Indian Initiatives To Promote Sustainable Use Of Animal Genetic Resources

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Introduction

The number of livestock of different species reared in India (according to the 2003 livestock census) – 185.2 million cattle, 97.9 million buffaloes, 124.4 million goats, 61.5 million sheep, 13.5 million pigs, 0.07 million yaks, 0.28 million mithuns, 2.2 million other animals and 489 million chickens in a human population of more than one billion (DAHD, 2009) indicates the importance of livestock in the national economy. During 2006-07, the contribution of the livestock and fisheries sectors to the national gross domestic product (GDP) was estimated to be about 5.3% of the GDP and around 31.7% of the agricultural GDP (TAAS, 2009). While the contribution of agriculture to GDP has gone down in the last few years, the contribution from livestock has increased at a 40% higher annual rate of growth than that from crops. Most livestock in India are owned by smallholders. Small landholders comprise 58% of the rural households and own 44% of the arable land. Their share in livestock ownership, however, is 70 to 90% (Rao and Birthal, 2008). Development in the livestock sector therefore has a larger potential to reduce poverty than the crops sector in India.

Ensuring sustainability of livestock production is important for India for several reasons: (a) the need to satisfy the animal protein needs of a growing population; (b) the increased demand for animal products from the increasingly affluent urban population which forms a growing proportion of the total population (28.9% in 2006 compared to 20% in 1971) (Birthal and Kumar, 2010); (c) the increased demand for animal products due to doubling of annual growth in per capita GDP during 1991-2007 compared to 1971-1990 (Birthal and Kumar, 2010); (d) the need for livestock rearing to continue as a source of livelihood and nutrition security of the rural populace in general and illiterate, unskilled, resource poor, underprivileged people and tribal and pastoralist communities in particular; (e) the need to develop the existing breeds (and animal genetic resources (AnGR) not falling under described breeds) adapted to their specific agro-climatic zones in the country and (f) the need to maintain the mixed crop-livestock agricultural production systems which support the majority of large ruminants. In the last few years, there is greater recognition in India, especially by the policy makers, of the role of livestock in livelihoods and the economy and there have been more initiatives to promote the sustainable use of AnGR. This paper reports on some of the important Indian initiatives in the area vital to sustainable use of AnGR such as genetic improvement, strengthening fodder resources, disease control, policy and law and marketing.

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Genetic improvement

The number of recognized and registered indigenous breeds of different species in India is 30 of cattle, 10 of buffaloes, 21 of goats, 39 of sheep (including some synthetic ones), 6 of horses, 8 of camels and 15 of chickens (http://www.nbagr.ernet.in accessed 16 February 2010). Two more buffalo breeds and four cattle breeds were recognized in May 2010. There are a few breeding programmes of large and small ruminants on government institutional farms but they have small populations and have no links with farmers' animals. In the commercial poultry industry, most of the parent stock is imported while some private companies breed their own lines. Frozen semen of Holstein Friesian bulls is imported by some private dairies for crossbreeding. The world famous meat breeds Boer goat and Dorper sheep have been imported into India and crossbreeding is being carried out on a small scale. Some intentional selection is carried out in smallholder sheep and goat flocks. There are few large scale performance recording programmes and the genetics of high yielding indigenous or crossbred cows and buffaloes with farmers is generally not exploited further through use of their progeny for breeding.

Sustainable use of AnGR encompasses the deployment of sound genetic principles for their development. India needs to implement genetic improvement programs effectively for all livestock species, especially for dairy animals as milk constitutes nearly 70% of the total value of livestock output. There exists a vast network of government cattle breeding and bull mother farms, frozen semen production and training institutes, central herd registration schemes in four states, central and regional disease investigation laboratories and projects such as the national project for cattle and buffalo breeding for indigenous breeds; especially the Murrah buffalo breed. Yet, NDC (2007) stated that the 'majority of bulls used for semen production are not produced through any systematic genetic improvement programmes'. A Field Progeny Testing Project of crossbred bulls is being carried out since 1991 under the aegis of the Indian Council of Agricultural Research (ICAR) in Maharashtra, Punjab and Kerala states involving two agricultural universities and BAIF Development Research Foundation (BAIF), an NGO (http://www.pdcattle.ernet.in/newprojectframeset.html accessed 17 Feb 2010). The improvement in first lactation milk yield and reduction in age at first calving appear to be promising but it needs to be ensured that they are not due to improvement in management. This project needs to be monitored carefully and strengthened so that the constraints of carrying out performance recording at the doorstep of cattle owners can be overcome.

