

**AGRICULTURAL BIODIVERSITY:  
INTERNATIONAL REGULATIONS AND  
IMPLICATIONS FOR INDIA**

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**MASTER OF PHILOSOPHY**

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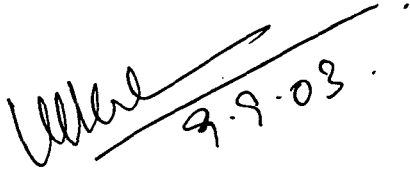


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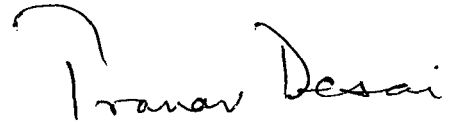
### Certificate

This is to certify that the dissertation entitled "**AGRICULTURAL BIODIVERSITY: INTERNATIONAL REGULATIONS AND IMPLICATIONS FOR INDIA**" submitted by **RINII SRIVASTAVA** in partial fulfillment of the requirements for the award of the degree of **Master of Philosophy** of this University is original work according to the best of our knowledge and may be placed before the examiners for evaluation.

  
9.9.03

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# 1. INTRODUCTION

## 1.1 Background

The decade of 1990s have seen an increasingly acrimonious debate over the emerging trends in agriculture e.g., the controversy over the so-called terminator technology<sup>1</sup>, the turmeric and Basmati patent<sup>2</sup> cases, the imposition of a global trading and patent regime under the World Trade Organization, etc. Shorn of its acrimony, this debate in a sense is welcome, for it brings to the fore what has been mankind's one of the chief concern i.e. the security of food supplies. Even as technology produces visions of bumper harvests, and even as countries like India claim self-sufficiency in food grains production, over half of the world's population (including tens of millions in India) don't have access to food. Paradoxically, even as income levels are rising in many sections of society, nutritional levels, and stability of access to food, are often declining in the other sections.<sup>3</sup>

The percentage of undernourished people to the total population is considerable in the developing countries and the trend is not changing.<sup>4</sup> Food insecurity associates closely with poverty. About 800 million people do not have access to sufficient food to lead healthy, productive lives. As many as 280 million of these food-insecure people live in South Asia and 240 million in East Asia, clearly further efforts are needed to reduce poverty and food security. According to Food and Agricultural Organization (FAO)

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<sup>1</sup> Terminator technology refers to the inclusion of certain genes in the seed which prohibit its propagation in the second generation, thus making it essential for the farmer to buy seeds every time for sowing and use of stored seeds, by the farmer, is checked. This is a mechanism which has been questioned on ethical grounds.

<sup>2</sup> In 1997, the Texas-based Rice Tec was granted US patent 5,663,484 on basmati rice lines and grains. This patent allowed the company to grow and sell a 'new' variety, which it claimed to have developed, under the name of Texmati in US and abroad. Rice Tec's Texmati was derived from the Indian Basmati. It was a case of cross-breeding and no new variety was developed. The case has become a classic example of Bio-piracy.

<sup>3</sup> Kothari A. (1999), "Agro-biodiversity: the future of India's agriculture", *MCAER Book*, February 7.

projections, the World Food Summit goal of halving the number of food-insecure people from 800 million in 1995 to 400 million by 2015 will not be achieved until 2030.<sup>5</sup>

Despite the high level political reaffirmation of the need to achieve speedily the goal of 'Food for All', millions of human beings still suffer from hunger and malnutrition. The increase in human population, enhanced purchasing power and increasing urbanization will lead to a large demand for food, as well as more diversified food products, in the coming millennium. It is important that both intensification and diversification of agriculture, particularly in the developing countries, is based on sound ecological foundations essential for sustainable advances in productivity.<sup>6</sup>

Productivity gains prominence over increase in cultivated area, in this millennium, because fertile land and water for farming are increasingly getting scarce. Agriculture land use increased by 13%, or 170 million hectares in the last 30 years, largely at the expense of lowland forests and their rich biodiversity.<sup>7</sup> The Green Revolution technologies have also almost run their course in much of Asia.<sup>8</sup> The key lessons learned from the Green Revolution were:

- It had benefited farmers in irrigated areas much more than those in rain-fed areas, thus worsening the regional disparity between them.
- It promoted an excessive use of pesticides and, in some situations, indiscriminate use of fertilizers harmful to the environment.<sup>9</sup>

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<sup>5</sup> Amarsinghe N (2001), "*Poverty, food security and agricultural biotechnology: challenges and opportunities*", paper presented at 'Technology and poverty reduction in Asia and Pacific', ADB-OECD program, Paris, 18-19 June.

<sup>6</sup> Pisupati B (2002), "Agrobiodiversity and food-security", *Daily News*, 14 March.

<sup>7</sup> Anonymous (2000), "*Rural Asia: beyond the green revolution*", ADB, Manila.

<sup>8</sup> Pingali P.L., M.Hussein and R.V.Gerpacio (1997), "*Asian rice bowl: the returning crisis*", CAB International and International Rice Research Institute, Wallingford, U.K.

<sup>9</sup> Amarsinghe N (2001), "*Poverty, food security and agricultural biotechnology: challenges and opportunities*", paper presented at 'Technology and poverty reduction in Asia and Pacific', ADB-OECD program, Paris, 18-19 June.



The new technology that is emerging in this millennium, as a development over the Green Revolution technologies (GRTs), is Biotechnology. The technology is an effort to increase productivity, without increased use of external inputs, as a response to the rising population of the world and the plateauing of the GRTs.

## 1.2 Structure of the Study

This provides the backdrop of the study - where scholars are looking for a new technological paradigm to replace the one which led to Green Revolution because of its detrimental effects on the environment; there is a growing awareness to conserve biodiversity for sustainable development; the issue of food-security has yet not been resolved due to rising population and other related causes; the issue of agro-biodiversity conservation has emerged as one encompassing science and society, for nutritional value of food is as important as its availability.

### 1.2.1. Objectives

In the given backdrop the broad objectives of the study are as follows:

- To analyze sector-specific international and national policies in the area of agro-biodiversity.
- To study India's harmonization efforts with international policies, viz. Convention on Bio-Diversity, Protocol on Biosafety, International Seed Treaty and Trade-Related Intellectual Property Rights.
- To discuss legal and policy reforms needed to improve India's capacity for conservation of agro-biodiversity.

### 1.2.2. Methodology

To achieve the above listed objectives, the study utilizes primary data - in the form of unstructured interviews conducted with agricultural scientists and, also, the Treaties and Acts, on national and international levels; and secondary data - in the form of studies on biodiversity and related available literature. The data so gathered will be combined together, contrasted, compared and used for analysis to get an in-depth understanding of the issue and to look for remedial procedures for the impending issues related to agro-

biodiversity in India. Since the data is of a qualitative nature, the analysis procedure will, also, be qualitative in nature.

The study, however, has some limitations due to the vastness of the subject, various dimensions of the study and dynamic nature of the issue. These limitations include:

- No work has been undertaken on the aspect of implementation of the various plans and policies, whether national or international.
- The response of farmers' and breeders', the two affected parties, about these policies, has not been elicited.
- No empirical data included about the change in status of agricultural biodiversity brought about by the introduction of these policies.
- The issue of wild-relatives of cultivated varieties has not been discussed in detail.
- The study is specifically on crops and excludes other elements of agricultural ecosystem.

The structure of the study, in view of this methodology is as follows:

The first chapter gives an overview of the situation, describing the issue of food-security and the background in which the concept of Agro-biodiversity has gained prominence.

The second chapter attempts to understand the meaning and significance of Agricultural biodiversity. Besides, the various reasons as to why agricultural biodiversity is threatened have been detailed in this chapter.

The next section, comprising of the third, fourth, fifth and sixth chapters gives the international policies and programmes, rules and regulations, related to agricultural biodiversity and analyses their complementarities and relevance in fulfilling their objective of conserving biodiversity, especially of the cultivated varieties. The third chapter deals with the evolution of the concept of Agro-biodiversity and discusses the Convention on Biological Diversity (CBD), which was developed as a response to the discussions on the issue of biodiversity at the Rio Earth Summit. The fourth chapter analyses the Protocol on Biodiversity, which was the first treaty to be signed under the CBD. The subsequent chapter is a work on the International Seed Treaty, which is

specifically a document on the plant genetic resources for food and agriculture. The sixth chapter analyses the Agreement on Trade Related Intellectual Property Rights (TRIPS) in the context of the other international stipulations and attempts to highlight the contradictions between the two types of policies in international arena- one being environmental in nature and the other being essentially a trade policy, and the dominance that the latter exhibits over the former.

India has been taken as a case to study the impact of these international stipulations on the developing countries, which are considered to be store-houses of agricultural biodiversity, and the response it elicits from them. The seventh chapter gives an overview of the changing status of the agricultural biodiversity in India, the degree of endemism of the flora, the variety that has been nurtured over generations and the reasons that have led to decline in this diversity. This intends to provide a perspective for the study in the Indian context.

The eighth chapter discusses the legal status of the issue, in India, the policies regarding agro-biodiversity in the country are analyzed. On the basis of the analysis, the researcher attempts to argue certain shortfalls of the policies, specifically in the context of the country under study.

Finally, conclusions have been drawn on the basis of the study and further areas of research have been delineated in the ninth and the concluding chapter.

## 2. AGRO-BIODIVERSITY AND THREATS

### 2.1 The Concept

Agricultural biodiversity is the most vital sub-set of biodiversity. Although the term "Agricultural Biodiversity" is relatively new – it has come into wide use in recent years as evidenced by bibliographic references - the concept itself is quite old. It is a creation of humankind whose food and livelihood security depend on the sustained management of those diverse biological resources that are important for food and agriculture. It has developed through human intervention by countless farmers, herders and fisher folk over the past thousands of years. Agro-biodiversity comprises the varieties, breeds, species and agro-ecosystems that underpin universal food security and provide the genetic material needed for industrial agriculture and biotechnology. The variety and variability of animals, plants and microorganisms, used directly or indirectly, for food and agriculture (including, in the FAO definition, crops, livestock, forestry and fisheries), it comprises the diversity of genetic resources (varieties, breeds, etc.) and species used for food, fodder, fiber, fuel and pharmaceuticals. It also includes the diversity of non-harvested species that support production (e.g. soil micro-organisms) and those in the wider environment that support agro-ecosystems (agricultural, pastoral, forest and aquatic), as well as the diversity of the agro-ecosystems themselves.

Agricultural biodiversity, also known as agro-biodiversity or the genetic resources for food and agriculture, includes:

- Harvested crop varieties, livestock breeds, fish species and non-domesticated ('wild') resources within field, forest, rangeland and in aquatic ecosystems;
- Non-harvested species within production ecosystems that support food provision, including soil micro-biota, pollinators and so on; and
- Non-harvested species in the wider environment that support food production ecosystems (agricultural, pastoral, forest and aquatic ecosystems).

The agro-biodiversity, thus, involves interaction between the environment, genetic resources and management practices which determines the evolutionary process, which may involve introgression from wild relatives, hybridization between cultivars,

mutations, and natural and human selections. These result in genetic material (farmers' crop varieties or animal breeds) that is well adapted to local a-biotic and biotic environmental variation.<sup>10</sup>

A few relevant definitions of Agro-biodiversity are:

- According to the 'Convention on Biological Diversity' (CBD,1992), "Biological Diversity means the variability among living organisms from all sources including, *inter alia*, terrestrial, marine and other aquatic ecosystems and the ecological complexes' of which they are a part; this includes diversity within species, between species and of ecosystems." The absence of a clear definition of agricultural biodiversity in the text of CBD, however, gives the impression that the convention did not attach specific relevance to the biodiversity of cultivated varieties. The Convention is a foundation forum for discussing biodiversity in its broad perspective, which includes agro-biodiversity simply as one of its elements.
- According to the 'Biological Diversity Bill (2000)' of the Government of India, "Biological Diversity means the variability among living organisms from all sources and the ecological complexes of which they are part and includes diversity within species or between species and of eco-systems. The term 'Agro-Biodiversity' is specifically defined as biological diversity of agriculture related species and wild relatives." The Indian Act, thus, though it takes the definition of biodiversity from the CBD, gives special mention to the concept of Agro-biodiversity. This may denote the evolution of the concept of agro-biodiversity, over the years, from the coming into being of CBD in 1992 to the legislation of the Act in 2000.
- The Food and Agricultural Organization of the United Nations (1999), is more specific in dealing with this concept. It states that "Agricultural biodiversity encompasses the variety and variability of animals, plants and micro-organisms

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<sup>10</sup> Anonymous, "*Sustaining Agricultural Biodiversity: Genetic, Species, Ecosystems, Cultural and Temporal dimensions*", <http://www.ukabc.org/ukabc3.htm#d>.

which are necessary to sustain key functions of the agro-ecosystem, its structure and processes for, and in support of, food production and food security.”<sup>11</sup>

It can thus be summarized that biodiversity is an addition sum of genetic, taxonomic and ecosystem diversity. Genetic diversity embraces the variation in genetic material, such as genes and chromosomes. Taxonomic diversity, mostly interpreted as the variation among and within species, includes the variation of taxonomic unities such as phyla, families, genera, etc. Ecosystem diversity or even better bio-geographic diversity concerns with the variation in bio-geographic regions, landscapes and habitats. It has to be realized that biodiversity is always concerned with the variability of the living nature within a specific area or region. The idea of biodiversity gets its content from within a time or space connection.<sup>12</sup> Agro-biodiversity refers primarily to genetic variability in cultivated plants and domesticated animals, together with their progenitors and closely related wild species, growing and evolving under natural conditions.<sup>13</sup> It results from the interaction between the environment, genetic resources, the land and water resources management systems and practices used by culturally diverse people, for food production.<sup>14</sup>

In the light of the above discussion, the multiple dimensions of agricultural biodiversity, as also discussed at an international Agricultural Biodiversity work-shop organized by the FAO and CBD, are summarized as providing for:

- Sustainable production of food and other agricultural products emphasizing-strengthening sustainability in production systems at all levels of intensity and improving the conservation, sustainable use and enhancement of the diversity of all genetic resources for food and agriculture, especially plant and animal genetic resources, in all types of production systems.

