IV. Livestock genetic diversity

India, endowed with varied forms of animal genetic resources, is traditionally considered as an important rearing centre for domesticated aniamals. India has vast resources of livestock (485 million) and poultry (489 million), which play a vital role in rural livelihood security. In terms of population, India ranks first in buffaloes, second in cattel and goats, third in sheep, fourth in ducks, fifth in chicken and sixth in camels in the world. The genetic resources of farm animals inIndia are represented by broad spectrum of native breeds of cattle buffaloes, goats, sheep, swine, equines, camel and poultry. There are around 140 listed breeds of livestock and poultry in India, with 30 breeds of cattle, 10 of buffalo, 42 of sheep, 20 of goat, 3 of pig, 6 of horse an dpony, 8 of camle and 18 of poultry. Besides, there are breeds of yak, mithun, ducks, quails and several nondescript populations.

Over the years, animal husbandry has intensified in India with widespread introduction of exotic breeds. There is a perceptible increase in the population of limited specialized breeds. This has led to the reduction in total genetic variability and reduction size of many local breeds. The majority (85 per cent) of the domestic livestock in India is reared under low input production systems. Of the indigenous breeds, 14 of cattle, 3 of bufalo, 9 of sheep, 4 of goat and almost all breeds of horse and poultry are showing declining trends in the country. Estimates indicate that 50 per cent of indigenous goat, 30 per cent of sheep, 20 per cent of cattle and almost all poultry breeds are threatened.

In this context, the National Bureau of Animal Genetic Resources (NBAGR) undertakes suitable programmes for identification, evaluation, characterization, conversation and sustainable utilization of animal genetic resources).

V. Fish genetic diversity

India is endowed with vast inland and marine bio-resources. It is the third largest producer of fish in the world and second lalrgfst producer of inaldn fish. As such, fisheries and aquaculture play and

Important Facts

6. Expert Group on Low Carbon Economy Planning Commission led Group set up to develop strategy for India as a low carbon economy; to feed into twelfth plan process.
7. State Action Plans on Climate Change Delhi becomes first State to release Climate Change Action Plan, other States finalising their Plans, Policy Development.
8. National Policy on Biofuels National Policy on Bio-fuels approved by Cabinet to promote cultivation, production and use of Bio-fuels for transport and in other applications.
9. National Missions under National Action Plan on Climate Change. National Mission on Solar Energy, Energy Efficiency and Strategic Knowledge approved; other Missions in final stages of preparation.
10. First National Conference on Green Building Materials and Technologies: Conference to stimulate green building sector, to set an example the Govt. proposals that all its new building will be GRIHA 4* compliant subject to site conditions.
11. 30 “Solar Cities”: In-principle approval given to 30 ‘Solar Cities’ with aim of 10% deduction in

important role in social development, economic upliftment of farmers and fisherfolks, apart from contributing to the nutritional security of the country. The NBFGR has taken up various research programmes and major achievements which are as under:—

- Development of a database on 2,182 fishes found in India wates; total listing of 287 fresh-water fishes of aquatic hotspot - the Western Ghats which include 192 endemic species.
- Identification of 47 potentially cultivable teleosts and 106 ornamental species endemic to Western Ghats.
- Assessment of 327 freshwater fish species for IUCN threat categories and listing of 79 threatened species.
- Preparation of a macro level fish occurrence map of entire India (1:1000000).
- Genetic characterzation of 33 species using different markers and development of DNA barcodes for 100 Indian marine fish species.
- Ex-situ conservation of prioritized endangered species undertaken through successful captive breeding techniques for Horabagrus brachysoma, Labeo dussumieri, L. dyocheilus, Chitala chitala, COmpok, pabda, Puntius sarana, Anabas testudineus, Nandus nandus, Clarias btrachus and Heteropneutes fossils; sperm cryopreservation protocols for 16 threatened and commercial fish species; and, tissue culture bank for housing 11,600 accessories of 273 species.
- Publication of a bibliography on 'Fish Pathogens and Diseases in India' which contans 2,610 reference of 1451 Indian research in different fields of fish pathology, quarantine and related topics across 104 years (1898-2001). Also, developed an information system 'Fish Diseases and Quarantine Information System'.
- Development of a new database on Indian fish diversity comprising information on 2,243 indigenous and 291 exotic fin fished (globally recognized number of fin fishes in 29,300).

