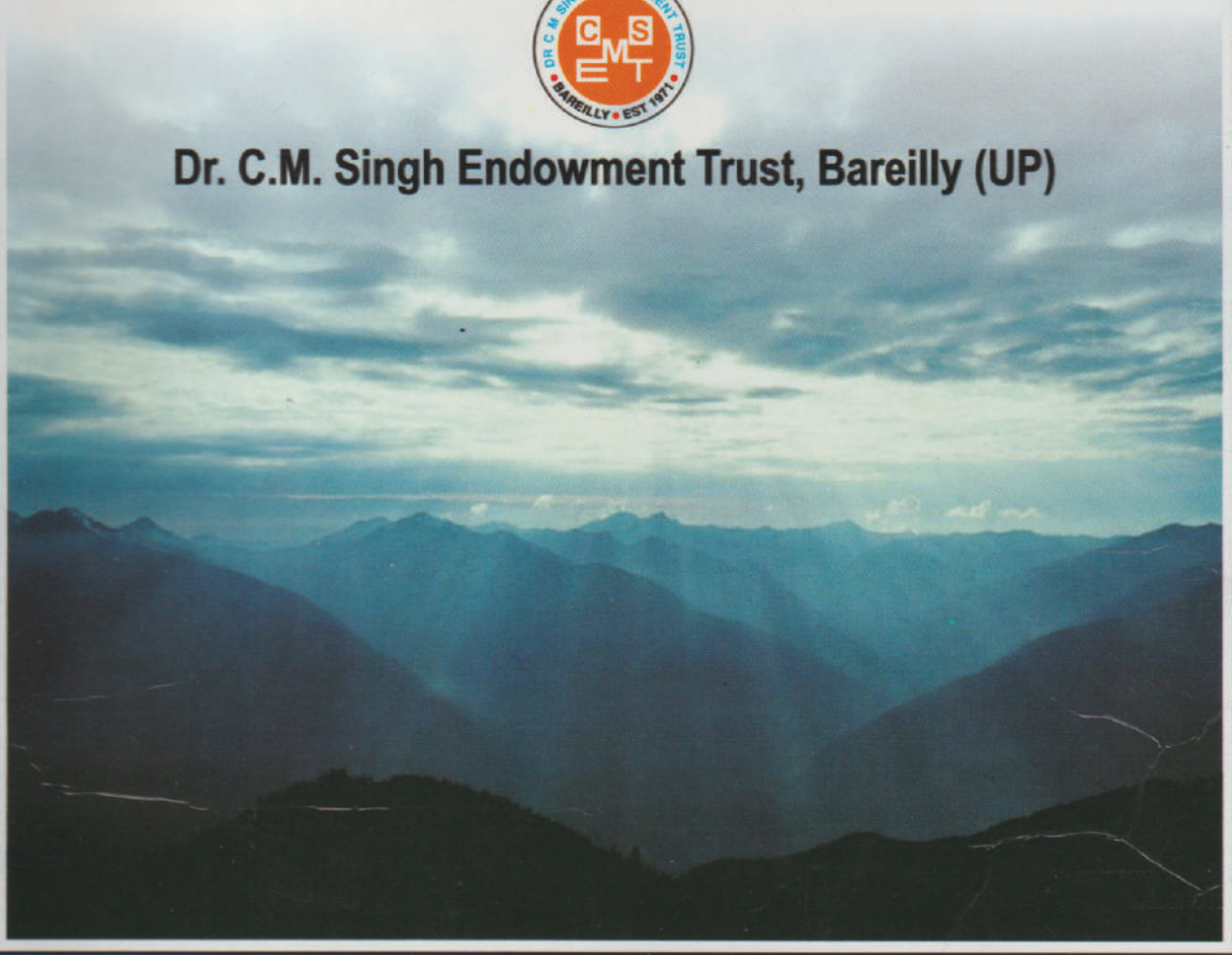
Third Dr. C.M. Singh Memorial Lecture

on

ANIMAL GENETIC RESOURCES AND THEIR CONSERVATION FOR THE SOCIAL TRANSFORMATION IN THE FOOT HILLS OF HIMALAYAS

by

Prof. S.P.S. Ahlawat
Director
Indian Veterinary Research Institute
Izatnagar-243122, U.P.