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<sup>11</sup> Anonymous (1999), “*Agricultural Biodiversity*”, FAO Multifunctional Character of Agriculture and Land: Conference Background Paper, No. 1, Maastricht, September.

<sup>12</sup> De Valk Webpages, "De Valk Environmental Law", devalk@biodiversity.nl

<sup>13</sup> Pisupati B (2002), “Agrobiodiversity and food security”, *Daily News*, 14 March.

<sup>14</sup> Anonymous (2002), “*Sustaining agricultural biodiversity - and the integrity and free flow of genetic resources for food for agriculture*”, ITDG, GRAIN and etc group, May.

- Biological or life support to production emphasizing conservation, sustainable use and enhancement of the biological resources that support sustainable production systems, particularly soil biota, pollinators and predators.
- Ecological and social services provided by agro-ecosystems such as landscape and wildlife protection, soil protection and health (fertility, structure and function), water cycle and water quality, air quality, Carbon Dioxide sequestration, etc.<sup>15</sup>

The multidimensional role of agro-biodiversity is further discussed in the next section, detailing the importance of the variety and diversity of agricultural species on food, health and livelihood security.

## 2.2 Significance

Biodiversity is very important for sustainable development of the society. Before describing the importance of agro-biodiversity, it is important to understand the concept of sustainable development, for it is in the context of sustainable development that the importance of agro-biodiversity can be stressed.

According to World Commission for Environment and Development's (WECD) Bruntland Report (1987), sustainable development is "to ensure that the development process meets the needs of the present without compromising the ability of future generations to meet their own needs." There are three schools of Sustainable Development:

- Conservationist school argues that any development activity needs to consider the 'trade-off' in terms of environment and any such damage done to environment needs to be adequately compensated.
- Preservationist school believes in having standards set and areas and zones of nature preserved from development activities. The environment is not meant for

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<sup>15</sup> Anonymous (2002), "*Sustaining agricultural biodiversity - and the integrity and free flow of genetic resources for food for agriculture*", ITDG, GRAIN and etc group, May.

development and there has to be rules, regulations and standards for preserving nature.

- Extreme school believes in maximum ecological preservation where human beings are to live in harmony with nature.<sup>16</sup>

Sustainable development is a multi-dimensional concept with three interacting angles—ecology, economics and ethics. The necessary conditions for achieving sustainable development are ecological security, economic efficiency and social equity.<sup>17</sup>

The relevance of agro-biodiversity can, hence, be analyzed in the perspective of overall biodiversity, of which it is a major component, and has great significance in view of food-security and livelihood of people.<sup>18</sup> Besides, diversity helps in adaptability; bio-diverse agriculture is stable; in absence of agro-biodiversity, farmers would increasingly depend on industry and government and subsidies; its absence would erode the base on which scientists depend for continuous improvement of crops and livestock. Besides, biodiversity forms the feedstock for the fast growing biotechnology industry.<sup>19</sup>

The genes from plants, animals and microorganisms of the developing world, in particular, are the strategic raw materials for the development of new food, pharmaceuticals and industrial products.<sup>20</sup> The future of not only food, but also health security, depends on the conservation and sustainable use of such diversity. Genetic engineering technologies help move genes across sexual barriers and hence no plant or

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<sup>16</sup> Mukherjee N. (1997), "Forests, indigenous communities and sustainable development", *Kurukshetra*, Jan-Feb, page 13-15.

<sup>17</sup> Lahiri S.C. (1997), "Sustainable economic development", *Kurukshetra*, Jan-Feb, page 39-40.

<sup>18</sup> Rana R.S. (1999), "Major global issues concerning plant genetic resources", *RIS Biotechnology and Development Review*, Vol. 2, No. 2, April.

<sup>19</sup> Swaminathan M.S (2000), "Biodiversity: equity in benefit sharing", *The Hindu: Survey of the environment*, 2000, page 45-52.

<sup>20</sup> Sarukhan J (2000), "GMOs: precautionary principle", *The Hindu: Survey of the environment*, 2000, page 155-62.



other living organism is useless, as Charaka reminded us centuries ago.<sup>21</sup> Bio-diverse agriculture, thus, provides the raw genetic material for continuous improvement in seeds and other farming inputs<sup>22</sup>

Genetic variety is essential, not only for improvement but also to boost the ability of species and populations to adapt to changing environmental conditions and is, therefore, a prerequisite for their survival. Without the genetic diversity that allows populations to respond evolutionarily to changes in the physical environment, diseases, predators, and competitors, populations risk extinction. Extinction occurs when a species can no longer reproduce at replacement levels. The doomed species might not have been able to adapt to the changed environment and, thus, perish without descendants; or it may have adapted but, in the process, may have evolved into a distinctly new species. The effect of humans on the environment, through hunting, collecting, and habitat destruction, has become a significant factor in plant and animal extinctions.<sup>23</sup>

Biodiversity also acts as a defense against pathogens; the more genetically uniform a population is, the more vulnerable it is to pandemic diseases. Pathogens evolve rapidly and plants and animals must adapt constantly to their attacks. In the case of domesticated plants, the object of food production is to select cultivars and races that have desirable qualities and which retain those qualities by being reproduced in as genetically uniform a manner as possible. Modern techniques of propagation and selective breeding have helped achieve a considerable degree of homogeneity in the developed varieties. This is considered an important contribution to food security; over recent decades high-yielding varieties (HYVs), with accompanying changes in agronomy, have significantly reduced the risk of famine, especially in Asia. This strategy, however, comes with its own risks. In their home areas, organisms co-evolve with pathogens and have more or less developed defenses. However, when transplanted, the plants and animals face an alien

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<sup>21</sup> Swaminathan M.S. (1996) (Ed.), ‘ *Agro biodiversity and Farmers' Rights*’, 303 pages.

<sup>22</sup> Kothari A. (1997), “Biodiversity, people and the proposed Forest Act”, *Kurukshetra*, Jan-Feb, page 3-7.

<sup>23</sup> De Valk Webpages, "De Valk Environmental Law", [devalk@biodiversity.nl](mailto:devalk@biodiversity.nl)

array of pathogens they have not encountered before. Many of these will be harmless, but it is possible for a 'super-pathogen' to evolve that will be extremely damaging to the imported plant. If such a pathogen is then carried back to the 'home' area of the organism (i.e. its center of evolutionary diversity) it can have enormous destructive potential.<sup>24</sup>

Biodiversity provides not only food, security and income but also raw materials for clothing, shelter, medicines, breeding new varieties, and performs other services such as maintenance of soil fertility and biota, and soil and water conservation, all of which are essential to human survival. The importance of agro-biodiversity encompasses socio-cultural, economic and environmental elements.<sup>25</sup>

Genetic diversity enables farmers to adopt crops suited to their own ecological needs and cultural traditions. Today, there is growing recognition worldwide that the innovation of farmers and indigenous people is of utmost importance in understanding, utilizing and conserving biodiversity for agriculture, human health and the environment. In other words, the world's biodiversity can not be conserved unless the human diversity that protects and develops it is also nurtured.<sup>26</sup>

The relevance of agro-biodiversity can, hence, be summarized under following heads:

- Productivity: Conservation and management of broad-based genetic diversity within domesticated species has been improving agricultural production for 10,000 years. High production levels are sustained through maximizing the beneficial impact of ecosystem services for agricultural, modified and natural ecosystems.
- Adaptation: A diverse range of organisms contributes to the resilience of agricultural and natural ecosystems, their capacity to recover from environmental

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<sup>24</sup> Blench R (1998), "*Biodiversity conservation and its opponents*", Overseas Development Institute, London, Number 32, July.

<sup>25</sup> Esquinas-Alcázar J (2001), "*Making plant genetic resources beneficial and accessible for all*", FAO, Secretary of the FAO Commission on Genetic Resources for Food and Agriculture, 30 October.

<sup>26</sup> Shand Hope J. (2000), "Biotechnology: under whose control", *The Hindu: Survey of the Environment, 2000*, page 163-170.

stress and their ability to evolve. Informed adaptive management of agricultural and natural biodiversity secures sustained production.

- Maintenance of ecosystem functions: Essential functions such as nutrient cycling, decomposition of organic matter, crusted or degraded soil rehabilitation, pest and disease regulation, water quality, and pollination are maintained by a wide range of biologically diverse populations in natural ecosystems and in and near agricultural ecosystems.<sup>27</sup>

The following table summarizes the arguments forwarded for the conservation of biodiversity on the basis of its importance, as highlighted above. The table is followed by a discussion of the factors that have emerged as threat to this biodiversity, bringing the whole issue of conservation into focus.

Table 2.1: Summary of arguments for conservation of Biodiversity

Economic	The output from land is greater when biodiversity is conserved Unknown biochemical and genetic resources of potentially considerable value
Protection against evolving pathogens	Genetic uniformity may allow super-pathogens to evolve and cause sudden catastrophic deficits in food, fodder, etc.
Ecosystem services	Biodiversity essential to ecological functioning of planetary system
Aesthetic	Diversity has a value in itself
Ethical	Present society is a 'steward' of earth's biological resources and we have no right to destroy them.

Source: Roger B (1998), "*Biodiversity conservation and its opponents*", Overseas Development Institute, London, No. 32, July.

### 2.3 Threats

Agricultural biodiversity is the storehouse that provides humanity with food, clothes and medicine. It is essential in the development of sustainable agriculture and food security. It

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<sup>27</sup> Anonymous, "*Biological diversity in food and agriculture*", FAO, UN, <http://www.fao.org/>

is estimated that 10,000 species have been used for human food and agriculture. However, only about 150 plant species make up the diets of the majority of the world's population. Of these, just 12 species provide over 70 percent of food, while four -- rice, maize, wheat and potatoes -- make up over 50 per cent of the food supply. The locally diverse food production systems are under threat and, with them, the accompanying local knowledge, culture and skills of the food producers. Agricultural biodiversity is disappearing at an extensive scale, with the introduction of mono-cultural farming practice and with the disappearance of harvested species, varieties and breeds goes a wide range of un-harvested species. More than 90 per cent of crop varieties have disappeared from farmers' fields. With the advance in agriculture, the human food security systems have successively begun to depend not only on fewer and fewer plant species, but also on a small number of varieties. Such genetic homogeneity enhanced genetic vulnerability to pests and diseases as well as to soil and climatic stresses. The on-farm conservation traditions of rural communities are also giving way to monoculture, thereby accelerating the pace of gene erosion.<sup>28</sup>

Genetic erosion is the loss of genetic diversity, including the loss of individual genes, and the loss of particular combination of genes such as those manifested in locally adapted landraces. The term 'genetic erosion' is sometimes used in a narrow sense, i.e. the loss of genes or alleles, as well as more broadly, referring to the loss of varieties. The main cause of genetic erosion in crops, as reported worldwide, is the replacement of local varieties by improved or exotic varieties and species. As old varieties in farmers' fields are replaced by newer ones, genetic erosion frequently occurs because the genes and gene complexes found in the diverse farmers' varieties are not contained in *toto* in the modern variety.

In addition, the sheer number of varieties is also considerably reduced when commercial varieties are introduced into traditional farming systems. While some indicators of genetic erosion have been developed, according to FAO<sup>29</sup> there have been few systematic

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<sup>28</sup> Swaminathan M.S. (1996) (Ed.), ' *Agro biodiversity and Farmers' Rights*', 303 pages.

<sup>29</sup> Anonymous (1998), "*Sustaining agricultural biodiversity and agro-ecosystem functions*", Report of the FAO/CBD Agricultural Biodiversity Workshop, Rome, 2-4 December.

studies of the genetic erosion of crop genetic diversity which have provided quantifiable estimates of the actual rates of genotypic or allelic extinction in plant genetic resources. However, nearly all countries say, in Country Reports to FAO in 1996, that genetic erosion is taking place and that it is a serious problem.

The 1960s witnessed the emergence of intensive agriculture aimed to maximize production. Use of a single or a few improved varieties over large areas, use of chemical inputs and the lack of environmental, as well as ecological concerns, on the part of agriculturists has led to a stage where production is maximized but at considerable cost to natural resources. Though this was a necessity at that time to feed the billions, time has come to reconcile some of the factors that can be reversed. As the Global Biodiversity Assessment puts it, "*overwhelming evidence leads to the conclusion that modern commercial agriculture has had a direct negative impact on biodiversity at all levels: ecosystem, species and genetic, and on both natural and domesticated diversity*".<sup>30</sup>

Agriculture is the main activity of natural development on land. The modern 'growth model of development' led to widespread cultivation of cash crops and mono-cultural species, and use of excessive fertilizers and pesticides. Though this increased production rapidly, it was found to be unsustainable.<sup>31</sup>

There are many causes of this decline of agro-biodiversity, which has been accelerating throughout the 20th century in parallel with the demands of an increasing population and greater competition for natural resources. The principal underlying causes include:

- The replacement of local varieties or landraces by improved and/or exotic varieties and species is reported to be the major cause of genetic erosion around the world, in all regions except Africa.<sup>32</sup> Examples are mentioned in 81 Country Reports, of which two are highlighted below:

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<sup>30</sup> Pisupati B (2002), "Agro-biodiversity and food security", *Daily News*, 14 March.

<sup>31</sup> Kocherry T.X. (2000), "Preserve natural capital", *The Hindu: Survey of the Environment, 2000*, page 62-63.

<sup>32</sup> Anonymous, "*Sustaining Agricultural Biodiversity: Genetic, Species, Ecosystems, Cultural and Temporal dimensions*", <http://www.ukabc.org/ukabc3.htm#d>.

