GEOPOLITICS OF BIODIVERSITY: A CRITICAL ANALYSIS FROM RIO TO JOHANNESBURG

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CERTIFICATE

This is to certify that the dissertation entitled ***"Geopolitics of Biodiversity: A Critical Analysis from Rio to Johannesburg"***, submitted by Arun Kumar Tripathi in partial fulfillment of the requirements for the award of the Degree of Master of Philosophy, is his own work under my supervision and has not been previously submitted for any degree of this university or any other university.

We recommend that this dissertation may be placed before the examiners for evaluation.

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IN MEMORY OF

MY FATHER

LATE SHRI SOMESHWAR NATH TRIPATHI

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Language has it's own barriers, hence my words will not be able to express the contribution of my mother, Smt. Indrapari Tripathi, my brothers Sri Ashwini and Sri Praduymn, and my sister in laws Smt. Suman and Smt. Paramita; who stood by me through thick and thin. The sweet and innocent smiles of my nephews-Tushar, Suchit and Aditya were quite stimulating and refreshing, which gave me enormous strength to concentrate on this work.

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ARUN KUMAR TRIPATHI

CHAPTERS

CONTENTS

List of Abbreviations

ABS	Access and Benefit-sharing
AIA	Advance Informed Agreement
BCH	Biosafety Clearing-House
BSWG	Biosafety Working Group
CBD	Convention on Biological Diversity
CITES	Convention on International Trade in Endangered Species
CHM	Clearing-House Mechanism
COPs	Conference of the Parties
EXCOPs	Extraordinary Meeting of the Conference of the Parties
FAO	Food and Agriculture Organization
GATT	General Agreement on Trade and Tariffs
GEF	Global Environment Facility
GTI	Global Taxonomy Initiative
ICCP	Intergovernmental Committee for the Cartagena Protocol on Biosafety
IPRs	Intallectual Property Rights
ISOC	Intersessional Meeting on the Operations of the Convention
LMOs	Living Modified Organisms
LMO-FFPs	LMOs for Food, Feed Or Processing
MAT	Mutually Agreed Terms
MOPs	Meeting of the Parties
NBA	National Biodiversity Authority
NBSAP	National Biodiversity Strategy and Action Plan
PVRs/PBRs	Plant Varieties Or Breeders' Rights
PAs	Protected Areas
SBSTTA	Subsidiary Body on Scientific, Technical and Technological Advice
TPU	Threatened Plants Unit
TRIPS	Trade-Related Aspects of Intellectual Property Rights
UNDP	United Nations Development Programme
UNEP	United Nations Environment Programme
UPOV	Union for the Portection of New Varieties of Plants
WIPO	World Intellectual Property Organization
WSSD	World Summit on Sustainable Development
WTO	World Trade Organization

Chapter I

Introduction

The main aim of this study is to look into the issue of biodiversity and how it is being affected by the interest-driven politics of different countries and blocks in the global arena. The study is relevant and of utmost urgency both for the present and the future human generations. In recent years the issue of biodiversity, which is vital for the very survival of human beings, has created a furore both at the national as well as international levels. Being rich in resource diversity, the Third World countries are specially concerned with the issue as the developed world is trying to monopolize the world resources by trying to gain control over it.

Though there is a vast amount of literature on the issue of biodiversity, its loss and conservation, a systematic study from the geopolitical angle of biodiversity is lacking. This study seeks to examine the geopolitics of biodiversity with special reference to the concern and commitment made by sovereign countries, in international conventions/protocols, in the context of the developments in this regard since the Rio Summit 1992 to World Summit on Sustainable Development, Johannesburg 2002.

INTRODUCING THE TOPIC:

The loss of biological diversity without any doubt is a serious global problem. Conservation and sustainable use of biodiversity is, therefore, one of the main issues of international environment politics, and therefore, it calls for the establishment of rules governing the appropriation of genetic resources for

various purposes, among others, because it is in the interest of the Life-Science-Industry.

Judicious utilization and conservation of the world's biodiversity is the cornerstone for global food security and human well-being. Biodiversity use and conservation became an important issue at the Rio Earth Summit in Brazil in 1992 and was duly included in the global political agenda for the first time. For obvious reasons the whole world came to be divided into two blocks of "biological powers" on this particular issue i.e. North and South. The North is rich in "biotechnology" while the South is rich in "biodiversity". The North wanted the South to agree to a list of especially valuable areas in the "tropical rain forest" rich in biodiversity as a "common property" for protection while foregoing the latter's "sovereign rights" over them. It was a blatant form of "Eco-imperialism" which the rich nations wanted to force upon the poor ones.

The "Biodiversity Convention" which was drawn up at the Rio Summit gives sovereign rights to the poor developing countries of the South to their tropical forests and their genetic resources within their political frontiers. But in the last few years the colonial and neocolonial powers in the rich countries of the North, particularly the USA, have been freely exploiting, rather robbing, the genetic resources of the South and making vast profits and economic gains after patenting their products particularly in the field of food and medicine.

The biological resources of the developing nations are its greatest economic assets in the modern world because the future of world economy and trade depends largely upon biodiversity. This can be used as an economic weapon

and a lever for political bargains with the rich nations of the North. But doing this will require an unprecedented show of political solidarity among the "gene rich" developing nations of the world.

Conservation and utilization of the world's biodiversity is essential to the very survival of mankind. In many parts of the earth, these common heritages particularly the biodiversity resources have been severely threatened by human greed. In order to acquire and capture these resources, conflict is arising between developed and developing countries. Therefore, it is in this context that the study of biodiversity has acquired immense significance in the contemporary global environmental politics.

Biodiversity simply means the immense variety in life-form on the earth. There is a great urgency and necessity to establish norms through international regimes to save the biodiversity from illogical and unreasonable exploitation and appropriation. To address this problem, the international community adopted AGENDA 21, an unprecedented global plan of action, at the Rio Earth Summit in 1992. Later on the issue was taken up in Earth Summit + 5, Cartagena Protocol on Biosafety, Hague Ministerial Declaration of the Conference Of the Parties to the Convention on Biodiversity and recently World Summit on Sustainable Development held at Johannesburg, to take concrete steps and identify quantifiable targets for the better implementation of the Agenda 21.

But the best strategies are only as good as their implementation and the question remains how far existing forms of international cooperation can serve these purposes.

OBJECTIVES OF THE STUDY:

The principal objectives of this study are:

1. To examine the emergence of biodiversity as a central issue in global politics;
2. To examine the ongoing controversy regarding biodiversity and the parameters of negotiations between the North and the South;
3. To critically examine the role of the spatial dimension in the politics of biodiversity;
4. To examine some genetic resources, both qualitative and quantitative, which have been taken away by the rich developed nations of North, particularly US multinational companies both by legal and illegal means;
5. To examine the strengths and weaknesses of international dialogues in solving the crisis;
6. To examine and evaluate the clause of 'Intellectual Property Rights' (IPR) with regard to bioprospecting of genetic resources ;
7. To examine and evaluate the threats to India's rich biodiversity and measures to conserve it.

HYPOTHESES:

The study proceeds with the hypotheses that there are some serious flaws in the international conventions/protocols for protecting and conserving biodiversity .The problem is not only structural but also implemental. These conventions which are special instruments, working to protect this common

heritage of mankind need to be strengthened, and the guidelines outlined therein to be legally binding for all the nations of the world. The ultimate aim should be to bridge the existing disparity between developed and developing nations of the world in utilization and conservation of biodiversity.

METHODOLOGY:

As per the requirement of the research, qualitative methods have been used for analyzing the relevant books and articles. An extensive uses of secondary sources have been made which includes literature on the subject, articles in journals and periodicals devoted to the relevant theme. Apart from these, primary sources like declaration of international conventions have also been used. Besides published documents have also been used.

LITERATURE REVIEW:

DR. Sinha (1996) in his paper "Biodiversity Convention and the North–South Conflict over Rights and Access to Genetic Resources" writes that the developed nations of 'North' wanted the 'South' developing nations to agree to a list of specially valuable areas in tropical forest rich in biodiversity as a 'common property' for protection while foregoing their 'sovereign rights' which the rich nations wanted to force upon the poor nations.

DR. Sinha (1996) in his book 'Global Biodiversity' writes that the convention on biological diversity at 'Earth Summit', asserts that nations have sovereign rights over their biodiversity, and requires international cooperation in

its conservation as also mutually beneficial agreements on its utilization. This means to utilize this opportunity. India and other countries of this region will be dependent on the regional cooperation agreements. He further suggest for regional cooperation on biodiversity conservation over the South and South-east Asian region.

DR. Kothari (1997) in his article "Biodiversity in India" holds that the scientists estimate that humans are causing the extinction of perhaps one species an hour and as human survival is directly related to biodiversity, so human survival itself is imperiled due to biodiversity loss. The convention on biological diversity assuring national sovereign and mandatory agreements on sharing of biological resources. The convention on biological diversity urges a serious rethinking of all economic and development policies.

Sandlund and Brown (1992) in their book "Conservation of Biodiversity for Sustainable Development" discusses two of the more accessible chapters on a topic more often addressed by sociologists than biologists: inequities between the South, which has already destroyed its own and therefore is very eager to exploit what's left in the South.

Vandana Shiva, Patrick Andeson, Heffa Schucking, Andrew Gray, Larry Lohmann, and David Cooper(1991)in their book " Biodiversity: Social and Ecological Perspectives" contends that the prevailing approach to biodiversity conservation by scientific and conservation establishments is biased and flawed: " it is as if the mind is in the North, the matter is in the South; the solution is in the North, the problems in the South". The biodiversity crisis in poor, tropical

countries can be traced back to the North, the authors charge, to unwise development projects and movements such as the Green Revolution, which robbed traditional farmers of their biodiverse agricultural; methods.

Kellert (1996) the book "The Value of Life: Biological Diversity and Human Society" collects his findings and thoughts. He classifies human attitudes toward nature into nine categories (utilitarian, naturalistic, ecologist-scientific, aesthetic, symbolic, dominionistic, humanistic, moralistic, and negativistic) and shows how and why these attitudes manifest in various periods of history, among different ethnicities, and in the work of selected professions.

Vandana Shiva,(1993) "Monocultures of the Mind: Perspectives on Biodiversity and Biotechnology" displays the five essays in this volume, culled from Shiva's writings of the previous decade, focus on how the disappearance of biodiversity is rooted in the loss of traditional knowledge and practices.

Grubb, Koch, Koy, Munson, and Sullivan (1993) in their book "The "Earth Summit" Agreements: A Guide and Assessment" provides a background to the 1992 Rio Summit negotiations, analyzes the summit itself, and predicts how each of the treaties that came out of the summit will be implemented Chapters elucidate each of the agreements resulting from the summit: the Convention on Climate Change, the Convention on Biodiversity, the Convention on Environment and Development, Agenda 21, and the Forest Principles.

Abbott (1998) in his report approaches the exhaustion/parallel imports question in broad economic terms, asking whether there may be an economic and social welfare benefit to permitting IPRs holders to block parallel imports that

outweighs the potential harm to liberalized trade. It addresses each major form of IPR separately and concludes with respect to each form that the evidence of benefits that might flow from allowing parallel imports to be blocked is insufficient to justify the potential inhibition of trade. The report observes that most objectives that IPRs holders seek to achieve by the allocation of geographical markets can be attained through less trade-restrictive means, namely through the vertical allocation of distribution territories by contract. The interests of the developing countries are a focus of the report, which concludes that developing and developed countries are better served by open markets and the operation of comparative advantage. The report recommends that the WTO adopt a rule precluding governments from blocking parallel imports save in certain exceptional cases.

Correa (1994) in his article "The GATT Agreement on Trade-Related Aspects of Intellectual Property Rights: new standards for patent protection" said that the TRIPS Agreement is perhaps the most far-reaching international instrument ever adopted on IPRs. This article analyses the main provisions of the TRIPS Agreement in the area of patents. Its purpose is to provide a preliminary interpretation of the most relevant aspects of the text, namely new patentable fields of technology, criteria of patentability, the non-discrimination clause, rights conferred and exceptions, conditions for patent applications, compulsory licensing, reversal of the burden of proof, and transitional arrangements.

DR. Moana Bhagabati (1995) in her article "Problems with Biosafety" writes that the first conference of parties (COP) to the convention on biological diversity held in Nassau in Bahamas, in Dec. 1994, seemed more concerned with issues like Biosafety and the dangers posed by the biotechnology industry. Issues like the sharing of benefits took a back seat.

Maskus (1998) in his paper "Price effects and competition aspects of intellectual property rights in developing countries" focuses on concerns raised about the additional market power created by stronger property rights in technology and information. It sets out the basic theory of fundamental trade-offs posed by IPRs in open economies. The limited evidence available on potential price impacts of stronger protection is reviewed in three key areas: pharmaceuticals, plant varieties and software. The paper also considers the role of IPRs in supporting restrictive conditions in licensing contracts. Finally, it discusses aspects of competition policy that might be used to ensure that stronger IPRs promote dynamic competition rather than foster competitive abuses.

Raghavan C.(1990) in his book "Recolonization: GATT, the Uruguay Round and the Third World" makes an effort to place in the hands of the Third World public, and concerned groups, information on the Uruguay Round and its implications. It is not intended to be an academic or objective exercise, but has been written from a Third World perspective and is aimed at filling the gap in other publications. Part one deals with the political economy of the Uruguay Round and its broad implications in terms of South-North relations. Part two

deals with the new themes on the agenda of the Round and their interlinkages. Part three looks at some of the traditional and old issues of trade and market access, particularly those of importance to the Third World countries. In the light of these, Part four looks at issues with systemic implications. Part five deals with the progress in the negotiating processes in the first two years and the outlook in the light of the mid-term review. The book also updates the situation up to 1990 and presents some views on what positions the Third World countries should take.

Reichman JH.(1997) in his article "From free riders to fair followers: global competition under the TRIPS Agreement" identifies the sources of tension between developed and developing countries, and evaluates the impact of the TRIPS Agreement on developing countries' capacity to acquire the knowledge and skills they need to compete on the market of technological goods. It argues that developing countries have much to gain by accepting the challenge implicit in the Agreement to become fair followers in the worldwide quest for technical innovation. The author outlines a pro-competitive strategy for implementing the TRIPS Agreement in developing countries in five points: tilt their intellectual property laws in favour of local competitors; distance themselves from protectionist measures being adopted in the developed countries; institute incentives structures to stimulate innovation at the local level; resist any further elevation of international intellectual property standards beyond the TRIPS; and resort to the global information infrastructure to acquire scientific and technical knowledge.

DR. McNeely (1997) in his article "Biodiversity Convention: Miles to Go" writes that the objective of the convention on biological diversity are to conserve biodiversity, the sustainable use of its components and the fair and equitable sharing of resources. The IUCN (World Conservation Unions) survey indicates that benefit sharing needs to be included in discussion on technology transfer, the clear house mechanism, access to genetic resources, agriculture biodiversity and intellectual property rights.

Verma (1996) In his paper "TRIPS: development and transfer of technology" discusses that the operation of the new intellectual property regime has yet to be seen, but given the fact of intense negotiations which accompanied its adoption, a few pertinent questions may be asked about the efficacy of the new regime for developing countries. Patenting in pharmaceuticals is still open to considerable debate in most developing countries. Will the emerging new regime work in the national interest of the developing countries? Will it encourage the transfer of technology to them from developed countries and help them become competitive in world trade? Will it help in boosting the inventive and innovative capacity in these countries? These are some of the issues addressed in this article, which for this purpose explores at the outset relevant provisions of the TRIPS Agreement.

DR. Nagore (1996) in his book "Biological Diversity and International Environmental Law" writes that the international community of the developed nations and their multinational companies are quite conscious of the necessity of species protection as well as their habitats in the developing world because

genetic diversity within each species has enormous economic value as source of food, medicine, fibre and other industrial products.

Weissman (1996) in his article "A long, strange TRIPS" said that intellectual property protection has become a central part of the free trade agenda and of the global WTO agreements. This article considers how this state of affairs came to be and what it means for developing countries. Its crucial concern is with the range of pharmaceutical patent policy options that remain open to them. Part I provides some background on the range of possible patent regimes, to emphasize that there is no single approach to patent policy. Part II recounts the United States pharmaceutical industry's political offensive over the last 15 years, designed to ensure that all nations adopt restrictive patent laws. Part III undertakes a close analysis of the TRIPS Agreement and argues that despite its appearing highly restrictive at first glance, the Agreement leaves in fact a number of options open to developing countries. Part IV considers the costs and benefits of some patent policy alternatives, especially compulsory licensing, and, in a concluding section, outlines a patent policy approach for developing countries that would better serve their national interests.

DR. Vandana Shiva in her book "Biodiversity and Third World Perspective" writes that until recent times, it was the local communities who have used, developed and conserved biological diversity. It was they who were custodian of biological wealth of the planet. It is their control, their knowledge and their rights that need to be strengthened if the foundations of biodiversity conservation are to be strong and deep. This strengthening has to be done through local action,

national action and global action. In the view of Dr. Shiva the governments of South nations can only be strengthened by standing behind their peoples and their biodiversity and supporting and protecting the democratic rights of diverse species to exist, and diverse communities to coexist with them.

Ahuja (1994) in his article "GATT and TRIPS: the impact on the Indian pharmaceutical industry" describes the discussions in India between Indian firms, the Government and the multinational drug industry on the issue of pharmaceutical patents and TRIPS. The author analyses the shortcomings of the 1970 Indian Patent Act *vis-à-vis* the TRIPS Agreement and the amendments necessary for compliance with the TRIPS provisions He then presents the status of pharmaceutical patents in the pre-GATT era and discusses the post-GATT implications, including the future for R&D.

DR. Mukund Govind Rajan(1997) in his book " Global Environmental Politics" writes that Indian interests at the preliminary stage of the biodiversity negotiations were to encompass international incentives for the conservation of biodiversity, easy access to biotechnology, and the prevention of Northern intellectual property legislation from hindering the flow of information and technology to the South. In addition, India displayed a strong interest during the negotiations in retaining its flexibility and independence of action, and avoiding international obligations.

Debroy (1996) in his book "Beyond the Uruguay Round: the Indian perspective on GATT" looks beyond the Uruguay Round and is an Indian perspective on the new GATT/WTO agreement. Beginning with a quick sketch of

the current global economic scenario, the author explains the details of the individual WTO agreements, including TRIPS. A special chapter is devoted to patents and pharmaceuticals that are the subject of an amendment in India and to the resultant impact on the Indian pharmaceutical sector. The issue of the protection to be granted to plant varieties and microorganisms is also discussed.

Dubey (1996) in his book "An unequal treaty: world trading after GATT" analyses the impact of the various WTO agreements and the WTO system on developing countries, with a special focus on India. A chapter is devoted to the TRIPS Agreement. It relates the history of the difficult negotiations leading up to the signing of the Agreement, and discusses the negative effects of the Agreement for developing countries in terms of development, technological dependence and losses. Finally, the author insists on the various possibilities for making the obligations under the Agreement more flexible.

Krishna Iyer VR, Chinnappa Reddy O, Desai DA, Rajinder Sachar (1996) in the report of the People's Commission on GATT On the constitutional implications of the Final Act embodying the results of the Uruguay Round of multilateral trade negotiations concern over the impact of the Final Act of the Uruguay Round on India's sovereignty, democracy and the Constitution led to the creation in 1993 of a non-official judges' panel, entitled the People's Commission on GATT, to examine the constitutional implications of the Final Act. The report of the People's Commission begins with a detailed chronology of events which provide a basis for understanding the domestic and international context in which the Final Act was negotiated. A background is provided on the functioning of the

previous GATT and the numerous rounds of negotiations preceding the Uruguay Round. The report describes the Indian Government's handling of the Uruguay Round and then examines the critical sections of the Final Act and their implications for the political economy.

Mehta (1998) in his book "TRIPS and pharmaceuticals: implications for India" said that since the TRIPS Agreement does not provide for the retrospective patenting of drugs already on the market somewhere in the world, no significant effect can be anticipated until after 2005 because the number of patented drugs on the Indian market will be too small for economic impact. Moreover, balances such as government price control should be considered as a safeguard against price explosion. But Indian firms will be affected to a large extent: the focus of R&D should change into innovation of new processes, development of generic drugs, and production of patented drugs under license and marketing of imported drugs.

Sen (1996) in the book "The Uruguay Round: implications for world trade" discusses the possible impact of the new WTO agreements on developing countries. With regard to the TRIPS Agreement, it focuses on patents for pharmaceutical and biotechnology products and their economic impact in respect of innovative capacity, foreign investment, technology transfer and domestic prices. The author also assesses the particular implications in India for pharmaceutical prices and the Indian drug industry, the impact on microbiology, and the significance for plant varieties.

Subbaram in his paper "Framing of national policy on intellectual property" discusses some important and special issues which require careful consideration while formulating amendments to the Indian Patent Act, and suggests how to frame a national policy on IP for taking advantage of the post-GATT era. The author focuses on the protection of pure compounds, the patenting of microorganisms and the protection of new plant varieties. He also insists on incentives for innovation and modernization of IPRs offices, including training of adequate IP professionals, creation of a good infrastructure and establishment of a patent tribunal.

Chapter II

Biodiversity: An Overview

2.1. Biodiversity: An Assessment

Biodiversity is the variety and variability of plants and animal species on our planet. Biological resources provide the basis for life on earth, including that of humans.[1] The term is defined in the Convention on Biological Diversity as, the variability among living organisms from all sources, including terrestrial, marine and other aquatic eco-systems, and the ecological complexes of which they are part; this includes diversity within species, between species, and of ecosystems. In simple words, Biodiversity is the totality of genes, species and ecosystems in a region.[2]

Biodiversity can be divided in to following main hierarchical categories;

1) Genetic diversity.
2) Species diversity.
3) Ecosystem diversity.
4) Human cultural diversity,

1)Genetic Diversity: The term genetic diversity refers to the diverse plant group from algae to angiosperms; the diverse animal groups from fishes to amphibians, reptiles, birds and the mammals; the various worms, within a population.[3] It refers to the variation of genes within species.[4] It covers distinct populations of the

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[1] Aggrawal, K. C. (1996), *"Biodiversity"* Agro Botanical Publishers, Bikaner, p.1.

[2] Chowdhery, H.J. & Murti, S.K., (2000) *"Plant Diversity and Conservation in India: and Overview"*, Published by Bishan Singh Mahenderpal Singh, Dehradun, p.3.

[3] Chauhan, S. S. (2001) *"Biodiversity ,Biopiracy and Biopolitics: The Global Perspective"* Kalinga Publication, Delhi, p. 21.

[4] Aggrawal, K.C., (1996), *"Biodiversity"* Agro Botanical Publishers, Bikaner, p. 2.

same species (like thousands of traditional rice varieties' found in India) or genetic variations within a population.

Gene is a segment of DNA (Deoxyribonucleic Acid), in which genetic code is enclosed. These genes are arranged linearly along the DNA and are responsible for various characters exhibited by the individual organisms. The DNA of a cell is divided to form chromosomes which are thread like structures. In the living organisms where sexual reproduction takes place, a set of chromosomes each from the two parents is passed on to the offspring during the process of fertilization. Thus, the genetic differences from the two individuals (i.e. parents) are combined to form new combinations. As a result of that, the new individuals with changed characters are formed adding to the diversity of the living world.[5]

2) Species diversity: It refers to the variety of species within a region. Such diversity can be measured on the basis of a number of species in a region.[6] A species is defined as a group of inter-breeding or potentially inter breeding natural populations that are reproductively isolated from other such groups. [7]

The species diversity refers to the variety of species within a region. It is surprising to note that we do not know how many species of plants and animals are there on this earth. So far only about 1.7 million species have been reported and described as against the estimated 10 million to 30 million species, out of

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[5] Chowdhery, H.J. & Murti, S.K., (2000), *op-cit.*, p. 3.

[6] Aggrawal, K.C., (1996), *op-cit.*,p. 2.