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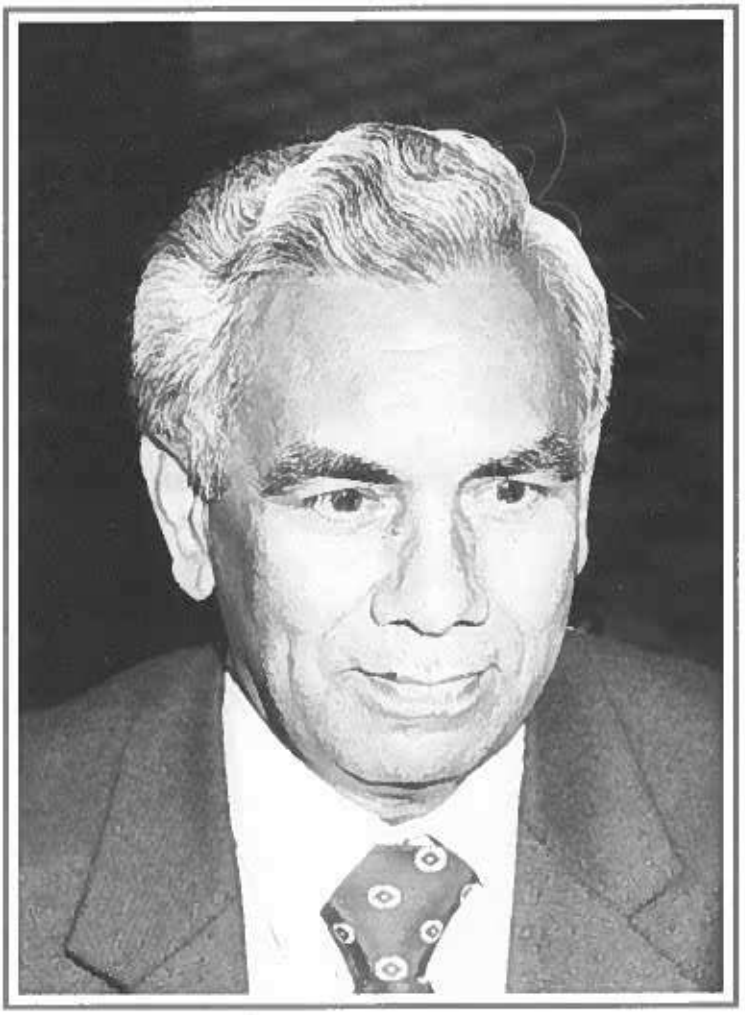

Dr. C. M. Singh

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Over 10 million species of living organisms exist on earth, of which nearly 0.5 % are birds and mammals. Within this small slice of biodiversity, around 40 species have been domesticated by man for food and agricultural production during last 12,000 years or so. The major share, however, comes from only 14 livestock and poultry species that are economically important. In the process of domestication, separate and genetically unique breeds have been evolved under different agro-ecological niches to meet the people's requirements including those of hills. As per FAO estimates, there were 6,300 breeds of livestock and poultry in 2002 of which nearly 4,000 to 5,000 domestic breeds might have been remaining by now. Animal production contributes nearly 30 to 40 per cent of the total global value of food and agriculture, while their direct contribution is around 19 per cent. In some areas, especially of fragile ecosystem-like those of hills and mountains, their contribution is much higher and provides socio-economic insurance to the owners.

Indian sub-continent presents a unique and wide spectrum of agroclimatic conditions ranging from humid tropical to semi-arid and temperate hills to alpine and arctic-like ecosystems. The cultural and ethnic diversity includes 550 tribal communities of 227 ethnic groups spread over more than 6,00,000 villages. Probably due to this anthropogenic, cultural and climatic diversity, India has been bestowed with immensely rich domestic livestock diversity besides some of their wild relatives. The array of genetic differences within each breed and across all the breeds within each species provides the great variation and genetic diversity that is absolutely necessary for the survival of animal species. This biodiversity of domesticated livestock and poultry has been developed during millions of years of evolution and a specific breed or population within specific ecological niche, forming and stabilizing within each species.

Livestock Farming System in Himalayan region:

The Himalayan region is vast, gigantic, diverse and youngest mountain system in the world. It occupies 591 thousand square kilometer (18% of geographical area of India) spread over 2,800 KM in length and 220 to 300 KM wide across the 11 states of India bordering China, Nepal, Myanmar, Bhutan and Pakistan. This region is characterized by small and fragmented land holdings, rain-fed subsistence agriculture, low input-low output production system, sparse population, undulating terrain, poor means of transport and communication, women centered agriculture, out migration of males in search of off-farm employment, poor productivity of crop and livestock, fragile ecosystem, low risk bearing capacity of farmers. Even then, this terrain of North-West India is rich in plant and animal diversity. With the application of local wisdom, the hill people have maintained the hill ecology in spite of many constraints. The livestock production system is integrated with crop production such as paddy, maize, millet, wheat, pulses, fruits and vegetables. In this system, livestock and poultry are the source of draft power, manure, milk and meat while crops provide food and fodder. Commonly found livestock species in mixed farming are cattle, buffaloes, sheep and goats though yak and mithun are available in North-East region of India and some utility

breeds of ponies and camel serve the local people of cold and high altitude of the Himalayas. Majority of the animal feed/fodder in this production system comes from crop residues which contribute about 50 -55 % of animal feed. Approximately, 6 % of Indian population resides in this region which raises 95 million of India's 485 million cattle genetic resources raised under mixed farming systems. In the central and eastern Himalayas, cattle are most common (47.5%), followed by buffalo (12.3%), sheep and goat (10.45).

