorganization.
(v) Breeding tracts and organized farms of important breeds lost after partition [7].
(vi) Indiscriminate cross-breeding practices.
(vii) Expansion of intensive agriculture.
(viii) Change in the economy.
(ix) Establishment of protective areas.
(x) Lack of market demand.
(xi) Disappearance of traditional livelihoods.
(xii) Loss of indigenous traditional knowledges (ITKs).

Reasons to conserve small ruminant genetic resources

To meet present socio-economic demand (FAnGR source of income for poor rural communities), insurance against future changes in production circumstances, cultural and historical reasons, opportunities to meet future demands, regenerating population after disease outbreaks, rescuing rare or endangered species or breeds providing a source of genetic material for research purposes and supplying germplasm for the development of new breeds. Moreover, maintaining indigenous livestock gene pool diversity.

Criteria for selecting breeds for conservation

1. Degree of endangeredness
2. Adaptation traits
3. Traits of economic importance
4. Unique traits

Conservation of sheep and goat resources

Characterizing livestock genetic resources to gather information on diversity and genetic merits

i. Develop conservation and genetic improvement programs.
ii. Whether, conservation and genetic improvement competitive or complementary

Primary activity in designing a national livestock conservation program to set conservation priorities at species and breed levels. Breed information collected for local or regional conservation purposes as well used for designing global conservation schemes.

Strategies for setting conservation priorities

1. Risk strategy
2. Maximum-diversity-strategy
   Measures of contribution to diversity
   Relevance to developing regions
3. Maximum-utility-strategy
   Setting conservation priorities
   Simplified approach
4. Identification and listing of all breeds of sheep and goat
5. Breed description and characterization in order to understand their unique qualities and potential contributions
6. Assessment of genetic variability for prioritizing the breed for conservation
7. Conservation of breeds through ex situ (frozen semen, embryos, somatic cell lines, DNA etc) methods

Conservation methods

1. In-vitro
   Cryopreservation of genetic materials (semen, oocytes, embryo & DNA)
2. In-vivo
   i. In-situ
   ii. Ex-situ

In-situ conservation

Conservation of Sheep and Goat genetic diversity refers to all measures to maintain live Sheep and Goat breeding populations, including those involved in active breeding programmes in the agro-ecosystem, together with husbandry activities that are undertaken to ensure the continued contribution of these resources to sustainable food and agricultural production.

On-farm

On-farm conservation of sheep and goat breeds involves maintaining and evaluating performance of productive and reproductive traits under natural condition on farm basis and it gives representative productive and reproductive performance level of the breed.

Community-based conservation

It is conservation approach based on combining socio economic values of farmer and indigenous traditional knowledge. It plays an important part in the sustainable use and conservation of such resources [8].

Ex-situ conservation

Ex-situ conservation of genetic material is within living animals but out of the environment in which it developed (ex situ *in vivo*), or external to the living animals in an artificial environment, usually under cryogenic conditions including, among others, the cryo-conservation of semen, oocytes, embryos, cells or tissues (*ex situ in vitro*).

Conservation models implemented in India

Conservation model adopted for Banpala Sheep in Sikkim [9]

The Banpala Sheep of Sikkim is considered to be a threatened breed due to low population of Banpala sheep. At present the number is considered to be almost below 4000. This Banpala breed of sheep is at the verge of extinction. Banpala sheep is among the 42 different animal species considered to be threatened in India alone. The state animal husbandry department submitted a project proposal for conservation of Banpala Sheep to the Government of India in accordance to the policy adopted for conservation by the international forum.

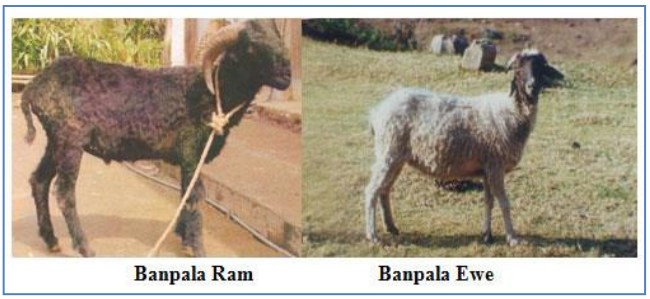

Fig-1 Banpala Sheep

(Source: KIRAN Empowering agriculture knowledge and innovation in agriculture in North-East)

Under this project the Begha Sheep farm has been revived to make it a nucleus farm and also providing feeds and fodders, mineral mixture, feeding equipments, insurance coverage, clinical treatment and extension education activity. At present Banpala sheep nearly 35 in numbers have been kept for Breeding. Other than farm, around 18 traditional farmers have also been listed as the members of Banpala Sheep Breeder association. All the farmers have been provided Banpala Sheep 4 in numbers each and other basic materials for initiating breeding programme. This will make one complete unit of Banpala Sheep conservation

programme at Begha, Dentam, West Sikkim.
Under this conservation programme second breeding unit is under establishment at Sardong Village, West Sikkim. The farmers of this village have established their traditional sheep farm in their natural breeding tract.