[7] Groombridge, B. and Jenkins, M.D. (2000), *"Global Biodiversity: Earth's Living Resources in the 21st Century"* World Conservation Monitoring Centre (WCMC), p.14.

which species of insects and micro organisms account for a major proportion.

The Biodiversity of a given region is generally assessed in terms of species richness. The species richness describes total number of species found occurring wild or domesticated in the given geographical area. However, the species richness only provides the total number of species and does not reflect the complete picture of the diversity of types of organisms.

The relative abundance of species in various taxonomic groups like micro organisms, cryptogams, angiosperms etc. is only understood by taxonomic diversity. For example, habitats with equal species diversity (number of species) may not have the same taxonomic diversity. An island with 10 species of flowering plants and 15 species of fungi is more diverse than another island which has 25 species of flowering plants and no fungi although both the islands have 25 species.

3) Ecosystem diversity: An ecosystem is defined as a square metre of grassland or of a forest, the edge of a pond, a tide pool, or any large area of nature that has living organisms and non living substances interacting and exchanging materials between them.[8] The ecosystems can be categorized as: aquatic ecosystems and terrestrial ecosystems. These can be further subdivided into:

a) Aquatic ecosystems are divided into –

1) Fresh water ecosystem

2) Marine ecosystem.

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[8] Chowdhery, H.J. & Murti S.K., (2000), *op-cit*, p. 3.

b) Terrestrial ecosystems are divided into -

1) Forest ecosystems.

2) Desert. Ecosystems.

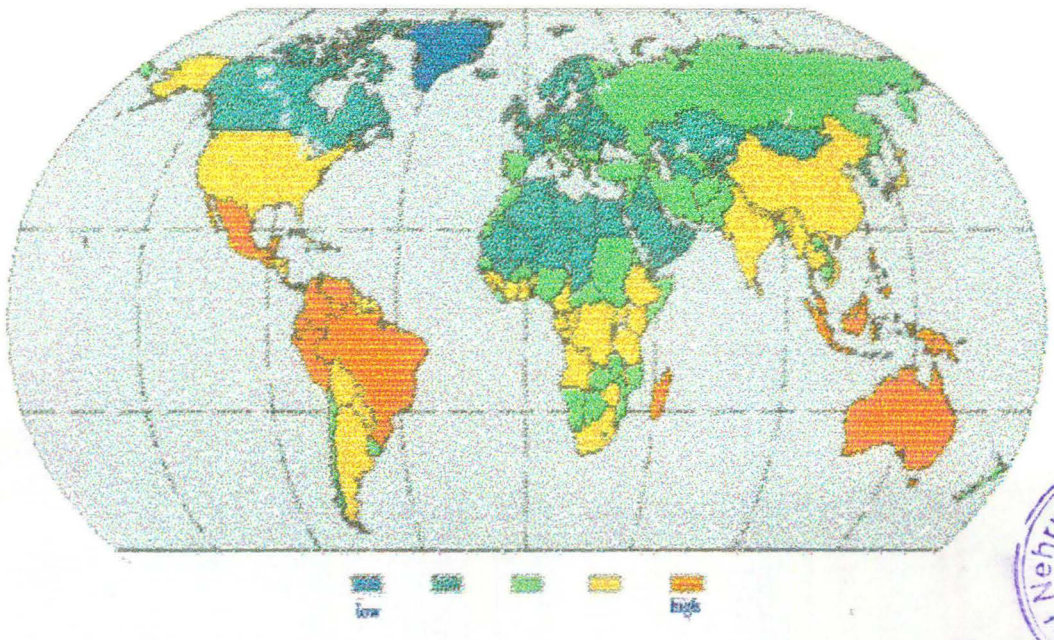
3) Man made ecosystems.

The most important types of ecosystems, from the biodiversity point of view are, Tropical forests (both dry and moist); wetlands such as Mangroves; aquatic habitats like-Fresh water lakes, Coral reefs; and wild lands like African savannahs, which are the store house of wild relatives of many important crop plants. Amongst all these, the Tropical Rain Forests are supposed to contain maximum diversity. As high as 90% of known species of are found in these forests. Ecosystem diversity is generally assessed by the diversity of the component species; relative abundance of various species, as well as types of species. For example an ecosystem with several plant species will be assessed as less diverse in comparison to one having plants and animals (both herbivores and carnivores) though the total number of species remains the same in both of these ecosystems.

4) Human cultural diversity: The wide variety of living organism on earth today is the outcome of hundreds of millions of years of evolutionary process and in the course of time, human societies have emerged and adapted to the local environment of the particular region, discovering, using and altering the local biotic resources leading to further shaping oft he biodiversity. Therefore, human cultural diversity can also be considered part of Biodiversity. The cultural diversity encompasses diversity in language, religious beliefs, and land management

practices, art, music, social structure, crop-selection, diet and various other similar aspects of human society.[9]

Map1. Biodiversity at country level



(Source: Global Biodiversity Outlook, 2001)

Map 1 represents an index of diversity based on richness and endemism in the four terrestrial vertebrate classes and vascular plants in most countries of the world.

2.2. Origin of Biodiversity:

Throughout the 1960s and 1970s biologists made public alarm over the deteriorating environment. Prominent biologists helped to raise awareness that

[9] Ibid, p.5.

biodiversity was under threat. Some countries, at that time, had taken some measures to counter that threat. As a result of that, biodiversity received widespread attentions from the public. Rosen coined the neologism "biodiversity" for the event as convenient shorthand, a buzz word that would at once encapsulate biologists' and would raise public awareness about threats to the natural world. [10]

Based on the fossil records it is presumed that the life appeared on this planet between 3,900 and 3,400 million years ago in the fom1 of Cellular Organisms (Prokaryotes) which were very similar to present day Cyan bacteria. The origin of the earliest Eukaryotes (in such organisms the cell nucleus is bounded by a membrane and it's DNA is combined with proteins to form chromosomes e.g. all higher organisms whereas all these features are lacking in the Prokaryotes e.g. Bacteria) is somewhat difficult to correctly ascertain in the absence of proper fossil evidence. However, based on the Precambrian microfossil called "acritarchs" (cysts of marine algae), it is generally accepted that it is the earliest known Eukaryote which appeared 1400 million years ago. From the fossil evidences it is known that from the simple, unicellular forms-complex, multicellular organisms were evolved and the land plants appeared much later than their aquatic counterparts. The process of species diversification started soon after life originated on the earth. It is a gradual process responsible for the creation of new strains/forms, species and subspecies and is influenced by climatic and geophysical factors.

The following two conditions are instrumental for population diversity:

[10] Encyclopedia of Biodiversity, Vol.3, Fo-Man Academic Press, p.364.

1) New individuals with changed genotypes are constantly evolved through the process of mutation, recombination and other related genetic processes and immigration of individuals, their reproductive bodies (gametes) and propagules etc.

2) Through the process of natural selection eliminating the diversity in the population and losses due to immigration of individuals.

The genetic variations within a population or entire species will eventually disappear and this loss may be a quick process or they may survive for a longer period, like Horseshoe Crab which has survived for around 200 million years and Cockroaches which appeared in the Carboniferous period. The fate of every species is to become extinct sooner or later. Influx of new species to is a necessary prerequisite for life to continue on earth.[11]

Mutations and sexual reproduction in an organism bring out changes in the composition of DNA molecule (the chemical substance responsible for heredity). The changed DNA molecules so obtained reproduce their changes and produce modified enzymes, thereby producing changed or altered cells which ultimately turn into modified organisms. Thus a large number of mutants in a population are produced. However, it is the process of natural selection that determines, which are the mutants that are going to survive and which will be extinct. The process of speciation separates and establishes genetic variations into distinct units or species. During the process of speciation, the original population with similar genes, also known as, "gene-pool" is divided into two or

[11] Chowdhery,H.J. & Murti, S.K., (2000), *op-cit.*, p.5.

several "gene-pools". Every new "gene-pool" soon acquires a different cellular, tissue, organ characteristics through mutations and natural selection. Such separations in the primary gene-pool inhibit interbreeding between individuals. In course of time, these newly segregated populations are changed to such an extent, that the interbreeding is completely stopped. But this is not the end, as certain individuals may survive and reproduce to form new off springs while many others may disappear without leaving any trace. The availability of resources in the environment and the capability of the individuals to utilize them limit the rate of their survival and multiplication. Individuals, who are more efficient in utilizing resources for generating energy and required materials, have better chances of surviving and reproducing, in comparison to those who are inefficient. The new mutations tend to provide increased efficiency to the individuals by altering their morphology, physiology, pollinating and reproductive capabilities.[12]

2.3. Importance of Biodiversity

The value of biodiversity can be described from various perspectives. The World Charter for Nature, e.g., has adopted the policy, which states, "every form of life is unique and warrants respect regardless of its worth to human beings".[13] Biodiversity has ethical, social and economic values distinct from Bioresources. The social, ethical, cultural and economic values of Biodiversity have long been recognized in religion, art and literature. The conservation of Biodiversity is a

[12] Ibid ,p.6.

[13] The Word Charter for Nature was adopted by the General Assembly of the United Nations on Oct. 28, 1982.

must for the maintenance of the Biosphere in a state, which supports human life. The value of Biodiversity can broadly be assessed under two main categories:

A- Resource value or direct uses of Biodiversity.

B- Non-resource value or indirect uses of Biodiversity.

2.3.1. Resource Use of Biodiversity: The Biological diversity provides the material basis of human life. Some of the important direct uses of Biodiversity are:

i) Agriculture: Every important species of food plant which we value today is a living tribute to our prehistoric ancestors who discovered the virtues of these plants, selected the most useful ones and started cultivating them. It is surprising that even without the knowledge of genetics, prehistoric man had displayed his wisdom in domesticating the most suitable wild plant species for food. These plants were dispersed to far flung places by ancient conquerors, sailors, travelers, merchants and in return they brought home seeds and useful plants from far off places.

Biodiversity has benefited agriculture by way of providing new crops, diverse traditional farming, improving existing crops, etc. and all the food items consumed by the human beings and animals are from natural resources. New products like Baby corn, Kiwi fruit, etc. are being regularly added to the long list of food items. The same is true for other crops and plant products like-fruits, vegetables, spices, beverage crops, root crops, sugar crops, timber, fuel wood, fodder, forage and pasture crops, etc. Even prior to the discovery of synthetic fibres (nylon, rayon, polyester etc.) all the materials required for clothing and

other purposes such as ropes, cordage, gunny bags, brushes, brooms, paper, paper products and upholstery work, etc. were entirely of vegetable origin e.g. cotton, jute, hemp, flax and many others.

ii) Pharmaceuticals: Since the time immemorial, man has been using various plant species for medicinal purposes. The plants used for curing various diseases in humans have figured in ancient literatures like the Rig-Vedas, Bible, etc. The ancient Chinese started using drug plants some 6000 years ago. The Greeks and Romans developed their own "Materia Medica". In India the "Ayurvedic" system of medicine is nearly 3000 years old. Charak and Susruta, the two earliest scholars had commendable knowledge of Indian medicinal plants and their "Charak Samhita" and "Susruta Samhita" are regarded as treasures of indigenous medicine even today.

After the advent of synthetic drugs the plant based drugs lost their significance for some time. However, in the last few decades, greater interest and importance is being given to herbal drugs as they do not have any side effects." Quinine", obtained from the bark of several species of Cinchona, has long been used as an antimalarial drug, "Opium" and its derivatives obtained from poppy seeds are widely used as pain reliever and to induce sleep. Some other popular plant drugs used to treat various disorders are- Rauwolfia, Belladona, Aconitum, Podophyllum, Nux-vomica, Ginseng, Ergot, Ephedra, etc. After the discovery of the wonder drug "penicillin" from fungi, by Sir Alexander Fleming, many other antibiotics have been isolated from Bacteria, Actinomycetes and moulds which have proved indispensable and irreplaceable in today's

medicine.

It is estimated that about 80% of the population in the under developed countries are dependent upon traditional medicines obtained from natural resources-like plants, animals or minerals, etc. for primary health care, although synthetic medicines (allopathic) are available.[14] There are many herbal medicines known which cannot be chemically synthesized like the most widely used cardiac stimulant "Digitoxin" which is extracted from Digitalis plant. Nearly all the Homeopathic medicines, which are based on plant extracts, are very popular and widely used. Unlike agriculture, at present only a very small number of plants contribute to health care while the properties and curing capabilities of millions of species have not been screened and therefore remain unknown.

iii) In addition to provide food and health care, plants have numerous other important uses in our daily life, some of these are:

a) For constructing houses, means of transport (Boats, Carts etc.).

b) Fuel for cooking, warming and industry.

c) Dye (colouring materials), perfumes, flavouring agents (in food stuffs), soaps and detergents etc.

d) Gums and resins.

e) Rubber and waxes.

f) Insecticides.

g) Narcotics.

h) Food for domestic animals.

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[14] Groombridge, B. and Jenkins, M.D. (2000), *op-cit*, p. 17.

The economic potential of biodiversity in the future is one of the most important reasons for its conservation. There will be a definite demand for new genetic materials for increasing the crop production/yield and to effectively counter the threat of new diseases and pests. Although the economic value of several plant species are well known and many have been screened for their commercial exploitation in agriculture, industry, health care (medicine), science etc. but it is only a fraction of the total number of existing known plant species are utilized to the optimum level. For example-most of the plant based drugs are extracted from about 100 out of nearly 2, 50,000 species of higher plants. Due to prohibitive cost, labour and time only a small number of species have ever been screened and are being exploited although the diversity is too large and poorly documented to be used effectively.

2.3.2. Non-Resource Value of Biodiversity:

One of the most important contributions of the biodiversity, particularly plant diversity, is to provide fresh air i.e. Oxygen for breathing to all living beings (except anaerobic organisms) and simultaneously purifying the atmosphere by assimilating carbon dioxide. They help in holding soil water, inducing rainfall and improving the climate. The habitats rich in species diversity also perform valuable ecological processes as a result of the interactions between species and the environment. These ecological processes include biogeochemical recycling, maintaining the soil fertility, moisture, and water quality and climate regulation. The relationship between Biodiversity and ecological processes is not clearly

known and understood and it is also not known that how far biodiversity can be reduced before it becomes critical for the crucial ecological processes to stop operating. But evidences from past experiences indicate that extinction of a species may cause disastrous impact on the ecosystem leading to catastrophical environmental changes.

Biodiversity contributes a great deal to man's pleasure. Nature provides peace and contentment to humans and millions of people visit forests, hills, wilderness areas, sea beaches, etc. in order to get relief from stress and for recreation. The protected areas, viz., Sanctuaries, National Parks and Biosphere Reserves, apart from conserving the biodiversity, also have immense recreational potential to satisfy the human needs for stress mitigation. [15]

2.4. Threats to Biodiversity:

Under the natural process of evolution, the unfit species becomes extinct due to natural selection but, in last couple of centuries the earth's biological diversity has been threatened by various human activities. The ever increasing human population has increased the extinction rate of species and today it is the highest in past 65 million years. This rate of extinction or species loss is growing faster as each day passes.[16]

All biological species (plants and animals) of an ecosystem are in a state of dynamic equilibrium forming a close net. The extinction of species is a natural

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[15] Chowdhery, H.J. & Murti, S.K., (2000), *op-cit*, p.10.

[16] Groombridge, B. and Jenkins, M.D. (2000), *op-cit*, p. 171.

process which is caused by geological and evolutionary changes in due course of time and all the species which have been evolved will become extinct sooner or later. But this slow natural process of extinction is being continuously accelerated by the human beings by degrading the environment through population explosion, habitat destruction and environmental pollution.

It is estimated that nearly one tenth of the world's total floristic diversity is seriously threatened or at the verge of extinction. It has also been observed that when a plant species is lost, the existence of several other plant and animal species also becomes seriously threatened.

The species which are endangered with extinction generally have limited colonizing and low regeneration capability. They have small individual populations and restricted to certain areas. As a result of that, a single catastrophe either natural or man made, may cause it to disappear forever as in the case of endemic species. Extinction prone plant species have been seen flowering late in the season, their frequency of flowering is low and the seeds have low viability.

Natural extinction of species by way of geological and meteorological catastrophes in the form of volcanic eruptions, meteor impact, etc. has taken a very heavy toll in the past. The largest mass extinction occurred at the end of Permian era, about 250 million years ago, which eliminated about 80% of the marine animal genera. The total elimination of Dinosaur and other contemporary animal and plant genera and species is another example of natural extinction.

A species may become vulnerable to extinction or extinct due to any of the

following natural or man-made causes:[17]

1. Population crash/fragmented population.
2. Loss of specific pollinators.
3. Loss of reproduction.
4. Seed germination capability.
5. Loss in genetic variability.
6. Habitat degradation or destruction (clearing of land habitat of plants and animal species) for human settlement, agriculture and other commercial projects, etc.
7. Over exploitation- removal of timber, fuel, fodder and other commercially important species in excess which the ecosystem can not sustain.
8. Competition i.e. ecologically better suited species replacing the weaker ones.
9. Pathological causes like outbreak of diseases, epidemics etc.
10. Environmental factors e.g. changes in environment beyond the tolerance limit of the species.

Of the above mentioned threats to the biodiversity, the most important is habitat loss. The tropical forest destruction will be the single greatest cause of species extinction in the years to come. According to the recent estimates, the destruction of the tropical forests may result in the loss of 5 to 15% species by

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[17] Chowdhery, H.J. & Murti ,S.K., (2000), *op-cit*, p.12.

the year 2020.With the continued population growth, the pressure on the existing land and undisturbed habitats (forest, etc.) will enormously increase. The increase in cultivated area and increase in yield per unit area, needed to feed the growing population, may lead to the loss in genetic diversity. The deforestation for agriculture in 1970s alone is estimated to be between 5.9 and 7.5 million hectares, of which about 4.5 million hectares was transformed to permanently cleared land. The rate of habitat loss due to agricultural expansion further increased in 1980s and will be further accelerated resulting in the loss of wild relatives of present day crops and livestock.

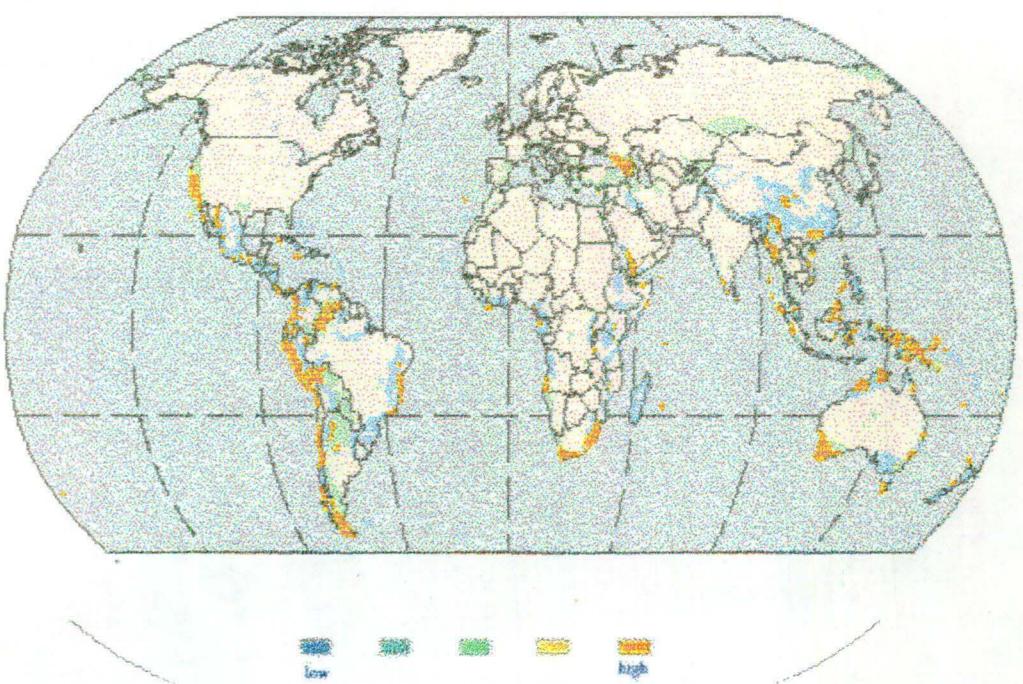
More than 1, 00,000 species become extinct each year due to various biotic and abiotic factors. But today, an even more dangerous and devastating threats like the Global Warming caused by the greenhouse gases in the atmosphere are looming large for the survival of living organisms. If this menace is not checked it will trigger a massive catastrophic change in the earth's natural environment, setting off a wave of mass destruction and extinction of species.

2.5. Species Extinction:

The species which are no longer known to exist in the wild after repeated searches for several decades of the type localities and other known or likely places are presumed to be extinct. As interpreted by IUCN (International Union for Conservation of Nature & Natural Resources) this includes species that are extinct in the wild but surviving in cultivation. A species may be extinct from a local area, region, country, continent or the world.

The species extinction is a natural process and all the species which have originated on this earth will have to face extinction when their lifespan is complete. The species becomes extinct as a result of all the individuals dying without producing off springs. During the natural process of biological evolution, unfit species become extinct due to natural selection. The fossil record indicates the extinction patterns through geological times and other details of the extinct species but due to structural differences, animals, especially the marine animals and other vertebrates, have better preserving qualities hence their fossil records are better preserved as compared to plants.

Map2. Selected Regions of High Biodiversity Value



(Source: Global Biodiversity Outlook, 2001)

2.6. Conservation of Biodiversity:

The Homosapiens came into being on this earth at the time when the biological diversity was at its peak. The increase in the human population gradually altered the natural environment, which in turn, adversely affected the biodiversity and today it is at its lowest ever level. The ultimate impact of this biological collision is beyond our imagination but it is certain that it will have only harmful implications for the survival of human beings on this planet. The biological wealth of a country is its valuable heritage, which is the product of millions of years of evolution.

Although the loss of biological diversity is an important process of environmental change but it is totally irreversible and we do not know what we are loosing in our quest for better living standards and claiming human superiority over the other living beings who share this planet with us. The value of earth's flora and fauna, which is still largely unknown and unfortunately remains untapped due to lack of requisite information, has immense potential in the form of food, medicine and other commercially valuable substances. The earth's biological resources , which were abundantly available once upon a time when man entered the industrial age, are becoming rare and scarce at a very rapid pace due to increased human population and consumption.

By the middle of 20th century man began to realize that these earth resources are limited and it's over exploitation is resulting in their total loss, thus diminishing the Earth's life support systems. The erosion of our planet's life support systems which is going on at a very fast rate will continue at a more

vigorous pace, unless the human activity falls in line with the Earth's carrying capacity through sustainable utilization.

It is very difficult or rather impossible to quantify the economic value of biodiversity, the genetic variations within a species, the variety of species themselves, and the existence of diverse and productive ecosystems are of immense economic importance. Diversity in genes, species and ecosystems provide raw materials with the help of which the human communities adapt to change. Thus the loss of each additional species, gene and ecosystem reduces the ability of nature and people to adapt to the changed environment.

The tropical forests which cover about 14% of the earth's total land surface are exceptionally rich in biodiversity. Nearly half of all vertebrates and 60% of known plant species of the world are found in the tropical forests. It is interesting to note, that a single hectare of these forests may contain up to 300 tree species in contrast to 700 species in the whole of continental North America. Despite their enormous biodiversity, the tropical forests are fragile ecosystems and are almost unable to recover from any human disturbance. It is unfortunate that these forests are being cleared at the rate of about 1, 40,000 sq. km per year.

The wild species in tropical forests and other natural habitats form the most important non-renewable resources for human survival. At present, only less than one tenth of 1 % of the naturally occurring species are being exploited by man while the rest remain unknown and untested. It is surprising to know that at present, in order to feed the worlds enormous population we are dependent on

only about 150 plant species (Cereals, Oil seeds, Legumes, Fruits, Vegetables, Sugar crops and root crops, etc.) out of which crops like wheat, rice, rye, millets, etc. are being grown ever since the man started agriculture some 10,000 years ago.