Although crossbreeding has been adopted in some areas of Himachal Pradesh and Uttarakhand, the long-term results have never been encouraging. Fortunately, our policy makers are now paying attention to rectify this mistake. Local breeds evolved through selection undertaken for thousands of years have to be improved in their own agro-climatic zones to have sustainability of health and production.

Livestock Population and trends

The present and future trends in livestock population growth in India are given in the Table 1. Recent trend in the population of some important livestock species available in the Himalayan states of India has been summarized in Table 2. From these figures, it is apparent that overall there is growth in livestock population, however, there are also declining trends in some species. The availability of feed/fodder resources and drinking water for the animals is the biggest challenge we are going to face in the years to come. Therefore, we need to analyze all these situations so that our valuable AnGR resources can be saved from further degradation and losses.

Table 1. Present trends in livestock population and anticipated by year 2012 (in lakhs).

Year	Cattle	Buffalo	Sheep	Goat	Pig	Poultry	Equine & Camel
2002	201.0	97.0	65.0	122.1	14.8	396.3	0.4
2003	200.8	98.6	66.6	123.2	15.1	406.1	0.4
2004	200.7	100.1	68.2	124.2	15.5	416.2	0.4
2005	200.5	101.7	69.8	125.3	15.8	426.6	0.4
2006	200.3	103.3	71.5	126.4	16.1	437.2	0.4
2007	200.2	105.0	73.2	127.4	16.4	448.1	0.3
2008	200.0	106.7	75.0	128.5	16.8	459.2	0.3
2009	199.8	108.4	76.8	129.6	17.1	470.6	0.3
2010	199.6	110.1	78.6	130.7	17.5	482.4	0.3
2011	199.5	111.8	80.5	131.9	17.8	494.4	0.3
2012	199.3	113.6	82.5	133.0	18.2	506.7	0.3

The increasing livestock population provides an opportunity to utilize the biomass from natural resources for ever-increasing human population. Many breeds, although low yielder, are highly efficient in energy utilization and conversions. There is a need to identify and introduce proper breeds for each agro-eco zone so that land productivity increases. The agroclimatic conditions in the hilly regions are very fragile and slight change may lead to disasters while minor improvement may bring the significant

Table 2 : Population trend (in thousand) of important livestock species in hill states of India (1997-2003)

Sl. No.	Hill States	Cattle			Buffaloes			Goat			Sheep			Poultry		
		1997	2003	Change %	1997	2003	Change %	1997	2003	Change %	1997	2003	Change %	1997	2003	Change %
1.	Himachal Pradesh	2174	2236	2.85	748	774	3.48	1168	1125	-3.68	1080	926	-14.26	665	767	-11.33
2.	J & K	3175	3084	-2.87	787	1039	32.02	1864	2055	10.25	3170	3411	7.60	5557	5568	0.20
3.	Manipur	508	418	-17.72	95	77	-18.95	33	33	0	8	6	-25.0	3055	2941	-3.73
4.	Meghalaya	756	767	1.46	17	18	5.89	351	327	-6.83	70	18	5.88	2152	2821	31.08
5.	Mizoram	33	36	9.1	5	6	20.0	15	17	13.34	1	1	0.0	1307	1125	-13.92
6.	Nagaland	383	451	17.75	36	34	-5.56	161	175	8.7	2	4	100	2444	2789	14.12
7.	Sikkim	143	159	11.19	2	2	0	86	124	44.19	5	6	20.0	221	322	45.70
8.	Tripura	1228	758	-38.2	18	14	-22.23	639	472	-26.13	6	3	-50.0	3595	3057	-14.96
9.	Uttarakhand	2031	2188	7.73	1094	1228	12.25	1070	1158	8.23	311	296	-4.82	971	1984	104.33

transformation in the life of people. For example, introduction of Angora rabbits in the Kullu Valley has brought such a perceptible change in the small scale rabbit producers. The rabbits provide one of the best animal-speciality fibres. When mixed with sheep wool, the quality of shawls and other wool products can be increased multifold and the income to the farmers is also tremendously enhanced. Such a social transformation is also feasible under the hilly terrain of similar agro-ecological conditions.

Natural resources and land use

The land use of India's total area (328.6 million ha) shows a maximum area (185.5 m ha) under crop land followed by forests (68.1 m ha). During last four decades, the area under pastures and cultivable wasteland fell by 43.4 m ha (36.2%). The fallow land and non-agricultural barren lands fell by 16 m ha (13.1%), respectively. Area under irrigation increased by over 200% up to year 2000, in five decades per capita land availability fell from 0.89 to 0.33 ha. Similarly, area under all other uses for livestock was reduced (Table 3). This has affected the forage supply for livestock. Area under cultivated fodders is almost static, rather per capita availability of fodder has decreased considerably.