Kachaikatti Black sheep

As per report of SEVA (Sustainable Agriculture and Environmental Voluntary Action) the population of the sheep is around 2000 in numbers. Kachaikatty black sheep are maintained in small herds. The sheep native to Kachaikatty village in Madurai district of Tamil Nadu state. Jet black in colour, the Katchaikatty sheep is found in five villages: Katchaikatti, Kulasegaranpatti, Bodinaickanpatti, Viralipatti and Kudladampatti of Madurai district. However, the small and landless labourers who are dependent on this breed for their livelihood. The animal is well-known for its traditional knowledge. The lamb has good market value. It has no sterility problems. Small and margin farmers and agriculture labourers belonging to Yadavar, Pallar, Mooppar and Parayar are involved in rearing of sheep. The average size of the herd is 45. In each herd they keep one or two rams.
Conservation programme initiated by SEVA in collaboration with Tamil Nadu Veterinary and Animal Science University in assistance of providing lambs, elite ram distribution, mineral mixture, farm set-up, insurance coverage, veterinary treatment and awareness programmes etc.

Fig-2 Flock of Kachaikatti Sheep (Source: SEVA, 2005)

Population trend of Kachaikatti Sheep [10] (SEVA, 2005)

Year	Population of Sheep	Source of Information
1990	3000	SEVA
2006	1638	SEVA
2012	2131	SEVA

Suggestions for Action Plan for conservation of Kachaikatti Sheep (Source: SEVA)
The future action plan conserving them in-situ include providing grazing rights in Vaguthumalai forests as per Forest Rights Act 2006 and for this set of procedure by passing resolution in Grama sabha and forwarding to District Collector is to be initiated.

1. Regular deworming for animals and other preventive treatments will avoid mortality and give moral support for the sheep herders.
2. Animal drinking water sources are to be surveyed in the migratory route/grazing sites and planning for renovation of ponds or installation of hand pumps in the locations where this need is crucial are to be mapped out with participation of local herders and taken up with district level authorities for implementation.

Beetal goat

The population of beetal breed was declined due to shrinkage of grazing land and lack of support from various developmental agencies. To improve the population trend in Beetal population, an *in-situ* project on Beetal goat was initiated in 2005 under the ICAR-NBAGR Network Project through The Society for Creation of Heaven on Earth, Krishi Vighyan Kendra (KVK), Tepla, Ambala.
The Network project was implemented with objectives of maintenance of Beetal goats in its native tract in pure form, checking further decrease in Beetal population, production of quality and elite breeding stock and improvement of production potential for sustainable utilization at the farmers' door. (Source: www.icar.nic.in)

Achievements of the Network Project on Beetal goat [11] (Source: www.icar.nic.in)

The project was initiated in 41 villages in 92 farmers' flocks. In the first phase 176 does were selected and registered for recording growth performance and production and reproduction parameters. Out of these 100 elite does were finally selected based on growth performance, milk production and prolificacy. Male kids from these elite goats were registered and 50 bucks were reared at farmers' door up to maturity. Selection criterion for these males was based on growth performance (greater than 12.5 kg. at weaning) and dams average milk yield (more than 2.25 kg). The bucks produced were exchanged across the villages to avoid the inbreeding and used extensively for breeding. 1259 goats were mated with these 50 selected bucks. The progenies were recorded for growth performance parameters. A total of 2501 kids were born to 1259 dams. In second phase 100 adults goats belonging to other 50 farmers were selected and 42 mature bucks were raised. A total of 1517 goats were mated with the selected elite sires to obtain 2977 kids. During last 2 years (2008 to 2010) 5,478 elite kids were born with the average kidding rate of 1.98 in number. The farmers were regularly trained on goat rearing and a package of practices in local regional languages was also published and distributed. Goat health camps were organized regularly in the breeding tract for vaccinating and treating the animals and creating awareness among the farmers (extension activities) for better health and hygiene management of goats at the farmers' door.
Better management practices such as pucca housing, vaccination and deworming practices and better hygiene was introduced at the farmers' flock. The kids were reared on milk feeding resulting in to better growth and earlier sexual maturity.

Rule for replacement

Every breeding animal must replaced by his or her progeny
Percentage of characteristics must kept approximately around foundation frequency
Immunogenetic characteristics and DNA level polymorphism data taken into consideration
Generation interval must keep as long as possible according to breed or species.
Number of males in consecutive years must be as many as possible

Conservation through utilization

1. Communities as vanguards of genetic resources
2. Genetic improvement-based conservation
   a. Conservation vs. definition of breeding objectives
   b. Conservation vs. breeding programs

Agencies for improvement and conservation programmes

1. National focal point
2. Central government
3. ICAR Institutes and Agriculture Universities
4. State government
5. Nongovernmental organizations (NGOs)
6. Private companies

Evaluation and conservation of genetic resources by NBAGR

1. Data Base Management
2. Phenotypic characterization
3. Molecular genetics characterization
4. Ex situ conservation
5. In situ conservation

Conclusion

Biodiversity of India reflected by more than 42 sheep and 21 goat breeds. Future breeds in India lies in appropriate approaches for conservation combining a number of integrally related components and effective action programmes. Molecular characterization, help to characterize and clarify relationships among breeds of existing ovine and caprine biodiversity, for conservation and improvement programmes.

Abbreviations: FAnGR- Farm Animal Genetic Resources, FAO-Food and Agriculture Organization, ICAR-Indian Council of Agricultural Research, NBAGR-National Bureau Animal Genetic Resources

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