The possible global climate changes in the future mainly due to global warming is likely to change the natural vegetation and cropping pattern, etc. and in such an event the conserved genetic diversity will be of immense help in maintaining the crop productivity in the changed climatic conditions. According to an estimate, nearly 75000 plant species have edible parts and some of them are demonstrably superior to present day crops in the particular use. For example, Psophocarpus tetragonolobus or winged bean, which grows in New Guinea, is called 'one species supermarket' as the entire plant-roots, stems, leaves, flowers and seeds are edible and a coffee like drink is prepared from its juice. The plant has a very high growth rate and it attains a height of 15 feet in few weeks, in nutritional value it is equal to soyabean. Many species are known to have the potential to serve as a reservoir of many other important and valuable products like, petroleum products, fibers, etc. A stand of 500 trees of Babassu palm (Orbignya phalerata) of Amazon basin produces about 125 barrels of oil in a year. Catharanthus roseus, the common rosy periwinkle, yields two alkaloids namely- Vinblastine and Vincristine, which are extremely effective in Hodgkin's disease and acute lymphocytic leukemia and the revenue earned trading these two alkaloids alone exceeds 100 million dollars a year. On the other hand, in Madagaskar five other species of Catharanthus are found of which one is

presently close to extinction but so far these species have not be been paid any attention and studied for commercial exploitation.

Apart from the immense value of biodiversity for human beings to survive, we also must realize that the man is also a part of nature and all the other species have an inherent right to exist regardless of their value to man. The human culture must be based on respect for nature and it is the social responsibility of the present generations to conserve nature in its natural form or state for the welfare of the future generations.

It is now very well established, that the biological diversity is essential for the survival of human race on this earth and there are ample reasons to conserve it on war footing because once a species becomes extinct it is lost to the society together with its potential contribution to sustainable development and human welfare. Following are some of the important reasons for conserving the biological diversity:

- It will be an 'Insurance Policy' for a prosperous future of mankind.
- It leads to the ultimate conservation of essential ecological diversity as well as life support systems.
- Genetic diversity of plants and animals is preserved.
- It ensures the sustainable utilization of natural resources.
- It provides vast source of knowledge for potential use to the scientific community.
- A large repository of plant and animal species is preserved which can be exploited (through cultivation, etc.) in the future, if needed.

- To preserve the biotic communities/ecosystems in their natural state.
- To benefit the society by providing means of recreation and tourism (Ecotourism).

2.7. Valuation of Global Biodiversity: A Contentious Issue

The World's Biological Diversity is a vast and undervalued resource. It comprises every form of life, from the tiniest microbe to the mightiest beast, and the ecosystems of which they are a part. It provides humanity with a cornucopia of goods and services, from food, energy and materials to the genes which protect our crops and heal our diseases. Only a fraction of 1 % of the world's total species has been properly studied for its potential value to humanity as food, medicine and in industry. 'Miracle herbal drugs' for incurable human diseases, 'miracle super crops' to feed the growing million's and 'miracle super industrial products' for our industries, wait to be discovered and are being destroyed without even being named. [18] People have to be educated about the socio-economic value of biodiversity and that how our own existence depends upon it.

The planet's natural wealth .lies in the 'genetic coding' of the DNA nucleotides which gives each living organism the traits which enable it to survive and evolve. Genetic engineers can use these genes to develop wonder drugs and miracle foods. As half of all medicines derived from plants, there could be countless curable herbal drugs still to be discovered. Food, medicine, clothing, housing, energy and other material needs, as also spiritual and intellectual inspirations, come from wild and domesticated biological resources. Even in an

[18] Swaminathan, M.S. (1994): "Towards a Rich Genetic Estate", The Hindu Jan 2, 1994.

sophisticated society like the USA, one tenth of all medical prescriptions dispensed, contain plant extracts which originates in some developing country. In India and other tropical nations, the majority of the people depend on traditional medicine, which is primarily based on plant and animal diversity.

2.8. Biodiversity Erosion and Potential Threat to Human Existence on Earth:

Apart from the nuclear wars, there is probably no more serious environmental threat to mankind than the continued decay of the genetic variability of crop plants. Once tile process has passed a certain critical limit, humanity will have permanently lose the co-evolutionary race with crop pests and diseases and will no longer be able to adapt crops to climatic changes. Extinction or loss of species in an ecosystem is an irreparable loss and is permanent.

Human civilization depends on the survival of the biological world. Perhaps in the short term, a species lost here and there may be of little consequence for overall ecosystem stability but in the long term the cumulative effect of such losses may some day threaten our existence. Homo sapiens are just one among 50 million species believed to be alive today. In the next three decades, he will preside over a holocaust which could remove a million species from the face of the earth. Some 100 species are becoming extinct every day. Most of them vanish unsung and unheard. This loss will hurt mankind in multiple ways. It is not only because a world without Polar bears, Pandas and Rhinos would be a poorer place but that it will erode global biological heritage and

eventually the potentials for emergence of new and useful products will disappear. Only the minutest proportions of plant and animal species have yet been tested for their usefulness to humanity. Of an estimated 265,000 species of plants, only about 5,000 have ever been cultivated for food. Even the most insignificant species may playa crucial role in the ecosystem to which we all belong to. We simply do not know what we are losing.[19]

The loss of the earth's biological diversity is one of the most critical environmental and developmental issues. With each species that disappears, mankind moves closer to his doomsday and developing countries, stewardship of most of the planet's biological wealth, lose potential for sustainable development. Though the biological resources constitute the basis of life on earth, their destruction by us, continues in complete silence far from the televised 'hot spots'.[20] Biological diversity is, in fact, the very basis of human existence on earth. Its conservation and wise management is likely to be critical to the very survival of humanity. It is important to create a new mentality in which the adoption of preventive action and precautionary measures will be as natural as our reactions to emergency situations and to catastrophes.

Biological extinction is a fact of life. As species evolve, the old give way to the new. Many of the extinct species are represented today by their descendants. Other species vanished completely as a result of drastic environmental and climatic changes. For example the giant reptiles, dinosaurs perished rather

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[19] Myers, N. (1983), *"A Wealth of Wild Species"*, Westview Press, Boulder, Colarado, USA, p. 27.

[20] Encyclopedia of Biodiversity, Vol.3, Fo-Man Academic Press, p.372.

abruptly some 65 mil1ion years ago, possibly due to global cooling. Their descendants - the crocodiles, vamuses and lizards escaped extinction then but are now facing the threat. Since then, the earth's climate has been fairly constant and the rate of extinction has significantly declined. However, the rate of extinction is again on the rise due to the combined effects of global environmental pollution, climatic changes and over- exploitation of flora and fauna by human beings. The next decade will see a wildlife holocaust. By the tum of the century a million kinds of animals, plants and insects are threatened to be driven to extinction. By 2050, half of the species existing today may be lost forever. The disaster threatens to rival the mass extinction of 65 mil1ion years ago. Species are now becoming extinct at 25,000 times the natural rate. By 2000 AD,several are likely to be vanishing every hour. While one vertebrate species became extinct every thousand years in natural course, now it is getting in every nine months.[21]

Mankind has altered the environment for millennia, causing some species to prosper and others to suffer. Human activity is now changing the natural world at a rate unprecedented in evolutionary history, and mass extinctions are a virtual certainty. A million species may disappear by the end of the century. The World Conservation Monitoring Centre (WCMC) estimates that some 22,000 plant and animal species are threatened with extinction mainly due to deforestation of the tropical forest. The seriousness of the problem is multiplied enormously when the

[21] Myers, N. 1979: *"The Sinking ark: A New Look At the Problem of Disappearing Species"*, Pergamon Press, New York, p.36.

plants get extinct, as they form the base of the 'ecological pyramid' and constitute the 'primary producer' of the food chain in the global ecosystem upon which depend all other species of life including human beings. There are some 'key species' upon which an average about 24 species in food chain depend for their very survival. Thus disappearing plants can take with them from 10 to 30 dependent species of insects, birds and even higher animals and parasitic plants and adversely affect the human ecosystem. Even the loss of a single species is a tragedy, because each form of life is a storehouse of irreplaceable substances, the 'genetic materials'. [22]

In India the loss of biodiversity and extinction of species has been alarming like any other developing country. More and more species are becoming endangered and are at risk of getting extinct. The lesser one horned rhinoceros, and the hunting leopard (cheetah) have already become extinct. Botanical Survey of India has prepared an inventory of threatened species and compiled 3 volumes of Red Data Book of Indian plants. According to it over 3000 plant species are endangered, out of which large numbers of species are of great medicinal value. There has been severe erosion in the crop diversity too. At the middle of the last century Indian farmers were cultivating 50,000 varieties of rice. By 2005 A.D. they will probably grow not more than 50 varieties.[23]

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[22] Swaminathan, M.S. (1994): *"Towards a Rich Genetic Estate"*, The Hindu Jan 2, 1994.

[23] Chauhan, S. S. (2001), *op-cit.*, p.31.

2.9. Conclusion:

The biologists and environmentalists of world warn that the species extinction is a threat to the civilization as it is 'second only to thermonuclear war' in its severity. The consequences could be literally quite incalculable. Life on earth will, at best, take millions of years to recover. An extremely ironical and worrying aspect of this situation is that even if all destructive human activities were to cease immediately, species extinction due to the impacts that have already taken place would continue for decades. What adds to the tragedy is our limited knowledge of the earth's biodiversity, as an ever-increasing number of species are being lost without even being discovered, much less studied. All other environmental problems like pollution, global warming and ozone depletion can be overcome but, for the loss of biodiversity, species once lost from the face of earth cannot be brought back. s

Thus the importance of biodiversity to the existence of human life on earth cannot be undermined. It thus becomes our moral, social and ethical responsibility not only to protect the biodiversity but also share its products equitably among the inhabitants of earth.

Chapter III

International Dialogues on Biodiversity: From Rio to Johannesburg

Throughout history, human societies have established rules and customs to keep the use of natural resources within limits in order to avoid long-term damage to the resources. Aspects of biodiversity management have been on the international agenda for many years, although early international environmental treaties were primarily concerned with controlling the excess exploitation of particular species.[1]

The origins of modern attempts to manage global biological diversity can be traced to the United Nations Conference on Human Environment held in Stockholm in 1972, which explicitly identified biodiversity conservation as a priority. The Action Plan in Programme Development and Priorities adopted in 1973, at the first session of the Governing Council of UNEP, identified the, "Conservation of nature, wildlife and genetic resources" as a priority area. The international importance of conservation was confirmed by the adoption, in the same decade, of the Convention on Wetlands (1971), the World Heritage Convention (1972), the Convention on International Trade in Endangered Species (1973), and the Convention on Migratory Species (1979) as well as various regional conventions.[2]

Rapid changes are being driven by accelerating of loss of biodiversity worldwide.[3] Though various policy measures had been taken by international

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[1] Sinha, Rajiv K. (1996), *"Biodiversity Convention and the North – South Conflict Over Rights and Access to Genetic Resources"* In Global Biodiversity, INA Shree pub., Jaipur, p. 189.

[2] Sahai, Suman ed., (1999), *"Bioresources and Biotechnology: Policy Concerns for the Asian Region"* Gene Campaign New Delhi, p. 68.

[3] Grumbine, R.E., ed., (1999), *"Environment Policy and Biodiversity"* Island press, California, p. 4.

community from time to time to conserve the global biodiversity but real breakthrough come with the inception of Rio convention 1992.The convention represents the first time a large majority of the world's states have come together and agreed a binding legal instrument in the field of biodiversity conservation. Up to the Johannesburg summit in 2002, during the last ten years international community has taken various measures through summits, Conference of the Parties (COP), Intergovernmental Committees and also through informal meetings.

3.1. Institutional Structure of the Convention:

The biodiversity convention contains specific articles that promote international technical and scientific cooperation among contracting parties, in particular between developed and developing countries.[4] The Convention establishes the standard institutional elements of a modern environmental treaty, governing body, the Conference of the Parties, a Secretariat; a scientific advisory body, a clearing-house mechanism and a financial mechanism. Collectively, these translate the general commitments of the Convention into binding norms or guidelines, and assist Parties with implementation. Because the Convention is more than a framework treaty, many of its provisions require further collective elaboration in order to provide a clear set of norms to guide States and

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[4] Castri, F. and Younes ,T. ed., (1996), *"Biodiversity, Science and Development"* CAB International, Willinford, U.K., p. 31.

stakeholders in their management of biodiversity[5]. Development of this normative basis centres on decisions of the Conference of the Parties (COP), as the governing body of the Convention process. The principal function of the COP is to regularly review implementation of the Convention and to steer its development, including establishing such subsidiary bodies as may be required. The COP meets on a regular basis and held five meetings in the period 1994 to 2000. At its fifth meeting (2000) the COP had decided that it would henceforth meet every two years.

The Subsidiary Body on Scientific, Technical and Technological Advice (SBSTTA) is the principal subsidiary body of the COP. Its mandate is to provide assessments of the status of biological diversity, assessments of the types of measures taken in accordance with the provisions of the Convention, and advice on any questions that the COP may put to it.

The principal functions of the Secretariat are to prepare for and service meetings of the COP and other subsidiary bodies of the Convention, and to coordinate with other relevant international bodies. The Secretariat is provided by UNEP and is located in Montreal, Canada.

The Convention provides for the establishment of a clearing-house mechanism to promote and facilitate technical and scientific cooperation (Article 18). A pilot phase of the clearing-house mechanism took place from 1996 to 1998 and, following evaluation of this, the COP has approved a clearing-house mechanism strategic plan and a programme of work until 2004.

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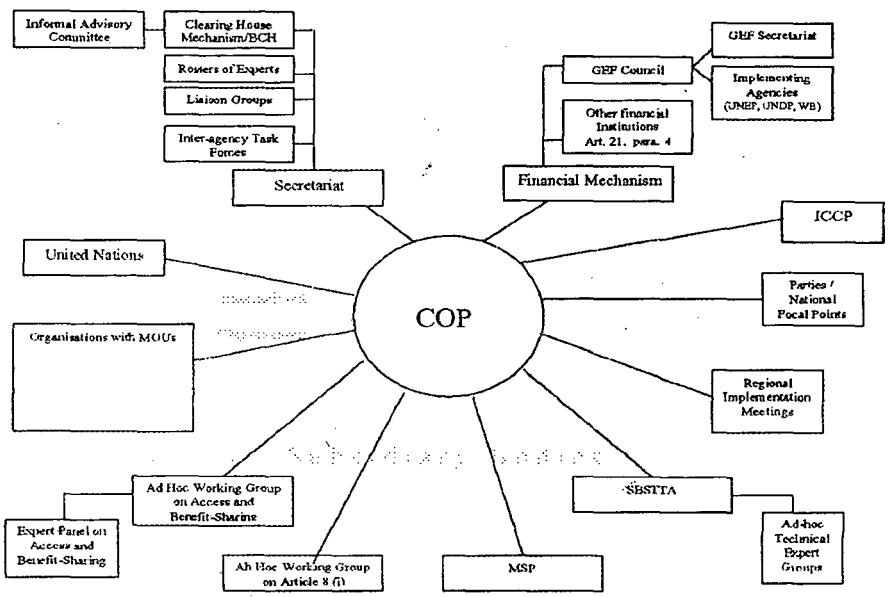
[5] McConnell, (1996), *"The Biodiversity Convention: A Negotiating History"* Kluwer Law International, London, The Hague, Boston,p. 46.

Figure. Institutions of the Convention



Source: Global Biodiversity Outlook (2001)

The Convention establishes a financial mechanism for the provision of resources to developing countries for the purposes of the Convention. The financial mechanism is operated by the Global Environment Facility (GEF) and functions under the authority and guidance of, and is accountable to the COP. GEF activities are implemented by the United Nations Development Programme (UNDP), UNEP and the World Bank. Under the provisions of the Convention, developed country Parties undertake to provide new and additional financial resources to enable developing country Parties to meet the agreed full incremental cost of implementing the obligations of the Convention (Article 20). In

addition to the provision of resources through the GEF, these Parties may also provide financial resources through bilateral and multilateral channels.

3.2. Earth Summit 1992:

In 1992, the largest-ever meeting of world leaders took place at the United Nations Conference on Environment and Development in Rio de Janeiro, Brazil. A historic set of agreements was signed at the "Earth Summit", including two binding agreements, the Convention on Climate Change, which was targeted to check industrial and other emissions of greenhouse gases such as carbon dioxide, and the Convention on Biological Diversity, the first global agreement on the conservation and sustainable use of biological diversity. The biodiversity treaty gained rapid and widespread acceptance. The CBD, negotiated under the auspices of the United Nations Environment Programme (UNEP), was opened for signature at the Earth Summit in Rio de Janeiro in June 1992, and entered into force on 29 December 1993. To date, 186 countries have ratified the Convention[6].

3.2.1. Objectives of the Convention:

The Convention has three main objectives[7]:

- Conservation of biodiversity,
- Sustainable use of the components of biodiversity, and

[6] Sinha, Rajiv K. (1996), *op-cit*, p. 35.

[7] See Convention on Biological Diversity text, Article 1.

- Sharing the benefits arising from the commercial and other utilization of genetic resources in a fair and equitable way

The Convention is comprehensive in its goals, and deals with an issue so vital to humanity's future, that it stands as a landmark in international law[8]. It recognizes, for the first time, that the conservation of biological diversity is "A common concern of humankind" and is an integral part of the development process. The agreement covers all ecosystems, species, and genetic resources.[9] It links traditional conservation efforts to the economic goal of using biological resources in a sustainable manner.[10] It sets principles for the fair and equitable sharing of the benefits arising from the use of genetic resources, notably those destined for commercial use. It also covers the rapidly expanding field of biotechnology, addressing technology development and transfer, benefit-sharing and biosafety. Importantly, the Convention is legally binding; countries that join it are obliged to implement its provisions.

3.2.2. Importance of the Convention:

The Convention reminds decision-makers that natural resources are not infinite and sets out a new philosophy for the 21st century, of sustainable use. While past conservation efforts were aimed at protecting particular species and

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[8] Nagore, Arjun Prasad, *"Biological Diversity and International Law"* A.P.H. Publishing corp., New Delhi p. 52.

[9] Sanchez and Juma, (1994), *"Biodiplomacy: Genetic Resources and International Relations"* African Centre for Technology Studies, Nairobi, Kenya, p. 10.

[10] Swanson, Timothy, (1997), *"Global Action Plan for Biodiversity"* Earth scan publications and IUCN, London, p. 170.

habitats, the Convention recognizes that ecosystems, species and genes must be used for the benefit of humans. However, this should be done in a way and at a rate that does not lead to the long-term decline of biological diversity.

The Convention also offers decision-makers guidance based on the precautionary principle that where there is a threat of significant reduction or loss of biological diversity, lack of full scientific certainty should not be used as a reason for postponing measures to avoid or minimize such a threat. The Convention acknowledges that substantial investments are required to conserve biological diversity.[11] It argues, however, that conservation will bring us significant environmental, economic and social benefits in return.[12]

3.2.3. Issues:

Some of the many issues dealt with under the Convention include:

- Measures and incentives for the conservation and sustainable use of biological diversity.
- Regulated access to genetic resources.
- Access to and transfer of technology, including biotechnology.
- Technical and scientific cooperation.
- Impact assessment.
- Education and public awareness.
- Provision of financial resources.

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[11] Kothari, Ashish, (1997), *"Understanding Biodiversity: Life Sustainability and Equity"* Orient Longman,, New Delhi, p. 116.

[12] Swanson, Timothy, (1997), *op-cit.*, p. 170.

3.3. Conference of Parties: The Conference of the Parties is the governing body of the Convention, and advances implementation of the Convention through the decisions it takes at its periodic meetings. [13]

To date the Conference of the Parties has held six ordinary meetings, and one extraordinary meeting (the latter, to adopt the Biosafety Protocol, was held in two parts). From 1994 to 1996, the Conference of the Parties had held its ordinary meetings annually. Since then these meetings had been held somewhat less frequently and. Following a change in the rules of procedure in 2000, the conference will now be held every two years. To date the Conference of the Parties has taken a total of procedural and substantive decisions. The Seventh meeting of the Conference of the Parties will be held in Kuala Lumpur, Malaysia (March 2004).

The agenda of the meetings of the Conference of the Parties is very wide-ranging, reflecting the programme of work the Conference of the Parties has established for itself. Following are the main agenda discussed in the Conference of the Parties (COP) and in the Subsidiary Body on Scientific, Technical and Technological Advice (SBSTTA):

3.3.1. COP-1: The first meeting of the Conference of the Parties (Nassau, the Bahamas, November-December 1994) adopted decisions on: the medium-term work programme; designation of the permanent Secretariat; establishment of the Clearing-House Mechanism (CHM) and the Subsidiary Body on Scientific,

[13] See Convention on Biological Diversity text, Article 23.

Technical and Technological Advice (SBSTTA); and designation of the Global Environment Facility (GEF) as the interim financial mechanism.[14]

3.3.2. COP-2: Major outcomes of the second meeting of the COP (Jakarta, Indonesia, November 1995) included: designation of Montreal, Canada, as the permanent location of the Secretariat; establishment of the Open-ended Ad Hoc Working Group on Biosafety; adoption of a programme of work; and consideration of marine and coastal biodiversity.[15]

3.3.3. COP-3: At its third meeting (Buenos Aires, Argentina, November 1996) the COP adopted decisions on several topics, including: work programmes on agricultural and forest biodiversity; a Memorandum of Understanding with the GEF; an agreement to hold an intersessional workshop on Article 8(j) regarding traditional knowledge; an application by the Executive Secretary for observer status to the World Trade Organization's (WTO) Committee on Trade and the Environment; and a statement from the CBD to the Special Session of the UN General Assembly to review implementation of Agenda 21.[16]

3.3.4. COP-4: At its fourth meeting (Bratislava, Slovakia, May 1998) the COP adopted decisions on: inland water ecosystems; marine and coastal biodiversity; agricultural and forest biodiversity; the CHM's pilot phase; Article 8(j) on traditional knowledge; national reports; cooperation with other agreements, institutions and processes; activities of the GEF; incentive measures; access to

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[14] Bhagabati, Moana(1995), "Problems with Biosafety"; *Down To Earth*, New Delhi, Jan., 15.

[15] Campbell, Davenport etal.(1998), *"Earth Negotiations Bulletin"*, Vol. 9, No. 96,18th May 1998, International institute for sustainable development (IISD), p. 14.

[16] Ibid , p. 15.

genetic resources and benefit-sharing (ABS); public education and awareness; and the long-term work programme. A Ministerial Round Table was convened to discuss integrating biodiversity concerns into sectoral activities, such as tourism, and private sector participation in implementing the Convention's objectives.[17]

3.3.5. ISOC: The first Intersessional Meeting on the Operations of the Convention (Montreal, Canada, June 1999) considered possible arrangements to improve preparations for and conduct of COP meetings. ISOC also held discussions on: ABS; ex situ collections acquired prior to the Convention's entry into force; and the relationships among intellectual property rights (IPR), relevant provisions of the Agreement on Trade-Related Aspects of Intellectual Property Rights (TRIPs), and the CBD.

3.3.6. COP-5: At its fifth meeting (Nairobi, Kenya, May 2001) the COP adopted decisions on a work programme on dry and sub-humid lands; the ecosystem approach; access to genetic resources; alien species; sustainable use; biodiversity and tourism; incentive measures; the Global Strategy for Plant Conservation; the Global Taxonomy Initiative (GTI); the CHM; financial resources and mechanism; identification, monitoring and assessment, and indicators; and impact assessment, liability and redress. COP-5 also included a high-level segment on the Cartagena Protocol on Biosafety, with a Ministerial Round Table and a special signing ceremony.[18]

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[17] Rosendal, Kristin, (2000), *"The Convention on Biological Diversity and Developing Countries"* Kluwer Academic publishers, Dordrecht, Nether land, p. 98.

[18] The Hindu dated 1st June 2001.