VI. Genetic diversity of agriculturally important microorganisms (AIMs)

India has initiated isolation and identification of AIMs mainly through the efforts of NBAIM. Important initiatives inter alia include the following:

- NBAIM has a repository of 2,517 cultures which includes filamentous fungi (2,077), bacteria (394), Actinomycetes (36) and yeasts (10).
- The sources of fungi collections include plants (1,212) soil insects (641), air flora (39) and others (185).
- The special collections of microoganisms having importance in agriculture and industry include: bio-control agents (Trichoderma viride, T. harzianum, T. aurioviride, Glocalidium virens, Bacillius subtilis, Pseudomonas (flurescens); bio-pesticides (beauvaria bassiana, Bacillus thrungenensis); biofertilizers (Rhizobium spp., Azotobacter chrococcum, Azospirillum brasilense, Bacillus subtilis, fluorescent Pseudomonas); bio-redemdation (Pseudomonas putida, P.

Important Facts

projected demand of conventional energy through a combination of energy efficienty and renewables.

12. Energy Efficiency Standards of Applicances: Energy efficiency ratings made mandatory for 4 key appliances—refrigerators, air conditioners, tubelights and transformers from January 7, 2010 more to follow through 2010.
13. Fuel Efficiency Norms Plan for fuel economy norms for vecicles announced; to be made operational in two years Policy Implementation.
14. CDM Program India assessed as Best CDM Country; Indian projects to neutralise 10% of emissions by 2012.
15. India to host Rio+20 India to host 11th COP of Convention on Biodiversity CBD) in 2012, mark 20th anniversary of Rio.
16. UN Climate Technology Conference India successfullyhosts global Conference on technology, Delhi Statement adopted.
17. SAARC Environment Ministers Conference: India successfully hosts SAARC Ministers

flourescens, Alcligens); industrial imporance (Aspergillus niger, Bacillus subtilis).

- The Vision 2025 envisages that the NBAIM act as a nodal agency, responsible for taking appopriate measures for system-wide management of AIMs by various means, such as, (i) constituting microbial genetic resource advisory committee (ii) preparing national exploration maps, developing and widely disseminating guidelines for handling and storage of microbial isolates, registration and notification of microbial deposits, (iv) developing / implementing coordination, linkages and cooperation mechanisms, (v) technical backstopping by development of national policy and its implementation, and (vi) handling matters / concerns related to biosafety, biopiracy and IPR issues, etc.

VII. Mountain diversity

The Himalayan flora represents 71 endemic genera and 32 per cent endemic species. Also, five families are endemic to the region (i.e. Tetracentraceae, Hamamelidaceae, Circaeaseteraceae, Butomaceae, and Stachyuraceae), while over 90 per cent of the species in Berberidaceae and Saxifragaceae are endemic to the Himalaya. A large number of orcids, many representing neo endemic taxa, have been reported from Sikkim and Arunachal Pradesh. Out of the five natural World Heritage Sites (WHS) recognized by United National Educational, Scientific and Cultural Organization (UNESCO) in India, three are located in the Himalayan region viz, Nanda Devi NP, Kaziranga NP and Manas NP. Further, the Valley of Flowers NP has been included in the list of WHS as an extension to Nanda Devi NP. In addition, Kangchendzonga NP and Namdapha NP are included in the tentative list of WHS. Considering the importance of natural sites, an externally aided project titled 'World Beritage Biodiversity Programme for India : Building Partnerships to Support UNESCO's WHS programme' is being undertaken.

Magnitude of Biodiversity : The known and described number of species of all organism on the earth is between 1.7 to 1.8 million, which is fewer than 15 per cent of the actual number. The predicted number of total species varies from 5 to 50 million and averages at 14 million. About 61 per cent of the known species are insects. Only 4650 species are known to science. Biological diversity includes three hierarchical levels:

(i) Genetic diversity,

(ii) Specific diversity, and

(iii)Community and ecosystem diveristy.

These levels are interrelated, yet distinct enough to be studied separately to understand the interconnections that support life on the earth.