There is a field progeny testing program of Mehsana buffaloes in northern Gujarat state that has been operating for 20 years (Solanki and Joshi, 2009). There are herds of the Murrah buffalo breed (141 heifers and 137 cows), Sahiwal cattle breed (107 heifers and 147 cows), Tharparkar cattle breed (37 heifers and 32 cows) and the synthetic breed Karan Fries (Holstein Friesian X Tharparkar) (186 heifers and 231 cows) at the National Dairy Research Institute, Karnal, Haryana (NDRI, 2009). One Murrah bull and two Sahiwal bulls were declared as 'proven' during 2008-09. These herds need to be made into nucleuses and linked with cattle belonging to smallholder cattle owners in the district. The NDRI supplies semen to central and state

governments, military dairy farms and farmers. The annual total requirement of proven bulls of different breeds and crosses for artificial insemination will be 1700 in 2011-12 (NDC, 2007) while the requirement of proven natural service bulls has not been estimated. It appears well nigh impossible to meet this requirement. The National Dairy Development Board (NDDB) set up in 1964 and given the status of an 'institution of national importance' in 1987, was instrumental in setting up a large dairying infrastructure under Operation Flood and has achieved great successes in milk procurement, marketing and quality control. However, the vision of laying the foundation of sound Indian genetic improvement programmes of indigenous and crossbred cattle and buffaloes is lacking. This inadequacy indicates that India will almost certainly become dependent on other countries for genetically improved germplasm or risk continued low productivity levels. Improved buffalo germplasm is of course not available elsewhere in the world.

Strengthening of fodder resources

Availability of feed and fodder are essential for the sustenance of AnGR. There is an overall shortage of fodder in India for the current livestock population. According to a sub-committee of the Indian Planning Commission, only about 37% of the requirement of green fodder was available in the country in 2005-06 and 78% of the requirement of dry fodder was being met in that year. Farm fragmentation has led to a reduction in own farm feed supplies and hence in herd sizes. This has brought into focus sharply, the urgency of improving productivity and efficiency through sustainable intensification.

Some organizations such as BAIF and the Society for Promotion of Wasteland Development have carried out commendable work in improving the productivity of community grazing lands also known as Common Property Resources (CPRs) and the training of villagers in the management of CPRs. A case in point is the almost 70% increase in the availability of palatable biomass per hectare from 45 hectares of regenerated common pastures of Gudha Gokulpura village in Bundi, Rajasthan (Nadoda et al., 2009). This was achieved with soil and water conservation works, use of improved grasses and legumes, tree plantation, and community protection and management of the produce. BAIF has developed about 500 hectares of CPRs in 90 villages of five districts of Rajasthan and there are other NGOs working on development of CPRs in Rajasthan and other states (personal communication Rangnekar, D.V., 2010). There are also initiatives for silvipasture development under the National Rural Employment Guarantee Scheme and Integrated Watershed Development Programmes. Considered in the context of the NDC (2007) recommendation that pasture development needed to be done on at least 10,000 hectares every year, it is clear that these programmes need to be expanded several-fold to have a substantial impact on livestock production.

Disease control

India has eradicated rinderpest and contagious bovine pleuro-pneumonia and surveillance for their recurrence is still carried out by the government. A vaccine was developed against *peste de petite ruminants* (PPR) and is now being widely used in the country to protect sheep and goats from this serious viral infection. In addition to other programs, the central government has undertaken a major program of control of the Foot and Mouth Disease (FMD) which is an economically important disease of cows, buffaloes, small ruminants, swine and other cloven footed animals. The FMD control program is being implemented in 54 districts (which is less than 10% of the total number of districts in India) by twice yearly vaccination of all cattle and buffaloes (DAHD, 2009). No FMD outbreak has been reported from these 54 districts since the start of the control program. Such creation of disease-free zones is expected to make it easier to export meat and other livestock products from India. India cooperates actively with international animal health surveillance and control organizations such as the World Organization for Animal Health (OIE). There is improving availability of vaccines against other diseases also from the government and private sectors. A pentavalent vaccine against Bluetongue disease has now been produced by institutes of the National Agricultural Research System (NARS) in India and released for commercialization to private companies. All state governments have a network of veterinary clinics which provide routine animal health care. Several non-government organizations (NGOs) such as Pradan and all the centres under the All India Coordinated Research Projects (AICRP) on goats and sheep provide vaccination and deworming to the livestock in the areas where they work. Some NGOs also train cadres of para-veterinarians. Private veterinarians function mainly in the more developed areas where high value dairy animals are reared. All these efforts help smallholders to combat disease in their livestock and promote sustainability of livestock rearing. Disease is, however, still one of the main constraints to livestock production in India. With an increase in crossbreeding of cattle with exotic breeds, the disease risk is likely to increase.