3.3.7. COP-6: The sixth meeting of the COP took place from 7-19 April 2002 in The Hague, the Netherlands. It adopted a revised work programme for forest biodiversity; guiding principles for alien species; the Bonn Guidelines on ABS; and the Strategic Plan. Its outcome also included decisions on: the Global Strategy for Plant Conservation; the GTI; the ecosystem approach; sustainable use; incentive measures; liability and redress; the CHM; financial resources and mechanism; cooperation with other conventions and international initiatives; a contribution to the ten-year review of Agenda 21; and Article 8(j) on traditional knowledge. A high level segment on the World Summit on Sustainable Development, including a Ministerial Round Table and a multi-stakeholder dialogue, were convened during the meeting.[19]

The COP has also undertaken to prepare and develop a Strategic Plan for the Convention, with a view to adopting it at its sixth meeting. The plan will initially cover the period 2002-2010. It will be based on the longer-term programmes of work of the COP and Subsidiary Body on Scientific, Technical and Technological Advice (SBSTTA) and is intended to provide strategic and operational guidance for the implementation of these programmes. It will contain a set of operational goals that the Conference of the Parties wishes to be achieved in the period covered by the plan, relating to the three main areas of work, these being the thematic programmes, cross-cutting issues and initiatives, and the implementation of the provisions of the Convention.

[19] The Hindu dated 20th may 2002.

3.4. Subsidiary Body on Scientific, Technical and Technological Advice (SBSTTA):

Article 25 establishes an open-ended intergovernmental scientific advisory body known as the Subsidiary Body on Scientific, Technical and Technological Advice (SBSTTA).[20] SBSTTA is a subsidiary body of the Conference of the Parties (COP) and is to report regularly to the COP on all aspects of its work. Its functions include: providing assessments of the status of biological diversity; assessments of the types of measures taken in accordance with the provisions of the Convention; and respond to questions that the COP may put to the body. [21]

SBSTTA has met eight times till date and produced a total of 71 recommendations to the Conference of the Parties, ten of which have been endorsed in full by the latter. Such endorsements make these recommendations de facto decisions of the Conference of the Parties. Parts of other recommendations have also been endorsed, and many others have been taken up in modified form.

The Ninth Meeting of the Subsidiary Body on Scientific, Technical and Technological Advice will be held in Montreal, Canada (10 - 14 November 2003).

3.4.1. SBSTTA-1: SBSTTA-1 (Paris, France, September 1995) produced recommendations on: SBSTTA's modus operandi; components of biodiversity under threat, access to and transfer of technology; scientific and technical

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[20] See Convention on Biodiversity text, Article 25.

[21] Campbell Davenport etal. (1998), *"Earth Negotiations Bulletin"*, Vol. 9, No. 96,18th May 1998, International institute for sustainable development (IISD).

information to be contained in national reports, contributions to the UN Food and Agriculture Organization (FAO) meetings on plant genetic resources for food and agriculture. and marine and coastal biodiversity. SBSTTA-1 requested flexibility to create two open-ended working groups to meet simultaneously during future SBSTTA meetings, ad hoc technical panels of experts as needed; and a roster of experts.[22]

3.4.2. SBSTTA-2: SBSTTA-2 (Montreal, Canada, September 1996) produced recommendations on monitoring and assessment of biodiversity; approaches to taxonomy; economic valuation of biodiversity, access to genetic resources, agricultural biodiversity, terrestrial biodiversity, marine and coastal biodiversity, biosafety; and the CHM.

3.4.3. SBSTTA-3: At SBSTTA-3, (Montreal, September 1997) delegates considered the implementation of the CHM's pilot phase, and formulated recommendations on biodiversity in inland waters, marine and coastal biodiversity, agricultural biodiversity, forest biodiversity; biodiversity indicators, and participation of developing countries in the SBSTTA.

3.4.4. SBSTTA-4: During its fourth meeting (Montreal, June 1999), SBSTTA delegates made recommendations on: SBSTTA's work programme, the GTI, guiding principles to prevent the impact of alien species, control of plant gene expression, sustainable use of terrestrial biodiversity; incorporation of biodiversity into environmental impact assessment, and approaches and practices for sustainable use of biological resources, including tourism.

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[22] Ibid, 18th May1998.

3.4.5. SBSTTA-5: The SBSTTA's fifth session (Montreal, January-February 2000) developed recommendations on, inter alia, inland water biodiversity, forest biodiversity, agricultural biodiversity, marine and coastal biodiversity, including coral bleaching, a programme of work on dry and sub-humid lands, alien species, the ecosystem approach, indicators, the pilot phase of the CHM, the second national reports, and ad hoc technical expert groups.

3.4.6. SBSTTA-6: The sixth meeting of the SBSTTA (Montreal, March 2001) featured a streamlined agenda with a focus on invasive alien species and emphasis on providing background information through presentations, side events, round tables and additional documentation. Recommendations were adopted on ad hoc technical expert groups, marine and coastal biodiversity, inland water ecosystems, invasive alien species, scientific assessments, the GTI, biodiversity and climate change; and migratory species.[23]

3.4.7. SBSTTA-7: The seventh session of SBSTTA (Montreal, November 2001) focused on forest biodiversity and its draft work programme, while also producing recommendations on agricultural biodiversity, including the International Pollinators Initiative, the Global Strategy for Plant Conservation, incentive measures, indicators, and environmental impact assessment.[24]

3.5. Cartagena Protocol on Biosafety:

Article 19.3 of the CBD provides for Parties to consider the need for and modalities of a protocol setting out procedures in the field of the safe transfer, handling

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[23] Ibid, 18th May1998.

[24] See Convention on Biological Diversity text, Article 19.3.

and use of living modified organisms (LMOs) that may have an adverse effect on biodiversity and its components.[25] A Biosafety Working Group (BSWG) was established to this end at COP-2. Following five years of negotiations, the Cartagena Protocol on Biosafety was agreed in January 2000. It addresses the safe transfer, handling and use of LMOs that may have an adverse effect on biodiversity, taking into account human health, with a specific focus on transboundary movements.[26] It establishes an advance informed agreement (AIA) procedure for imports of LMOs for intentional introduction into the environment, and also incorporates the precautionary principle and mechanisms for risk assessment and risk management. The Protocol further establishes a Biosafety Clearing-House (BCH) to facilitate information exchange, and contains provisions on capacity building and financial resources with special attention to developing countries and those with domestic regulatory systems[27].

3.6. Biosafety Working Group:

The BSWG met six times between 1996 and 1999. Delegates used the first two meetings to define issues and terms and to articulate positions. By the third meeting, in October 1997, delegates had produced a consolidated draft text to serve as the basis for negotiation, established two sub-working groups to address the core articles of the Protocol and also formed a contact group on institutional matters and final clauses.[28] The fourth and fifth meetings focused on

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[25] Bail, Falkner and Marquard, ed., (2002), "The Cartagena Protocol on Biosafety", Earthscan publication Limited, London, p. 6.

[26] Krattiger etal. (1994), *"Widening Perspective on Biodiversity"* Natraj Pub., Dehradun, p. 282.

[27] Bail, Falkner and Marquard, ed., (2002), *op-cit*, p. 4.

[28] Ward, Halina, (2000), "Introduction and Overview" , *International Affairs* ,Vol. 76(2), Apr.2000,

reducing and refining options for each article of the draft Protocol.[29] The final meeting of the BSWG (Cartagena, Colombia, February 1999) was intended to finalize negotiations on the Protocol for submission to the first Extraordinary Meeting of the Conference of the Parties (ExCOP) immediately following BSWG-6. Despite intense negotiations, delegates were not able to finalize the Protocol, disagreeing primarily over its scope, trade-related issues and treatment of LMOs for food, feed or processing (LMO-FFPs).[30]

3.7. Extraordinary Meeting of the Conference of the Parties (ExCOP):

The first ExCOP (Cartagena, Colombia, February 1999), immediately following BSWG-6, sought to develop a compromise package over two days of non-stop negotiations, under the guidance of Juan Mayr, Minister of Environment of Colombia.[31] Unable to do so, the ExCOP adopted a decision to suspend the meeting, which would be resumed based on further consultations. Outstanding issues included: inclusion of LMO-FFPs within the Protocol's scope, the Protocol's relation to other agreements, most especially those related to trade, the application of the AIA procedure, particularly with regard to the precautionary principle, and requirements for documentation and identification.

Informal Consultations: After the meeting's suspension, three sets of informal consultations (Montreal, July 1999; Vienna, September 1999; and Montreal,

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p. 219.

[29] Bail, Falkner and Marquard, ed., (2002), *op-cit,* p. 57.

[30] Ibid, p. 59.

[31] Ibid, p. 73.

January 2000) were held under ExCOP President Mayr's chairmanship to address outstanding issues. These meetings included spokespersons from the five major negotiating groups: the Central and Eastern European countries (CEE); the Compromise Group (Japan, Mexico, Norway, Republic of Korea and Switzerland); the European Union (EU); the Like-Minded Group (the majority of developing countries); and the Miami Group (Argentina, Australia, Canada, Chile, the US and Uruguay).

Resumed Excop: The resumed ExCOP (Montreal, January 2000) followed the final set of informal consultations and, after seven days of intensive negotiations, adopted the Cartagena Protocol on Biosafety in the early morning hours of 29 January 2000.[32] The ExCOP also established the Intergovernmental Committee for the Cartagena Protocol on Biosafety (ICCP), under the chairmanship of Amb. Philémon Yang (Cameroon) and advisement of an ICCP Bureau, to undertake preparations for the first Meeting of the Parties (MOP). The ExCOP requested the CBD's Executive Secretary to start preparatory work on the development of a BCH, and established a regionally balanced roster of experts to be nominated by governments to provide advice and support upon request.

3.8. Intergovernmental Committee for the Cartagena Protocol on Biosafety (ICCP):

3.8.1. ICCP-1: The first meeting of the Intergovernmental Committee (Montpellier, France, December 2000) discussed information sharing and the

[32] Falkner,Robert , "Regulating Biotech Trade: The Cartagena Protocol on Biosafety" *International Affairs*,,Vol. 76(2), Apr.2000, p. 305.

BCH, capacity building; the roster of experts, decision-making procedures; handling, transport, packaging and identification, and compliance. The meeting reflected a congenial "Montpellier Spirit" as a positive force in building confidence and political momentum.[33] ICCP-1 concluded with recommendations for intersessional activities and synthesis reports for each substantive item to be further considered by ICCP-2.

3.8.2. ICCP-2: The second meeting of the ICCP (Nairobi, Kenya, October 2001) developed recommendations on information sharing; handling, transport, packaging and identification, monitoring and reporting; capacity building, the roster of experts, guidance to the financial mechanism, decision-making procedures, liability and redress, compliance, consideration of other issues necessary for the Protocol's implementation, the Secretariat; Rules of Procedure, cooperation with the International Plant Protection Convention under other matters; and preparatory work for MOP-1.[34] ICCP-2 highlighted continued concerns regarding capacity building and information sharing as essential elements for the Protocol's ratification and implementation at the national level.

3.8.3. ICCP-3: The third meeting of the Intergovernmental Committee (The Hague, the Netherlands, April 2002) adopted recommendations on liability and redress, compliance, information sharing, capacity building, the roster of experts,

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[33] Bail, Falkner and Marquard, ed., (2002), *op-cit,* p. 77.

[34] Ibid ,p. 79.

handling, transport, packaging and identification; monitoring and reporting; other issues necessary for the Protocol's implementation; and entry into force.[35] The most contentious issues concerned compliance, liability and redress, and documentation for LMO-FFPs, contained use and intentional introduction. The meeting's difficulties with the pace and sense of urgency, as well as contentious discussions over process and texts to be transmitted to MOP-1, reflected the end of the "Montpellier Spirit" established at ICCP-1.

3.9. Working Group on Access and Benefit-Sharing

The Convention contains provisions on access to genetic resources and the sharing of benefits arising out of their use, which address both users and providers, contained in Articles 15 (Access to Genetic Resources), 16.3 (access to and transfer of technology that makes use of genetic resources), 19.1 (participation in biotechnological research on genetic resources) and 19.2 (access to results and benefits from biotechnologies).[36] The Ad Hoc Open-ended Working Group on Access and Benefit-sharing (ABS) was established by COP Decision V/26.[37]

The second COP meeting adopted a decision, requesting the CBD Executive Secretary to further elaborate a survey of measures taken by

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[35] Ibid, p. 81.

[36] See Convention on Biological Diversity text, Article 15, 16, 19.

[37] Rosendal, Kristin, (2000), *op-cit.*, p. 107.

governments to implement Article 15.[38]The COP-3 considered a compilation of views from Parties on possible options for developing national legislative, administrative or policy measures to implement Article 15.[39] In Decision III/ 15, the COP urged governments to submit relevant information on possible elements for guidelines and other measures for the implementation of Article 15. Based on this and other COP-3 decisions, the CBD Executive Secretary called for case studies on ABS mechanisms to prepare a synthesis for COP-4.

The COP-4 addressed matters related to benefit-sharing, including, inter alia, measures to promote and advance the distribution of benefits from biotechnology in accordance with Article 19, and the compilation of Parties' views on possible options for developing national legislative, administrative or policy measures to implement Article 15. In Decision IV/8, the COP established a regionally balanced Panel of Experts on ABS, to be appointed by governments and composed of representatives from the private and public sectors, and indigenous and local communities. The Panel's mandate was to develop a common understanding of basic concepts and to explore options for ABS on mutually agreed terms (MAT), including guiding principles, guidelines and codes of best practices for ABS arrangements. In Decision IV/16, the COP decided to hold a preparatory discussion on access to genetic resources at the ISOC to provide input into COP-5.

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[38] Campbell, Davenport etal.(1998), *"Earth Negotiations Bulletin"*, Vol. 9, No. 96,18th May 1998, International institute for sustainable development (IISD).

[39] Ibid, 18th May 1998.

3.9.1. ISOC: The ISOC (Montreal, June 1999), inter alia, conducted preparatory discussions on ABS arrangements to provide guidance to COP-5, made recommendations for the preparation, composition and agenda of the Experts' Panel on ABS; and made recommendations for future work to develop a common appreciation of the relationship between intellectual property rights and relevant provisions of the WTO Agreement on Trade-Related Aspects of Intellectual Property Rights (TRIPS Agreement).

3.9.2. ABS EP-1: The first Experts' Panel on ABS (San José, Costa Rica, October 1999) focused on four items, ABS arrangements for scientific and commercial purposes; legislative, administrative and policy measures at the national and regional levels, regulatory procedures and incentive measures, and capacity building. Significant discussion revolved around issues of IPR and the use and terms of contractual ABS agreements. The Panel developed a set of recommendations, which included general conclusions and specific points on prior informed consent (PIC), mutually agreed terms (MAT), information needs and capacity building.[40]

The COP-5 adopted Decision V/26, which established an Ad hoc Open-ended Working Group to develop guidelines and other approaches on: PIC; MAT; roles, responsibilities and participation of stakeholders; aspects of in situ and ex situ conservation and sustainable use; mechanisms for benefit-sharing; and the preservation and maintenance of traditional knowledge. COP-5 also decided to reconvene the Experts' Panel on ABS to provide further input to the Working

[40] Rosendal, Kristin, (2000), *op-cit*, p.123.

Group. Decision V/26 also addresses ex situ collections acquired prior to the CBD's entry into force, IPR and relevant provisions of the TRIPS Agreement.[41]

3.9.3. ABS EP-2: The second Experts' Panel on ABS (Montreal, March 2001) produced a report and conclusions on: user and provider experience in ABS processes; approaches for stakeholder involvement in ABS processes; and complementary options to address ABS within the CBD's framework, including possible elements for guidelines. The Panel's report and conclusions were forwarded as an input into the first meeting of the Working Group on ABS.

3.9.4. First Meeting Of The Working Group On ABS (ABS-1): At the first meeting of the Working Group on ABS (Bonn, Germany, October 2001), delegates developed the draft Bonn guidelines on ABS and also identified elements for a capacity-building action plan, called for an open-ended workshop on capacity building for ABS, and considered the role of IPR in implementation of ABS arrangements.

The COP-6 adopted Decision VI/19 which addresses: the Bonn Guidelines on ABS, other approaches, including capacity building; the role of IPR in the implementation of ABS arrangements, the relationship with TRIPS, cooperation with other relevant intergovernmental organizations, information related to ABS arrangements, and ex situ collections acquired prior to the CBD's entry into force and not addressed by the FAO Commission on Genetic Resources for Food and Agriculture.

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[41] Bail, Falkner and Marquard, ed., (2002), *op-cit*, p. 67.

3.10. Working Group on Article 8(J) and Related Provisions:

Article 8(j) of the CBD states that Parties will, subject to national legislation, respect, preserve and maintain knowledge, innovations and practices of indigenous and local communities embodying traditional lifestyles relevant for the conservation and sustainable use of biodiversity; promote their wider application with the approval and involvement of knowledge-holders; and encourage the equitable sharing of benefits arising from the utilization of such knowledge, innovations and practices.[42] Related provisions of the Convention include: Article 10(c), which calls on Parties to protect and encourage customary use of biological resources in accordance with traditional cultural practices[43]; Article 17.2, which addresses scientific and technical information exchange with specific reference to traditional knowledge[44]; and Article 18.4, which states that Parties shall encourage and develop methods of cooperation for the development and use of technologies, including indigenous and traditional technologies, pursuant to the CBD's objectives[45].

Additionally, CBD discussions on cross-cutting themes, such as the ecosystem approach, ABS, and the CHM, as well as the specific ecosystem themes, have addressed the integration of considerations relating to Article 8(j) and indigenous and local communities.

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[42]. See Convention on Biological Diversity text, Article 8.

[43] See Convention on Biological Diversity text, Article 10(c).

[44] See Convention on Biological Diversity text, Article 17.2.

[45] See Convention on Biological Diversity text, Article 18.4.

In COP-2 Decision II/12 on IPR, calls for consultation with all stakeholders, particularly indigenous and local communities, to improve the understanding of the needs and concerns of such groups, as well as for a preliminary analysis of IPR systems, which could focus on the preservation and maintenance of traditional knowledge.

In COP-3 delegates adopted Decision III/14, which, inter alia: requests Parties to develop national legislation to implement Article 8(j); invites case studies on the implementation of Article 8(j) and related provisions; requests the interim financial mechanism to examine support of capacity-building projects for indigenous and local communities; and establishes a process to advance work on implementation of Article 8(j), including the organization of an intersessional workshop.

3.11. Workshop on Traditional Knowledge:

The Workshop on Traditional Knowledge and Biological Diversity (Madrid, Spain, November 1997) met to produce recommendations for the COP on how to advance the implementation of Article 8(j).[46] The workshop produced a report, which contains an extensive list of options and recommendations on participatory mechanisms, status and trends in relation to Article 8(j), traditional cultural practices for conservation and sustainable use, equitable sharing of benefits, exchange and dissemination of information, monitoring; and legal elements. The report also includes recommendations for actions at the national and

[46] See Convention on Biological Diversity text, Article 8(j).

international levels, and suggests terms of reference for establishing an open-ended working group or a subsidiary body on Article 8(j).

In COP-4 delegates discussed the development of a work programme on Article 8(j) and the formation of an ad hoc working group. Decision IV/9 establishes a working group to provide advice on the development of a work programme on Article 8(j) and its implementation, based on the report of the Madrid workshop. The decision also calls for: representation from indigenous and local communities to the widest extent possible; short- and medium-term work programmes, case studies relating to Article 8(j), and application for observer status to and development of a memorandum of understanding with the World Intellectual Property Organization (WIPO).

3.11.1. First Meeting of the Working Group on Article 8(J):

The first meeting of the Working Group on Article 8(j) (Seville, Spain, March 2000) considered elements for a work programme on Article 8(j), including participatory mechanisms for indigenous and local communities, equitable sharing of benefits, legal elements, status and trends in relation to Article 8(j) and related provisions, traditional cultural practices for conservation and sustainable use, exchange and dissemination of information, and monitoring. The Working Group also addressed the application and development of legal and other appropriate forms of protection for traditional knowledge, international cooperation among indigenous and local communities, and opportunities for collaboration and implementation of the work programme.[47]

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[47] Kate,K.T.,and Laird S.A., "Biodiversity and Business :Coming to Term with 'Grand Bargain' " *International Affairs* ,Vol. 76(2), Apr.2000, p. 259.

In COP-5 delegates discussed the report of the first meeting of the Working Group on Article 8(j), including its recommendations for a proposed work programme and advice on the application and development of legal and other appropriate forms of protection. Decision V/16 establishes a work programme with two phases. The first phase would address participatory mechanisms, status and trends, benefit-sharing, exchange and dissemination of information, and monitoring and legal elements. The second phase would also consider traditional cultural practices for conservation and sustainable use, exchange and dissemination of information, and monitoring elements. The decision extends the Working Group's mandate to address progress in implementation and increased participation of indigenous and local communities in other thematic work programmes of the CBD. It also notes the importance of case studies and sui generis systems for protecting traditional knowledge, while recognizing the importance of maintaining cultural identities and the material base of such knowledge.

3.11.2. Second Meeting of the Working Group on Article 8(J):

The Working Group's second meeting (Montreal, February 2002) considered an outline for the composite report on the status and trends of traditional knowledge, draft guidelines/recommendations for the conduct of cultural, environmental and social impact assessments regarding developments proposed on or impacting the lands of indigenous and local communities, participatory mechanisms, and the effectiveness of existing instruments impacting the protection of traditional knowledge, particularly IPR.

In COP-6 Decision VI/25 calls for: a report on the integration of Article 8(j) into the CBD's thematic programmes; a review of the work programme's implementation; and conducting the first phase of the composite report for consideration at the third meeting of the Working Group on Article 8(j). It requests the Working Group to further work on guidelines for cultural, environmental and social impact assessments, and to address sui generis systems for the protection of traditional knowledge and the equitable sharing of benefits arising from its utilization. It invites WIPO to consider IPR mechanisms to protect traditional knowledge, and calls for cooperation with other environmental conventions, the Permanent Forum on Indigenous Issues, WIPO, GEF and other relevant organizations. It also calls for funding, improved communication and capacity building for indigenous participation through the establishment of a thematic focal point in the CHM.

3.12. The Johannesburg Summit:

Ten years ago we left the Rio Earth Summit full of hope. The official outcome of this summit certainly did little to raise new hopes, but a great deal happened in Johannesburg that are encouraging. [48]

The summit negotiators did not do much to assure that ten years from now the poor will be better off, or that our world be safer or more secure by virtue of Johannesburg agreements to address global environmental threats.

[48] The Hindu, 9th sept., 2002.

Unfortunately, there are too many gaps and too few teeth in the WSSD Plan of Action to assure real progress.[49]

It is tempting to blame it all on U.S. resistance to commitments and targets, and U.S. refusal to even discuss climate change. U.S. policies did cast a shadow over the summit. The U.S. which ratified the Climate Convention in 1992, has not only pulled out of the Kyoto Protocol, it has offered no alternative to address global warming. The U.S. has refused to ratify a long list of other global agreements on the environment, conveying a message of broad hostility to the idea of global cooperation to address global environmental problems. Nevertheless, in Johannesburg U.S. negotiators were adept, effective, and not nearly as hardline as U.S. conducts leading up to the Summit suggested they would be. Indeed, the Administration's clumsy unilateralism on climate, trade, Iraq, and the International Criminal Court, together with our creation of massive new agricultural subsidies, has created such a powerful impression globally, that it effectively masked the growing cynicism and rightward swing of Europe.

For months the U.S. denigrated the importance of this Summit, and fought to limit its agenda. The rest of the world gave in to that negative leadership. Issues were swept off the table. No binding agreement to improve the lives of the poor, value and protect biodiversity, create incentives to reduce the global economy's massive use of materials, or protect the Earth's climate was ever on the agenda.

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[49] The Hindu, 9th sept., 2002.