- A survey of farm households in the Republic of Korea showed that of 14 crops cultivated in home gardens, an average of only 26% of the landraces cultivated there in 1985 were still present in 1993. The retention rate did not exceed 50% for any crop, and for two crops it was zero. These results are disturbing as such home gardens have traditionally been important conservation sites, especially for vegetable crops.
- In China, in 1949, nearly 10,000 wheat varieties were used in production. By the 1970s, only about 1,000 varieties remained in use. Statistics from the 1950s show that local varieties accounted for 81% of production, locally produced improved varieties made up 15% and introduced varieties 4%. By the 1970s, these figures had changed drastically; locally produced improved varieties accounted for 91% of production, introduced varieties 4% and local varieties only 5%. (FAO 1996, 1998)
  - Expansion of human settlements and increasing specialization of agriculture, particularly during the 20th century, led to destruction of habitats rich in biodiversity and the narrowing of the composition of the food basket. The loss of biodiversity has to be seen against a greater need to produce food and other commodities under conditions of expanding biotic and a-biotic stresses and shrinking per capita availability of arable land and irrigation water.<sup>33</sup>
  - The package of HYV technologies had markedly greater impact in areas where inputs such as irrigation water, fertilizers and pesticides were easily available. As a result of the Green Revolution farmers often introduced mechanization and vastly increased their productivity, though often with negative effects on levels of chemical pollution, biodiversity, human health and nutrition.<sup>34</sup>
  - Reduced or degraded habitats threaten biodiversity at gene, species and ecosystem level, hampering the provision of key products and services.<sup>35</sup>
  - Biotechnology has been, from the beginning, a revolution with a definite environmental impact on biodiversity through the complete removal of natural

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<sup>33</sup> Swaminathan M.S (2000), "Biodiversity: equity in benefit sharing", *The Hindu: Survey of the environment, 2000*, page 45-52.

<sup>34</sup> Stayamurty D. and T. Wakeford (2000), "Genetic engineering: seeds of discord", *The Hindu: Survey of the environment, 2000*, page 171-178.

<sup>35</sup> Anonymous (2000), '*Global environment outlook-2000*', UNEP.

ecosystems. Contrastingly, it also increased biological diversity through the creation of a new, formerly non-existent, domesticated plants and animals. This was achieved through a process of selection under domestication and germplasm management.<sup>36</sup> However, biotechnology in many of its applications has reduced genetic diversity, and this is a concern to some, especially at a time when world attention is focused on the preservation of biodiversity.<sup>37</sup>

- Biodiversity is threatened not just by monoculture plantations, but also by patent monopolies. With the advent of genetic engineering, the rights of farmers have eroded as biological products and processes become subject to exclusive monopoly control under evolving intellectual property systems. Plant breeders' rights and industrial patents increasingly restrict the farmers' right to save seed, prohibit researchers' room using proprietary germplasm and, thus, restrict access to and exchange of germplasm. The biological options needed to strengthen food security and to survive global climate change are being lost. According to one study done for the FAO, crop genetic resources are being wiped out at the rate of 1-2 percent per annum.<sup>38</sup> Far from being a new departure from the HYVs of the 1970s and 1980s as the gene giants often claim, such (biotechnologically improved) new crops risk merely perpetuating the chemical dependence and uniformity of that narrow technological trajectory.
- Globalization of the food system and marketing, and the extension of industrial patenting and other intellectual property systems to living organisms, has led to the widespread cultivation and rearing of fewer varieties and breeds for a more uniform, less diverse but more competitive global market. In the years after Rio Earth Summit (1992), the process of globalization, linked to liberalization, has gained so much force that it has considerably undermined the sustainable

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<sup>36</sup> Sarukhan J (2000), "GMOs: precautionary principle", *The Hindu: Survey of the environment, 2000*, page 155-162.

<sup>37</sup> Dasilva E (1993), "Biotech route to development", *RIS Biotechnology and Development Review*, December.

<sup>38</sup> Shand H. J. (2000), "Biotechnology: under whose control", *The Hindu: Survey of the environment, 2000*, page 163-170.

development agenda. The most glaring weakness at Rio (Earth Summit) was the failure to include the regulation of business, financial institutions and transnational companies in Agenda 21 and the other decisions. These institutions are responsible for most of the world's resources extraction, production, biodiversity loss and generation of consumer culture.<sup>39</sup>

Summarily, it can be said that the contemporary surge of interest in the field of Agro-biodiversity has helped focus attention on this specific area of biodiversity, which is significant for nutrition, health, livelihood and cultural dimensions of society. Although it wasn't specifically mentioned under CBD, over the years its importance has been realized. This realization has also led to a detailed inquiry of the factors which threaten it, such as monoplantation, patenting, degradation of habitats and most important of all, the loss of human diversity. As a consequence, of these threat factors, there has been marginalization of small-scale, diverse food production systems that conserve farmers' varieties of crops, which form the genetic pool for food and agriculture in the future. The international community recognizes the threats to the agricultural biodiversity and has formed certain policies, developed certain conventions and regulated certain laws to conserve it at a sustainable level. The efforts started with the adoption of the CBD, in 1992, at the Rio Earth Summit of the United Nations. The following chapter discusses the background in which CBD was born and the foundation that it has provided to the policy structure on biodiversity.

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<sup>39</sup> Khor M. (2000), "Development: Time for a paradigm shift", *The Hindu: Survey of the environment, 2000*, page 37-44.



### 3. CONVENTION ON BIOLOGICAL DIVERSITY

#### 3.1 Overview

For the coming generations to cope with unpredictable environmental changes and human needs, it is very important to maintain existing farmers' traditional varieties. Conventions and codes of conduct play an important role in the regulation, both voluntary and mandatory, of the use, transfer, protection, management and trade of biological diversity at the regional, national and international levels. The important international Conventions and codes of conduct on biodiversity relevant to food and agricultural biodiversity are:

- Convention on Biological Diversity
- Cartagena protocol on Bio-safety
- International Treaty on Plant Genetic Resources for Food and Agriculture
- World Trade Organization/Trade-Related Intellectual Property rights

The genetic resources were recognized as a concern for humankind, requiring concerted intergovernmental action, with the establishment of the Food and Agricultural Organization-Commission on Plant Genetic Resources (FAO-CPGR) in 1983. This coincided with the introduction of the Sustainable Agriculture and Rural Development (SARD) concept, which recognizes the need to integrate environmental and production goals. Several other organizations, such as the World Conservation Union (IUCN), had been developing policies and programmes for integrating nature conservation with agriculture, especially in Western Europe, since the early 1970s. Subsequently the Leipzig Conference (1996) helped to translate some of these concepts, such as the *in situ* approach, into priority activities, specifically for the conservation and sustainable use of plant genetic resources for food and agriculture.

Currently, the focus is on developing the ecosystem approach. It emphasizes on the need to understand and recognize the knowledge components for an integrated and holistic approach- linking the genetic level, the species level and farm and agro ecosystem level- to understand and recognize whose knowledge contributes most and how this can be

protected and further developed.<sup>40</sup> Biodiversity has developed not only as a scientific concept but also as a political concept, comprising:

- Conservation of resources,
- Sharing of resources, and
- Rights of farmers and breeders.

The development of the concept, hand in hand with the concept of sustainable development, over the years has been traced in the next section.

### 3.2 History

Since 1972, world leaders have met every ten years to address the state of the environment and the impact of development. Since 1987, this practice had become known as 'Sustainable Development' summits. The first of such meetings was held in Stockholm in 1972, known as the United Nation (UN) Conference on the Human Environment. The meeting discussed the basic responsibilities of governments towards protecting the environment. Thereafter, a meeting was held in Nairobi, Kenya in 1982. At that stage, the Cold War between the Western powers and the Socialist bloc was at its height and the summit failed to reach any significant agreements. It was regarded as such a failure that it was not considered an official 'Earth Summit'. Ten years later, in June 1992, the Earth Summit [also known as United Nations Conference on Environment and Development (UNCED)], was held in Rio de Janeiro, Brazil. There were important international agreements, given that 179 countries were represented.<sup>41</sup> The assembled leaders signed the Framework Convention on Climate Change and the Convention on Biological Diversity (CBD); endorsed the Rio Declaration; and adopted Agenda 21, a plan for achieving sustainable development in the 21st century.

The CBD was developed as a response to the UN Earth Summit. The Convention came into force in December 1993 and by January 2000, over 170 nations had ratified it.

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<sup>40</sup> Mulvany P, "Managing Agricultural Resources for Biodiversity Conservation", *Knowledge for sustaining agricultural biodiversity*, ITDG.

<sup>41</sup> Anonymous (2002), "Frequently Asked Questions on WSSD", UNDP, 23 January, [www.undp.org](http://www.undp.org)

Agricultural biodiversity is recognized by CBD as essential for global food production, livelihood security and sustainable agricultural development. The plant, animal and microbial organisms important to food and agriculture need to be conserved and used sustainably if, as is required for universal food security, sustainable food production is to be achieved across the whole range of agro-ecosystems and production systems.<sup>42</sup>

The UN Commission on Sustainable Development (CSD) was created in December 1992 to ensure effective follow-up of UNCED; to monitor and report on implementation of the Earth Summit agreements at the local, national, regional and international levels. The CSD is a functional commission of the UN Economic and Social Council (ECOSOC), with 53 members. A five-year review of Earth Summit progress took place in 1997 by the UN General Assembly meeting in special session, followed in 2002 by a ten-year review by the World Summit on Sustainable Development (WSSD).

Earth Summit +5: The Special Session of the General Assembly held in June 1997 adopted a comprehensive document entitled Programme for the Further Implementation of Agenda 21 prepared by the CSD. It also adopted the programme of work of the Commission for 1998-2002.

World Summit on Sustainable Development (WSSD): It was held in Johannesburg, South Africa, from 26 August to 4 September, 2002. It took place against a backdrop of increasing economic polarization between the rich North and the poor South, as well as continuing environmental degradation. According to Greenpeace, "*The power of large corporations has massively increased in the last decade, spurred on by corporate mergers, supported by governments, and protected by powerful trade bodies such as the WTO*". The focus on this Summit was, therefore, on sustainable development and its relation to international trade and finance.

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<sup>42</sup> Anonymous "*The Johannesburg Summit Test: What Will Change?*", [www.johannesburgsummit.org/html/whats\\_new/feature\\_story.html](http://www.johannesburgsummit.org/html/whats_new/feature_story.html)

The Summit reiterated the initial mandate and functions of the CSD as a high level forum on sustainable development and deliberated to enhance its role so that it can respond to the new demands emerging from the WSSD Plan of Implementation. As an implementation-focused Summit, Johannesburg did not produce a particularly dramatic outcome. However, some important new targets were established, such as:

- An aim to achieve a ‘significant reduction’ in the current rate of species loss by 2010;
- Some progress in establishing a stronger benefit-sharing regime under the Convention on Biological Diversity, which would give Southern countries stronger rights to a share of profits from bioprospecting and biopatenting.

While the time targets are new, the goals stated are not. Besides, the Johannesburg text says very little about how these aims will be realized or who will be responsible for their achievement. Without new funding commitments and clarity on responsibilities its effective implementation is likely to prove difficult. A critical flaw of the Johannesburg process was that, while it was intended to cement common purpose and set out the means for collaboration to achieve shared goals, two years of preparation merely served to emphasize the gaps between key countries and blocs and entrench their positions. And finally, the emphasis from governments and the UN on ‘implementation of existing commitments’ merely drew attention to the mismatch between the process behind a global Summit and the action required to make a difference.

The Johannesburg Summit also showed that globalization has emerged as a priority in its own right, increasingly understood as distinct from the duties and aspirations of states. It was hoped by many that WSSD would be able to agree a framework for sustainable development governance which would encompass global trade. Given the participation of all countries in the negotiations and the more equitable ways of working of the UN this might have really come to influence the WTO, in the ongoing Doha negotiations. However, the US was persistent in arguing that multilateral environmental agreements should be in conformity with WTO rules. There was a real danger that the message coming from Johannesburg would be that environmental policy should be subservient to economic policy. It was only avoided when an impromptu coalition of countries –

notably Ethiopia, Norway and Switzerland – raised eleventh hour objections. Although this dramatic resistance was widely celebrated, the text does no more than maintain the existing lack of clarity on the issue.

Two frameworks for action in follow-up to WSSD were advanced during the Summit process:

- The Millennium Development Goals (MDGs) were endorsed as the overarching objectives which should guide efforts to implement existing commitment.
- The WEHAB Agenda (water, energy, health, agriculture, biodiversity), put forward shortly before the Summit by UN Secretary-General, Kofi Annan, was seen as a way to concentrate on key policy areas in the final negotiations for Johannesburg. The United States proposed that these issues be the basis for the annual programme of work of the CSD, but a number of G-77 countries had reservations and noted that this framework was never negotiated by governments and so is a pretty tenuous basis for future action.

The challenge is that a political process which has been good at defining policy frameworks and goals must show itself as being effective, also, in maintaining the pressures for implementation. It is very important that the CSD use its strength, which is its capacity to bring so many diverse actors together and the openness that it has to civil society, the way in which it has embraced the notion of partnerships, to really focus, not just on policy development, but on implementation.<sup>43</sup>

### 3.3 Approaches to Policy

The process of agro-biodiversity conservation and sustainable and equitable use involves a blend of political will and action, professional skill and know-how and peoples' concern and participation at the local, national, regional and global levels; the CBD is an effort in this direction on the global arena.

The CBD accords member countries sovereign rights to determine how to regulate access to the genetic resources found within their national boundaries. The issue here is the right

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<sup>43</sup> Desai N (2003), "*Statement to the Commission on Sustainable Development 11th Session by the UN Under-Secretary-General for Economic and Social Affairs*", New York, 28 April.

of holders of traditional knowledge to be asked and informed about requests from other parties to access their knowledge, and to extend or refuse their approval for such access. The international stipulation requires national governments to recognize the special position of those biological resources that are nurtured, used and maintained, mainly or exclusively, by holders of traditional knowledge.<sup>44</sup> The Convention recognizes that there is a need to have built-in mechanisms for introducing economically and socially relevant measures that can act as incentives for the conservation efforts of the local communities. Exchange of information, technical and scientific cooperation, research and training, public education and identification of suitable financial resources are all important for arresting the loss of agro-biodiversity.