Table 3 Availability of total land base in India (ha per capita)

Status of land availability	1950	1980	2010
Availability of total land	0.89	0.50	0.26
Cultivable land	0.48	0.20	0.09
Land availability for animals (excluding forests)	0.37	0.15	0.05
Land availability for animals (including forests)	0.50	0.32	0.13

In hilly region also, the situation of natural forages has been reduced considerably due to large scale deforestation. The land which was fit for fodder cultivation has been brought under cash crops and as a result, the availability of fodder and crop residues has reduced. Under such situations, it has to be ensured that only those livestock should be introduced which can thrive on local resources and do not become burden on already degrading bio-resources.

Livestock and degradation of forest resources

Overgrazing and open grazing are often argued as major causes of poor regeneration and degradation of forest areas in the Himalayas. Livestock density per unit of land in the Himalayas is much higher than in the lowlands and there is lack of fodder crop production for animals in the mountains. Another view is that the main causes of degradation of natural resources in the Himalayas are cutting of forests for commercial purposes and to meet the needs of growing human population. The above facts and figures not withstanding, the growing livestock population has, indeed, had some effect on natural resources. It has created great pressure on access to common property resources. The average land holding in the Himalayan region is small, therefore, crop residues are not sufficient to feed the existing animal population and fodder cultivation is not a common practice.

Forage resources

The major fodder and feed for livestock is herbage from cultivated forages, i.e. cultivated forage crops, crop residues from crop lands, dry fodder from self owned or community land and grazing on wasteland, degraded land and forest grazing lands. In most places, cattle obtain only about 25 per cent of their feed from grazing in forests and other uncultivated lands while the balance comes from crop residues.

The area under cultivated fodder is only 8.4 million ha, and has been static for two decades. The scope for further increase seems to be very low due to demographic pressure for food crops. Since, no systematic efforts to collect data on forage are made, the provisional figures of area under important fodders have been reported under the aegis of All-India Coordinated Research Project (AICRP) on Forage Crops. Sorghum (3.6 million ha) amongst the *kharif* (monsoon-based season) crops and berseem (1.1 m ha) amongst *rabi* (autumn-sown, spring-harvested cropping season) crops, occupy about 55 per cent of the total cultivated area. Among states, Rajasthan (1.6 m ha) occupies first place with regard to forage area followed by Gujarat (1.1 m ha) and Punjab (1.0 m ha).

Area under forages is lowest in the Himalayan states-like Himachal Pradesh (0.3 m ha), Uttarakhand (0.32 m ha), Jammu and Kashmir (0.7 m ha) and other states (mostly North-eastern hills). In the diverse climate of India, a variety of forages, pasture grasses and legumes and trees as well as shrubs find their place in the natural vegetation. The production potential of many forage species such as the annual fodder berseem and lucerne are the highest green forage producers (60 - 130 t/ha in a season). Amongst perennial forages, Napier x *Bajra* hybrid, Guinea and Para grass produce high yields (90-230 t/ha/green fodder annually).

An increase in the population of goats in most of hill states has been at the cost of the other ovine species, the sheep. A spurt in tourist activities and growing urbanization in mountains has led to an increase in the demand for meat, which, obviously, has to be met by

argument against preservation is the cost and the modern society is reluctant to fund a long term project-like conservation from which no economic or financial returns can be expected in near future.

Role of AnGR in social transformation

Livestock products, mainly the milk production, have always been an instrument in social transformation of rural poor. Many studies have suggested similar trend in hill states of Uttarakhand and Himachal Pradesh. With gradual emphasis on dairy sector, milk production in Uttarakhand has increased from mere 419 thousand MT in 1979-80 to about 715 thousand MT in 1999-2000, recording an impressive rise of 71 per cent over this period. Whereas milk production from cows has increased only 19 per cent, buffalo milk production has leapt by 111 per cent during this period. The milk production increase in Uttarakhand, thus, is largely due to buffaloes' contribution. Presently buffalo population contributes more than 60 per cent to the total milk production in the state.

Bio-physical and socio-economic resource base in Uttarakhand provides potential scope for dairy development. The emerging scenario suggests that the state can take advantage of this situation. What is imperative is that a well-planned institutional intervention should help to develop the smallholder dairy sector in tune with local specificities.

Threat to livestock biodiversity in hills

Besides large-scale crossbreeding undertaken in past, the livestock genetic resources of hills and mountain regions of India are facing threat from the erosion of socio-economic environment of Himalayan region. Human intervention in the name of so called modernization and developmental activities have resulted in loss of forests and fodder cultivated areas. Such invasion has also taken a heavy toll on soil and air quality, which is so essential to keep a proper ecological balance between flora and fauna. It is high time that immediate action plans should be developed to protect and secure our valuable wealth of animal genetic resources otherwise the coming generation will suffer heavily.

Conservation of AnGR in hill areas

Conservation is the management of human use of the biosphere so that it may yield the greatest sustainable benefits to present generation while maintaining its potential to meet the needs and aspiration of future generations. Thus conservation is positive, embracing preservation, maintenance, sustainable utilization, management and enhancement of the natural resources of the environment. However, it may be Herculean task to conserve each and every type of animal genetic resources available in the country due to limited resources. Nonetheless, the germplasm has to be conserved for posterity. For this, it would be desirable to draw the line as which of the germplasm should be conserved first so that the threats of its loss are minimized. The prioritizing of the germplasm can be done on two line of thinking, firstly of course is the population size and its trends where it has reached the critical limits.