Rio was a hopeful moment because world leaders for the first time recognized the connection between global environmental threats - global warming, the extinction of species, the destruction of forests, reefs, and wetlands and the future well being of rich and poor alike. Rio produced bold declarations of intent to address those problems, and a pair of treaties on climate change and biodiversity that established frameworks for action, but left unresolved how to implement the treaties' broad goals.

Since then progress has been negligible. Greenhouse gas emissions continue to grow, stresses on the world's biodiversity have grown, and assistance to developed nations has declined. No discussion of the implications of the unfulfilled promises of Rio was on the WSSD agenda, but that history colored the proceedings. It was a failure of accountability following on ten years of failed commitments that created a corrosive mood of cynicism. It was difficult resist the sense that far from seeking to overcome the obstacles to blocked action in the last ten years the official process was, in the end, designed to produce only words. Nations that negotiate with dogged determination to achieve binding trade agreements have not yet been persuaded of the need to agree on how to protect the physical future of the oceans, atmosphere, and biological systems that sustain human life and make prosperity possible.

There were some successes in the negotiations. The WSSD Plan of Action calls for halving the proportion of people without access to proper sanitation by 2015, restoring depleted fish stocks by 2015, and significantly reducing the extinction rate of the world's plants and animals by 2010.

But that is not the most important outcome. This is the global era. The products we use, the clothes we wear, the food we eat, the Internet we rely on, and the environmental problems that will most profoundly affect our future are all global. We must find a way to deal with them globally. This Summit will be remembered not for the treaties, commitments, or eloquent declarations it produced, but for the first stirrings of a new way of governing the global commons, the beginnings of a shift from the stiff formal waltz of traditional diplomacy to the jazzier dance of improvisational solution oriented partnerships that may include non-government organizations, willing governments and other stakeholders.

3.13. Conclusion:

The Convention's success depends on the combined efforts of the world's nations. The responsibility to implement the Convention lies with the individual countries and, to a large extent, compliance will depend on informed self-interest and peer pressure from other countries and from public opinion. The Convention has created a global forum-actually a series of meetings-where governments, non-governmental organizations, academics, the private sector, and other interested groups or individuals share ideas and compare strategies.

Achieving the goals of the Convention will require progress on many fronts. Existing knowledge must be used more effectively; a deeper understanding of human ecology and environmental effects must be gained and communicated to those who can stimulate and shape policy change,

environmentally more benign practices and technologies must be applied, and unprecedented technical and financial cooperation at international level is needed. Much, much more needs to be done. The passage of the earth's biodiversity through the coming century will be its most severe test. With human population expected to rise dramatically, particularly in developing countries, and the consumer revolution set for exponential expansion - not to mention the worsening stresses of climate change, ozone depletion, and hazardous chemicals - species and ecosystems will face ever more serious threats.

These Conventions offers a comprehensive, global strategy for preventing such a tragedy. A richer future is possible. If governments and all sectors of society apply the concepts embodied in the Conventions and make the conservation and sustainable use of biological diversity a real priority, we can ensure a new and sustainable relationship between humanity and the natural world for the generations to come.

Chapter IV

Biodiversity and Attitudes of Developed Nations

After the Rio Summit, the whole world was divided into two political blocks of 'biological power' – the North being superior in 'biotechnology', and the South being rich in 'biodiversity'. The developed nations pressurized the South to agree to a list of especially valuable areas in the tropical rain forest, rich in biodiversity, as 'common property' for protection and forego their 'sovereign rights' over them. It was blatant 'eco-imperialism', which the rich nations wanted to force upon the poor.[1] Some developed nations, particularly the US, claim proprietorial rights over all the genetic material they import from anywhere in the world. In recent years, the developed nations have been freely exploiting the biodiversity of the South.

Control of the biodiversity of the South for profits is still the primary logic of North-South relationships on biodiversity. There have been countless controversies and accusations between the North and the South for unfair trade practices. While pointing its fingers at the South for unfair trade practices, the US freely exploits the biodiversity of the South and makes immense profits that are not shared with the original owner countries of the germ plasms. But this trend is not confined only to the US, and is the routine for many developed nations. Although there are innumerable instances when the biodiversity of the South contributed to the wealth of the developed countries, yet corporations, governments and aid agencies of the North continue to create legal and political frameworks to make the South pay for what it originally owns.

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[1] Sinha, Rajiv (1996), "*Biodiversity Convention and the North South Conflict Over Rights and Access to Genetic Resources; In Global Biodiversity*" INA Shree Pub., Jaipur.p. 191

The biodiversity convention has started out primarily as an initiative of the north to 'globalize' the control, management and ownership of biological diversity which due to ecological reason lies primarily in the Third World.[2] The North is continuously exploiting the South for its genetic resources. The intensity of this assault can be seen from the pressures exerted by major drug and agricultural input companies and their home governments on international political instruments such as the General Agreement on Trade and Tariffs (GATT) and the Food and Agricultural Organization (FAO) to recognize such resources as 'universal heritage' in order to guarantee for themselves free access to the raw materials.[3] These international patent and licensing agreements are increasingly being used to secure a monopoly over valuable genetic materials that can be developed into drugs, food, and energy resources.

The North countries are using biotechnology, consciously or unconsciously, as their newest and most promising addition to the arsenal of arms used to force the South into submission and to keep resources, including biodiversity, flowing unhindered into the North. They thus insisted, as they have been doing in the negotiations on the Uruguay Round of the GATT, on the inclusion of Article 16.2.[4] That they intended this to be a new and effective gap for the flow of resources to the North is seen from the fact that they blocked the

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[2] Shiva, Vandana (1993), "*Monocultures of the Mind*" Third World Network, Penang, Malaysia p.151.

[3] Chauhan ,S. S. (2001) "*Biodiversity ,Biopiracy and Biopolitics: The Global Perspective*" Kalinga Publication, Delhi, p. 134.

[4] Shiva, Vandana (ed.), 1994: "*Biodiversity Conservation: Whose Resource? Whose Knowledge?*" , Indian National Trust for Art and Cultural Heritage, New Delhi. p. 199

inclusion of even a mildly worded balancing provision on farmers' rights. The only concession that they made was to allow a statement to be made in Resolution Three, sponsored by the Scandinavian and some South countries, to the effect that the issue of 'farmers' rights' should be resolved which was adopted during the final act of the convention.

The outflow of resources from the South to the North is obvious. Hence, the North could no longer manage to completely refuse to accept that the South, thus impoverished, could not be expected to be an effective guardian of biodiversity needed by the biotechnology industry of the North, unaided by the North. The international financial agencies have become the instruments of the developed nations. They put certain pre-conditions for their aid programmes. The South being poor in terms of capital and technology has more or less submitted to the demands of these agencies. The World Bank, which continues to introduce biodiversity action plans, has been financing the destruction of the biodiversity of the South. It financed the Green Revolution that replaced genetically diverse indigenous cropping systems in the Third World with vulnerable and genetically uniform monocultures. It has accounted for erosion of agricultural diversity of the Third World to a large extent.

4.1. IPRs and Biodiversity: Some Contentious Issues

IPRs, as the term suggests, are meant to be rights to ideas and information, which are used in new inventions or processes. Intellectual property rights are used to grant private ownership to genetic and biochemical products

because of the ingenuity involved in finding, identifying and developing them.[5]These rights enable the holder to exclude imitators from marketing such inventions or processes for a specified time; in exchange, the holder is required to disclose the formula or idea behind the product or process.[6] The effect of IPRs is therefore monopoly over commercial exploitation of the idea/information, for a limited period. The stated purpose of IPRs is to stimulate innovation, by offering higher monetary returns than the market otherwise might provide. Intellectual property laws, typically viewed only as engines of industrial and cultural progress, have recently received attention as tools for achieving broader goals of conserving biodiversity while promoting sustainable development and the equitable sharing of resulting benefits.[7]

While IPRs such as copyrights, patents, and trademarks are centuries old, the extension of IPRs to living beings and knowledge/technologies related to them is relatively recent. In 1930, the U.S. Plant Patent Act was passed, which gave IPRs to asexually reproduced plant varieties. Several other countries subsequently extended such or other forms of protection to plant varieties, until in 1961; an International Convention for the Protection of New Varieties of Plants was signed. Most signatories were industrialised countries, who had also formed

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[5] Reid, Laird D., Meyer, Gamez etal. (ed.), 1993, *"Biodiversity Prospecting"* World Resource Institute, New York USA. p. 19.

[6] Hiremata, S.R., Krishnan, Paranjaye (1996), *"All About Convention On Biodiversity"*, pub. By Samaj Parivartana Samudau,Dharwad, p. 93.

[7] Reid, Laird D., Meyer, Gamez etal. (ed.), 1993, *op-cit*, p.179.

a Union for the Portection of New Varieties of Plants (UPOV). This treaty came into force in 1968.[8]

Plant varieties or breeders' rights (PVRs/PBRs), give the right-holder limited regulatory powers over the marketing of 'their' varieties. Till recently, most countries allowed farmers and other breeders to be exempted from the provisions of such rights, as long as they did not indulge in branded commercial transactions of the varieties. Now, however, after an amendment in 1991, UPOV itself has tightened the monopolistic nature of PVRs/PBRs, and some countries have substantially removed the exemptions to farmers and breeders[9].

TRIPs allow countries to exclude animals and plants *per se* from patentability. However, the provisions above have serious enough implications, for no longer are countries allowed to exclude patenting of life forms altogether (micro-organisms have to be open for patenting). Nor is there likely to be a great amount of flexibility in evolving sui generis systems of plant variety protection, for the term "effective" may well be interpreted by industrial countries to mean a UPOV-like model.

The history of IPRs shows that the monopolistic hold of governments, corporations and some individuals over biological resources and related knowledge is continuously increasing. As the examples noted in the Introduction shows, a substantial amount of this monopolisation is built upon, and through the

[8] Kothari, Ashish And Anuradha R.V.(1997) "Biodiversity, Intellectual Property Rights, And The GATT Agreement: How To Address The Conflict?" *Economic and Political Weekly*, Vol. XXXII (43), October 1997, p.2817.

[9] Chauhan, S. S. (2001), *op-cit.* p. 127

appropriation of, the resources conserved and knowledge generated by indigenous and local communities.

4.2. TRIPs vs. Convention on Biodiversity:

The TRIPs agreement is only likely to greatly intensify the impacts outlined above. In particular, its attempt to homogenise IPR regimes militates against a country's or community's freedom to choose the way in which it wants to deal with the use and protection of knowledge. Gradual extension of patents in new technologies such as computer programmes and biogenetic engineering without the emergence of agreed international minimum standards create both opportunities and risks for the developing countries.[10] Equally important, it contains no provision for the protection of indigenous and local community knowledge. Such knowledge, because of its nature, may not be amenable to protection under current IPR regimes. Finally, it has no recognition of the need to equitably share in the benefits of knowledge related to biodiversity. Indeed, it legitimises the conventional inequities that have characterised the interactions between the industrial-commercial use of biodiversity-related knowledge, and the community/citizen use of such knowledge[11].

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[10] Narasaiali, M.L. (2001) *"W.T.O. and the Developing Countries"* Discovery Publishing House, New Delhi, p.61.

[11] Kothari, Ashish (1997), *"Understanding Biodiversity: Life, Sustainability and Equity"* Orient Longman, New Delhi, p.76.

4.3. TRIPS Vs Farmers' Rights:

The requirements about usefulness and not being known earlier came into prominence in the context of certain herbal remedies and farmer's rights prevalent in India from ancient times. There was a Convention on Biodiversity under the UN auspices in July 1999 when the issue of TRIPs vis-a-vis the rights of farmers came to be debated. The TRIPs agreement became controversial because it recognised patents on plants developed through biotechnology using plant varieties that themselves are the result of years of cross breeding by farmers[12]. It does not recognise the rights of communities over their intellectual resources but concentrates on the rights of individuals and companies claiming the patents as their own investments.

Farmers in many countries have warned corporations and governments not to bring in IPRs on crop varieties, and have decided to openly violate any such IPRs even if it means being jailed. Indigenous peoples everywhere are acquiring a deeper understanding of IPR regimes, and ways of challenging them when they impinge on their human or resource rights. Though not of the same nature, the Dutch challenge to the recent European Directive on Legal Protection of Biotechnological Inventions (which attempts to make patents on life forms uniformly possible in Europe), is also noteworthy[13].

In what is known as biopiracy, Western patent offices have granted patents to multinational companies on staple crops in the developing world. The

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[12] Chauhan, S. S. (2001), *op-cit.* p. 282.

[13] Grisberger, M.A. (1999), *"Biodiversity and the Concept of Farmers' Right in International Law"* Peter Lang pub., Berne p. 32.

TRIPs agreement was seen as creating potential for disastrous conflicts between the technologically advanced and less technologically advanced countries[14]. Article 27 of the TRIPs agreement excludes from patentability, plants and animals and essentially biological processes but the agreement also lays down that such protection should be through an effective sui generis, "of its own kind", system. The agreement does not lay down what is an effective sui generis system. The US and the UK have interpreted as the model provided by the Union for the Protection of New Varieties of Plants. It does not take into account the needs of less developed countries, which are still in the process of evolving their own sui generis legislation[15].

4.4. Space for Developing Countries: Prospects and Challenges

Though essentially favouring the further expansion of current IPR regimes, there are some provisions in TRIPs that can be exploited by communities and countries interested in protecting their interests against those of dominant industrial-commercial forces.[16]

Article Eight allows for legal measures to protect public health/nutrition, and public interest; though environmental protection is not explicitly built into this, it could be justified as being in "public interest". Unfortunately, this clause is subject to "the provisions of TRIPs", which leaves wide open the interpretation of

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[14] Krattiger etal. (1994), *"Widening Perspective on Biodiversity"* Natraj Pub., Dehradun, p. 285.

[15] Kothari, Ashish (1997), *op-cit.* p. 86.

[16] .Shiva, Vandana (ed.), 1994, *op-cit* p. 200.

its applicability; Article 27(2) allows for exclusion, from patentability, inventions whose commercial use needs to be prevented to safeguard against "serious prejudice" to the environment. This is somewhat convoluted, because a country will first need to determine such serious prejudice, justify the prevention of commercial use, and then only be able to justify non-granting of patents; Article 27(3) allows countries to exclude plants and animals from patentability, and also plant varieties, so long as there is some other "effective" form of IPR to such varieties.[17] As mentioned above, what is "effective" is likely to be determined by powerful countries, in which case the almost patent-like regime being advocated by UPOV could well be pushed. However, an exceptionally bold country could well experiment with completely different sui generis systems and face up to any charges that are brought against it at WTO.

Article 22 allows for the protection of products, which are geographically defined through "geographical indications"[18]. This could help protect some products, which are known by the specific locations in which they have originated (as has been done, for instance, with Champagne). It is debatable whether, for instance, Basmati rice could have been protected in this manner (the name does not derive from any location, but the variety is known to come from a particular geographical area).

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[17] See Convention on Biological Diversity text, Article 27.

[18] See Convention on Biological Diversity text, Article 22.

Both Article 16(5) and Article 22 provide countries with some maneuverability with regard to IPRs.[19] If indeed a country can establish that IPRs run counter to conservation, sustainable use, and/or equitable benefit-sharing, it should be justified in excluding such IPRs. However, the caveat, "Subject to national legislation and international law" may well make this difficult, since TRIPs is also "international law"[20]. Between TRIPs and the CBD, which holds legal priority? Legal opinion would perhaps be that TRIPs, being the later treaty, would supercede CBD in case of a conflict. However, given that CBD deals much more with the protection of public interest and morality, which TRIPs acknowledges as valid grounds for any measures that countries want to take, it could be argued that CBD's provisions should supercede those of TRIPs. This interface has not yet been tested in any active case in the international arena; only when it does, will we know what intrepretation is likely to hold. The CBD, unfortunately, is at a serious disadvantage as it does not yet have a dispute resolution mechanism of its own, unlike the WTO.

Perhaps the most crucial provision within CBD may be Article 8(j), which requires countries to respect and protect indigenous and local community knowledge, ensure that such communities are asked before using their knowledge for wider society, and further ensure the equitable sharing of benefits arising from such use. Built into this provision are the seeds of a radically different vision of protecting knowledge and generating and sharing benefits from

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[19] See Convention on Biological Diversity text, Article 16, 22.

[20] Kothari, Ashish (1997), *op-cit.* p. 34.

it. Discussions within the CBD forums, including at successive Conferences of Parties, have demonstrated this potential, especially since a wide range of indigenous and local community groups have used the forums to push their case.

In this connection, an interesting question would be can, whether a country can challenge another country's IPR regime on the ground that it fails to give adequate protection to informal innovations of indigenous or local communities, and therefore eventually violates Article 8(j) of the CBD, or whether India can challenge the US patent regime as a whole, citing examples such as the turmeric patent. The Indian delegation to WTO's Committee on Trade and Environment posed this question in a June 1995 meeting, but reportedly got no specific response. It would be interesting to see how the CBD forums would deal with a charge like this, if brought by one country against another[21].

4.5. Need for an International Trust for Biodiversity: From Bio-imperialism to Bio-democracy:

In spite of the immeasurable contribution that third world biodiversity has made to the wealth of industrialized countries, corporations, the governments and aid agencies of North continue to create legal and political frameworks to make the Third World pay for what it originally gained.[22] The Third World countries feel that they can protect their own house against any theft by simply requesting the thief to give back a small part of the loot. But the fact is that

[21] Kothari, Ashish (1997), *op-cit.* p. 121.

[22] Shiva Vandana (1993), *op-cit.*, p. 82

protection can only come by not allowing the theft to take place in the first place. Ecology, equity and efficiency are in opposition with each other in uniformity while they meet in biodiversity. Diversity makes sure ecological stability, multiple livelihood and social justice. Till recently, it used to be the local communities who were the guardians of the biological wealth of this planet by way of using, developing and conserving biodiversity.

After centuries of gene-rich South providing biological resources fully and without any charge to the North, the governments of the South are now not inclined to provide it for free anymore. The simple reason is that they are not willing to pay exorbitant prices to the North for 'improved' seeds and packaged drugs derived from their source. It is an irony that the biodiversity of the South is treated and exploited as 'common heritage of mankind' and the biological articles that are prepared from the same source are patented, priced and treated as private property of the corporations of the North.

The US Trade Act, the World Bank and the intellectual property rights by GATT are the new means by which this new inequality and injustice are being forced upon the South. This will only make the world unstable because of the new North-South asymmetries. Simultaneously, the sovereignty of the Third World is also being undermined. But a more serious matter is the erosion of sovereignty of the local communities who are the original protectors of biodiversity.

Making the gene valuable through patents defeats the very purpose of biology. This makes it very disturbing that the complex organisms which have

evolved over thousands of years in nature, through the efforts of Third World peasants, tribal and healers, are now treated as mere inputs into genetic engineering. In order to amend the North-South imbalance and to recognize the inputs of local communities to the development of biodiversity, the present regime based on bio-imperialism must be replaced by structures based on bio-democracy.

Mahatma Gandhi had shown that absolute power based on unethical and undemocratic foundations can only be challenged by a resurgence of the ethical and democratic norms and values.[23] Bio-democracy includes the recognition of the intrinsic value of all life forms and their underlying right to co-exist. But the definition of bio-diversity cannot be completed without giving due recognition to the contribution and rights of the local communities which have co-evolved with local biodiversity.

Bio-democracy envisages that it is the duty of the concerned government to protect these prior rights from encroachment by corporate claims to private property in life forms through patents and intellectual property rights. They have to realize that it is only for the benefit of the economic powers of the North whose global empires in the biotechnology era are built on the destruction and colonization of the biodiversity of the South. The North wishes to retain free access to the South's storehouse of genetic biodiversity while it resists the South to have the propriety varieties of the North's industry declared a similar public good. Governments of the South can only be truly welfaring in their work and

[23] Chauhan S. S. (2001), *op-cit*, p. 136.

actions if they stand behind their people and biodiversity and support and protect the democratic rights of diverse species to exist, and the diverse indigenous communities to co-exist with them.

The advanced capitalistic nations wish to retain free access to the developing world's storehouse of genetic diversity, while the South like to have the propriety varieties of the North's industry declared a similar public good. The, North, however resist this democracy. North has freely taken the biological diversity of the Third World to earn millions of dollars of profits, none of which have been shared with Third World countries who are the original owners of the biological resources. The convention on biological diversity is also not clear on this score. Developed countries, particularly the U.S. interpreted key clause of the treaty in a manner that would protect the interest of its biotechnology industries. This is a clear setback to the developing countries, who stands to loose the benefit due to them.

4.6. Biodiversity and Biotechnology:

There has been a revolution in the field of biotechnology in the last quarter of 20th century. With the advent of recombinant DNA technique, there has been a much better understanding of the biological molecule and manipulation of genes[24]. Basically biotechnology requires huge infrastructure base which would lead to exploitation of agriculture, animal husbandry, fisheries, forestry and

[24] Shiva Vandana (1993), *op-cit.*,p. 96.

medicine.[25] All over the world the biotechnologists have made efforts to create transgenic crops which will withstands the pests as also have enough resistance to withstand environmental stress. Recombinant DNA technology has the potential to transform the genes into a global resource that can be used to shape novel life forms.[26]

The countries of the world can be divided in four groups:

S. NO.	Biodiversity	Countries
1.	Biodiversity poor and biotechnology poor	Middle east
2.	Biodiversity poor but biotechnology rich	USA, South Africa, France, Sweden and UK
3.	Biodiversity rich but biotechnology poor	Indonesia, India, China, Mexico, Brazil, Malaysia, and others in the tropical and subtropical belt
4.	Biodiversity rich and biotechnology rich	No country.

As we see from the above table that there is number of country which is both biodiversity rich as well as biotechnological rich. So there is

[25] Prasad B.N. (1999) *" Evolution of D.N.A.: Biotechnology and Biodiversity"* Oxford IBH Publishing Co. Private Limited, New Delhi ,p. 4

[26] Ibid pp.6.

interdependence among the countries of the world and thus there is flow of biodiversity from one side and further flow of biotechnology from the other side. The relationship between biodiversity and biotechnology is shown in following figure:

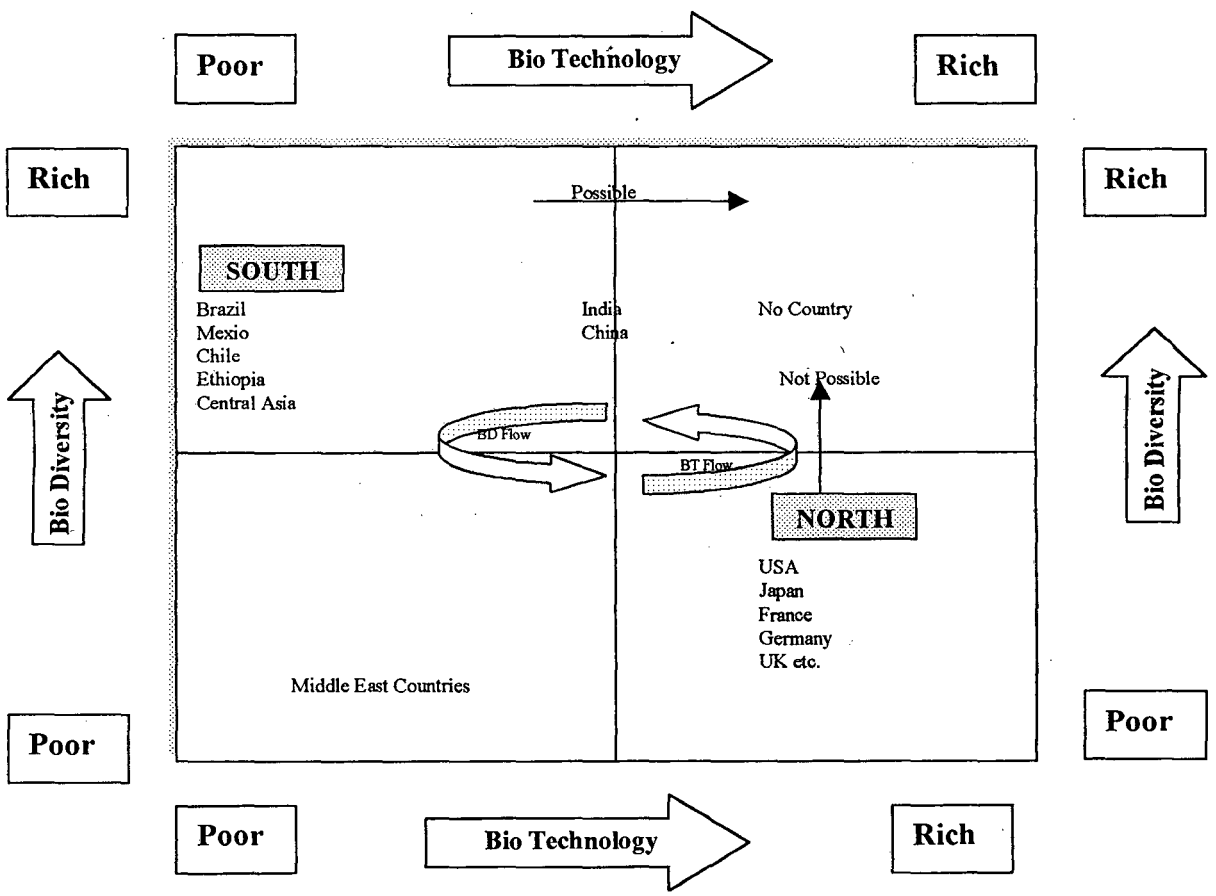

Fig: Relationship between Bio Diversity and Bio Technology[27]

[27] Chauhan S. S. (2001), *opcit*, p. 309.