Policy and law

India is a signatory to the Convention on Biological Diversity (CBD) and the International Treaty on Genetic Resources for Food and Agriculture. India also adopted the Interlaken Declaration and the Global Plan of Action on Animal Genetic Resources in September 2007. Animal husbandry is a subject under the control of state governments under the Indian Constitution. The government passed 'The Scheduled Tribes and other Traditional Forest Dwellers (Recognition of Forest Rights) Act, 2006' to recognize the rights of traditional forest dwellers who include nomadic or settled pastoralists, on all forest lands. To fulfill its commitments under the CBD, the Indian government passed the Biological Diversity Act of 2002. A National Biodiversity Authority (NBA) has been set up under the Act. The functions of the NBA include the protection of the country's biodiversity and regulation of access to biological resources and associated traditional knowledge for commercial and research purposes. The NBA has recently instituted annual awards for outstanding pastoralists keeping indigenous livestock in different parts of India (http://www.dry-net.org accessed 18 Feb. 2010). It needs to be ensured, however, that excessive protectionism does not harm the country's scientific

interests. The legal ban on slaughtering of cows and young bulls in most states of India also acts as an impediment to efficient cattle production and efforts to increase cow productivity.

As a first step for national implementation of the Global Plan of Action on AnGR, a brainstorming workshop of a selected group of experts from the NARS, International Livestock Research Institute (ILRI) and NGOs was held in Ranchi in April 2009 and the 'Ranchi Declaration on Management and Conservation of AnGR' was passed unanimously (TAAS, 2009). No livestock keepers were present. The Declaration called for a 'National Plan of Action'. It urged for a doubling of the government's resource allocation to livestock research and development. It acknowledged the major gaps and weaknesses in India's national and state capacities to characterize, make inventories of, sustainably use, develop and conserve AnGR. The set of recommendations of the workshop out of which the declaration evolved, emphasized the need to identify and characterize even the lesser known populations and non-descript (i.e. undescribed) populations through comprehensive surveys.

Accurate information on populations of different Indian livestock breeds and on the current sourcing and selection of sires of different breeds is currently not available. Most state governments conducted breed wise livestock censuses in 2007. However, it is understood that this information has not been compiled yet. There is anecdotal evidence from various states such as Orissa (personal communication, Dash S. 2009) which indicates that the number of so called 'non-descript' sheep and goats is much higher (six to ten times) than that of sheep and goats of 'recognized or other local breeds'. Government funds are, however, only available for the improvement of 'recognized breeds', thus leaving the majority of animals outside the purview of improvement projects. The characterization of all these undescribed populations and their elevation to the status of 'breeds' could take a long time. In the meantime, a widely held unscientific view which is advocated in the livestock breeding policies of most states is that the 'nondescript' animals need to be 'upgraded' by crossing them with animals of 'recognized' breeds. Since neither the nondescript nor the recognized breed animals are performance recorded or selected, this recommendation does not have a scientific basis. It would be more sensible to establish community based breeding programmes of animals adapted to different agro-climatic conditions irrespective of the breeds they belong to.

There are some NGOs such as Sahaja Samrudha and Seva in Tamil Nadu and the Vechur Conservation Trust in Kerala that are making determined efforts to promote the rearing of indigenous breeds e.g. Hallikar, Kangayam and Vechur cattle but they are hampered by inadequate funds. Conservation of draught breeds is especially difficult since use of animals for agriculture and transport has reduced considerably in the last 30 years. Some states of India which are home to well-known breeds have several times imposed restrictions against the sale of such breeds outside the state (even within India) to maintain their numbers inside the state; for example, Haryana state for Murrah buffaloes, Gujarat State for Gir cows and Uttar Pradesh state for Jamnapari goats. It needs to be considered whether imposition or removal of restrictions is more likely to promote the rearing and therefore sustainable use of a particular breed. If there is

demand for the breed outside the state or the country, allowing export at remunerative prices might increase the return to the keepers of these breeds and reverse the trend of reducing populations and their eventual extinction.

Marketing

The old Agricultural Produce Marketing Act has been replaced by a new Act considering the changing market conditions. The new Act allows processors or marketing firms to directly purchase their raw material requirements outside the state-designated markets. The Milk and Milk Products Order has also been amended to encourage competition among market players. Some other measures taken to promote production-market linkages are institutional financing of contract farming schemes, priority sector lending to food processing industry and reduction in excise duties on processed products (Birthal and Kumar, 2010).