### 3.3.1. The Ecosystem Approach

The threefold objective of conservation, sustainable use and sharing of benefits is a challenging goal for the CBD parties. The concept of 'Ecosystem Approach' was recommended as an appropriate implementation strategy for the Convention follow-up. This approach was later recommended as a way forward when the Conference of Parties (COP) made decisions on the biome-thematic work programmes. It was not, however, until 1998 that the various dimensions of the approach were more clearly developed and laid down as principles of the ecosystem approach and the 'Malawi principles' were born. These principles, although slightly modified, have been endorsed by the COP in decision V/6 from Nairobi, and have been recommended to the Parties for application when implementing the convention and its articles.

The twelve principles of the ecosystem approach as described in decision V/6, reflect the present level of common understanding of the integrated way of thinking for implementation of CBD, and are to be up for evaluation, revisions and improvements as the Parties gain experience from its application; further research is needed to find out whether any changes are necessary and recommendable.

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<sup>44</sup> Seiler A. and G. Dutfield (2002), "Regulating access and benefit sharing", *Biotechnology and Development Monitor*, March, page 2-7.

As laid out in the various principles of the ecosystem approach, there are a number of dimensions to management of nature that ought to be taken into account to ensure the most effective implementation of the CBD, in the long-term perspective. There is also a clear understanding of the need for flexibility and adaptation to local conditions and the relevant challenges at hand when applying the various principles. The ecosystem approach is general and meant for larger geographical areas, often with complex socio-cultural conditions and relationships between nature and people. It is not meant to be applied for special areas that need to be addressed for protection or restoration of biodiversity or some other specific purpose. The matter of geographical scale is very important here, and this, together with the temporal scale, has been considered to be basic factors to be taken into account in decision-making, and is formulated into a separate principle of the ecosystem approach itself.

The ecosystem approach, establishes the importance of including the socio-economic dimensions of nature management when implementing the CBD. Human life, activities and well-being are to be included as basic factors in the wider geographical application of the ecosystem approach. Biodiversity has to be integrated into the economy of the relevant communities, and the various values of biodiversity captured and realized at the local level to give the right incentives to those that are nearest to guard it. This socio-economic dimension is also a reflection of the obligation of the Parties to CBD to integrate biodiversity concerns into the activities and responsibilities of the economic sectors, as laid out in article 6<sup>45</sup> of the Convention.

### 3.3.2. Attempts to Agro-biodiversity

Biodiversity, however, has also values beyond the short-term consumption, extraction and direct use value. The intraspecific diversity is the insurance for the species survival in difficult times, the inter-specific diversity is the guarantee for ecosystem functioning and services, and the variation of functional ecosystems is the life insurance for sustainable development. The CBD has several articles relating to sustainable use of biodiversity (Article 10), sharing benefits derived from the use of biodiversity (Article 19.2) and

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<sup>45</sup> See Appendix 2 for the text of CBD

involvement of, and equitable sharing of benefits with, indigenous and local communities (Article 8 (j)).

The CBD also has an agricultural biodiversity work programme, to achieve the above given objectives, which focuses on:

- Assessing the status and trends of the world's agricultural biodiversity and of their underlying causes, as well as of the local knowledge of its management.
- It pays attention at identifying and promoting adaptive-management practices, technologies, policies and incentives.
- It promotes the conservation and sustainable use of genetic resources that are of actual or potential value for food and agriculture.
- It also studies the impacts of trade liberalization on agricultural biodiversity, identifies policy issues that governments can consider, when addressing such matters, while considering various ways and means to improve the capacity of stakeholders and promote their mainstreaming and integration in sectoral and cross-sectoral plans and programmes at all levels.<sup>46</sup>

A major issue is the development of a mechanism for sharing of resources. The Convention points out that the sharing of resources can take form of an appropriate transfer of relevant technologies, and/ or by appropriate funding. However, access to such technologies is also subject to conditions: the countries providing genetic resources must recognize the IPRs protecting the relevant products and processes.<sup>47</sup> The issue of technology transfer is a much debated issue as the countries possessing the relevant technologies are usually the developed countries while the countries possessing the genetic resources are the developing ones. Biotechnology also offers new opportunities for global partnerships, especially between the countries rich in biological resources (which include genetic resources) but lacking the expertise and investments needed to apply such resources through biotechnology and the countries that have developed the

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<sup>46</sup> Anonymous (2002), “*Agricultural biodiversity: Introduction*”, CBD, UNEP, 5 September.

<sup>47</sup> Seiler A. and G. Dutfield (2002), “Regulating access and benefit sharing”, *Biotechnology and Development Monitor*, March, page 2-7.



technological expertise to transform biological resources so that they serve the needs of sustainable development.<sup>48</sup> The issue of cost of technology is being addressed through the provision of Global Environment Facility (GEF).<sup>49</sup> The GEF, established as a result of the Earth Summit, is an innovative mechanism for financing the incremental costs of meeting these needs. It has been notably successful, but its resources are limited.<sup>50</sup> Besides, the variety of issues covered under GEF tends to dilute specific emphasis on agro-biodiversity.

Along with the issue of sharing of resources and technology transfer, concerns regarding risks associated with the release of Living Modified Organisms (LMOs) on biodiversity came into sharp focus by the recognition accorded to it in Agenda 21, as decided at plenary session at Rio de Janeiro in 1992, and in Article 8 of the CBD to the environmentally sound management of biotechnology. This emphasized the need for ensuring safety in biotechnology development, application, exchange and transfer, and of countering the risks to human health, through an international agreement on the principles to be applied in risk assessment and management.<sup>51</sup> As a follow-up to this, in 1995, the non-legally binding 'International Technical Guidelines for Safety in

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<sup>48</sup> Anonymous (1992) 'Chapter 16', Agenda 21, UN Earth Summit, Rio de Janeiro, July.

<sup>49</sup> The Global Environment Facility (GEF) forges international cooperation and finances actions to address six critical threats to the global environment: biodiversity loss, climate change, degradation of international waters, ozone depletion, land degradation, and persistent organic pollutants (POPs). It serves as the financial mechanism for the CBD and the UN Framework Convention on Climate Change. The GEF has allocated \$4 billion in grants and leveraged an additional \$12 billion in co-financing from other sources to support more than 1,000 projects in over 140 developing nations and countries with economies in transition. In August 2002, 32 donor nations pledged nearly \$3 billion to fund the work of the GEF for the next four years. GEF brings together 175 member governments, working in partnership with the private sector, NGOs, and international institutions to address complex environmental issues while supporting national sustainable development initiatives.

<sup>50</sup> Strong M.F. (2000), "Earth: in our hands", *The Hindu: Survey of the environment, 2000*, page 15-22.

<sup>51</sup> Chauhan K.P.S.(1999), "Aspects of biosafety in the Conservation of Biological Diversity", S.Shantharam and J.F.Montgomery(ed.): '*Biotechnology, Biosafety and Biodiversity*', Oxford and IBH Publishing Co., New Delhi, Page 191-205,

Biotechnology' were finalized, under the aegis of the United Nations Environment Programme (UNEP) which was a significant step forward.<sup>52</sup>

Initially the Convention gave only a passing reference to agricultural biodiversity per se, the emphasis was on biodiversity in totality. However, the CBD has been increasing its interest in the conservation, sustainable use, and benefit sharing from the use, of the resources for three reasons:

- There is global recognition of the need to halt genetic erosion. It is estimated that over 75% of crop varieties and 50% of livestock breeds have disappeared from farmers' fields, mainly due to changes in global production and consumption patterns.
- The need to support continued development of varieties and breeds for food security that are adapted to new social, economic, physical including climatic environments in the next millennium, is fully recognized.
- In recognition that these resources embody farmers' knowledge, innovations and practices and that it is their right to retain communal ownership of them, the CBD wants to ensure the development of satisfactory benefit sharing measures.

The community rights may incorporate rights to manage some aspects of self-governance, natural resource management and economic livelihoods, including control over biodiversity, local knowledge, innovations and practices as required by the CBD. The movement to set up community registers of biodiversity, to thwart mis-appropriation and initiatives to implement a moratorium on bio-prospecting are evidence of concern at community level, in the absence of adequate protection. Farmers' Rights should also be considered within this bundle of rights and, importantly, need to be seen as complementary to, rather than in conflict with, other forms of community or indigenous peoples' rights. Some of these rights are embodied in the CBD, especially Article 8(j), as well as in the FAO Farmers' Rights resolution 5/89<sup>53</sup>, but these have yet to be enacted in

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<sup>52</sup> Chauhan K.P.S. and R.K.Tyagi (2000), "Implications of the protocol on biosafety – an Indian perspective", *RIS Biotechnology and Development Review*, Vol.3, No. 2, page10-38.

<sup>53</sup> FAO Farmers' Right Resolution 5/89 endorses the concept of Farmers' Rights (Farmers' Rights mean rights arising from the past, present and future contributions of farmers in conserving,

national laws in most countries though there are a number of models under consideration. Some countries, including India, have developed legislation that protects certain aspects of community rights.

Thus, the debates on issues of farmers' rights, technology transfer, sharing of resources has made the countries become more aware of the complex issue of biodiversity loss and through the Convention, the necessary institutional mechanisms have been put in place to address it. More than 100 countries have developed a national biodiversity strategy and action plan, the fundamental tool for the implementation of the Convention at the national level.

The Convention's most important contributions to the implementation of Agenda 21 and to the basic objective of the WSSD include:

- Benefit-sharing of the utilization of genetic resources: The adoption of the Bonn Guidelines, on access to genetic resources and sharing of the benefits of their utilization, constitutes a major step forward in the implementation of the objective of the Convention and of particular concern to developing countries, which are the host to most of the world's genetic resources. Guidelines on this issue were adopted by the Conference of the Parties to the CBD in April 2002. They were developed in response to concerns in many developing countries that the commercial and scientific gains realized from their genetic resources were being reaped mainly by the industrialized world. The Guidelines aim at improving the way researchers, collectors, foreign companies and other users gain access to

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improving, and making available plant genetic resources, particularly those in the centers of origin/diversity. These rights are vested in the International Community, as trustee for present and future generations of farmers, for the purpose of ensuring full benefits to farmers, and supporting the continuation of their contributions, as well as the attainment of the overall purposes of the International Undertaking) in order to:

- (a) ensure that the need for conservation is globally recognized and that sufficient funds for these purposes will be available;
- (b) assist farmers and farming communities, in all regions of the world, but especially in the areas of origin/diversity of plant genetic resources,
- (c) allow farmers, their communities, and countries in all regions, to participate fully in the benefits derived, at present and in the future, from the improved use of plant genetic resources, through plant breeding and other scientific methods. (Refer to Appendix 3 for the complete text.)

valuable genetic resources in return for sharing the benefits with the countries of origin. At the same time, they guide Governments on ways to set fair and practical conditions for users seeking genetic resources, who, in return, must offer benefits derived from their use, in the form of profits, royalties, scientific collaboration, or training.

- Biosafety: The Cartagena Protocol on Biosafety establishes mechanisms likely to make an important and concrete contribution to technology transfer, and provides an opportunity for developing countries to gain access to information and technology that will enable them to participate in this industry. This Protocol has been analyzed in detail in the following chapter.
- Technology transfer: Work is being initiated to prepare for the introduction of technology transfer as an item for in-depth consideration at COP-VII, in 2004, providing an additional opportunity for the developing countries to pursue concrete actions in this field, in connection with genetic resources and biotechnology.
- Traditional knowledge: The Convention provides an opportunity to ensure maintenance, protection and promotion of traditional knowledge relating to biological diversity in the region, through intellectual property rights or *sui generis* systems.
- Financial resources for sustainable development: Through the financial mechanism of the Convention, operated by the GEF, the Convention is the single largest source of funding for biodiversity conservation in the world.

In spite of all its achievements the Convention has yet to cover much ground. In 1996 the Civil Society Organizations' (CSO) forum at the World Food Summit agreed that farmers' rights should be the "fundamental pre-requisite to the conservation and sustainable utilization of agricultural biodiversity". Ways must be found for society to recognize the contribution of these producers and their communities to food security and ecosystem management, as well as to recognize their inalienable right to access to and

use of resources.<sup>54</sup> The issue has still not been conclusively decided, though the Convention agrees, in principle, to the concept. Steps need to be taken to ensure these rights as incentives to conserve and sustain agro-biodiversity, by the local people.

The Convention has overreached itself, trying to reach a political consensus among the varied interests of developed and developing nations. Commitments remained unmet while the developed world not only pursued its own agenda but forced the developing nations to go on a path of unsustainable development.<sup>55</sup>

Besides, the major decisions arising out of CBD have still not been given sovereign effect, for example, CBD recognizes the right of the States over their biodiversity. The non-implementation of this provision has led to a situation where transnational corporations have carried out bio-prospecting, with a view to developing biotechnologies, but countries that are the repositories of the genetic resources have not been able to secure a share in the benefits arising out of commercialization of these technologies. In the last few decades, developing countries have lost much of their biodiversity components to bio-industry. While it may not be possible to claim share in the benefits from the agricultural biodiversity that have gone out from the developing countries to the various international *ex-situ* collections, in the past, in the future these countries could keep a track record of their *ex-situ* collections. At the international level, it could be ensured by the future users of these collections that benefits also goes to the country of origin of the material.<sup>56</sup>

Also, CBD objectives need to be taken into consideration in the WTO dispute settlement process. In the event of a conflict, the Trade Related Intellectual Property Rights (TRIPS)

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<sup>54</sup> Anonymous (2002), "*Sustaining agricultural biodiversity - and the integrity and free flow of genetic resources for food for agriculture*", ITDG, GRAIN and etc-group, May.

<sup>55</sup> Krishnakumar A. (2002), "Towards Johannesburg", *Frontline*, August 30, page 89-90.

<sup>56</sup> Anonymous (1998), "*Sustainable use of biodiversity: an agenda for urgent initiatives*", RIS Publications, India.

agreement at times interfere with a Party's legitimate implementation of its CBD obligations, which may hamper the cause of biodiversity.<sup>57</sup>

CBD was the first international treaty which focused on biodiversity, though the emphasis was not specifically on cultivated diversity. Gradually the issue gained prominence in the different Conference of Parties to the CBD. It was realized that conservation, sustainable development and sharing of benefits of the utilization of the resources were the three key areas of focus and they were dealt under the Ecosystem approach, which is a multi-dimensional approach to a multi-dimensional issue.