But the problem arises because the extent and nature of flow of biotechnology from North to South is not commensurate with the flow of biodiversity from South to North. This unequal exchange has created the whole furore over the international forum. There are some countries like India and China are rich both in biodiversity and biotechnology. But it will be against the interest of the countries of north to help them in the field of biotechnology. Therefore, the North will not be readily help there countries so that there interested could be pursued. On the other hand their strategy (North) is to set up 'ex situ' conservation so that they could utilise the diverse genetic features of 'biodiversity rich' south. The North has will develop 'ex situ' facilities in the form of gene banks, seed banks and other banks. But again the problem arises which is inherent with the ex situ conservation because it do not have long-range ecological processes and organic evolution that operates under natural conditions and constantly refine and biodiversity through mutation, recombination and natural selection which are the three cordial elements of organic evolution.

Though biotechnology could be a miracle solution to the problem of biodiversity crisis the developing countries. In the absence of a proper biotechnological base, a developing country cannot match an industrial country, although the farmer may be far richer in biodiversity. However, the Convention on Biodiversity, helped to place the subject matter of technology transfer and IPRs on the top of the agenda of policy and decision-makers. Furthermore, access to genetic resources and transfers of technology are treated on the same plan.

Thus, it is very much essential for the developing countries to come to a common front but a hard bargain with the developed countries is inevitable. On the one hand, strengthening their biotechnological base has become all the more important on account of the introduction of factors like IPRs and patenting.[28] If the biodiversity rich countries are able to enhance their technological capability, then they have a better way of negotiations and bargain with strength with the biodiversity poor developed world on their own term. Therefore, the developing countries must come together and reach an understanding regarding various aspects, industry scientific and technological, economic, social, cultural and legal issues, and collection, supply and costing of the raw material of biodiversity and put the developed countries on the defensive front. Though the developed countries are biotechnological rich but biotechnology does note create new genes, it merely relocates genes already existing in the organism so it is imperatives for developed world to have access to genetic resources of south therefore south should utilize their strengths in best possible manner.

4.7. Agriculture and Convention on Biodiversity:

Agricultural biodiversity is of immense importance. The components of biodiversity have been demonstrated to be very important to human health in both traditional and modern medical practices.[29] Threatening its survival and availability are the industrialization of farming and food systems and intellectual

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[28] Aggrawal K.C., (1996), *"Biodiversity"* Agro Botanical Publishers, Bikaner, p. 30.

[29] Swaminathan M.S., Jana S. (ed.) 1992, *"Biodiversity: Implications for Global Food Security"*, McMillan India Limited, New Delhi. p.165.

property schemes. The main actors in the conservation and use of agricultural biodiversity have been and continue to be the millions of farmers and local communities who use and maintain this resources pool as the basis for their livelihood.[30] Still the Convention of Biodiversity remains remarkably silent on all of these issues. Although the Convention explicitly includes with in its scope that part of biodiversity that feeds people, its operational articles elude any reference to it.

Considering the importance of agricultural biodiversity, and the specific dynamics of its conservation and use this is a dramatic oversight in the Convention, which needs to be resolved. In fact, this oversight was recognised when the Convention was negotiated and several countries tabled a special resolution on the interrelationship between the Convention and sustainable agriculture. Resolution three was adopted together with the Convention itself and forms part of it. In this resolution, all governments confirm the great importance of biodiversity in Agriculture.[31] It also urges that co-operation between the Convention and the FAO global system to be enhanced and recognised the need to find solutions to outstanding matters such as access to current gene bank collections and the right of farmers.

It is not only logical, but also urgent that the issues surrounding agricultural biodiversity are dealt with in a clear and comprehensive matter. The

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[30] Swaminathan, M.S.And Jana S. (1992), *"Biodiversity: Implications for Global Food Security"* pub. by Macmillan India Limited, New Delhi ,p. 249.

[31] Thrupp, L. "Linking Agriculture Biodiversity and Food Secutity", *International Affairs*, Vol. 76(2), Apr.2000, p.269.

most appropriate way forward is to bundle all these issues in a special protocol on agricultural biodiversity as part of the Convention.

4.8. Convention on Biodiversity vs. industry:

Industry already burdened with environmental regulations is far from enthusiastic about biodiversity conservation. The corporate interests that stand to loose from biodiversity conservation are those that base their profit on unsustainable resource use. But for industries that also seek to manage resources sustainable, biodiversity conservation provides significant opportunities.[32]

One of the industry's greatest needs is predictability. Today a firm might invest substantial sums in a developments project, only to find its plans halted when an environmental review turns up an endanger species or a rare plant community. Biodiversity conservation in contrast, involves upstream planning that can prevent such financial fiascos. The time and work spent on inventorying and protecting species and ecosystem means that the distribution of threatened flora and fauna will be known before the first dollar is invested in a project. Granted, same sites closed to development as a result but certainly about the rest will more than offset those losses.

Moreover, biodiversity conservation provides greater options for industry and development planning. Current regulatory practices came into effect on when a crisis is already at hand, i.e. when a species is at the brink of extinction.

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[32] See p.39, Global Biodiversity Strategy:Guidelines for Action to Save, Study and Use Earth's Biotic Wealth Sustainably and Equitably, pub. By World Resource Institute(WRI),The World Conservation Union (IUCN),United Nations Environment Programme (UNEP)

So no options are left, either the species goes or the development project goes. In contrast, upstream planning entailed in biodiversity conservation reveals new opportunities for planners and helps them keep potential conflict from erupting.

Despite these opportunities, industry cannot be expected to support biodiversity conservation until criteria and guidelines are developed that will clarify the actions it must take. Currently, industry is being taken to task for not conserving biodiversity, but it has no widely accepted indicators of biodiversity's status to use in planning.

4.9. "Biological Diversity and Developing Countries: Issues and Options"

The problems of determining priorities both across and in ecosystems are formidable. Priorities and activities depend to large extent on the values we are seeking to maximise and on an assessment of the significance of those values[33]. This, and the different priorities of different actors, needs to be taken into account in considering priorities. It is apparent that local, developing countries, developed country and global values are unlikely to be congruent. The direct value of biodiversity livelihoods and genetic improvement of locally important crops is likely to be a first order priority for the least developed countries. The potential value of unknown species for advanced industrial and medicinal uses, or the existence value of unique wilderness habitats, may be of less immediate importance to least developed countries.

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[33] Flint, Michael, (1991) *"Biodiversity and Developing Countries: Issues and Options"* pub. By Overseas Development and Administration, London, p. 35.

This has potentially major implications for biodiversity priorities with in normal aid programs. These must be responsive to, and determines by, Government and Non-Government priorities in developing countries first and foremost, and not global priorities or a domestic political pressure in develops countries. The problem with this approach is the now familiar one of evolution. Economics can assist in determining the types of value associated with biodiversity, the likely beneficiaries and occasionally with the broad orders of magnitude but is unlikely to generate useable figures. However, even a ranking of the different types of economic value for developing country is instructive.

If the directly productive use-value of biodiversity in the form of genetic resources for developing country, agriculture is considered to be the most valuable, the conservation of wild relatives of food crops will be a major priority. The priority accorded to tropical moist forest would, according to this criterion at least, be rather lower. The ultimate priority accorded to each category of biodiversity would need to be determined by a wider set of criteria than just value. However, the important point to emphasis is that some consideration of the types and rank orders of values for developing countries is an absolute necessity for priority setting.

Chapter V

Biodiversity and Indian Dilemma

India is the seventh largest country in the world and Asia's second largest nation with an area of 3,287,263 Square km. The Indian mainland stretches from 8° 4' to 37° 6' north latitude and from 68° 7' to 97° 25' east longitude. It has a land frontier of some 15,200-km and a coastline of 7,516 km[1].

5.1. India's Biodiversity:

India has a rich and varied heritage of biodiversity, encompassing a wide spectrum of habitats from tropical rainforests to alpine vegetation and from temperate forests to coastal wetlands. India figured with two hotspots - the Western Ghats and the Eastern Himalayas - in an identification of 18 biodiversity hotspots carried out in the eighties[2]. Recently, Norman Myers and a team of scientists have brought out an updated list of 25 hotspots[3]. In the revised classification, the 2 hotspots that extend into India are The Western Ghats/Sri Lanka and the Indo-Burma region (covering the Eastern Himalayas), and they are included amongst the top eight most important hotspots. In addition, India has 26 recognised endemic centres that are home to nearly a third of all the flowering plants identified and described to date. It is not only the sheer biodiversity which is significant, but also its uniqueness as many as 33% of all flowering plants and 18% of all plants in India are believed to be endemic.[4]

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[1] India Year Book 2003, Ministry of Information and Broadcasting, Government of India, p.1.

[2] Myers, N. (1988). *Threatened biotas: "Hot spots" in tropical forests.* The Environmentalist 8(3), p. 189.

[3] Myers, N., R A Mitttermeier, Mitterneier, C.G., da Fonseca, G A B, Kents, J. 2000. *Biodiversity hotspots for conservation priorities.* Nature 403: pp 853-858.

[4] Krattiger, McNeely etal (1999), *"Widening Perspective on Biodiversity"* IUCN, The World Conservation Union and The International Academy of Environment, p. 139.

- Of the estimated 5–50 million species of the world's biota, only 1.7 million have been described to date[5], and the distribution is highly uneven. About seven per cent of the world's total land area is home to half of the world's species, with the tropics alone accounting for 5 million. India contributes significantly to this latitudinal biodiversity trend. With a mere 2.4% of the world's area, India accounts for 7.31% of the global faunal total with a faunal species count of 89,451 species[6]. Some salient features of India's biodiversity have been mentioned below.
- India has two major realms called the Palaearctic and the Indo-Malayan, and three biomass, namely the tropical humid forests, the tropical dry/deciduous forests, and the warm desert/semi-deserts.
- India has ten biogeographic regions including the Trans-Himalayan, the Himalayan, the Indian desert, the semi-arid zone(s), the Western Ghats, the Deccan Peninsula, the Gangetic Plain, North-East India, and the islands and coasts[7] .
- India is one of the 12 centres of origin of cultivated plants.
- India has five world heritage sites, 12 biosphere reserves, and six Ramsar wetlands. Amongst the protected areas, India has 88 national parks and 490 sanctuaries covering an area of 1.53 lakh sq. km.

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[5] Groombridge, B. (ed). 1993. *The 1994 IUCN Red List of Threatened Animals*. IUCN, Gland, Switzerland and Cambridge's, UK.p285.

[6] MoEF 1999 Annual Report.1999-2000, New Delhi: Ministry of Environment and Forest, Government of India.

[7] MoEF 1999 Annual Report. 1999-2000, New Delhi: Ministry of Environment and Forest, Government of India.

The endemism of Indian biodiversity is high. About 33% of the country's recorded flora are endemic to the country and are concentrated mainly in the North-East, Western Ghats, North-West Himalaya and the Andaman and Nicobar islands. Of the 49,219 plant species, 5150 are endemic and distributed into 141 genera under 47 families corresponding to about 30% of the world's recorded flora, which means 30% of the world's recorded flora is endemic to India. Of these endemic species, 3,500 are found in the Himalayas and adjoining regions and 1600 in the Western Ghats alone. About 62% of the known amphibian species are endemic with the majority occurring in the Western Ghats. Nearly 50% of the lizards of India are endemic with a high degree of endemicity in the Western Ghats; India is a centre of crop diversity, the homeland of 167 cultivated species and 320 wild relatives of crop plants.

India's record in agro-biodiversity is equally impressive. There are 167 crop species and wild relatives. India is considered to be the centre of origin of 30,000-50,000 varieties of rice, pigeon-pea, mango, turmeric, ginger, sugarcane, gooseberries etc and ranks seventh in terms of contribution to world agriculture.

5.2. Species Diversity in India: India contains a great wealth of biological diversity in its forests, its wetlands and in its marine areas. This richness is shown in absolute numbers of species and the proportion they represent of the world total (see Table 1)[8].

[8] Groombridges, B. (ed). 1993. *The 1994 IUCN Red List of Threatened Animals*. IUCN, Gland, Switzerland and Cambridge, UK., p.286

Table 1. Comparison between the Numbers of Species in India and the World.

Group	Number of species in India (SI)	Number of species in the world (SW)	SI/SW (%)
Mammals	350 (1)	4,629 (7)	7.6
Birds	1224 (2)	9,702 (8)	12.6
Reptiles	408 (3)	6,550 (9)	6.2
Amphibians	197 (4)	4,522 (10)	4.4
Fishes	2546 (5)	21,730 (11)	11.7
Flowering Plants	15,000 (6)	250,000 (12)	6.0

Source: Groombridges, B. (ed). 1993. *The 1994 IUCN Red List of Threatened Animals*. IUCN, Gland, Switzerland and Cambridge, UK.

India has great many scientific institutes and university departments interested in various aspects of biodiversity. A large number of scientists and technicians have been engaged in inventory, research, and monitoring. The general state of knowledge about the distribution and richness of the country's biological resources is therefore fairly good.

5.3. Endemic Species:

India has many endemic plant and vertebrate species. Among plants, species endemism is estimated at 33% with, 140 endemic genera but no

endemic families[9]. Areas rich in endemism are North-east India, the Western Ghats and the north-western and eastern Himalayas. A small pocket of local endemism also occurs in the Eastern Ghats. The Gangetic plains are generally poor in endemics, while the Andaman and Nicobar Islands contribute at least 220 species to the endemic flora of India[10].

WCMC's Threatened Plants Unit (TPU)is in the preliminary stages of cataloguing the world's centres of plants diversity; approximately 150 botanical sites worldwide are so far recognized as important for conservation action, but others are constantly being identified [11]. Five locations have so have so far been issued for India: the Agastyamalai Hills, Silent Valley and New Amarambalam Reserve and Periyar National Park (all in the Western Ghats), and the Eastern and Western Himalaya.

5.4. Threatened Species:

India contains 172 species of animal considered globally threatened by IUCN, or 2.9% of the world's total number of threatened species[12] .These include 53 species of mammal, 69 birds, 23 reptiles and three amphibians. India contains globally important populations of some of Asia's rarest animals, such as the

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[9] Botanical Survey of India, 1983.*Flora and Vegetation of India-An Outline*. Botanical Survey of India,howrah p24.

[10] Ibid p25.

[11] IUCN (1980): '*World Conservation strategy*':International Union for Conservation of Nature and Natural Resources (IUCN),UNEP,WWF,FAO and UNESCO.

[12] Groombridges, B. (ed). 1993. *The 1994 IUCN Red List of Threatened Animals*. IUCN, Gland, Switzerland and Cambridge, UK, p. 286.

Bengal Fox, Asiatic Cheetah, Marbled Cat, Asiatic Lion, Indian Elephant, Asiatic wild Ass, Indian Rhinoceros, Markhor, Gaur, Wild Asiatic Water Buffalo etc.

A workshop held in 1982 indicated that as many as 3,000 to 4, 000 higher plants may be under a degree of threat in India. Since then, the Project on Study, Survey and Conservation of Endangered species of Flora (POSSCEP) has partially documented these plants, and published its findings in Red Data Books.[13]

5.5. Protected Areas Network: Development and History

The protection of wildlife has a long tradition in Indian history. Wise use of natural resources was a prerequisite for many hunter-gatherer societies which date back to at least 6000 BC. Extensive clearance of forests accompanied the advance of agricultural and pastoral societies in subsequent millennia, but an awareness of the need for ecological prudence emerged and many so-called pagan nature conservation practices were retained. As more and more land became settled or cultivated, so these hunting reserves increasingly became refuges for wildlife. Many of these reserves were subsequently declared as national parks or sanctuaries, mostly after Independence in 1947.examples include Gir in Gujrat, Dachigam in Jammu & Kashmir, Bandipur in Karnataka, Eravikulam in Kerala, Madhav (now Shivpuri) in Madya Pradesh, Simlipal in Orissa, and Keoladeo, Ranthambore and Sariska in Rajasthan.

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[13] Nair,N.K.,N.Ravindran and S. Edison "*Genetic Resources in Spices,Their Diversity and Utilization*":National Symposium on Plant Genetic Resources, NBPGR,IARI ,New Delhi, March 3-6, 1987.

Wildlife together with forestry, has traditionally been managed under a single administrative organization within the forest departments of each state or union territory, with the role of central government being mainly advisory, there have been two recent developments. First, the Wildlife (Protection) Act has provided for the creation of posts of chief wildlife wardens and wildlife wardens in the states to exercise statutory powers under the Act. Under this Act, it is also mandatory for the sates to set up state wildlife advisory boards. Secondly, the inclusion of protection of wild animals and birds in the concurrent list of the constitution has proved the union with some legislative control over the states in the conservation of wildlife [14].The situation has since improved all states and union territories with national parks or sanctuaries having set up wildlife wings.

The adoption of national policy for wildlife conservation in 1970 and the enactment of the Wildlife (Protection) Act in 1972, led to a significant growth in the protected areas network, from five national parks and 60 sanctuaries to 69 and 410 respectively, in 1990 .These protected areas, shown in figure eight, are distributed throughout mainland India and its islands.

The network was further strengthened by a number of national conservation projects, notably Project Tiger, initiated in April 1973, by the Government of India with support from WWF, and the crocodile breeding and management project launched on 1April, 1975 with technical assistance from UNDP/FAO.

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[14] Sinha, P.C., (1998), *"Protected Areas Networks"* Anmol Publications and Private Limited, p. 8.

5.6. Convention on Biodiversity and India:

The CBD has its implication on both international relations and domestic policies with in each country. At international level, earlier also several steps has been taken. There are over 150 bilateral, multilateral and global treaties on the environment[15]. The treaty was earlier disappointing. India and other developing countries which possess most of the world's wild species germplasm resisted the developed nations lobby to agree to a list of specially valuable areas in the tropical forest rich in biodiversity as a 'common property' for protection while foregoing their 'sovereign rights' over them[16].

In India aspects like ' in situ' conservation and trade in wild flora and fauna are well covered, serious legal gaps existed with respect to patenting of life forms conservation of crop and cattle biodiversity, restrictions on introduction of 'exotics' and transgenic (genetically modified) crops and appropriate sharing of benefits of biodiversity use.

Before CBD in 1992, India has also taken several programs and agreements for preservation of nature such as Convention on International Trade in Endangered Species (CITES), World Heritage Convention, Ramsar Convention etc. India became party to CITES on 18th October 1976. It has provided data annually to the CITES Secretariat on the trade of endangered species thorough its CITES management authority. India ratifies the World

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[15] Chauhan, S. S. *"Biodiversity ,Biopiracy and Biopolitics: The Global Perspective"* Kalinga Publication, Delhi, 2001 p. 215.

[16] Ibid. p.215.

Heritage Convention in 1977 and since then five natural sites has been inscribed as areas of 'Outstanding Universal Value'. These sites are:

- Kaziranga National Park.
- Keoladeo National Park.
- Manas National Park.
- Sundarbans National Park.
- Nanda Devi National Park.

India has also been a contracted party to the Ramsar Convention since 1st February 1982. India has now 16 sites of wetlands. These sites are;

- Kolleru (Andhra Pradesh).
- Wular (J&K).
- Chilka (Orissa).
- Loktak (Manipur).
- Bhoj (Madhya Pradesh).
- Sambhar (Rajasthan).
- Pichola (Rajasthan).
- Astamudi (Kerala).
- Sasthankitta (Kerala).
- Hariki (Pune).
- Kanjali (Pune).
- Ujni (Maharastha).
- Reuna (Uttar Pradesh).

- Kabar (Bihar).
- Nubrovar (Gujarat).
- Sukhra (Chandigarh).

But, a comprehensive step has been taken to preserve biological diversity only after CBD in 1992. India signed the CBD on 5th June 1992, ratifies it on 18th February 1994 and brought it into force on 19th May 1994. In July 1994, the Government of India ratified the Convention and set into motion a number of follow up setups. These include;

- Formulation of a National Biodiversity Action Plans,
- Profiting of a National Biodiversity Law,
- Setup towards promulgation of a ratification regulation access to the country's biological resources,
- Calling of a Asian regional meeting on biodiversity co-operation and
- Initiation of a dialogue with industry and scientists on enhancing indigenous capacity
- To utilize our own biological resources.

This Convention will provide a framework for the sustainable management and conservation of India's natural resources. Earlier also India has taken several steps which are concerned with aspects of nature conservation and sustainable development. These range from legal instruments, which place obligations on those nations, which become contracting parties, to scientific programs such as the UNESCO 'Man and the Biosphere Programme', a global Programme of international scientific cooperation. This legally binding treaty

obliges ratifying countries to protect biodiversity to move towards the sustainable use of biological resources and to ensure that benefits from such use are shared equitable across local, regional, national and global societies. As a signatory to the Convention, India is committed to take appropriated legal and administrative steps to follow its provisions. Starting in 1994, a Biological Diversity Bill has been in the making and finally entered parliament in the year 2000. In 1998, the Government of India applied for funding to the Global Environment Facilities through United Nations Development Program, to formulate a comprehensive Biodiversity strategy and action plan.

5.7. Biodiversity in India: Strategy and Action Plan

The central concern for such as action plan and strategy was that it should be consistent with the ecological, social, cultural and economic framework of the country. In 1999, GEF/UNDP approved a grant of almost one million dollars (about Rs. 4.3 crores). Soon thereafter, the National Biodiversity Strategy and Action Plan (NBSAP) were launched in January 2000 by the Ministry of Environment and Forests.

The NBSAP process stands in contrast to the general trends of planning in India, where a few experts sitting in New Delhi or state capitals define what is good for the rest of the country. It attempts towards truly operationalising the much-abused word in the development sector called 'participation'. To achieve

this there has been an effort to decentralize the entire process. The NBSAP entails the preparation of action plans at five levels[17]:

- About 20 substate sites ranging from a village like Nahin Kalan in Uttaranchal to a protected area like the Simplipal Tiger Reserve in Orissa to the biodiversity rich West Garo Hills in Meghalaya.
- All 33 states and union territories of India.
- 10 interstate ecoregions, cutting across state.
- 13 National themes.
- A National Strategy and Plan building on all of the above.