Examples of sustainable use of AnGR

Sustainable pastoral system. A good example of a sustainable livestock production system that benefits from access to marketing opportunities is that of the 'Banni' buffalo production system in the Rann of Kutch in Bhuj area of Kutch district of Gujarat state (Virmani et al., 2010). People from the 'Maldhari' community own these buffaloes which are reared on a 'free grazing' system on an approximate area of 45,000 sq. km. It is a semi-arid drought prone area and there is a drought every three years out of five. Overgrazing and degradation of land are largely avoided by following the tradition of a migratory life style so that the grassland gets time to recuperate. '*Never stop living in temporary homes*' is the traditional saying which they still follow. The buffaloes are allegedly highly productive and well-known so that people visit from other areas and states to buy them. This easy availability of a market and high sale price help the system to thrive. An organized milk collection scheme has also now been started. They also have other avenues of income earning such as the sale of handicrafts. The threat to this system, however, is the absence of the community's legal control over the grazing area. The exotic *Prosopis juliflora* trees, the leaves of which cannot be used for fodder due to high tannin content, introduced by the government in this area have now taken over large tracts of former grazing lands. Land is also being allotted for industrialization. The breeders are therefore getting organized with the help of NGOs to maintain their livelihoods.

A sheep breeding program using gene introgression and smallholders' preferences. This is an initiative of the Nimbkar Agricultural Research Institute (NARI) in Phaltan, Maharashtra under a project initially funded by the Australian Centre for International Agricultural Research and now by the government of India. The FecB (Booroola) gene for prolificacy has been introgressed from the small Garole sheep of West Bengal state into the Deccani sheep of Maharashtra reared mainly for lamb and meat production. After eight years of systematic breeding and backcrossing aided by a DNA test to detect the FecB mutation, FecB carrier heterozygous and homozygous sheep are being disseminated that are phenotypically similar to

the Deccani and also selected for early growth and reproductive performance traits. The rearing practices for sheep in the nucleus flock are kept as similar as possible to those of the local smallholder sheep owners. Heterozygous FecB carrier ewes produce at least 50% more lambs. With a small quantity of supplementary feed for pregnant ewes and twin-born lambs and a little extra care of twin-born lambs, 30 to 40% higher profit can be earned (Nimbkar et al. 2009). Sheep owners have access to genetically improved breeding stock from the open nucleus breeding flock of 500 ewes at NARI. The breeding enterprise is, however, not yet financially self-sustaining.

The private dairy business model. Many private dairies have established modern, mechanized and computerized cow and buffalo rearing farms in different parts of the country; for example the Chitale dairy (<www.chitaledairy,com> accessed 15 Feb 2010) in Sangli district of Maharashtra, started in 1939. They have milking parlours, milk point controllers to store milk yield data, activity meters for buffaloes to aid heat detection, frozen semen laboratories and veterinary pathology laboratories. They collect milk from farmers and have state of the art milk sterilization, pasteurization, chilled storage and transport facilities ensuring strict hygiene and quality control. Artificial insemination and veterinary services are made available to farmers. Some other such dairies have set up community milking parlours where farmers can take their buffaloes and cows for machine milking to ensure hygienic milk supply to the dairy. A business model of dairy development has thus been laid down where a large number of farmers share the advanced scientific and technical know-how.

The Raika Biocultural Protocol. The Raika (or Rebari) numbering about 1 million, is the largest group of pastoralists in Western India. They manage 80% of the camel and sheep breeding stock in Rajasthan (personal communication Köhler-Rollefson, I., 2010). They are finding their livelihoods and the survival of their breeds threatened by the constant reduction in grazing areas due to the diversion of CPRs to other uses and restrictions on grazing in forest areas declared as sanctuaries. The Raika have therefore been forced to sell significant numbers of their livestock over the past five years and the number of camels they owned has decreased by 50% in the past 10 years. They also find a prevailing lack of respect in society for their way of life and traditions. A group of Raika with the help of the NGO Lokhit Pashupalak Sansthan have evolved a biocultural protocol (http://www.abs.biodiv-chm.de/fileadmin/ABS/documents/2009-Raika Community Protocol final.pdf) which illustrates the disastrous impact that their exclusion from traditional grazing areas is having on their lives, livestock genetic resources, traditional knowledge and the forest ecosystem. It articulates their forest access rights and rights over their genetic resources and associated traditional knowledge under Indian law.

Conclusion

The demand for livestock products and therefore for good quality breeding animals in India is increasing rapidly. Livestock production does not appear to be able to keep up with the demand. This is due to many constraints the most important of which are shortage of fodder, lack of

breeding choices that would lead to genetic improvement and losses due to disease. There is increased awareness of the importance of promoting sustainable use of AnGR. A legal framework conducive to the development of AnGR is in place but is not being reflected adequately in practice. Widespread illiteracy and unequal participation in decision making, even at the local level, make it difficult for good initiatives to spread quickly. The potential that already exists in Indian institutions is not being used properly to help overcome the problems. Relaxation of regulations aimed at increasing commercial development of existing resources could bring substantial benefits. In response to the vibrant markets for livestock products, private entrepreneurs are increasingly setting up integrated production, processing and marketing units. Support services for smallholder livestock producers are, however, still inadequate and inaccessible to the majority. Clear goals and a clear direction to achieve those seem to be missing. The tendency to over-regulate also needs to be checked.

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