The Convention had its share of achievements and shortcomings, often influenced by other international Treaties and Regulations, but the focus remains on the issue of conservation. The Thammasat Action Plan (December 1997) developed by CSO gives strong support to the conservation of agricultural biodiversity, especially the defense of *sui generis* community rights over their genetic resources. Besides, the need for the regulation of transfer of these resources has also been felt. The Protocol on Biosafety was adopted as a response. The Protocol is discussed in the next chapter along with the issue of impact of biotechnology on biodiversity.

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<sup>57</sup> Sahai S. (2001), "TRIPS Review: basic rights must be restored", *Economic and Political Weekly*, August 4-10, pp 2918-19.

## 4. CARTAGENA PROTOCOL ON BIO-SAFETY

### 4.1 History

The COP, pursuant to Article 19 of the CBD, by its decision II/5, established an Open-ended Ad Hoc Working Group on Biosafety to develop a draft protocol on biosafety, specifically focusing on trans-boundary movement of any living modified organism resulting from modern biotechnology that may have adverse effect on the conservation and sustainable use of biological diversity. The Working Group on Biosafety held meetings between July 1996 and February 1999. At its conclusion, the Working Group submitted a draft text of the Protocol, as well as the outstanding concerns of the Parties, for consideration by COP at its first extraordinary meeting, convened for the purpose of adopting a protocol on biosafety to the CBD.

In accordance with decision IV/3, the first extraordinary meeting of the COP was opened on 22 February 1999, in Cartagena, Colombia. It was not able to finalize its work due to ongoing debate on several issues. As a result, the meeting was suspended and it was agreed that it should be reconvened as soon as possible.

The debate that led to the suspension of the first meeting was basically on two issues. The Miami Group (including the US, Canada, Australia, Argentina, Uruguay and Chile), argued that commodities<sup>58</sup> should be excluded from Advanced Informed Agreement (AIA), because they will not be released into the environment, and therefore cannot have an adverse impact on biodiversity. Developing countries insisted that all first-time trans-boundary transfers of LMOs, including commodities, should be covered under the informed consent procedure, as the only way to monitor what is entering one's borders and to allow for consideration of human health impacts. The European Union (EU) wanted labeling for commodities, rather than a full-fledged informed consent procedure.

Another area of dispute was whether decisions for LMO transfers under AIA should be based upon 'Sound Science' or 'Precaution' (and whether the WTO's sound-science

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<sup>58</sup> LMOs that are "intended for food, feed or processing" rather than deliberate release are called "commodities"

based agreements such as the Sanitary and Phyto-sanitary (SPS) should be given primacy over the protocol's obligations). The Miami Group calls for 'Sound Science'-based decision-making, with primacy for WTO's obligations, while the EU (as well as developing countries) called for reliance upon the 'Precautionary' principle<sup>59</sup>, as well as no primacy for WTO. This stand-off was one of main reasons for lack of agreement in Cartagena, perhaps superseding all others. Reflected in this conflict is the desire of the Miami Group and the EU to use the bio-safety protocol as a vehicle by which to legitimize their preferred norm of governance (whether Sound Science or Precaution) for LMO regulation.<sup>60</sup>

The resumed session took place in Montreal from 24 to 29 January 2000 and was preceded by regional and inter-regional informal consultations from 20 to 23 January 2000. On 29 January 2000, the COP, by its decision EM-I/3, adopted the Cartagena Protocol on Biosafety to the CBD and approved interim arrangements pending its entry into force. It also established an open-ended ad hoc Intergovernmental Committee for the Cartagena Protocol on Biosafety (ICCP). The Intergovernmental Committee held its first meeting in Montpellier, France, from 11 to 15 December 2000.

## 4.2 The Protocol

The Protocol on Bio-safety was adopted by 130 countries at Montreal in January 2000 and is expected to be brought into force in September 2003. The Bio-safety Protocol is the first treaty under CBD.<sup>61</sup> Taking into account the precautionary approach, the objective of the Protocol on Bio-safety is "*to contribute to ensuring an adequate level of*

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<sup>59</sup> The Precautionary Principle: Principle 15 of the Rio Declaration states that 'Where there are threats of serious or irreversible damage, lack of full scientific certainty shall not be used as a reason for postponing cost-effective measures to prevent environmental degradation'. The principle has been invoked in a number of trade disputes, most notably over genetically modified organisms. In the WSSD process, the US consistently argued for scientific certainty as one of the principal goals of sustainable development policy. The US and Japan wanted a weaker reference to 'the precautionary approach', while the European Union pushed for endorsement of the Rio terminology.

<sup>60</sup> Gupta. A. (1999), "*Biosafety in a transnational context*", <http://environment.harvard.edu/gea>.

<sup>61</sup> Swaminathan M.S (2000), "Biodiversity: equity in benefit sharing", *The Hindu: Survey of the environment, 2000*, page 45-52.



*protection in the field of safe transfer, handling and use of LMOs resulting from modern biotechnology that may have adverse effects on the conservation and sustainable use of biodiversity, also taking into account risks to human health, and specifically focusing on trans-boundary movements.”(Article1).*

The Protocol seeks to protect biological diversity from the potential risks posed by LMOs resulting from modern biotechnology. It establishes an Advanced Informed Agreement (AIA) procedure for ensuring that countries are provided with the information necessary to make informed decisions before agreeing to the import of such organisms into their territory. The Protocol contains reference to the ‘Precautionary approach’ of the Rio Declaration on Environment and Development. The Protocol also establishes a Biosafety Clearing House to facilitate the exchange of information on LMOs and to assist countries in the implementation of the Protocol.

It specifically highlights the role of citizens in biotechnology development, stating that governments shall promote public participation concerning the safe transfer, handling and use of LMOs in relation to the conservation, and sustainable use of biological diversity, also taking into account risks to human health.<sup>62</sup> This would mean that impact of international trade in LMOs on conservation of biodiversity as well as on human health comprise the coverage of the Protocol.<sup>63</sup>

The protocol seeks to develop rules for informed consent or AIA of a receiving country before trans-boundary transfers of LMOs. All agree that LMOs that will come into contact with the environment of an importing country are to be covered under AIA, to assess for potential adverse impacts on biodiversity.

The Protocol on Biosafety represents a significant advance in international environmental law, as its procedures constitute the most detailed elaboration of the precautionary

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<sup>62</sup> Satyamurty D. and T. Wakeford (2000), “Genetic engineering: seeds of discord”, *The Hindu: Survey of the environment, 2000*, page 171-178.

<sup>63</sup> Kaushik A.(2000), “India and the biosafety protocol”, *RIS Biotechnology and Development Review*, Vol.3, No. 2, December, page72-83.

approach so far. The Protocol, which will enter into force with 50 countries ratifying it, establishes a system of information exchange on living modified organisms that will allow countries to make informed choices on whether or not to permit their import into their territory. This system is backed up by a capacity-building initiative that is already under way and is aimed at ensuring that countries, particularly those in the developing world, have the means to access and analyze the information they receive and to fully assess the potential risks or otherwise of the LMOs concerned.

The efforts towards ensuring bio-safety have, however, only been partially successful, because of the efforts of 'known' parties of the CBD to give more emphasis to bio-trade. As a result the Protocol on Bio-safety appears as a weak treaty for bio-safety purposes. The enforcement of various provisions contained therein will require in depth examination to identify gaps in the existing institutional framework, including policies and laws, and developing a comprehensive plan of action compatible with WTO agreements so that the application of biotechnology leads to better food production, health care and minimum environmental degradation, without creating any significant socio-economic conflicts.

### 4.3 Biotechnology and Biodiversity

If a balance can be found between the benefits of biotechnology and the preservation of biodiversity, it may prove to be critical to the sustained success of agriculture. Biotechnology offers many benefits for agriculture, including enhancing the flexibility of crops to thrive in varied growing environments, improve nutritional content, and optimize the use of agricultural inputs. While the potential risks associated with biotechnology are not different in kind from other techniques, studies are needed to ensure the safe introduction into the environment of agricultural crops derived from modern biotechnology to avoid any potential adverse impacts on the conservation and sustainable use of biodiversity and the optimum utilization of plant genetic resources for food and agriculture.<sup>64</sup>

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<sup>64</sup> Anonymous, "*Representing the plant science industry: a reference guide*", [www.gcpf.org/library/attachments](http://www.gcpf.org/library/attachments)

Increasing economic growth spurred by genetically improved crops may provide much-needed resources in the efforts to conserve biodiversity. Genetically improved crops are no more a threat to biodiversity than conventionally bred crops. Further, improved tools, such as cryo-preservation, developed by biotechnologists help in the *ex-situ* preservation of biodiversity, while creative techniques, such as gene shuffling, help create more biodiversity and perhaps even recreate extinct crop traits. Molecular biology techniques, such as the use of DNA-markers and genomics, provide valuable insights into the dynamics of biodiversity in crop plants and, thus, help to understand crop evolution and relatedness between different varieties, thus enabling the intelligent use of the available biodiversity.<sup>65</sup>

This knowledge of available biodiversity can be utilized by the biotechnology industry to fulfill the requirements of their host nations, to maintain its relevance, for example in India pulses are primarily the crop of poor farmers, and unless determined efforts are made the country will have to continue to import large quantities of this crucial and nutritious component of the Indian diet. It is the rice genome about which the industrial nations primarily the US, UK, Canada, Japan, France -- are upbeat and not on pulses, because the former offers better monetary prospects.<sup>66</sup>

In the contemporary situations, where the next millennium has been termed as one dedicated to Biotechnology, the Protocol on Biosafety deals with an extremely sensitive and significant area- the LMOs and their trans-boundary transfer. Due to the high stakes of the countries in the new technology, i.e. biotechnology, and its implications on genetic resources not yet completely delineated, the Protocol has been widely debated in the international arena. The next chapter analyses the international treaty on these genetic resources and the areas it covers, also the issues that have yet to be incorporated for optimum results.

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<sup>65</sup> Prakash C. S. (2000), "Monocultures, monopolies, myths and the gene revolution-II; Potential Benefits, Hypothetical Risks", *Observer of Business and Politics*, March 3

## 5. INTERNATIONAL TREATY ON PLANT GENETIC RESOURCES FOR FOOD AND AGRICULTURE

### 5.1 History

The International Undertaking on Plant Genetic Resources for Food and Agriculture (IU) was first adopted by governments at the Food and Agriculture Organisation of the United Nations (FAO), in 1981. It was meant to be a legally-binding convention that would counteract the privatisation of genetic resources by establishing their status as the 'common heritage of mankind'. At that time, the main impetus for privatisation was coming from the expansion of the plant breeders' rights system (the Union for the Protection of Plant Varieties or UPOV). The IU was the first global treaty to spell out commitments to conserve genetic resources and ensure their long-term benefit to all.

The treaty however had its own problems. Northern governments (developed countries) refused to make it binding, so it became a voluntary undertaking instead of a convention. The North was upset with the IU questioning the legitimacy of intellectual property rights (IPR). This concern was somewhat 'resolved' by a 1989 annex which doubly acknowledged that plant breeders have legitimate rights as do farmers. Farmers' Rights, as framed in the IU, started out as a bold attempt to recognise and reward farmers' innovation with respect to crop genetic resources. But eventually it has come to be an empty promise of compensation to communities for having contributed the genetic diversity so useful to industry. The South (developing world) also had its own problems with the IU. In particular, it became severely disillusioned with the concept of common heritage because it turned out to be meaningless: the North continued patenting and profiting from the South's germplasm, while the South got nothing in return.

By the late 1980s, the same governments that had dreamed up the IU started drafting the Convention on Biological Diversity. The CBD was originally meant to be an umbrella framework for *in situ* conservation of biological resources, particularly in national parks and protected areas. But it gradually took on *ex situ* conservation and all of FAO's

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<sup>66</sup> Nair K. P. P. (2001), "Agriculture: Unyielding sector?", *Business Line*, March 08.

political issues as well. Finalised in 1992, the CBD reframed the status of genetic resources from a common heritage to 'national sovereignty', making them subject to negotiations on a bilateral basis. Genetic resources were thus reduced to a commodity to be bought and sold under the authority of individual governments.

As a consequence, the FAO member states decided to revise the old Undertaking to bring it into harmony with the CBD. The negotiations dragged on for eight years, almost collapsing several times. And in the meanwhile, the legal and political backdrop to the negotiations grew even more complicated with the establishment of the WTO. The WTO administers an agreement on Trade-Related Aspect of Intellectual Property Rights (TRIPS), which is now a central pillar of the global trade system. Despite CBD and the International Undertaking, it requires all WTO members to grant intellectual property rights on plant varieties (seeds). This makes private control over genetic resources the rule, not the exception – and seriously threatens any exchange of germplasm as well as the inherent rights of local communities, particularly in developing countries.

A reconstructed draft of the International Undertaking, which tried to account for all these issues, was finally agreed to but several issues remain unresolved and in brackets. The treaty was submitted for adoption by FAO member states at the biennial FAO Conference meeting in November 2001 and will enter into force after ratification by 40 countries.

## 5.2 Focus areas

The major focus areas of this undertaking are:

- Facilitating access and sharing benefits: The agreement establishes a system to facilitate access to a list of crops crucial to food security. It includes materials in gene banks, farmers' fields and in the wild. The agreement also provides for the exchange of information and technology between countries, particularly to benefit developing countries. It ensures equitable sharing of the financial benefits resulting from the use of the plant genetic resources covered by the system. Mandatory payments will be required when commercial benefits are obtained from the use of these resources. Payments will be voluntary; however, when a

commercial product derived from these resources is still available for research and plant breeding. These payments will be used for publicity activities, particularly in developing countries and countries in transition.

- Spotlight on farmers' rights: Farmers' rights are entrenched within the Undertaking. It highlights the contributions of farmers around the world in conserving and improving plant genetic resources. It acknowledges that the responsibility for realizing farmers' rights rests with national governments and asks governments to 'take measures to protect and promote farmers' rights.' Such measures would include protecting traditional knowledge relevant to plant genetic resources, promoting farmers' rights to share equitably in the benefits arising from the use of genetic resources and to participate in national-level decision-making on matters related to their conservation and sustainable use.