Genetic Diversity : Each species, varying from bacteria to higher to higher plants and animals, stores an immense amount of genetic information. Genetic diversity refers to the variation of genes within species; the differences could be in alleles (different variants of same genes), in entire genes (the traits determining particularly characteristics) or in chromosomal structures. The genetic diversity enables a population to adapt to its environment and to respond to the natural

Important Facts

conference and agrees joint action on Climate Change 2010 SAARC Summit to be on the theme of Climage Change International Cooperation.

18. India's Submissions to UNFCCC Report documenting India's 12 proactive submissions to UNFCCC released.
19. State of Forests Report 2009 Latest State of Forest Report released, shows continued rise in India's forest cover.
20. Launch of CAMPA Ambitious Rs. 11,700 crore (USD2.5Bn) Programme for forest conservation launched.
21. Green India Mission New mission under NAPCC to fast-track reforstation being finalised.
22. Capacity Building in Forestry Scheme New Rs. 369 crore (USD 80 Mn) scheme for HRD for forest personel.
23. Intensification of Forest Management New Rs. 600 crore (USD 125Mn) scheme to improve forest in manatement, infrastructure, fires, etc.

selection. If specie has more genetic diversity, it can adapt bettern to the changed environmental conditions.

The amount of genetic variation is the basis of speciation (evolution of new species). It has a key role in the maintenance of diversity at species and community levels.

Species Diversity : Species are distinct units of diversity, each playing a specific role in an eco-system.

Community and Ecosystem Diversity : Diversity at the level of communiyt and ecosystem has three perspectives:

Alpha diversity (within-community diversity) refers to the rate of replacement of species along a gradient of habitats or communities.

Gamma diversity (overall) refers to the diversity of the habitats over the total landscape or geographical area.

Gradient of Biodiversity: Biodiversity varies with the change in latitude or altitude. As we move from high to low latitudes, broadly speaking, the biological diversity increases. Similarly, we generally notice a decrease in species diversity from lower to higher altitudes on a mountain.

Problems of Biodiversity

A global scientific analysis of current trends and plausible future scenarios project that biodiversity loss is likely to continue in the foreseeable time largely because the direct drivers of biodiversity loss are projected to either remain constant or to increasein the near future. This global concern about loss of biodiversity is sough to be addressed in the international Convention on Biological Diversity (CBD), to which India is a Party.

The growing population, industrialization and urbanization and excessive use of chemical fertilizers and pesticides has completely perturbed the existing ecological balance of the country. As a result of this about 1,336 plant species are considered vulnerable and endagered; about 20 species of higher plants are categorised as possibly extinct because these have not been sighted during the last 6-10 decades.

More than 33 species of mammals, 72 species of birds, 17 species of reptiles, three species of amphibious, two species of fish and a large number of butterflies, mothand beetles are considered vulnerable and endangered.

Habitat destruction is identified as the main threat to biodiversity. The major impact of developmental activities involves diversion of forest land. Since the enactment of Forest (Conservation) Act in 1980, 11.40 lakh heactares of fores area, for about 14,997 development projects, has been approved for diversion. Against this diversion, compensatory afforestation has been stiuplated for over 12.10 lakh hectares of land.

The lossof diversity is not only an ethical tragedy but also a great social, economic and cultural one. In fact, official conservation policies and progammes, planned and controlled by a centralized bureaucracy in collaboration with urban environment, is responsible to greater extent for this state of nature. It is only an alliance between local communities, government agencies and concerned NGOs and individuals that can save natural habitats and wildlife from the cluthes of

Important Facts

Forestry

24. Inclusion of Forestry within NREGA Forestry related activities included as part of India's flagship employment guarantee scheme to fast track reforestation; Pilots being implemented.

- The loss of diversity is not only an ethical tragedy but also a great social economic and cultural one. In fact official conservation policies and programme, planned and controlled by a centralized bureau cracy in collaboration with urband environment is responsible to a greater extend for this state of nature.
- Even though forestry is the second largest land use in India after agriculture, covering approximately 23.57 percent (recorded forest area) of the total geographical area, the contribution to the Gross Domestic Product from foresry is minimal (it was barely 1.1 percent in 2001).
- Nearly 50 per cent of the aquatic plant of the world are recorded from the India sub-continent but only a few have been studied in detail in order to address some of these concerns a National Institute on Mangroves and Coastal Bioresources is being set up by the MoEF an underbans.

destructive forces.