In case of breeds having still sizeable population but showing declining trends due to one or other compelling reasons, the breed showing lesser variation at face needs to be

prioritized for conservation first while breeds still showing relatively higher heterozygousity levels for various genetic loci can be deferred for the present. Therefore, the strategies should be to characterize each and every breed using all the available markers both phenotypic as well as genetic for decision making in the process of long term conservation policies.

Strategy for Conservation of Livestock Bio-diversity

A number of methods have been used for conservation of livestock genetic resources. These include *in situ* conservation of the breeds/populations; cryopreservation of semen, ova, embryos, skin, blood, DNA fragments etc. These methods are relevant when the breed is rare or near extinction. In India the situation is not so acute as to call for large-scale *ex situ* conservation efforts. What is, however, necessary is technology evaluation and perfection at selected institutions which can be used whenever and wherever required.

It is recommended that research institutions of ICAR, State Agricultural Universities and other research laboratories initiate programs to study and identify valuable adaptive traits at all levels (phenotypic, genotypic and DNA/RNA levels) and locate structural genes /QTLs responsible for these traits. Special emphasis should be laid on resistance to various diseases. Resistance to harmful endo- and ecto-parasites, tolerance to large fluctuations in quantity and quality of feed, tolerance to non availability of adequate quantity and quality of drinking water, tolerance to extreme temperature, humidity and other adverse climatic factors, adaptation to low capacity management conditions, ability to survive, regularly reproduce and produce for long periods of time.

A number of approaches have been used to stop or reduce the decline of livestock genetic resources and these models can be mutually supportive for short and long term insurance. "Wise use" forms a highly desirable form of conservation. The maintenance of a breed in its native environment whose components helped it to sustain also satisfies the requirements of Article 8 of the Convention of Biological Diversity, which gives first priority to *in situ* conservation. It is therefore, suggested that "wise use" should form the basis for framing conservation policies.

Conservation Approaches

Generation and loss of alleles is a dynamic process which should be maintained at equilibrium through sound management. The strategy for the *in situ* activity should be on wise use of locally adapted livestock genetic resources. The breeding goals and strategies for sustainable production system should be laid out very clearly. Effective development of more of these adapted germplasm to meet the future requirements is all important. The active *in situ* conservation is equivalent to breed development through well designed animal breeding programme, while the passive *in situ* conservation is concerned with the maintenance of live animal populations within their native environments for breeds at risk of loss. The in situ conservation involves the maintenance of live populations of animals in their adaptive environment and animal population continues to evolve and be developed for more sustainable use. Therefore, a well laid out national action plan has to be prepared to not only preserve the live animals within their native environment but to make them self sustainable under the given agro-ecosystem.

In situ Conservation

1. Institutional herds:

A large network of infra-structural facilities in terms of Research Institute/University Animal Breeding Farms, Central and State Animal Breeding Farms, AI Centres and Bull Mother Farms exists in India. They have good population of some important indigenous breeds. However, until recently, their main emphasis was only on improvement of productivity by crossbreeding. There are some pure breeding herds also however, the population size is too small to carry out effective selection for improvement. These institutional herds need to be strengthened both in terms of superior germplasm as well as modern tools and techniques.

2. In farmer's herds :

The majority of animal population in the country is present in small herds/flocks maintained by individual farmers. Many of the farmers still believe that their indigenous animals are sustainable and want to keep them. However, they lack good breeding male germplasm. In the absence of good males of the recognized breeds they allow the mating of their females with unselected bulls, resulting into creation of nondescript population. The following programmes can help them in maintaining the pure bred population of indigenous livestock breeds.

Ex situ Conservation

The preservation of a small population at a place away from the main breeding tract is *ex situ* conservation of live animals. This may be in the form of organized herds maintained in a research institution, bull mother farm, state owned livestock farm, zoo or breed park. Keeping of large herd/ flock, especially of relatively less productive breeds is not feasible on economic grounds. In small populations, animals suffer from inbreeding and appearance of deleterious genetic defects. In such cases, it is very important to maintain the breeding population in such a manner that the inbreeding rate is kept at minimal level and production performance can be improved over the years to make the breed self sustaining.

The currently employed techniques for the conservation of endangered animal genetic resources *ex situ* are cryopreservation of gametes, embryos and DNA besides development of somatic cell and DNA banks for resurrecting a lost breed or species.

CONCLUSIONS

Mountain specificities such as inaccessibility, marginality and fragility, diversity and niches play crucial role in determining the livestock species and breeds suitable for the region. Keeping in view the hill agro-ecosystem and multipurpose nature of the livestock resources, the milk production and per capita availability of milk has increased although, there is still a huge potential to further increase it by improving feeding and follow up-gradation of local breeds. But, unfortunately, the capacity of adapted local breeds to meet human needs and preserve environment is yet to receive attention in research and development interventions.