The new Undertaking will, however, have little direct and immediate impact on the rights of farmers over genetic resources. It contains a very weak article on Farmers' Rights, and the only explicit reference to farmers as plant breeders says that they will have the same rights over their breeding materials, during the period of varietal development, as formal sector breeders have. This may prove useful as some protection against biopiracy, but the IU essentially sets rules for the formal research and breeding sector. For that reason, its direct effects will be felt almost exclusively there. But indirectly, there will be real impacts on farmers. The multilateral system that the Undertaking aims to set up promises at least some shelter from purely bilateral and commercial approaches to managing the planet's shrinking genetic diversity. The agreement is in no way revolutionary, but there is little doubt that a world with a properly crafted IU will be better for farmers than one without it.

The main potential positive effects of the Undertaking are listed below.

- Facilitated access to agricultural biodiversity: The IU to some extent re-establishes, between its signatories and for the crops that are covered, the free exchange of genetic materials that was the norm until the advent of IPR. In a world of increasing interdependence, and in the face of ongoing genetic erosion, this makes a very considerable difference to plant breeders. Importantly, the

system will cover materials collected both before and after the coming into force of the CBD.

- Strengthened public sector breeding and conservation in the developing countries through more stable funding commitments from the industrialized countries. If directed well, this could also support and promote on-farm biodiversity management. While public research institutions are not always helpful or sensitive to farmers' needs, they are almost always a better alternative to the transnational companies which increasingly dominate international agricultural research to serve their own extremely narrow agenda.
- A strong global forum specifically for agricultural biodiversity will be preserved. The FAO Commission on Genetic Resources, created by the original Undertaking, has contributed a lot to advancing the political discussion about genetic resources between governments, and with other actors, including farmers' organisations and Non-Governmental Organizations. There is a clear and continued need for such a high-level and public political forum.

### 5.3 The Crucial Points

- *IPR*: Most of the South is generally willing to provide access to genetic resources as long as the North shares the benefits it derives from them. Most of the North generally accepts this, as long as benefit sharing is based on some level of acceptance of IPR. There are really three components of the IPR picture in the IU negotiations.
  - The definition of plant genetic resources.
  - Second, whether the parties will allow IPR on them.
  - Third, what kind of benefit sharing system will be involved.

The benefit sharing scheme says that when one party accesses germplasm from the system and commercializes a product developed from that germplasm, there will be a mandatory payment back to the system "*except whenever such a product is available without restriction to others for further research and breeding*". (Within five years, the parties will decide whether the mandatory payment applies in all cases of commercial use.) This rule is ambiguous. It might mean that when intellectual property rights are

granted over new products, a payment has to be made. In which case, the Undertaking would promote IPR as a political basis for benefit sharing. Yet the article in question does not mention IPR, so it is unclear.

- *WTO*: There is an Article in brackets which talks about the IU's relationship with other international agreements. On the one hand, it says that the IU will not affect the rights and obligations that the parties have contracted under any existing agreement. On the other hand, it also asserts that the IU will not be subordinate to any other international agreement. This is an internal contradiction and is especially important in the context of TRIPS. While the primary battle is about how far the IU will go in banning IPR on seeds, this Article will need to be ironed out to clearly put the IU in relation to WTO/TRIPS.
- *The list*: The access and benefit sharing rules of the IU will only apply to a specific list of crops.<sup>67</sup> The agreed principle is that crops which are important for food security and for which there is international interdependence in terms of plant breeding should go on the list. Once a crop is on the list, any material from that crop will be under the rules of the system. Presently, the list is very short with many relevant crops not included, mainly due to resistance from various developing countries. This is in part a reflection of negotiation tactics. Countries rich in biodiversity do not want to put their crops on the list before agreements are reached on other fronts – most importantly IPR. But some countries, like Colombia and Brazil, expect to gain more from bilateral deals and are hesitant to commit them to a multilateral system. These commercial considerations are therefore mixed up with legitimate fear of biopiracy. Again, progress can be made on the crops discussion once the IPR picture is cleared up.

The bottom line is that a solution is possible with the IU. The North can be brought to bend on the IPR issue and agree to clearer wording that bans IPR on the materials covered by the IU. In turn, the South could offer more of its crops for inclusion in the

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<sup>67</sup> Refer to the Appendix 4 for the list of the crops covered under the Treaty on Plant Genetic Resources for Food and Agriculture.



multilateral system. Countries like the USA and Australia – which have been notoriously obstructive through the whole process – would most likely not agree to any restrictions on IPR, but they are increasingly isolated.

To address the outstanding issues on intellectual property rights, relationship with the WTO especially TRIPS, material transfer agreements, financing, and strengthening the international implementation of Farmers' Rights, the Treaty recognizes Farmers' Rights to save, exchange and sell seeds but subordinates these to national laws. Some of these are restrictive through recognition of patents and other IPRs on plant genetic resources. Other laws, such as the African Union Model Law on Community Rights does not subordinate Farmers' Rights but recognizes them as inalienable. The concept of 'Farmers' Rights' values the knowledge system of local farming communities and recognizes the value of the genetic enhancements they have developed within seeds. It implies rights arising from the contributions of farmers in conserving, improving, and making available plant genetic resources, particularly those in the centers of origin/diversity.<sup>68</sup> The issues this Treaty deals with are fundamental to food sovereignty, food security and the environment, but discussions need to continue in the political space created in the Governing Body to ensure that these resources are secured in the public domain in perpetuity,<sup>69</sup> the Treaty aims to achieve its objectives by following a multilateral system.

#### 5.4 Multilateral System

All the countries depend, for their food and agriculture, on plant genetic resources that come from other nations. However, the countries richest in genes are often the poorest in economic terms. Most of the world's plant genetic diversity is found in the tropical and subtropical regions, that is, in the developing countries. In spite of their vital importance for human survival, genetic resources are being lost at an alarming rate due to the lack of incentives to continue developing and conserving them. The convention, therefore, aims at ensuring both the conservation and sustainable use of plant genetic resources, as well

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<sup>68</sup> Shand H. J. (2000), "Biotechnology: under whose control", *The Hindu: Survey of the environment, 2000*, page 163-170.

<sup>69</sup> Hambling J. (2002), "CSO Statement on Agricultural Biodiversity and the International Seed Treaty (ITPGRFA)", Presented at CBD/COP-6, The Hague, 10 April.

as the fair and equitable sharing of benefits arising out of their use. When the convention comes into force, access to the genetic resources of the listed crops would be multilaterally regulated, and also the sharing of the benefits, including capacity-building, the transfer of technology and the payment of an equitable share of the commercial benefits derived from the use of genetic resources.<sup>70</sup> The significance of the multilateral agreement increases due to the fact that recent developments have focused more on asserting ownership rights, rather than access to food.

*“With modernization, fewer and fewer crops form the basis of the world's food security,”* says José Esquinas-Alcázar, secretary of the FAO Commission on Genetic Resources for Food and Agriculture. *“A study carried out by FAO shows that, over the years, about 7,000 plant species have been cultivated or collected by humans for food. At present, however, only 30 crops provide 90 percent of the world's calorie intake. This agreement will help protect global agricultural biodiversity.”*

The International Seed Treaty (International Treaty on Plant Genetic Resources for Food and Agriculture - ITPGRFA) envisages a ‘Multilateral System’ (as opposed to the existing CBD ‘Bilateral System’) of access, to a list of some of the most important food and fodder crops essential for food security and interdependence, for the countries that ratify the Treaty. It aims that benefits arising from the use of plant genetic resources for food and agriculture, which are shared under the Multilateral System, should flow, directly and indirectly, to farmers in all countries, especially in developing countries, who conserve and sustainably utilize these resources. The Treaty also defines a mechanism for fair and equitable benefit-sharing in the Multilateral System. The mechanism includes:

- the exchange of information,
- access to and transfer of technology, capacity-building, and
- the sharing of the benefits arising from commercialization, taking into account the priority activity areas in the rolling Global Plan of Action, under the guidance of the Governing Body.

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<sup>70</sup> Ramanna A. (2001), “India’s policy on IPRs and agriculture – relevance of FAOs new international treaty”, *Economic and Political Weekly*, December 22, pp 4689-92.

The multilateral system to be so established has to be efficient, effective, and transparent, both to facilitate access to plant genetic resources and to share, in a fair and equitable way, the benefits arising from the utilization of these resources, on a complementary and mutually reinforcing basis.

### 5.5 Unchartered territory

The Treaty, however, has yet not clarified a few issues conclusively, such as:

- Will the Treaty allow new crop varieties or genes from food crops, if extracted, transformed or modified and included in new varieties, to be patented and have other IPR claims?
- Will the Treaty be recognized as the competent authority to deal with plant genetic resources for food and agriculture by the WTO/TRIPS with respect to these resources?
- Will the Treaty provide benefits and funding commensurate with the contribution that farmers have made over past centuries to the development of the diversity of crops?
- Will the Treaty's Governing Body insist of full international recognition of Farmers' Rights?
- What will be the nature of relationship of the Treaty to other environmental and trade-related international agreements?
- Is the list of the crops covered under the system holistic? Will it be expanded to cover the crops which are important for food-security and nutritional adequacy, how?
- Governments, while negotiating the International Seed Treaty, have themselves been promoting or facilitating, or at best tolerating, corporate sector involvement in a wide range of actions that are undermining diversity, threatening access to genetic resources, destroying rights and spreading genetic pollution<sup>71</sup>.

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<sup>71</sup> Anonymous (2002), "*Sustaining agricultural biodiversity - and the integrity and free flow of genetic resources for food for agriculture*", ITDG, GRAIN and etc-group, May.

*“Work remains to be done, but there is much cause for optimism,” says Mr. Esquinas-Alcázar. “The International Undertaking is a milestone in international cooperation. It will promote the use of genetic resources for research and plant breeding, the equitable sharing of benefits derived from this use and the conservation of genetic resources for future generations.”*

The International Seed Treaty is recognized as the agreement that will deal with all issues concerning plant genetic resources. It has the potential to showcase responsible global governance, ensuring that these genetic resources that underpin social needs are maintained in the public domain. It takes a multilateral approach to the issue of sharing of resources and focuses on improved accessibility of plant genetic resources. However, it has not been able to solve the issue of the international recognition of Farmers' Rights and the exclusion of genetic resources for food and agriculture from patentability.

The three international treaties that have been discussed so far are all related directly to the question of agro-biodiversity, in a socio-economic dimension. However, all these treaties presently seem to be pitted against a trade treaty which has gained importance with the provision of introduction of patents for living organisms and has thus ensured a debate on the economic dimension of agro-biodiversity. This is the Agreement on Trade Related Intellectual Property Rights, under the WTO, which has been discussed in the following chapter.

## **6. THE WORLD TRADE ORGANIZATION – AGREEMENT ON TRADE RELATED INTELLECTUAL PROPERTY RIGHTS (WTO/TRIPS)**

### **6.1 Background**

Historically, systems for the protection of intellectual property were applied principally to mechanical inventions of one kind or another, or to artistic creations. The assignment of Intellectual Property Rights (IPRs) to living things is of relatively recent origin in developed countries. Vegetatively propagated plants were first made patentable, in the US, only in 1930 and the protection of plant varieties (or plant breeder's rights - PBRs), a new form of intellectual property, only became widespread in the second half of the 20<sup>th</sup> Century. Thus, systems for the protection of plants derive from the economic structure and circumstances of agriculture that prevailed in developed countries in this period. That such systems came into being reflected the growing interest of private breeders in protecting their intellectual property. Farmers have traditionally replanted, exchanged or sold seed from the previous years' crop which means that breeders have difficulty in recouping the investments made in improved varieties through repeat sales.

Patents or PBRs normally impose restrictions on farmers' ability to sell grown seed (and in some cases to reuse it) and thus enhance the market for the breeder's seed. Even in the developed countries, reuse of seeds remains quite common although for many crops annual purchase is now the rule. In developing countries the majority of farmers reuse, exchange or sell informally to neighbors, and annual purchase of new seed is relatively rare in most countries. According to Rabobank International, current world seed sales of US\$30 billion a year should jump to US\$90 billion soon.<sup>72</sup> But a substantial part of world food production is based on farm-saved seed – as much as 90% in sub-Saharan Africa or 70% in India. Even in industrialized countries, farmers also save seed rather than buy a

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<sup>72</sup> Lather V. (2002), "Hike research spend in seed technology: Rabobank report", *Hindu Business Line*, Mumbai, 25 March.

fresh batch, if it makes sense for them and they can.<sup>73</sup> So there's still a sizeable market out there for the seed industry to get a grip on and the industry is working hard to secure legal systems that restrict seed saving by farmers, be it through the WTO/TRIPS, bilateral trade agreements or direct lobbying of governments. IPRs applied to seeds give breeders, or whoever claims to have discovered or developed a new plant variety, an exclusive monopoly right in relation to the seed. Under patent law, that monopoly right is very strong. It will generally prevent anyone from using, selling or producing the seed without the patent holder's permission. Under a typical *sui generis* plant variety protection law – an IPR system designed specifically for plant varieties – there are usually a few exceptions to this powerful right built in. One of those exceptions is that farmers may be allowed to save, exchange, sell or reuse part of their harvest as a new batch of seed.<sup>74</sup>

On the one side, the developed world side, there exists a powerful lobby of those who believe that all IPR are good for business, benefit the public at large and act as catalysts for technical progress. They believe and argue that, if IPRs are good, more IPRs must be better. On the other side, the developing world side, there exists a vociferous lobby of those who believe that IPRs are likely to cripple the development of local industry and technology, will harm the local population and benefit none but the developed world. They believe and argue that, if IPRs are bad, the fewer the better. There has been much debate over the suitability of patents and other forms of IPRs for the protection of plant genetic resources for food and agriculture. However, in spite of the debate still continuing, there is an overwhelming pressure on all WTO Members, through TRIPS Article 27.3(b)<sup>75</sup> to consider applying IPRs to living material, and an obligation to apply them to plant varieties. The agreement obligates all signatory states to adopt intellectual

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<sup>73</sup> Alvaro T. (2002), "Saving the seed: Europe's challenge", *Seedling*, GRAIN, Barcelona, April.