There are also about 20 commissioned subthematic reviews looking at certain specialized aspects of biodiversity (natural dyes, thermal power, mining, pastoral nomads, remote sensing, eco-friendly technologies, impacts of biotechnology and others). Apart from being integrated into the National Plan, each one of these plans stands independently, ready for implementation. So, if the villagers of Chedmas in Nagaland want they can go ahead and implement their action plan without actually waiting for the national plan to be implemented, they are free to do so. Here lies the strength of this process as it attempts to reserve the trend of imposing strategies and action plans from the top to local and state agencies.

NBSAP is moving along with two guiding principles, that of ecological security of each area and the country as a whole, and of livelihood security of the people most dependent on biodiversity. The NBSAP process has for the first time provided an opportunity to cover a whole range of issues relevant to biodiversity:

[17] MoEF 2000 Annual Report. 2000-2001, New Delhi: Ministry of Environment and Forest, Government of India.

wild plants and animals, micro-organisms, ethical and economic aspects, intellectual property rights and others.

In the final analysis, the hope for implementation of the product lies in the process of making plan itself. Previous national policies and plans on environments have had only a handful of "owner", usually urban elite's who are themselves far removed from the natural environment. In NBSAP, there are several thousand owners, people from various sections of society who will, hopefully, not allow the plans to simply itself remain on paper. And if the process itself leads to greater dialogue and understanding, and out of this dialogue and understanding, and greater action, it will have justified the few crores spent on it.

In a policy decision taken lately, India has categorically asserted that it will not allow patenting of life forms. It is however, not against the introduction of transgenic crops such as in tomato, cotton and in mustard seeds which are insect resistant, India is also redefining microorganisms in the context of patentability as required by the World Trade Organization (WTO) guidelines. This is crucial because the proposed amendments to the Patent Act, 1970, to comply with WTO guidelines had included micro-organisms in the list for allowing patents in India along with product patents in pharmaceutical and agro-chemical industries. India was also not in the possession of multinational corporations of developed nations.

Large scale and unregulated transfer of biodiversity from India to outside country is occurring. Soil from Kerala's rich tropical ecosystem is being taken outside India. There are other reports of soil being taken by Japanese

companies. Bacteria, fungi and other microbes found in the soil are of invaluable industrial applicants, especially in biotechnology. Micro-organism as well as the rich plant and animal diversity found in the tropics, are indispensable for the development of biotechnology.

GATT now requires as accepting patentability of micro-organism. Article 27(3') (b) of GATT states that 'parties may exclude from patentability plants or animals other than non-biological and microbiological focuses.[18] The level of information and research into microorganism in India is extremely poor. While a number of 'ex-situ' culture collections of microbes exist in the country, there is very little work going on in inventorying and researching microbes 'in situ'. Only a tiny fraction microbial diversity that India posses have been studied so far.

5.8. TRIPS and the Indian Context:

India is home to 45,000 plant species and 75,000 animal species. Ninety per cent of the world's biological resources emanate from the underdeveloped regions world of Asia and Africa. Yet, MNCs hold 97 per cent of all patents worldwide. In the past 15 years, 10,778 patents on plants were registered in the US alone. At the World Intellectual Property Organisation, patent applications went up from 3,000 in 1979 to 67,000 in 1997. Countries such as India are at the losing end of the new patent regime. According to the US based Rural Advancement Foundation International, if contributions of peasants and tribal

[18] Chauhan, S. S., *op-cit*, 2001 p. 221.

people from the developing world are taken into account, the US will owe as much as $2.7 billion to the developing countries.

Patents provide monopoly domination through technological supremacy by extending control over the biological wealth and the traditional knowledge of the gene rich developing countries. American MNCs have taken advantage of the illiteracy of the Indian agriculturists and indulged in plain bio piracy as the case laws will illustrate.

The 1998-99 World Development Report wondered if the demand for protection of IPRs did really encourage innovation. "Tighter IPRs", said the World Bank, "Can disadvantage developing countries in two ways: by increasing the knowledge gap and by shifting bargaining power towards the producers of knowledge, most of who reside in Industrial countries." Patents in the western world are used to block other companies from entering the market. Plant patents hit poor farmers hard. While the Western countries zealously guard their own patents, they exert pressure on Third World countries to dilute their patent laws. The American multinational, Monsanto, exerted pressure on Pakistan not to extend protection to plant varieties under TRIPs.

Developing countries such as India are caught in a dilemma in as much as the controversy about product versus process patent is tripping them up under the TRIPs agreement. The truth is that protection for IPRs requires a huge investment in infrastructure which these countries find difficult to meet. It is this reason that accounts for the low number of patent applications being filed.

Some six MNCs from Europe and the US are known to control 70 per cent of the IPRs internationally. India is now struggling with the latest case of Ashwagandha. We need protection not only for the IPRs but also against the depredations of the MNCs trying to make a killing out of our own age-old knowledge.

As our own Patents Amendment Bill is hanging fire, it is necessary that before giving effect to our obligations under the TRIPs agreement, we should seek revision of the international patents regime sought to be imposed for the benefit of about half a dozen multinational corporations in the West.

5.9. Biopiracy of Medicinal Plants from India:

Collecting and cultivation of medicinal plants is a specialised task and the local communities who know their indigenous use are adept at this job. The pharmaceutical companies fetch very handsome money from these plants by selling drugs made from them. But the locals in return get very little. While traders working as middlemen earn their share, the plants are bought from officers are also involved in this rocket. In many cases, such trade goes on smoothly due to the ignorance of our forest officers who do not allow trees to be hacked but do not have knowledge about medicinal plants which are banned from trading.[19]

[19] Chauhan S. S.,*op-cit.*, p. 231.

5.10 Biopiracy Case Studies:

Case Study- I: Turmeric

The Indian Council for Scientific and Industrial Research (CSIR) filed a case with the US Patents Office challenging the patent granted to turmeric on the ground of "prior art", that is, existing public knowledge. The CSIR pointed out that turmeric has been used in India for thousands of years for healing wounds and rashes. Its use as a medicine was known and was not a new invention. The American Patent Office upheld the objection and cancelled the patent.

Case Study-II: Neem

Again India has been complaining to the WTO's dispute resolution mechanism against 70-odd patents granted on products from the neem trees, pointing out that dried neem leaves have been used for centuries in India to protect clothes and grains against fungus. Some patents have been cancelled and some are in the process of investigation of India's claims.

Case Study-III: Basmati

There was a clear case of biopiracy and theft with regard to the way Basmati patent was obtained in 1997 by the Texas-based Rice Tec Inc. The Texas Company was already trading in basmati rice with such brand names as texmati, jusmati and kasmati. The American Patent Office declared, "The invention relates to novel rice lines and to plant and grains of these lines and to a method for breeding these lines. The invention also relates to a novel means for

determining and starch properties of rice grains and its use in identifying desirable rice lines."[20]

The Texas Company claimed a patent on basmati variety of rice on the ground that it was derived from Indian Basmati crossed with semi-dwarf varieties, including Indica varieties. The patent is for a variety essentially derived from a farmer's variety -- a simple case of cross breeding. It had to be treated as a false claim for an invention. The Indian Research Foundation pointed out that basmati covers about 15 per cent of the area under rice cultivation and that the country exported large quantities of Basmati rice earning foreign exchange of Rs 1,100 crore in 1996-97. It is unique to Punjab in the same way that champagne is unique to certain areas in France. The patent represented a theft of collective intellectual biodiversity heritage of Indian farmers, an act of stealing markets for Indian aromatic rice varieties and a theft of the name basmati itself. The patent was cancelled.

Case Study-IV: Bitter Gourd (Karela)

Indian scientists have been pointing out how the American patent law never takes into account the use of technology elsewhere in the world and encourages biopiracy. A New Jersey-based company, Cromak Research Inc, obtained an American patent for an edible herbal mixture comprising karela, jamun, gurmar and brinjal. Karela juice has long been in use in India as an anti-diabetic mixture and is well documented in such authoritative treatises as the Wealth of India and the Compendium of Indian Medicinal Plants. The patent was taken on the mixture of the various plants mentioned above and not on the whole

[20] Ibid p 243.

vegetable or fruit showing how indigenous traditional Indian knowledge is exploited abroad.

Case Study-V: Quinoa

In 1994, two scientists from Colorado State University were granted an American patent on Bolivian quinoa. The broad spectrum patent was not limited to a single hybrid but covered any quinoa hybrid derived from the male sterile cytoplasm (Apwlawa), found in quinoa, including 36 traditional varieties. Quinoa is a staple food crop in Chile, Bolivia, Peru and Ecuador.

Commercial exploitation of the patent would have destroyed Bolivian export of quinoa to the US and ruined the Bolivian small-holders growing Quinoa for export. The patent was abandoned after pressure from indigenous and campaigning groups.

5.11. Curbing Biopiracy: An Awesome Challenge Ahead

At the centre of bioprospecting debate is a clash between the two tendencies: the rights of communities and countries over their bio-assets and the contemporary trend toward creating stringent mechanism for safeguarding intellectual property based on achievements of science and technology.[21]There has been confrontation between CBD and TRIPS agreement within the ambit of WTO. The parties to the CBD have to incorporate national laws. India is facing difficulties in implementing these provisions because of the problems attached to enforcement.

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[21] Chauhan, S. S. (2001), *op-cit*, p. 146.

Up to 1st Jan. 2005 India has transition period for the amendment of national patent laws. Patent centres in India need utmost attention. The number of patents India has been able to seek is far less than the other countries. For example, china has been able to seek about 90000, against a mere 3500 by India. Besides India has 1500 patent training centres. India still needs to develop highly patent professionals. India still holds far behind in this area. Untill unless we achieve strong hold on this particular issue, it is impossible to curb biopiracy. Various developed states have legislated their genetic resources. For example, in Philippines and Indonesia, bioprospectors have to negotiate a research agreement with the government, seek prior consent and share benefits with the local communities. India too should take this path. It should ask for a reasonable one time royalty from joint ventures and domestic companies. There should be stringent laws to curb biopiracy.

5.12. New Economic Policy and Biodiversity:

The CBD urges a serious rethinking of all economic and development policies. The new economic policies have increased the exports of natural resources (e.g. Marine Organism and Minerals), encouraged the opening up of PAs (Protected Areas) for commercial-industrial exploitation, causing serious erosion of diversity. Experts estimate that the total commercial value of the genes originating in the third world, which the individual world continues to use, is several times the total foreign aid that flows from individual world to the third

world. To form a part of comprehensive national, such as tax, may be implemented on the industries, which uses biological resources.

5.13. Biological Diversity Act 2002:

Our recent biological act (2002) is a most significant arising piece of legislation. It responds to concerns arising out of developments in biotechnology and information technology, and from the ongoing erosion of biological diversity[22]. With the passage of this bill, the legislative infrastructure is now in place for a sustainable use of India's bioresources that would aid conservation and simultaneously provides remuneration of local communities for protecting species ands developing traditional knowledge. But the risk is there as in all laws that give the Government additional powers, that the new rules and regulations will be used to harass rather than benefits the very communities which are to be served by the legislation[23].

India is home to 8% of the recorded species in the world and is the first country of "mega" diversity to have enacted legislation that will govern extraction and use of biological with the resources. India's law will be consistent with the 1992 UN Convention on Biological Diversity, which laid down the international framework for conservation, sustainable development and equitable sharing of benefits from the utilization genetic resources. The Indian legislation will provide the instruments for prevention of bio-piracy and simultaneously encourage

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[22] Gadgil, M., The Hindu 20 April, 2003.

[23] Ibid .

domestic use of bio-resources. These will be in the hands of a three-tied structure of organizations. Bio-piracy, which is the development by foreign companies of commercial products using local resources or traditional knowledge without providing any remuneration, is to be prevented by the new National Biodiversity Authority (NBA). Any foreign institution individuals which want to use Indian genetic resources for commercial development or even for research will have to first obtained permission from NBA, which will be the apex organization overseeing the regulation of India's genetic resources. The NBA will also have to first approve the commercial utilization of any intellectual property that may arise from the development of native genetic resources. Indian organizations and citizens engaged in similar development of genetic resources will not be governed by these restrictions, but they will have to work with the State Biodiversity Boars. At the grassroots will be the Biodiversity Management Committees that will be responsible for preparing inventories of species in the area and administering the sharing of benefits flowing from the use of local; resources. These benefits will be provided to individuals and groups of people from Biodiversity Funds that will be created at the national, state and local levels and will be financed by the payments made for the use of genetic resources.

The proposed institutional structure is appropriate for sustainable use of India's bio-resources, but the first question is if the mechanisms will function properly. For instance, the channels will payments be made to the communities, which have so far protected the genetic resources remains an unsolved issue. Criteria for identifying communities are still not decided. Protection of traditional

knowledge remains a contentious issue. While these are some important questions governing implementation, the biggest concern must be that the new rules for conservation do not become instruments for a denial of customary rights. Parallels already exist for such abuse of the rules and regulations on conservation. In the name of forest protection, local communities are often denied access to the forests. In the same manner, the new regulatory powers that the Central and State Governments will now have for protection and conservation of bio- resources can be used to prevent local communities from harvesting local genetic resources. The question is if the lessons from forest management practices have been learnt. Another set of issues that will arise in the future is the consistency between India's biodiversity legislation and the World Trade Organization's agreement on Trade Related aspects of Intellectual Property Rights (TRIPs). This is part of larger issue of consistency between the CBD and TRIPs, since the CBD explicitly calls for payment to local communities and traditional knowledge while the WTO agreement does not recognize the rights of local communities to any returns from the commercial development of bio-resources.

5.14 Conclusion:

A assessment of India's state of attentiveness concerning biodiversity convention reflects that while aspects like 'in-situ' conservation and trade in flora and fauna are well covered but serious legal gaps existed with respect to patenting of life forms, conservation of crop biodiversity, restriction on

introduction of transgenic (genetically modified) crops and appropriate sharing of benefits of biodiversity use.

In Indian agriculture, the Convention may be able to bring attention to the need for revival of on-farm biodiversity, though the main text does not have many specific references to this. In the negotiating process, it took a great deal of persuasion by some governments and NGOs, to get delegates to accept agro-biodiversity within the definition of biodiversity. For the geographical indication issues India should take a long-term perspective on the whole matter of exploitation of Indian biodiversity and germ plasm resources by third parties. To refuse access to our national resources would be counterproductive and a physical ban on material transfer would not only be impractical, but would also be negating the virtues of better R&D for the discovery and development of new products for health care, agriculture and ecological improvements from natural products. India neither has the capability nor the resources to exploit the full potential its biological resources and consequently it will be beneficial to enter into formalised collaborative agreements with international companies and agencies on clearly defined terms and conditions. The Convention fully provides for such an option, and it will be in the country's interest to expeditiously bring in appropriate measures to legitimacy for its approaches.

Chapter VI

Conclusion

The discussions in foregoing chapters indicate that the international community's approach has changed over past ten years. The last ten years have clearly demonstrated that the convention is the principle global instrument to discuss and achieve the significant goals. With the convention, entry into force, the international effort to conserve biodiversity is entering a new and exciting phase. The conventions represent a true conceptual, practical and political breakthrough which is our best chance to stem the loss of global biodiversity. These conventions for the first time make such a large number of states to come to a common platform and agreed to a legal binding instrument in the field of biodiversity conservation and the sustainable use of biological resources. These conventions represent more than a treaty, and are an important departure for an organized and comprehensive process. It establishes a mechanism through which parties will continue to review and act on biodiversity related issue and influence other forum as well.

These conventions articulate a series of national and international biodiversity related rights and obligations. It sets broad goals which parties must fulfill at national level. These conventions draw the connection between the extent to which developing countries will effectively fulfill the commitments under the convention, and to which developed countries provide financial resources and transfer of technology. The convention recognizes that states have sovereign rights over their natural resources. It obligates states to endeavor to create conditions to facilitate access for environmentally sound uses by other states, and not to impose restrictions that run contrary to the objectives of the

conventions. Thus biodiversity has emerged as a central issue in global politics through the legal binding instrument of the convention.

As it has been observed in the previous chapters that biodiversity is of immense importance, both, for developed countries and developing countries. So there has been attempt from both sides to acquire and capitalize these resources. Due to uneven distribution of resources, there has been a clear cut division in the world order; one is of biological diversity rich countries and other comprises of poorly endowed biodiversity countries. But most of the biological diversity rich countries are poor in terms of biotechnology. So they are dependent on developed countries for the technology. Developed countries are dictating their own terms and forcing the developing countries to conform to their unjustifiable demands. The conventions, which have been called for bridging the existing disparity between developed and developing nations of the world in utilization and conservation of biodiversity, have been used as a platform by developed countries to put these unjustifiable demands initially. Recently with the increasing awareness the developing countries have realized their potential and adopted a collective approach in countering the unjustifiable demands of developed countries. This awareness in developing countries has worked as a counter balance force in the global order. The biological resources of the developing nations are its greatest economic assets in the modern world. The future of the world economy and trade largely depends upon biodiversity. So developing countries should use this as an economic weapon and as an instrument for political bargains with the rich nations of the North. But to do this

will require an unprecedented show of political solidarity among the "gene rich" developing nations of the world against the developed countries.

It is hoped that in the "post-cold war" and "post apartheid era" there would be greater goodwill and co-operation among nations in the conservation and sharing of "common genetic resources" of mankind and equidistribution in the benefits derived from them. But divergent political pressures, commercial and political interests and indifferent attitude of developed countries, population pressure and rampant poverty in the developing countries, and the ethnic, economic and political conflicts across the world are impending realisation of this hope.

The role of spatial factors has also been recognised in global biodiversity politics. It clearly demonstrates the importance of geography in determining the biodiversity politics. To counter this geographical advantage of developing nations, the developed countries are trying to make irrational benefits of the international forum. They are trying to monopolize the world resources by trying to gain control over it with the tools such as patents. The TRIPs agreement is only likely to greatly intensify the impacts outlined in the preceding chapters. In particular, its attempt to homogenise IPR regimes militates against a country's or community's freedom to choose the way in which it wants to deal with the use and protection of knowledge. The conflict between TRIPs and CBD is still unresolved. On the relationship between TRIPS and CBD, while countries of the South have called for the CBD taking precedence over TRIPs in issues related to

biodiversity and indigenous knowledge. The objectives and principles of the TRIPs agreement shall not be contradictory to the CBD.

The earth summit 10 years ago in Rio, grandly resolved to save all of nature, from the humblest algae to the elephant and it agreed the planet's delicate climate urgently needed protection. Rio convention made sincere efforts and took measures to protect the biodiversity. The Johannesburg summit on the other hand, dealt with these issues very loosely especially in relation to biodiversity. Whereas Rio produced a pair of global treaties, the Johannesburg summit's final action plan offers a few specific and non-binding promises for change. The issue of biodiversity was nearly ignored at this summit.

The most important lessons of last 10 years is that the objective of the convention will be impossible to meet until consideration of biodiversity is fully integrated into other sectors. The need to mainstream the conservation and sustainable use of biological resources across all sectors of the national economy, the society and the policy making framework is a complex challenge at the heart of the convention. At the global level, it is needed for other international regimes to take into consideration the concerns of this convention.

There are some serious flaws within the international conventions/protocols for protecting and conserving the biodiversity .The problem is not only structural but also implemental. One of the most controversial and sensitive issues in the Convention is that of compliance. Critics have argued that, given its country-driven nature, the highly qualified nature of many of its substantive provisions, and the absence of any standardised measures, targets

or lists, it is difficult to see how implementation can ever be measured, still less enforced. Even if measurable standards are set, it is not clear what action might be politically feasible to be taken under the Convention if these are not reached. The Conference of the Parties has emphasised, for example in its guidelines for national reports, that information provided by Parties will not be used to rank performance or to otherwise compare implementation between individual contracting Parties. However, without such measurable standards, the long-term credibility of the Convention as an instrument of genuine change may well be at stake. This problem is all the more complex as implementation of this Convention implies making politically difficult changes in many important sectors.

It is vital that, in their efforts to implement the Convention, Parties are supported by a strong and flexible institutional structure. The institutions of the Convention must be able to respond to changing political circumstances and to the evolving scientific understanding of the subjects that the Convention deals with. Moreover, they must be able to bring together the scientific and the policy or political spheres in ways that allow science to inform policy in a persuasive and comprehensible way.

BIBLIOGRAPHY

PRIMARY SOURCES:

- **Food and Agriculture Organization of the United Nations (FAO): (1995).** Forest Resources Assessment 1990: Global Synthesis. FAO Forestry Paper 124, FAO, Rome.
- **Food and Agriculture Organization of the United Nations (FAO); (1996**). Report on the State of the World's Plant Genetic Resources. Fourth International Technical Conference on Plant Genetic Resources. Leipzig, Germany, 17-23 June 1996
- **Gupta, A K., (1992):** Sustainability Through Biodiversity: Designing Crucible Of Culture, Creativity and Conscience; Working Paper No. 105, IIM, Ahemdabad.
- **Navdanya (1993):** 'Cultivating Diversity: Biodiversity Conservation And The Politics Of Seed'; Research Foundation For Science, Technology & Natural Resources Policy, Dehradun.
- **WWF (1992):** 'Atlas of the Environment', WWF Publication; Oxford.
- **WWF and IUCN:** 1994/1995. Centres of Plant Diversity: A Guide and Strategy for Their Conversation Vol.1, 1994 (Europe, Africa, the Middle East and Southwest Asia); Vol.2 (1995), Asia and the Pacific; Vol.3 (1996). The Americas, World Wildlife Fund UK, Godalming, World Conservation Union/ IUCN, Gland.

SECONDARY SOURCES:

BOOKS:

- **Anderson, R., Levy, E., and Morrison, B., Rice (1991):** Science and Development Politics: Research Strategies and IRRI'S Technology Confront Asian Diversity (1950—1980); Oxford University Press, Oxford, pp. 213-214.
- **Anonymous (1990):** 'Global Biodiversity Strategy'; Global Biodiversity `Institute; Washington.
- **Arnes, IA. AW, Crossby (1986):** Ecological Imperialism`: The Biological Expansion of Europe, 900-1900; Cambridge University Press, Cambridge.
- **Ayad, W.G. (1994):** The CGIAR and the Convention on Biological Diversity; in IUCN and Wildlife Institute of India Pub., "Widening Perspectives on Biodiversity", New Delhi; pp.243-254
- **Chauhan, D. (1998):** ' A Critical Study of The Eco-Political Issues on Biodiversity Use and Conservation in North Vis-À-Vis South Nations at the Rio Earth Summit and its Souci-Political implications on the Indian Sub-Continent', Ph.D. Thesis, Submitted to the University of Rajasthan, Jaipur (India).
- **Gadgil, Madhav (1992):** Conserving India's Bio Diversity: the Human Context; in the Khoshoo and Manju Sharma (ed.) Sustainable Management of Natural Resources; Malhotra Pub. House, New Delhi; pp243-255

- **Gadgil, M. and R. Guha (1992):** The Fissured Land: An Ecological History of India: Oxford University Press, New Delhi.
- **Grubb, Michael, Matthias Koch, Koy Thomson, Abby Munson, and Francis Sullivan, (1993):** "The "Earth Summit" Agreements: A Guide and Assessment" Earthscan Publications Ltd., London .
- **Khoshoo, T.N. (1981):** 'Conservation of Biodiversity: The Indian Experiences'; Proc. of the US Strategy Conference for Productive Agriculture 'Indian Council for Agriculture Research (ICAR) Publication, New Delhi, pp.58-72.
- **Khoshoo, T. N. and G.V.Subrahmanyam(1986):** 'Conservation of Biological Diversity', In 'Conservation for Productive Agriculture', Indian Council for Agricultural Research (ICAR)Publication, New Delhi, pp.58-72.
- **Kothari, Ashish, 1997):** Understanding Biodiversity: Life, Sustainability and Equity; Orient Longman, New Delhi.
- **Mc Collenll, F: (1996):** The Bio-Diversity Convention: A Negotiating History; Kluwer Law International, London, The Hague, and Boston.
- **Menon, Usha (1991):** 'The Conservation on Biodivesity, Intellectual Property Rights, and Policy Options', National Institute of Sciences, Technology and Development Studies, New Delhi.
- **Miller, A. Marian & Iynne Reiner (1995):** The Third World in Global Environment Politics; Boulder Colarado & London.