Sustainable development in hills can only be achieved through optimum utilization of its natural resources. Health care to the livestock needs to be strengthened and improved in order to maintain biodiversity and conserve these valuable resources. The potential of indigenous livestock needs to be tapped by improving nutrient availability from locally available feed and fodder resources. Participation of local NGOs in overall development of livestock sector is essential as they can educate the farmers on available technology and other information related to it. Similarly, a rational approach towards refinement of indigenous technology will help the local farmers to adopt animal husbandry practices on scientific lines and help to conserve and preserve the local genetic resources.

Recommendation for changes in AnGR of hills for better economic returns

- The locally available germplasm under each species should be evaluated characterized and conserved vis a vis their sustenance on locally available resources. If the germplasm is found to be distinct from other resources, it can be named appropriately such as hill cattle genetic resources (HCGR) of different hill ranges.

- When a new germplasm is introduced, its impact on agro-ecological conditions needs to be studied under controlled conditions. The new germplasm should be eco-friendly and should not be a burden on local resources.

- The efforts should be made to improve the local AnGR through selective breeding and their maintenance in in situ.

- Application of recently developed biotechnological tools can be made use for faster improvement in the local AnGR of hill ecosystem.

- The local germplasm should be made more productive by making value added products and bringing them on tourist map to improve the socio-economic conditions of farmers-like bee keeping and honey production, Angora rabbit's farming for woolen shawls and other products and rearing of rabbits for fur production.

larger number of goats. An overwhelming increase in the population and composition of buffaloes in the herd is at the cost of cattle. Cattle, undoubtedly, have been the most important species in the herd in mountains and elsewhere in the plains. Cattle are dual purpose. They are reared primarily for the supply of draught power for agriculture and secondarily for milk production. Cattle carry a notion of sacredness and have always ruled over the psyche of the farming community in the Hindu heartland. An increase in buffalo population is no indicative of the erosion of values associated with cattle. The gradual shift in the composition of herd is due to the imposition of cash economy on the farm families. Cattle require more hours for tending during grazing, often by females. With increasing values of education and gender-consciousness in the region, cattle management is less affordable.

Spectrum of biodiversity on national scene

The indigenous livestock breeds were developed for their utility under a certain set of agroclimatic conditions and such breeds have some unique traits which not only distinguish them from others but also give them a special economic role to play. There is large genetic diversity in livestock species as reflected in important domesticated breeds and a large number of known and less known breeds/strains. There are nearly 140 breeds of livestock and poultry in India, which have been sustaining Indian agriculture for centuries. The preservation of such a huge biodiversity for all these years has been primarily because of traditional wisdom, social and economical values in sustainable management of animals and their environment and meeting their both ends in the bargain.

Cattle

There are 30 well defined breeds of indigenous (*Bos indicus*) cattle, spread over the entire country. If we look back to the spectrum of cattle diversity in India, it would reveal a well planned strategy by agricultural geniuses of the country. The milch breeds-like Sahiwal, Red Sindhi, Gir, Rathi, Tharparkar have been developed in arid, semi-arid desert ecosystem where agriculture was not developed and the animal's milk was the only source of livelihood for the farmers living almost in nomadic way due to regular draughts. In the Indo-Gangetic plains and other irrigated areas duel propose cattle breeds-like Hariana, Kankrej, Ongole, Kangayam etc. emerged by providing good bullocks for agriculture while cows produces some milk for farmer's families. In other areas, the draft cattle breeds of desired body frame and strength were evolved for meeting the agricultural requirements depending upon the type of soil and agroclimatic conditions. In this process, unique draft cattle breeds-like Nagauri, Amritmahal, Hallikar, Khillari, Malvi, Namari, Kenkutha, Dangi, Krishna Valley, Bargur, Umblecherry, Kherigarh, Ponwar, Bachaur etc. were developed.

Buffalo

India is considered as the motherland of world's best riverine buffalo breeds like-Murrah, Nili-Ravi, Surti, Jaffrabadi, Nagpuri, Mehsana. Bhadawari is a unique breed known for high fat percentage (8-13 %) in milk. Toda is a unique hill buffalo. Small populations of buffaloes in Orissa have also developed some unique features and are named

in North-Eastern hills especially in parts of Manipur, Nagaland and Mizoram where they provide milk and meat to the tribal populations.

The sheep breeds-like Karnah, Gurej are fine wool types from hills of Jammu and Kashmir. Changthangi is from Ladakh region. Gaddi and Rampur-Bushair sheep breeds are found in Himachal Pradesh and adjoining Garhwal Hills of Uttarakhand. Poonchi and Bhakharwal sheep from Jammu region are now in small numbers. In these areas, sheep and goats graze together as there is no feed competition between these two species because sheep graze while goat brows.