<sup>74</sup> Anonymous (2003), "*Farmers' privilege under attack*", <http://www.grain.org/publications/bio-ipr-fp-june-2003-en.cfm>

<sup>75</sup> TRIPS Article 27.3: Members may also exclude from patentability:  
(b) plants and animals other than micro-organisms, and essentially biological processes for the production of plants or animals other than non-biological and microbiological processes. However, Members shall provide for the protection of plant varieties either by patents or by an effective *sui generis* system or by any combination thereof. The provisions of this subparagraph shall be reviewed four years after the date of entry into force of the WTO Agreement.

property laws, covering both micro-organisms and plant varieties. Many developing nations have been forced to adopt IPRs under the threat of trade sanctions, although the current intellectual property regimes are inadequate to protect the right of informal innovators, and they are predatory on the rights, knowledge and resources of farmers and indigenous people.<sup>76</sup> With the adoption of the TRIPS Agreement, developing countries have been obliged to adopt protection of plant varieties, by patents or by other means, without any serious consideration being given to whether such protection would be beneficial, both to producers and consumers, or its possible impact on food security.

A crucial issue is whether and how intellectual property (IP) protection can help promote research and innovation, relevant to the needs of developing countries and poor people. Besides it also needs to be ascertained as to how IP protection affects the cost and access of farmers to the seeds and other inputs they need. If the aim of plant variety protection is to provide incentives to breeders, one of the questions that arise is how the contribution of farmers to the conservation and development of plant genetic resources should be recognized and preserved. Until formal breeding programmes were introduced, varietal and cultural improvements depended on a process of selection and experimentation by farmers. Formal breeding programmes have since utilized those varieties and knowledge in order to develop improved varieties of higher productivity, or with other desirable characteristics. The question is whether this contribution of farmers to conservation and innovation should be either protected or rewarded.

There is, also, a broad consensus about the need to limit the incidence of biopiracy<sup>77</sup> by introducing more checks and balances in IPR systems. But there is also a very real risk that even limited reforms in this direction will serve to legitimize, expand and strengthen

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<sup>76</sup> Shand H. J. (2000), "Biotechnology: under whose control", *The Hindu: Survey of the environment, 2000*, page 163-170.

<sup>77</sup> Biopiracy can be defined as the stealing of knowledge from traditional and indigenous communities or individuals. The term can also be used to suggest a breach of a contractual agreement on the access and use of traditional knowledge to the detriment of the provider and bioprospecting without the consent of the local communities.

IPRs on life. That would leave local communities who depend on biodiversity and traditional knowledge for their livelihood in a worse position than they are at present.<sup>78</sup>

### 6.1.1. Disclosure of origin and biopiracy

Developing countries started pushing for a rule on disclosure of origin in TRIPS because of the increasing incidence of patents granted in foreign countries on biopirated materials or knowledge. At present, the only possible remedy is to challenge the patent in the courts or before the patent office of the country, where it was granted. This is difficult and expensive, and although some countries, like India, have sometimes succeeded in having such patents invalidated, the legal avenue is not in most cases a practical option. If TRIPS forced patent applicants to say where they got genetic resources or leads on inventions, it is assumed that fewer biopiracy patents will be granted. Developing country governments have a strong case also because the CBD clearly recognizes the right of parties, i.e. States, to control access to genetic resources and to receive a share in any benefits from their commercial use or development.

The submissions from developing countries have typically argued for a strong and effective disclosure of origin mechanism which must be:

- Mandatory: all countries must implement it as a requirement for patent grant;
- Linked to patentability itself: no relevant patent should be granted without disclosure, and any patent should be cancelled if it is shown that the disclosed information was false;
- Linked to prior informed consent (PIC): it must be shown that the materials and knowledge that fed into the development of the invention were acquired with the consent of at the least the government agency in charge of granting access to these things; and
- Linked to benefit sharing: it must be shown that whoever accessed the materials or the knowledge complied with the provider country's benefit sharing regulations.

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<sup>78</sup> Anonymous (2003), "*The TRIPS review at a turning point?*", [www.grain.org/docs/trips-july-2003-en.pdf](http://www.grain.org/docs/trips-july-2003-en.pdf)



There is little doubt that this kind of rule would make a real difference in reducing biopiracy. However, even if the proposals from developing countries were accepted in full, they would not solve the problem of biopiracy. One major flaw in the current proposals is that nothing would guarantee a fair deal for the local communities, who are the real providers of resources and knowledge. No proof of their consent or of benefit sharing with them would be required, only that of government agencies. Worse, an agreement on disclosure of origin will probably be viewed as a capitulation on the life patenting issue – the very crux of the controversy. Civil society organizations from many parts of the world have been quick to point out that making disclosure of origin a condition for patenting plants or animals contradicts the fundamental principle of ‘no patents on life’.<sup>79</sup>

## 6.2 Developing countries, Patents and Plant Variety Protection.

Developing countries resisted TRIPS from the very outset because they saw it as a threat to sustainable development on their own terms. They were proved correct, as critical assessments from UN bodies and other independent analyses, as well as the growing public opinion in both North and South show. In the past couple of months alone, several major studies and analyses have been produced by agencies such the UK IPR Commission<sup>80</sup>, the UK Royal Society<sup>81</sup>, UNDP<sup>82</sup> and the Human Genome Organization<sup>83</sup> which call for changes in intellectual property law or limitations on its use to stop its ill effects on research, innovation and development.

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<sup>79</sup> Anonymous (2003), Declaration from the Civil Society Conference on ‘TRIPS, Biodiversity and Traditional Knowledge’, Hyderabad, India, 18-21 June.

<sup>80</sup> Anonymous (2002), “*Integrating intellectual property rights and development policy*”, Commission on Intellectual Property Rights, London, September.

<sup>81</sup> Anonymous (2003), “*Keeping science open: the effects of intellectual property policy on the conduct of science*”, Royal Society, London, April.

<sup>82</sup> Anonymous (2003), “*Making global trade work for people*”, UNDP, Earthscan, London.

<sup>83</sup> Pearson H. (2003), “Human Genome Organization calls for open-access sequence repositories”, *Nature*, 30 April.

In recent past, plant variety protection (PVP) and the patents have emerged as two important forms of IPRs concerning genetic resources. In context of developing countries, PVP has been there for some time but patents for plants is a recent phenomenon. Plant variety protection has worked well as a mechanism to promote the interests of the plant breeders for developing new varieties through giving those proprietary rights, on the one hand, and as a custodian of public rights of access and use of genetic materials, on the other. PVP gives patent-like rights to plant breeders, what gets protected in this case is the genetic makeup of a specific plant variety. The criteria for protection are, however, different from those applied for industrial patents. They are: novelty, distinctness, uniformity and stability. PVP laws can provide exemptions for breeders, allowing them to use protected varieties for further breeding, and for farmers, allowing them to save seeds from their harvest. PVP also encourages cross licensing between a holder of Plant Variety Rights and a holder of patent. Under the breeders' exemption of plant variety rights anyone may use protected material for breeding purposes. However, the patent regime does not reciprocate this.<sup>84</sup> In plant breeding, thus, PVP is the weaker sister of patenting mainly because of these exemptions.

A comparative analysis of TRIPS and UPOV is given in the following table to highlight the differences between patents and an applied *sui generis* system.

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<sup>84</sup> Chaturvedi S. (2001), "The public-private debate in agricultural biotechnology and new trends in the IPR regime: challenges before developing countries", *RIS Discussion Paper*, No. 17.

Table 6.1: Comparison between attributes of TRIPS and International Convention on the Protection of New Varieties of Plants (UPOV).

<u>Criterion</u>	<u>TRIPS Agreement</u>	<u>UPOV Convention'1991</u>
Granting criterion	Novelty, inventive step, industrial applicability	New, distinct, uniform, stable
Distinctness	Not defined even as a requirement for the <i>sui generis</i> system of protection mandated for plant varieties under Article 27(3) (b).	The variety must be clearly distinguishable in its essential characteristic from other varieties, which are a matter of common knowledge, at the time of application.
Extent of protection	a) In case of a product the holder may prevent third parties from using, selling or importing it. b) Patent holder can deny usage of the process or the sale of product of that process.	a) Right to produce, reproduce, sale or stock any plant variety. b) Right to extend to harvested material and other products obtained from material of the variety provided.
Farmers privilege	Not specific but possibly permitted via Article 30	Optional. Contracting parties may, with reasonable limits and subject to the safeguarding of the legitimate interests of the breeders, restrict the breeders' right in relation to any variety in order to permit farmers to use for propogating purposes.
Breeders/Research exemption	Not specific but possibly permitted via Article 30	Yes, non-infringing act include: a) Acts done privately and for

		non-commercial purposes. b) acts done for experimental purposes and for breeding.
Compulsory licenses	Yes, but only where: a) The applicant has requested for and been refused a license from the patent holder. b) the use for which the applicant wishes to use the protected invention is non-exclusive c) The use is predominantly within the domestic market. d) The license holder pays an adequate remuneration. Each case is assessed on its individual merit, it is non-assignable, is subject to termination when the circumstances change and is subject to judicial review.	Not mentioned as such. Article 17 states that: a) Except where expressly provided in the Convention, party may restrict the free exercise of the breeders' right for reasons other than of public interest. b) When any such restriction has the effect of authorizing a third party to perform any act for which the breeders' authorization is required, the contracting party concerned shall take all measures necessary to ensure that the breeder receives equitable remuneration.
Duration of protection	20 years from the date of filing.	30 years for trees and vines, 25 years for all other varieties.

Source: Chaturvedi S. (2001), "The Public-Private debate in agricultural biotechnology and new trends in the IPR regime: challenges before developing countries", *RIS Discussion Papers*, No.17, page 16.

The reason why the patent system does not work for traditional knowledge holders, particularly in the developing region, is because:

- It is impossible to identify an individual inventor due to the collective nature of traditional knowledge

- Traditional knowledge often can not be attributed to a particular geographical location
- Ownership of varieties of plants is alien to many social and cultural beliefs
- The required criteria of ‘novelty’ and ‘inventive step’ are not always possible particularly in cases where the traditional knowledge has been in existence over a long period of time
- The costs of applying for a patent and pursuing patent infringement cases are prohibitive.

Table 6.2: What the different parties want

In terms of....	Many companies and industrial countries	Many governments in developing countries	Many NGOs, local communities and small farmers
Plant Varieties	PBRs and patents	Willing to provide for PBRs, with some provision for farmers’ ‘privilege’	Farmers’ rights and community rights
<i>Sui Generis</i>	UPOV standards	Not clear what they want, but most go for UPOV	Real alternatives to IPR
Patents	No exclusions	Certain exclusions	No patents on life
Ownership	Market control	State sovereignty	Community sovereignty
TRIPS Review	No amendments that lower standards of IPR protection	Amendments to conform to CBD, but not challenging patents on life or traditional knowledge.	Exclude biodiversity and do not introduce traditional knowledge,
Access	Free and unregulated	State control	Community control
Benefit sharing	Through IPR	Through IPR	Through community intellectual property regimes or comprehensive

			resource rights
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### 6.3 Shortcomings of TRIPS

The WTO recently published an update of where countries are in implementing TRIPS, including the question of the farmers' privilege.<sup>85</sup> The result is sobering, to say the least. Country after country, the historic and supposedly untouchable right of farmers to save and reuse seeds is under attack. But this is not where the story ends – it is where it starts. IPRs for plant breeders, once adopted, are always being strengthened at the expense of the farmers. It is in that sense that PVP laws, and their imposition on virtually all countries through the WTO, really serve as a jumping board towards accepting full-fledged industrial patents on all forms of life.

Entrusting the development of framing people's rights, to traditional knowledge, to a body with a narrow focus on trade and intellectual property rights is a very dangerous step to take. The privatization and commercial appropriation of traditional knowledge through IPRs is one of the major threats to traditional knowledge systems, not a route to safeguarding them. The positive agenda – developing better safeguards for traditional knowledge systems and tools through which communities can control the development and use of genetic resources – may be pursued by providing less power to TRIPS and more to other actors for whom sustainable development, community rights and cultural diversity are truly on the agenda.

The TRIPS Agreement's objective of protection of IPRs should provide benefit to both producers and users of technological knowledge, in a manner conducive to social and economic welfare in reality. The current IPR regimes, particularly TRIPS, fail to adequately address a number of concerns central to the achievement of the objectives of CBD. They do not address a range of equity issues including intergenerational equity and they render difficult both access to genetic resources and the fair sharing of benefits

<sup>85</sup> Anonymous (2003), "Review of the Provisions of Article 27.3(b): Illustrative List of Questions", WTO Council for TRIPS, IP/C/W/273/Rev.1, Geneva, 18 February.

arising from their use. Perhaps more seriously, they fail to recognize and protect traditional systems of knowledge that are needed to meet the objectives of the CBD fully, especially the local and community knowledge and the knowledge systems of indigenous people. There is therefore a need to achieve necessary amendments to it to address these concerns.<sup>86</sup> It has been argued that the system of intellectual property protection, when extended to agriculture, impinges on the traditional agricultural practices of the farmers. The rights that commercial plant breeders would enjoy in the regime of intellectual property protection covering the agricultural sector would militate against the interest of the farmers as the users of planting material. Besides, this regime is seen to discriminate against the farming communities by remaining silent about the contributions made by the farmers in both developments of new varieties of plants as well as conservation of biodiversity. The new IP protection regime, by giving a short shrift to the critical role played by the farmers in the process of agriculture in developing countries, has thus raised serious doubts about the sustainability of agriculture in these countries.