- **Nagore, Arjun Prasad (1996):** ' Biological Diversity: An Introduction'; Biological Diversity and International Environment Law, India.
- **Nijar, gurdial singh (undated):** developing a right's regime in defence or biodiversity and indigenous knowledge; third world network, Penang, Malaysia.
- **Nijar,G.Singh and Chee Yoke Ling(1994):** The Implications of the Intellectual Property Rights Regime of the Convention Biological Diversity and GATT on Biodiversity Conservation: A Third Perspectives; in IUCN and Wildlife Institute of India (Dehradun), Pub., " Widening Perspectives on Biodiversity", New Delhi, pp. 277-286.
- **Perings (ed) (1995):** The economic value of biodiversity in: Global Biodiversity Assessment. Heywood V.H. 1995 (ed.). UNEP/Cambridge University Press.
- **Reid, W., S.A. Meyer, R. Gamez, A. Sittenfeld, D.H. Janzen, M.A. Gollin and C.Juma (1993):** Biodiversity Prospecting: Using Genetic Resources for Sustainable Development; World Resources Institute (WRI); Washington DC.
- **Rajan, Mukund Govind (1997):** Global Environmental Politics: India and The North-South Politics Of Global Environmental Issues; Oxford University Press, Delhi.

- **Sancheg, V. and C. Juma (1994):** Challenges and Opportunities for South-South Cooperation in Implementing the Convention on Bioplogical Diversity; In IUCN and WWI (Dehradun) Pub., " Widening Perspectives of Biodiversity", New Delhi, PP. 305-307.
- **Shiva, Vandana (Undated):** Biodiversity: A Third World Perspective , Third World Network, Penang, Malaysia.
- **Shiva Vandana (1993):** Monocultures of the Mind: Perspectives on Biodiversity and Biotechnology, Zed Books Ltd. and Third World Network, London and Penang, Malaysia .
- **Sinha, Rajiv K. (1994):** 'Development Without Destruction- The Challenge To Survival', Environmentalist Publisher, Jaipur, India.
- **Solbrig, O.T., H.M.van Emden, and P.G.W.J. van Oordt, ed. (1994):** Biodiversity and Global Change, CAB International, Oxon, UK.
- **Kellert, Stephen R. (1996):** The Value Of Life: Biological Diversity And Human Society, Island Press, Washington, DC.
- **Wilson, E.O (1998):** 'Biodiversity'; National Academy Press, Washington D.C.

ARTICLES:

- **Anderson Stacey (1992):** The Million Dollar Seed: The Genetic Diversity And The Quest For Profit', Our Planet, Vol. 14, No. 1, UNEP, 1992.
- **Banerjee, Indrani (1992)**: 'Lost Horizon'; Sunday, India, March, 15-21

- **Basu, Ranjan (1998):** ' Bio-diversity in India and relevance of GATT: Expectations and apprehensions'. Geographical Review of India, pp26-32.
- **Bhagabati, Moana (1995) :** 'Problems With Bio Safety'; Down To Earth, New Delhi, Jan., 15
- **Boisvert, Valerie and Caron, Armelle (2002):** 'Convention on biological diversity: An institutionalist perspective of the debates'; Journal of Economic Issues, pp151-66.
- **Chakraborty, Manab (1997)**: ' Economic incentives for biodivesity: will they work in developing countries?'; Economic and Political Weekly, pp1071-73.
- **Gadgil, Madhav (1993):** 'Biodiversity: Tapping Folk Knowledge'; The Hindu, January 10, 1993.
- **Goswami, H: (1997)**. Biodiversity –Patents are Against National Interests; Current Science 73, 3, 10 Aug 1997,218.
- **Gupta, Arvind (1998):** Bio-prospecting: Challenge to Biodiversity? Science Reporter, CSIR, New Delhi; pp. 60-63; July 1998.
- **Harlan, J.R '(1975):** Our Vanishing Genetic Resources. Sciences, 188: 618-622.
- **Janzen, D.H, Hallwachs, W: (1994).** All Taxa Biodiversity inventory (ATBI) of Terrestrial Systems: A Genetic Protocol For Non-Damaging Use. Report of a NSF Workshop, 16-18 April 1993, Philadelphia, pa, 1-132.

- **Johnston, S: (1997).** The Convention on Biological Diversity: the next phase; RECIEL, 6, Issue 3, 1997, 219-230.
- **Kate, Kerry Ten and Laird, Sarah A (2000): '**Biodiversity and business: Coming to terms with the 'grand bargain'; International Affairs, pp241-64.
- **Khanna, PP. & Neeta Singh (1987):** 'Conserving Of Genetic Resources in India-Present Status & Future Prospects'; National Symposium on Plant Genetic Resources, NBPGR, IARI, New Delhi, pp. 58-72.
- **Kothari, Ashish (1996):** Environment and New Economic Policies; In Alternative Economic Survey, Delhi Science Forum, New Delhi.
- **Kothari, Ashish (1994a):** 'Conserving Life- Implications Of The Biodiversity Conservation For India'; Kalpavriksh, Institute Of Public Administration, New Delhi.
- **Kothari, Ashish (1997):** 'Biodiversity in India; Hindu Survey of the Environment, New Delhi, India.
- **Macilwain, C: (1998):** Boost to Biodiversity Research "Would Strengthen US Economy". Nature, 391, 829.
- **Mahajan, A.K. (1996): 'Biodiversity**, pollution and ocean environment', Journal of Indian Ocean Studies, pp127-30.
- **Malviya, R.A. (2001):** 'Biological diversity and international environmental law with special reference to the biological diversity convention'; Indian Journal of International Law, pp633-43.

- **McNeely, Jeffrecy A. (1997);** 'Biodiversity Convention: Miles to go'; Hindu Survey of the Environment, New Delhi, India.
- **Mukherjee, Ambarish (1997):** 'Biodiversity Conservation', Journal of the Asiatic Society, pp 1-6.
- **Nair, M.D. (1998):** Basmati: Biodiversity and Germplasm Issue; The Hindu; May 6, 1998.
- **Navdanya (1993):** 'Cultivating Diversity: Biodiversity Conservation And The Politics Of Seed'; Research Foundation For Science, Technology & Natural Resources Policy, Dehradun.
- **Raman, Kannamma. S (1997):** 'Conservation of bio-diversity: Need of the decade', Social Action, pp73-87.
- **Sadhukhan, Sunil and others (1998):** 'Biodiversity: Some reflections on its connotation'; Geographical Review of India, pp448-56.
- **Shah, S.A. (1995):** 'Crimes Against Nature" Down To Earth. New Delhi, May 15.
- **Shand, H., (1993):** A Landmark Year for Biodiversity or Bio-Piracy? Biotechnology and Development Monitor, Vol. 17.
- **Shiva, Vandana (1997):** Biodiversity totalitarianism: IPRs as seed monoplanes', Mainstream, pp23-28.
- **Sinha, Rajiv K. (1993):** 'Global Environment Protection and Eco-Politics At The Rio Earth Summit, 1992; in R.M. Lohda (ed.) Environment Ruin and The Crisis Of Survival, Indus Pub, New Delhi, pp . 389-400.

- **Sinha, Rajiv K (1995 b):** Biodiversity conservation through faith and tradition in India: Some case studies; International Journal of Sustainable Development and World Ecology, (U.K.) Vol.2, No.4, Dec. 1995; pp. 278-284.
- **Sinha, Rajiv K. (1996):** (1) 'Erosion of Biodiversity: Threat to Human Existence'; (2) 'Biodiversity Conservation: Key To Human Survival' In self (ed.) 'Environmental Crisis & Humans at Risk: Priorities for action', INA Shree Pub, Jaipur, pp. 189-217.
- **Swanson, Timothy (1999): 'Why** there is a biodiversity convention? : the international interest in centralized development planning'; International Affairs, pp 307-31.
- **Szentandrasi, S and others (1995):** 'Conserving biological diversity and the conservation reserve program'; Growth and Change, pp383-404.
- **Tisdell, Clem (1996):** 'Biodiversity, conservation and sustainable development: Challenges for North-East India in context'; Indian Journal of Quantitative Economics, pp1-18.

Appendix A

Membership of Multilateral Environmental Agreements

Country	Contracting Party? (*)						
	Biodiversity-related Conventions					Rio Conventions	
	CBD	CITES	CMS	Ramsar	WHC	UNFCCC	UNCCD
Afghanistan	[S]	CP	-	-	CP	-	CP
Albania	CP	-	-	CP	CP	CP	CP
Algeria	CP	CP	-	CP	CP	CP	CP
Andorra	-	-	-	-	CP	-	-
Angola	CP	-	-	-	CP	CP	CP
Antigua and Barbuda	CP	CP	-	-	CP	CP	CP
Argentina	CP	CP	CP	CP	CP	CP	CP
Armenia	CP	-	-	CP	CP	CP	CP
Australia	CP	CP	CP	CP	CP	CP	CP
Austria	CP	CP	-	CP	CP	CP	CP
Azerbaijan	CP	CP	-	[a]	CP	CP	CP
Bahamas	CP	CP	-	CP	-	CP	CP
Bahrain	CP	-	-	CP	CP	CP	CP
Bangladesh	CP	CP	-	CP	CP	CP	CP
Barbados	CP	CP	-	-	-	CP	CP
Belarus	CP	CP	-	CP	CP	CP	-
Belgium	CP	CP	CP	CP	CP	CP	CP
Belize	CP	CP	-	CP	CP	CP	CP
Benin	CP	CP	CP	CP	CP	CP	CP
Bhutan	CP	-	-	-	-	CP	-
Bolivia	CP	CP	-	CP	CP	CP	CP
Bosnia and Herzegovina	-	-	-	-	CP	CP	-
Botswana	CP	CP	-	CP	CP	CP	CP
Brazil	CP	CP	-	CP	CP	CP	CP
Brunei Darussalam	-	CP	-	-	-	-	-
Bulgaria	CP	CP	CP	CP	CP	CP	CP
Burkina Faso	CP	CP	CP	CP	CP	CP	CP
Burundi	CP	CP	-	-	CP	CP	CP
Cambodia	CP	CP	-	CP	CP	CP	CP
Cameroon	CP	CP	CP	-	CP	CP	CP
Canada	CP	CP	-	CP	CP	CP	CP
Cape Verde	CP	-	-	-	CP	CP	CP
Central African Republic	CP	CP	[S]	-	CP	CP	CP
Chad	CP	CP	CP	CP	CP	CP	CP
Chile	CP	CP	CP	CP	CP	CP	CP
China	CP	CP	-	CP	CP	CP	CP
Colombia	CP	CP	-	CP	CP	CP	CP

Comoros	CP	CP	-	CP	CP	CP	CP
Congo	CP	CP	CP	CP	CP	CP	CP
Cook Islands	CP	-	-	-	-	CP	CP
Costa Rica	CP	CP	-	CP	CP	CP	CP
Côte d'Ivoire	CP	CP	[S]	CP	CP	CP	CP
Croatia	CP	CP	CP	CP	CP	CP	CP
Cuba	CP	CP	-	CP	CP	CP	CP
Cyprus	CP	CP	-	-	CP	CP	CP
Czech Republic	CP	CP	CP	CP	CP	CP	CP
DPR Korea	CP	-	-	-	CP	CP	-
DPR Congo	CP	CP	CP	CP	CP	CP	CP
Denmark	CP	CP	CP	CP	CP	CP	CP
Djibouti	CP	CP	-	-	-	CP	CP
Dominica	CP	CP	-	-	CP	CP	CP
Dominican Republic	CP	CP	-	-	CP	CP	CP
Ecuador	CP	CP	-	CP	CP	CP	CP
Egypt	CP	CP	CP	CP	CP	CP	CP
El Salvador	CP	CP	-	CP	CP	CP	CP
Equatorial Guinea	CP	CP	-	-	-	CP	CP
Eritrea	CP	CP	-	-	-	CP	CP
Estonia	CP	CP	-	CP	CP	CP	-
Ethiopia	CP	CP	-	-	CP	CP	CP
European Community	CP	-	CP	-	-	CP	CP
Fiji	CP	CP	-	-	CP	CP	CP
Finland	CP	CP	CP	CP	CP	CP	CP
FYR Macedonia	CP	CP	CP	CP	CP	CP	-
France	CP	CP	CP	CP	CP	CP	CP
Gabon	CP	CP	-	CP	CP	CP	CP
Gambia	CP	CP	-	CP	CP	CP	CP
Georgia	CP	CP	CP	CP	CP	CP	CP
Germany	CP	CP	CP	CP	CP	CP	CP
Ghana	CP	CP	CP	CP	CP	CP	CP
Greece	CP	CP	CP	CP	CP	CP	CP
Grenada	CP	CP	-	-	CP	CP	CP
Guatemala	CP	CP	-	CP	CP	CP	CP
Guinea	CP	CP	CP	CP	CP	CP	CP
Guinea Bissau	CP	CP	CP	CP	-	CP	CP
Guyana	CP	CP	-	-	CP	CP	CP
Haiti	CP	-	-	-	CP	CP	CP
Honduras	CP	CP	-	CP	CP	CP	CP
Hungary	CP	CP	CP	CP	CP	CP	CP
Iceland	CP	CP	-	CP	CP	CP	CP
India	CP	CP	CP	CP	CP	CP	CP
Indonesia	CP	CP	-	CP	CP	CP	CP
Iran (Islamic Republic of)	CP	CP	-	CP	CP	CP	CP

Iraq	-	-	-	-	CP	-	-
Ireland	CP	[S]	CP	CP	CP	CP	CP
Israel	CP	CP	CP	CP	CP	CP	CP
Italy	CP	CP	CP	CP	CP	CP	CP
Jamaica	CP	CP	[S]	CP	CP	CP	CP
Japan	CP	CP	-	CP	CP	CP	CP
Jordan	CP	CP	CP	CP	CP	CP	CP
Kazakhstan	CP	CP	-	[a]	CP	CP	CP
Kenya	CP	CP	CP	CP	CP	CP	CP
Kiribati	CP	-	-	-	CP	CP	CP
Kuwait	[S]	[S]	-	-	-	CP	CP
Kyrgyzstan	CP	-	-	[a]	CP	CP	CP
Lao PDR	CP	-	-	-	CP	CP	CP
Latvia	CP	CP	CP	CP	CP	CP	-
Lebanon	CP	-	-	CP	CP	CP	CP
Lesotho	CP	[S]	-	-	-	CP	CP
Liberia	CP	CP	-	-	-	-	CP
Libyan Arab Jamahiriya	CP	-	-	CP	CP	CP	CP
Liechtenstein	CP	CP	CP	CP	-	CP	CP
Lithuania	CP	-	-	CP	CP	CP	-
Luxembourg	CP	CP	CP	CP	CP	CP	CP
Madagascar	CP	CP	[S]	CP	CP	CP	CP
Malawi	CP	CP	-	CP	CP	CP	CP
Malaysia	CP	CP	-	CP	CP	CP	CP
Maldives	CP	-	-	-	CP	CP	-
Mali	CP	CP	CP	CP	CP	CP	CP
Malta	CP	CP	CP	CP	CP	CP	CP
Marshall Islands	CP	-	-	-	-	CP	CP
Mauritania	CP	CP	CP	CP	CP	CP	CP
Mauritius	CP	CP	-	-	CP	CP	CP
Mexico	CP	CP	-	CP	CP	CP	CP
Micronesia (Federated States of)	CP	-	-	-	-	CP	CP
Monaco	CP	CP	CP	CP	CP	CP	CP
Mongolia	CP	CP	CP	CP	CP	CP	CP
Morocco	CP	CP	CP	CP	CP	CP	CP
Mozambique	CP	CP	-	-	CP	CP	CP
Myanmar	CP	CP	-	-	CP	CP	CP
Namibia	CP	CP	-	CP	CP	CP	CP
Nauru	CP	-	-	-	-	CP	CP
Nepal	CP	CP	-	CP	CP	CP	CP
Netherlands	CP	CP	CP	CP	CP	CP	CP
New Zealand	CP	CP	CP	CP	CP	CP	CP
Nicaragua	CP	CP	-	CP	CP	CP	CP
Niger	CP	CP	CP	CP	CP	CP	CP
Nigeria	CP	CP	CP	CP	CP	CP	CP
Niue	CP	-	-	-	CP	CP	CP

Norway	CP	CP	CP	CP	CP	CP	CP
Oman	CP	-	-	-	CP	CP	CP
Pakistan	CP	CP	CP	CP	CP	CP	CP
Palau	CP	-	-	-	-	CP	CP
Panama	CP	CP	CP	CP	CP	CP	CP
Papua New Guinea	CP	CP	-	CP	CP	CP	CP
Paraguay	CP	CP	CP	CP	CP	CP	CP
Peru	CP	CP	CP	CP	CP	CP	CP
Philippines	CP	CP	CP	CP	CP	CP	CP
Poland	CP	CP	CP	CP	CP	CP	-
Portugal	CP	CP	CP	CP	CP	CP	CP
Qatar	CP	CP	-	-	CP	CP	CP
Republic of Korea	CP	CP	-	CP	CP	CP	CP
Republic of Moldova	CP	CP	CP	CP	-	CP	CP
Romania	CP	CP	CP	CP	CP	CP	CP
Russian Federation	CP	CP	-	CP	CP	CP	-
Rwanda	CP	CP	-	-	CP	CP	CP
St. Kitts and Nevis	CP	CP	-	-	CP	CP	CP
St. Lucia	CP	CP	-	-	CP	CP	CP
St. Vincent and the Grenadines	CP	CP	-	-	-	CP	CP
Samoa	CP	-	-	-	-	CP	CP
San Marino	CP	-	-	-	CP	CP	CP
Sao Tome and Principe	CP	-	-	-	-	CP	CP
Saudi Arabia	-	CP	CP	-	CP	CP	CP
Senegal	CP	CP	CP	CP	CP	CP	CP
Seychelles	CP	CP	-	-	CP	CP	CP
Sierra Leone	CP	CP	-	CP	-	CP	CP
Singapore	CP	CP	-	-	-	CP	CP
Slovakia	CP	CP	CP	CP	CP	CP	-
Slovenia	CP	CP	CP	CP	CP	CP	CP
Solomon Islands	CP	-	-	-	CP	CP	CP
Somalia	-	CP	CP	-	-	-	-
South Africa	CP	CP	CP	CP	CP	CP	CP
Spain	CP	CP	CP	CP	CP	CP	CP
Sri Lanka	CP	CP	CP	CP	CP	CP	CP
Sudan	CP	CP	-	-	CP	CP	CP
Suriname	CP	CP	-	CP	CP	CP	CP
Swaziland	CP	CP	-	-	-	CP	CP
Sweden	CP	CP	CP	CP	CP	CP	CP
Switzerland	CP	CP	CP	CP	CP	CP	CP
Syrian Arab Republic	CP	-	-	CP	CP	CP	CP
Tajikistan	CP	-	CP	[a]	CP	CP	CP

Thailand	[S]	CP	-	CP	CP	CP	CP
Togo	CP	CP	CP	CP	CP	CP	CP
Tonga	CP	-	-	-	-	CP	CP
Trinidad and Tobago	CP	CP	-	CP	-	CP	CP
Tunisia	CP	CP	CP	CP	CP	CP	CP
Turkey	CP	CP	-	CP	CP	-	CP
Turkmenistan	CP	-	-	[a]	CP	CP	CP
Tuvalu	[S]	-	-	-	-	CP	CP
Uganda	CP	CP	CP	CP	CP	CP	CP
Ukraine	CP	CP	CP	CP	CP	CP	-
United Arab Emirates	CP	CP	-	-	CP	CP	CP
United Kingdom	CP	CP	CP	CP	CP	CP	CP
United Republic of Tanzania	CP	CP	CP	CP	CP	CP	CP
United States of America	[S]	CP	-	CP	CP	CP	CP
Uruguay	CP	CP	CP	CP	CP	CP	CP
Uzbekistan	CP	CP	CP	[a]	CP	CP	CP
Vanuatu	CP	CP	-	-	-	CP	CP
Venezuela	CP	CP	-	CP	CP	CP	CP
Viet Nam	CP	CP	-	CP	CP	CP	CP
Yemen	CP	CP	-	-	CP	CP	CP
Yugoslavia	[S]	-	-	CP	CP	CP	-
Zambia	CP	CP	-	CP	CP	CP	CP
Zimbabwe	CP	CP	-	-	CP	CP	CP

[S] Signifies the country has signed but has not yet ratified the convention.

[a] awaiting confirmation by these members of the Commonwealth of Independent States of their status as Parties.

CP Contracting Party (*) as of August 2001.

Appendix B

Comparative statement of recorded number of plant species in India and the world

Taxa	Species		Percentage of India to the world
	India	World	
Bacteria	850	4000	21.25%
Viruses	Unknown	4000	–
Algae	6500	40000	16.25%
Fungi	14,500	72000	20.14%
Lichens	2000	17000	11.80%
Bryophyta	2850	16000	17.80%
Pteridophyta	1100	13000	8.46%
Gymnosperms	64	750	8.53%
Angiosperms	17500	250000	7%

Source: MoEF 1999.

Comparative statement of recorded number of animal species in India and the World

Taxa	Species		Percentage of India to the world
	India	World	
Protista	2577	31259	8.24
Mollusca	5070	66535	7.62
Arthropoda	68389	987949	6.9
Other Invertebrates	8329	87121	9.56
Protochordata	119	2106	5.65
Pisces	2546	21723	11.72
Amphibia	209	5150	4.06
Reptilia	456	5817	7.84
Aves	1232	9026	13.66
Mamalia	390	4629	8.42

Source: MoEF 1999.

Endemic species of plants	
Group	**No. of species**
Pteridophyta	200
Angiosperms	4950

Endemic species of animals	
Group	**No. of species**
Mollusca	
Land	878
Freshwater	89
Insecta	16,214
Amphibia	110
Reptilia	214
Aves	69
Mammalia	38

India's World heritage sites

Site	Location
Kaziranga National Park	Assam
Keoladeo Ghana National Park	Rajasthan
Manas Wildlife Sanctuary	Assam
Nanda Devi National Park	Uttar Pradesh
Sundarban National Park	West Bengal

Source: MoEF 1999.

Biosphere reserves of India

Name of the site	Date of notification	Area in Sq. km	Location (State)
Nilgiri	01.08.86	5,520	Parr of Wynad , Nagarhole, Bandipur and Madumalai, Nilambur, Silent Valley and Siruvani hills (Tamil Nadu, Kerala and Karnataka)
Nanda Devi	18.01.88	######	Par of Chamoli, Pithoragarh, Almora Districts (Uttaranchal)
Nokrerk	01.09.88	820	Part of Gora Hills (Meghalaya)
Manas	14.03.89	2,837	Part of Kokrajhar, Bongaigaon, Barpeta, Nalbari, Kamprup and Darang district (Assam)
Sunderbans	29.03.89	9,630	Part of delta of Ganga & Brahamaputra river system (West Bengal)
Gulf of Mannar	18.02.89	10,500	Indan part of Gulf of Mannar between India and Sri Lanka (Tamil Nadu)
Great Nicobar	06.01.89	885	Southern most islands of Andaman and Nicobar (A&N islands)
Similpal	21.06.94	4,374	Part of Mayurbhanj district (Orissa)
Dibru-Saikhowa	28.07.97	765	Part of Dibrugarh and Tinsukia district (Assam)
Dehang Debang	02.09.98	5,112	Part of Siang and Debang velley (Arunachal Pradesh)
Pachmarhi	03.03.99	######	Parts of Betul, Hoshangabad and Chindwara districts (Madhya Pradesh)
Kanchanjanga	07.02.00	######	Part of Kanchanjanga Hills (Sikkim)

Source: MoEF 1999.