Gaddi is a dual purpose goat with long hair. Chegu and Changthangi goats of cold arid region of Himalayas produce very fine fiber. In Garhwal and Kumaon hills, Gaddi type goats are very popular for milk, meat and fibres at medium altitudes. Chegu, a Pashmina goat is very useful breed reared for one of the best speciality fibre known as *pashmina* at higher altitudes.

Changthangi goats

Flock of Changthangi goats

Zanskari, Spiti, Manipuri and Bhutia ponies are useful livestock for hilly terrain, need immediate attention for conservation and improvement. These equines provide important means of transport in hills besides their utility in military operations and tourist attractions. Mules and donkeys are also useful livestock of hills.

Herd of ponies in Valley

Manipuri breed of ponies is one of the purest and prestigious breed of equines of India. It is a strong and hardy breed and has very good adaptability to extreme geo-climatic conditions. It is one of the well-known pony breeds of India and has been claimed as the oldest polo pony. They are found in Manipur and Assam and are similar to the South-east Asian type pony. Generally the Manipuri ponies are of 11-13 hands high at wither along with a good shoulder, short back, well developed quarters and strong legs. Perhaps all these good qualities have made it suitable for polo game for which it is globally famous.

Manipuri pony

The Spiti ponies are distributed in Spiti valley and adjoining areas of Kullu and Kinnaur divisions of Himachal Pradesh. These horses are smaller in height. The Spiti ponies have two strains, Spiti pure and Konimare. The Konimare ponies are comparatively taller. They are capable of thriving in cold regions under adverse conditions of scarcity of food, low temperature and long journeys at high altitude. The Spiti horses are used for riding and as pack animals.

Spiti pony

Zanskari horses are available in Leh and Laddakh region of Jammu and Kashmir. These horses are known for their ability to work, run adequately and carry loads at high altitude. Only a few hundred horses exist in the Zanskar and other valleys of Laddakh. Large scale breeding with non-descript ponies has endangered this breed. The Animal Husbandry Department, Jammu and Kashmir has recently established a Zanskari Horse Breeding Farm at Leh for breed improvement and conservation through selective breeding.

Zanskari Horse

Bhutia horses are distributed in Sikkim and Darjeeling. They are usually gray or bay coloured and similar to the Tibetan pony.

The Gaur or Indian Bison is a large endangered herbivore and can be seen in protected sanctuaries in India. In the wild, its young are preyed upon by tigers and leopards and the loss of its habitat due to human encroachment has led to the reduction in its population across India. In North-East India a tame version of the Gaur, known as Mithun is used as a farm animal and is sacrificed and eaten at ritual feasts. It is estimated that there are around 1000 Gaur or Indian Bison worldwide.

Mithun

Yak

The wild yak was once numerous and widespread on the entire Tibetan plateau north of the Himalayas. Currently, it is found in remote areas of the Tibetan plateau and adjacent highlands with a few having been observed in the Chang Chenmo Valley of Ladakh (eastern Kashmir). Wild yak distribution is highly clumped, with most animals in widely scattered herds, concentrated in the areas with little disturbance by humans. Uncontrolled hunting by natives and military personnel is the main reason for the wild yak's decline. Its range has been reduced by more than half during this century. Poaching remains the main threat. The wild yak has lost most of the best alpine meadow and steppe habitat to pastoralists. Problems are also caused by

habitat disturbance, hybridization and competition with domestic yaks and infectious disease transmitted by domestic yaks.

The Dromedary/double humped camel may first have been domesticated as early as 4000 BC in central or Southern Arabia. From there, they spread to North Africa, Egypt, East Africa and India. In India it is present in Leh and Ladakh valley and they are very few in numbers and needs conservation.

Double humped camel

Poultry also provides the important food and regular income to the rural people on hills. There are some indigenous breeds which are known to be backbone of backyard and scavenger poultry in the hilly regions. Kashmir Favorella is an important indigenous poultry breed raised for eggs and meat in the entire Kashmir valley. The *Miri* poultry in hills of Assam and Arunchal Pradesh, supplements the socio-economic life of tribal population. In recent times, introduction of *Van Raja* and *Van Priya* strains of poultry at backyard level in hills has been found to be economical based on local agro-ecological resources.

Kashmir Favorella

Issues related to domestic animal diversity:

Animal genetic diversity is part of the earth's natural heritage. Man started domestication of animals both as companions (pets) as well as for food much before he adopted agrarian practices. During prehistoric times, there are numerous archeological evidences when man used to follow the herd of animals as a pastoralist until many of them settled to agricultural farming. During past 12,000 years or so, a wide spectrum of livestock and poultry germplasm has been created through well-planned strategies and named them either according to some feature or for location of its main breeding tract. Therefore, the loss of a breed with some unique characteristic is an irreplaceable reduction in the nature's profusion of life forms, which not only contains the set of genes but their interactions with specific environmental condition. This concept has already been accepted world wide in case of wild life and plants. The indigenous livestock breeds having some unique genetic characteristics cannot be put at risk of permanent loss. There is not only scientific but also the economical justification of conservation of breeds. It would be a tragic commentary on mankind if at a time when scientific programme opens up the molecular opportunities for man's selection of animals the adapted breeds with unique characteristics are not available.