Declining natural resource base and over-exploitation or resources:

Construction of roads and canals, quarrying, shifting cultivation and encroachments are other threats. Degradation of forests results from illicit felling, excess removal of forest products, fodder, fuel wood, forest floor litter, overgrazing and forest fires. As a result, some of the floristic and faunal components, including many keystone and endemic forest species are now left with narrow eroding populations which need to be urgently conserved.

Even though forestry is the second largest land use in India after agriculture, covering approximately 23.57 percent (recorded forest area) of the total geographical area, the contribution to the Gross Domestic Product from forestry is minimal (it ws barely 1.1 percent in 2001). An estimated 41 percent of the country's forest cover has been degraded to some degree. As much as 78 percent of forest area is subject to heavy grazing and about 50 percent of the forest area is prone to forest fires. Domestic demand for timber and fuelwood is well above the sustainable level.

The rich diversity of medicinal plants (over 6,500 species) in the country needs conservation and sustainable utilization, as their habitats are either degraded or the species are being over-exploited. In fact, nearly 90 per cent of the medicinal plants in trade are harvested from the wild. The medicinal plants constitute critical resource for health care of rural communities and for the growth of India herbal industry. Currently, India's share in the complementary medicine related global market is only 0.3 per cent and there exits immense scope for expanding its share in the 62 billion US$ world market from the present level of Rs. 5,000 crores (approximately 1.2 billion US$).

But, it is asad reflection that while it has the knowledge, skills and resources, India has not yet seized opportunities in the global market. Even its 0.3 per cent share is largely (70 per cent) through export of raw materials and only in a limited way (30 per cent) through value addition and sasle of finished products. Indian exports are thus guided by what may be termed as a trader's vision rather than by a knowledge-products vision.

Why to conserve Bio-diveristy?

Each genetic resource has a certain specific character of its own. The genetic material can be exploited by the man in the form of food, medicines and specimens. The example, plant bio-diversity can be used to develop transgenic plants that can yield more production and are resistant to disease, drought, and pess. Grains with higher percentage of protein and biofertilizer can also be produced by these genetic resources.

Problems related to the underground biodiversity:

The undergound biodiversity, particularly soil microbes, are poorly understood. The degration of land has led to the loss of underground biodiversity. Similarly, the microbial diveristy of fresh water and marine ecosystems is less know and may yield novel compounds of therapeutic and industrial vlaue. For sustainable agriculture, microorganisms play a decisive role. The information on biodiversity of freshwater, coastal and maine areas of the country is highly fragmentary, although it has vaste economic potential.

Nearly 50 per cent of the aquatic plants of the world are recorded from the Indian sub-continent but only a few have been studied in detail. In order to address some of the these concerns, a National

Important Facts

- Government initiated a schme on bio-diversity conservation to ensure coordination among various agencies dealing with the issues related to conservation of biodiversity and to review monitor and evolve adequate polity instruments for the same.
- A draft National Action Plan (NAP) has been prepared based on 71 mega Biodiversity Strategy and Action Plan (BSAPs) at local (sub-state) state, eco-regional and thematic levels.
- The international Agricultural Research Centre, operating under CGIAR, decided in 2000 against the use of this technology and India was the first country to block its only. The Government of India has further strengthened this action through Protection of Plant Vaneties and Farmers' Rights Act, 2001.

Institute on Mangroves and Coastal Bioresources is being set up by the MoEF in Suderbans.

GMOs and Biodiversity:

The appliation of Genetic Use Restriction Technologies (GURTs) or terminator technologies is prohibited and import of GURTs based products is also banned in the country. Hence, there is a need to further develop state-of-the-art containment facilities and diagonstic tools for GURTs in the country. GURT, also called terminator technology, is a biotech-based strategy that prevents seeds from germinating in the next growing season unless treated chemically by the seed company prior to planting. When seeds of crop varieties (containing this kind of genetic manipulation) are purchased from the company and planted, they germinate and grow normally but produce seeds that do not germinate when saved by the farmers for sowing during the following season. Thus, healthy and high yielding plants are genetically commanded to produce 'sterile' preventing the farmers to use them for the next season's planting.

The technology was first developed by the Delta & Pine Land, a multinational seed company, and the US Deparment of Agriculture. If commercialized, 'terminator' would compel farmers to purchase fresh seeds from the company every year. It is bad for agricultural biodiversity and worse for the small and marginal farmers.