In most developing countries, there are many breeds whose unique genetic qualities are associated with the ability to survive and produce under the hard ships of hostile climate and limited feed resources. The loss of such breeds means the loss of specific adaptation traits and the DNA sequences coding for this ability, which we may require to introduce in pure biotechnologically evolved highly productive germplasm. The most important

PROF. S.P.S. AHLAWAT

Prof. S.P.S. AHLAWAT, basically an Animal Breeder, was born on 5th June, 1948 in District Meerut (U.P.). He did his graduation, post-graduation and doctorate from G.B. Pant University of Agriculture & Technology, Pantnagar. He had been throughout a University merit scholar. During under-graduation and post graduation, Dr. Ahlawat was awarded ICAR fellowship and for doctorate programme, he received CSIR fellowship. Dr. Ahlawat is M.Sc. in Animal Genetics and Ph.D. in Animal Breeding.

Dr. Ahlawat started his scientific career as Pool Officer from HAU, Hisar. Thereafter, he got selected in Agricultural Research Services of ICAR and joined as Scientist S-1 at IVRI/CARI, Izatnagar. He remained in IVRI/CARI Izatnagar from 1978 to 1985. He joined CARI, Port Blair in the year 1985 as Scientist S-2. Thereafter, he was selected to the post of Scientist S-3 in 1989 and served as Incharge Animal Science Division from October, 1989 to October, 1995. In the year 1995, he was selected as Head, Division of Animal Genetics and Breeding IVRI and served there from October, 1995 to May, 1999. Dr. Ahlawat has worked as Director of Central Agricultural Research Institute, Port Blair from May,1999 to October, 2002 and Director, NBAGR, Karnal from October, 2002 to November, 2006. He is presently serving as Director, IVRI, Izatnagar from November, 2006. Dr. Ahlawat has 250 research papers to his credit and is the author of 8 books on various aspects of Animal Science.

Presently, Dr. Ahlawat is working in the field of Animal Genetics and Animal Biotechnology. So far he has guided 2 Ph.D. and 2 M.V.Sc. students of Animal Genetics. He has evolved new breeds of goat, poultry and cattle which are of great significance in improving the economic status of farmers of Andman and Nicobar islands and country as a whole. Dr. Ahlawat has developed a Barren goat surviving on saline sea water, the only animal in the world which drinks sea water. He also developed Nicobari fowl laying highest eggs (i.e. 162 eggs/year under zero management)among the indigenous poultry birds of the Country.

Dr. Ahlawat is the recipient of several National Research and Development Awards. Some of them are : ICAR Team Research Award as Team Leader (1991-92), Fakruddin Ali Ahmed Award (Twice - 1986 and 1994), Rashtriya Vikas Jyoti Award (2002), Rajshri Tandon Rajbhasha Award (2002), Bishnu-Sudama Memorial Award (1999), ICAR-Best Annual Scientific Report Award (1998-1999) and Best KVK Award (2002). He is member of editorial board of various scientific journals such as Indian Journal of Poultry Science, International Journal of Animal Science, Indian Poultry Review, Indian Journal of Heredity and Agricultural Review. Dr. Ahlawat was nominated as National Coordinator for preparation of Country Report on State of World's Animal Genetic Resources. The report was prepared and presented in the Regional Workshop for Discussion on Country Reports on the State of World's Animal Genetic Resources (Sow-AnGR) organized by FAO from 8th to 10th December, 2003 at Bangkok, Thailand.

Dr. Ahlawat was also engaged in characterization and conservation of Animal Genetic Resources in India and South-East Asia. He is an active member of various scientific societies and committees. Some of them are: President, Society for Conservation of Domestic Animal Biodiversity, Karnal; President, Andaman Science Association; Member- Secretary and Coordinator, Zonal Planning Team Zone XV, Planning Commission; Member, Haryana & Punjab State Steering Committee for preparation of National Biodiversity Strategy and Action Plan; Member, State Advisory Committee for Livestock Breeding and Establishment of State of AGR in Uttar Pradesh; Member, Core Committee, State Biodiversity Action Plan, Govt. of Madhya Pradesh, Bhopal; Member, Task Force for Promotion of Biotechnology in Himachal Pradesh. Govt. of Himachal Pradesh, Shimla; Member, Core Group for preparation of National Document on Import and Export of Animal Germplasm; Member, Central Advisory Committee for the Development of Sheep, Goats and Rabbits; Member, National Consultative Committee for preparation of a country driven report on State of World's Animal Genetic Resources (SoW-AnGR).

As Director IVRI, Dr. Ahlawat has given top emphasis on green and clean Institute, identified/enlisted frontier areas of research in animal production and veterinary sciences under his vision plan of IVRI and encouraged young scientists/teams to come forward and undertake research projects in such advanced/basic areas which may revolutionize animal production in country.