Farmers have to purchase seeds of high yeilding hybrid varieties because seeds produced by the hybrid plants are not uniform and their production capacity decreases in successvie seasons. Hybrid varieties are not yet popular in self-fertilised crop plants like wheat and rice whose seeds are normally replaced after five years or so and that too on exchange among the farmers.

Multinational seed companies intend to prevent this traditional practice through GURTs. It is noteworthy that India opted to enact its sui generis system (PPVFR Act 2001) for protection of crop varieties as required under the WTO-TRIPS provisions. The India system is largely compliant to an accepted international system for variety protection, called UPOV 1978, that permits farmers to use saved-seeds and also exempts researchers in using seeds of protected varieties. These tow exemptions distinguish this system from its more recent version called UPOV 1991 which does not permit them and operates more like the patenting system. GURTs can be employed to achieve this objective without the need to seek protection or patenting of new seed varieties.

The International Agricultural Research Centre, operating under CGIAR, decided in 2000 against the use of this technology and India was the first country to block its entry. The Government of India hasd further strengthened this action through Protection of Plant Varieties and Farmers Rights Act, 2001. Its section 29(3) states that "Notwithstanding anything contained in sub-section (2) and sub-sections (1) and (3) of section 15, no variety of any genus or species which involves 'any technology' injurious to the life of health of human beings, animals or plants shall be registered under this Act. For the purpose of this subsection, the expression "any technology" includes genetic use re-constriction technology and terminator technology."

Government Efforts for Conversation

Envirment protection is enshrined in the Constitution of India [Article 48A and Article 51A (g)]. Wide-raging policies, programmes and projects are in place, which directly or indirectly serve to protect, conserve and sustainably use the country's biological resources. These include the Forest

Important Facts

- Several species specific projects are being implemented for flagship animal species such as Tiger (National Animal), Elephant (National Heritage Animal) Rhinoceros, Gharial, Hangul and snow leopard, birds such as Vulture, Great Indian Bustard and plants such as Orchids, Rhododendron and citrus.
- India has a National Wildlife Action Plan, which envisages 10 per cent of the geographical area of the country under PA coverage. This is significant, keeping in view that India holds 18 per cent of the world's livestock population in an area which is only 2.4 per cent of the world's geographical area.
- India has a National River Conservation Plan under implementation in 160 cities covering 34 rivers.

(conversation) Act, Wildlife (Protection) Act, Biological Diversity Act, National Green Tribunal Act, National Biodiversity Action Plan, National Forest-Policy, National Wildlife Action Plan, National Forestry Action Programme, National Environment Policy and National Action Plan on Climate Change.

Government initiated a scheme on bio-diversity conservation to ensure coordination among varius agencies dealing with the issues related to conservation of biodiversity and to review, monitor and evolve adquate polity instruments for the same. Imporant steps taken are:

(i) A comprehensive project National Biodiversity Strategy and Action Plan (NBSAP) has been launched for preparation of planning documents relating ecological security and livelihood of people depending on natural resources. The ultimate aim is to develop a National Plan for conservation of biodiversity and to sustainable use.

A draft National Action Plan (NAP) has been prepared based on 71 mega Biodiversity Strategy and Action Plan (BSAPs) at local (sub-state) state, eco-regional and thematic levels. Thereby are draft and thematic review, large number of secondary sources and so on.

The National Biodiversity Authority (NBA) set up at Chennai on October 1, 2003 as per the provisions of the Biological Diversity Act, 2002 is mandated to faciliate implementation of the Act. Progress / Achievements made during the year.

- The Authority has held two meetings during the year and taken a number of important decisions including prescribing format for “agreements” to be signed between NBA and other parties seeking access to Genetic Resources and Associated Knowledge and Notification of guidelines on collaborative research.
- The Authority organized a number of seminars, symposia involving various stake holders to educate and create awareness in regard to provisions of the Act. The NBA has also considered 38 applications related matters and another 62 applications are under consideration and examination by the Authority.

NCDMA : India has established National Clean Development Mechanism Authority (NCDMA) for according host country approval to CDM projects as mandated under the Kyoto Protocol to the UN Framework Convention on Climate Change (UNFCCC). One of the criteria used for approval of CDM projects is impact on biodiversity. Host country approvals have so far been accorded to 404 CDM projects facilitating investment of mor than Rs. 22,000 crores.