Part of the confusion is inherent in the word 'protection', which means very different things in intellectual property law and in ordinary usage. 'Protection' of IP means enforcing private, exclusive economic rights to a specific creation in order to prevent others from using or reproducing it. 'Protection' of traditional knowledge, on the other hand, necessarily implies protecting the whole social, economic, cultural and spiritual context of that knowledge so that it continues to be produced and reproduced. There is a need to introduce limits and conditions on the use of IPRs on inventions derived from traditional knowledge and it can be done by amending TRIPS, however, there is an even more urgent need to strengthen the protection of traditional knowledge in the broader, non-IPR sense. Without better safeguards, many traditional knowledge systems are threatened by extinction. But this is not a matter for a trade body like WTO, or for an intellectual property body like WIPO (World Intellectual Property Organization). This is instead a matter for intergovernmental bodies with other mandates and competence, such

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<sup>86</sup> Anonymous (1999), "*Workshop on biodiversity conservation and intellectual property rights: statements and recommendations*", RIS Publications, India, pp 2.

as the UN Human Rights Commission, UNDP (UN Development Programme), CBD or UNESCO (UN Educational, Scientific and Cultural Organization). All of these have already done valuable work in the field and at least in principle are in a better position to approach the matter in a more holistic manner.

The decisions in the WTO, dominated by ministries of trade and finance, have the possibility of reversing any progress made by the CBD and FAO.<sup>87</sup> While WTO rules are 'GM-neutral' in principle, there could be questions about the application of some of its rules on GM trade, agreements and the concept of 'like-product' enshrined in the General Agreement on Trade and Tariff(GATT) Articles.<sup>88</sup> With regard to the WTO, agricultural biodiversity policies may be impacted by trade measures, including TRIPS, if these policies do not permit local determination of production methods and priorities nor recognize the importance of protecting agricultural biodiversity for sustainable food production, biological or life support systems and ecological and social services.

There is much doubt about the effect of application of TRIPS on agro-biodiversity, such as:

- TRIPS is not in harmony with all the rights and opportunities that have been granted to local communities in the CBD and it strikes at their ability to engage in sustainable development in a self-reliant way.
- The TRIPS Agreement is likely to be detrimental to the conservation and sustainable use of biological diversity.
- WTO, especially TRIPS supports agricultural growth that is far from sustainable. Patents on biological materials strike at the root of self-reliance in agriculture, denying rural and tribal communities the ability to even earn their livelihoods. The food sources of the poor are threatened, their access to bio-resources, the

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<sup>87</sup> Patrick M. (1998), "Agricultural Biodiversity", *Connections*, ITDG, Schumacher Centre, Bourton-on Dunsmore, RUGBY, CV23 9QZ, UK, March

<sup>88</sup> Kaushik A. (2000), "India and the biosafety protocol", *RIS Biotechnology and Development Review*, Vol.3, No. 2, December, page72-83.



mainstay of their subsistence economy is being cut-off as corporations corner these resources to fuel their biotechnology industry.<sup>89</sup>

Concerned governments may have to take action to rescind the current requirements, under Article 27.3(b) of WTO/TRIPS to implement intellectual property protection for plants and micro-organisms, on the ground that patenting regimes are fundamentally inequitable and predatory on the rights and knowledge of farming communities and indigenous peoples. Governments may also invoke their rights under Article 27.2<sup>90</sup> of WTO/TRIPS to exclude patents and entire classes of technology such as Terminator seeds that are contrary to public morality and the environment.<sup>91</sup>

As Darrell Posey points out in “Beyond Intellectual Property”, IPR laws are generally inappropriate and inadequate for defending the rights and resources of local communities and indigenous peoples. Traditional community knowledge is usually shared and the holders of restricted knowledge in communities probably do not have the right to commercialize it for personal gain.

The developing countries have been obliged to adopt protection of plant varieties, by patents or by other means, without any serious consideration being given to whether such protection would be beneficial, both to producers and consumers, or its possible impact on food security. PVP gives patent-like rights to plant breeders, what gets protected in this case is the genetic makeup of a specific plant variety. The criteria for protection are, however, different from those applied for industrial patents. They are: novelty, distinctness, uniformity and stability. The current intellectual property regimes are

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<sup>89</sup> Sahai S. (2001), “TRIPS Review: basic rights must be restored”, *Economic and Political Weekly*, August 4-10, pp 2918-19.

<sup>90</sup> TRIPS Article 27.2: Members may exclude from patentability inventions, the prevention within their territory of the commercial exploitation of which is necessary to protect ordre public or morality, including to protect human, animal or plant life or health or to avoid serious prejudice to the environment, provided that such exclusion is not made merely because the exploitation is prohibited by their law.

<sup>91</sup> Shand H. J. (2000), “Biotechnology: under whose control”, *The Hindu: Survey of the environment*, 2000, page 163-170.

inadequate to protect the right of informal innovators, and they are predatory on the rights, knowledge and resources of farmers and indigenous people.

Entrusting the development of framing people's rights, to traditional knowledge, to a body with a narrow focus on trade and intellectual property rights is a very dangerous step to take. The privatization and commercial appropriation of traditional knowledge through IPRs is one of the major threats to traditional knowledge systems, not a route to safeguarding them. The current IPR regimes, particularly TRIPS, fail to adequately address a number of concerns central to the achievement of the objectives of CBD. They do not address a range of equity issues including intergenerational equity and they render difficult both access to genetic resources and the fair sharing of benefits arising from their use. Perhaps more seriously, they fail to recognize and protect traditional systems of knowledge that are needed to meet the objectives of the CBD fully.

## 7. CHANGING STATUS OF INDIAN AGRO- BIODIVERSITY

### 7.1 Indian flora: Endemism

Indian flora accounts for 7% of the global total. India has over 45,000 wild species of plants and 77,000 wild species of animals recorded. These together comprise about 6.5% of the world's known wildlife. India's biological heritage is impressive not only in its sheer diversity, but also in its uniqueness. India is one of the 12 mega-biodiversity areas of the world. Equally impressive is the range of domesticated biodiversity.<sup>92</sup>

Table 7.1: Comparative statement of recorded number of plant species in India and the World.

<u>Taxa</u>	<u>Species</u>		<u>Percentage of India to the World</u>
	India	World	
Pteridophyta	2850	16000	17.80 %
Gymnosperms	1100	13000	8.46 %

<sup>92</sup> Anonymous (1997), '*National Action Plan for Biodiversity*', Ministry of Environment and Forests, Government of India, New Delhi.

Angiosperms	64	750	8.53 %
Total	17500	250000	7.00 %

Source: Anonymous (1999), '*National Policy and Micro-level Action Strategy on Biodiversity*', Ministry of Environment and Forests, Government of India.

At least 166 species of crops and 320 species of wild relatives of crops are known to have originated here. Within each of these species, the diversity of varieties is outstanding.<sup>93</sup> India has 26 recognized endemic centers that are home to nearly a third of all the flowering plants identified and described to date.<sup>94</sup> India is one of the 12 centers of origin of cultivated plants. 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 Northeast, 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.

Table 7.2: Endemic species of plants in India

<u>Group</u>	<u>No. of Species</u>
Pteridophyta	200
Angiosperms	4950

Source: Anonymous (1999), '*National Policy and Micro-level Action Strategy on Biodiversity*', Ministry of Environment and Forests, Government of India.

<sup>93</sup> *ibid.*

<sup>94</sup> Myers N., R A Mittermeier, C. G. Mittermeier, G A B da Fonseca and J. Kents (2000), "Biodiversity hotspots for conservation priorities", *Nature*, No. 403, pp 853-858.

India's record in agro-biodiversity is equally impressive. There are 167 crop species and wild relatives. India is considered to be the center 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. A complex mosaic of distinct agro-ecosystems, differentiated by their climatic, soil, geological, vegetational, crop growing, and other features, characterizes India. A recent classification by the National Bureau of Soil Survey and Land Use Planning distinguishes 20 broad agro-ecological zones, separated by natural features and crop growing periods.<sup>95</sup> Each of these agro-ecological zones is in turn comprised of myriad microhabitats. It is within this diversity of habitats that Indian farmers have developed an amazing variety of crops and livestock over the millennia. The Indian region is one of the world's eight centers of crop plant origin and diversity, distinguished by Russian scientist N.I. Vavilov.<sup>96</sup>

## 7.2 Threat to Indian Agro-biodiversity

It has been estimated that at least 10% of India's recorded wild flora, and possibly a larger fraction of its wild fauna, are on the threatened list, many of them on the verge of extinction. This need not be surprising considering the fact that in the last few decades, India has lost at least 50% of its forests, built or cultivated over much of its grasslands and degraded most of its coasts. In addition, hunting, overexploitation, poisoning by pesticides, excessive botanical and zoological collection, displacements by exotics, and a host of other activities have taken a heavy toll of biodiversity.<sup>97</sup> India has many endemic plant and vertebrate species. World Conservation Monitoring Center's (WCMC) Threatened Plants Unit (TPU) is in the preliminary stages of cataloguing the world's centers of plant diversity five locations have so far been issued for India: the

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<sup>95</sup> Sahgal J.L., D.K. Mandal, C. Mandal and S. Vedivelu (1992), "*Agro-ecological regions of India*", Technical Bulletin, National Bureau of Soil Survey and Land Use Planning, Indian Council of Agricultural Research, New Delhi, and Oxford and IBH Pub. Co.

<sup>96</sup> Kothari A. (1999), "Agro-biodiversity: the future of India's agriculture", *MCAER Book*, February 7.

<sup>97</sup> Anonymous (1997), '*National Action Plan for Biodiversity*', Ministry of Environment and Forests, Government of India, New Delhi.

Agastyamalai Hills, Silent Valley and New Amarambalam Reserve and Periyar National Park (all in the Western Ghats), and the Eastern and Western Himalaya. A workshop held in 1982 indicated that as many as 3,000-4,000 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.

Table 7.3: Summary of plant conservation status information at WCMC.

<u>IUCN Threat category</u>	<u>Number of species</u>
Extinct	19
Extinct/Endangered	43
Endangered	149
Endangered/Vulnerable	2
Vulnerable	108
Rare	256
Indeterminate	719
Insufficiently Known	9
No information	1441
Not threatened	374
TOTAL	3120

Source: WCMC Species Unit.

The rich biodiversity of India is under severe threat owing to habitat destruction, degradation, fragmentation and over-exploitation of resources. According to the Red List of Threatened Animals, 44 plant species are critically endangered, 113 endangered and 87 vulnerable.

Table 7.4: Threatened Plants of India by Status Category

<u>Status</u>	<u>Number of species</u>
Extinct	7

Extinct in the Wild	2
Critically Endangered	14
Vulnerable	87
Lower Risk conservation dependent	1
Lower Risk near threatened	72
Data Deficient	14

Source: Anonymous (2000), "*Red list of threatened species*", IUCN- The World Conservation Union, Switzerland.

The major proximate causes of species extinction are habitat loss and degradation affecting 89 percent of all threatened birds, 83 percent of mammals and 91 percent of all threatened plants assessed globally.<sup>98</sup> The main causes of habitat loss are agricultural activities, extraction (including mining, fishing, logging and harvesting) and unplanned development (human settlements, industry and associated infrastructure). Habitat loss and fragmentation leads to the formation of isolated, small, scattered populations. These small populations are increasingly vulnerable to inbreeding depression, high infant mortality and susceptible to environmental stochasticity, and consequently, in the end, possible extinction.

This diversity has a social aspect as well, the majority of India's population depends directly on the diversity of plant and animal life for their food, medicine, clothing, household items and other produce, as also for spiritual and cultural sustenance. Without this diversity they would simply perish.

With the advent of the Green Revolution in the mid-1960s, a small number of laboratory-generated varieties have been promoted over vast areas, particularly in the plains of northern India. Agricultural schemes have also resulted in homogenizing growing conditions, for example by surface irrigation, so that where there was earlier a complex mosaic of diverse micro-habitats, there are now immense stretches of uniform agricultural landscape. Inter-cropping is replaced by mono-cropping, a wide diversity of species is replaced by a handful of profitable ones, and a narrow genetic range of

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<sup>98</sup> Anonymous (2000), "*Red list of threatened species*", IUCN, The World Conservation Union, Switzerland.

financially lucrative varieties replaces genetic diversity within the same crop species. Some idea can be gauged by the fact that a handful of High Yielding Varieties (HYVs) are now grown over 70% of the paddy land and 90% of the wheat land of the country (Government of India 1990). Thousands of varieties of cereals (rice, wheat, etc.), cotton, minor millets, pulses, and other crops are no longer in use on farms.

Other factors that have caused erosion in agricultural biodiversity include:

- The destruction or conversion of habitats to which breeds or varieties were specially adapted, and the disruption of traditional lifestyles, through urban migration and through displacement by development projects.
- Changing social and religious norms, and cultivation methods, which threaten the genetic diversity of crops, especially cereals, pulses, vegetables, and plants used for religious and social purposes.
- Intense grazing activity by cattle, which has depleted wild cereal grasses, vital sources of genes for the improvement of existing crops.
- Exploitation such as hunting, collecting, fisheries and trade are a major threat to birds (37%), mammals (34%), plants (8% of those assessed), reptiles and marine fishes. Alien invasive species are a significant threat affecting 350 (30% of all threatened) birds and 361 (15% of all threatened) plant species. Islands are particularly susceptible to invasions of alien species.
- The clearing, in modern agricultural practice, of bunds and hedgerows, which once served as repositories of wild and semi-wild genetic diversity of crop and animal species.
- The Green Revolution represented a trade-off between quantity and quality in people's diets, especially among the poor. Over two billion people consume diets that are less diverse now than thirty years ago, leading to widespread micronutrient deficiencies.<sup>99</sup>

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<sup>99</sup> Stayamurty D. and T. Wakeford (2000), "Genetic engineering: seeds of discord", *The Hindu: Survey of the environment, 2000*, page 171-178.



- The subtle changes in food habits. The people have been brainwashed into believing that wheat and rice are the only two cereals worth eating. As perceptively pointed out by Dr. P.V. Satheesh of the Deccan Development Society, the ration shops of the country's Public Distribution System (a governmental measure to make available cheap food to the poor) do not stock any of the coarse grains. Not only do people have to buy only rice and wheat for consumption, but also farmers do not have the incentive to grow their traditional crops since there is no guaranteed buyer. The end result: a handful of varieties of wheat and rice, have replaced many local cereals like jowar, bajra and ramdana.<sup>100</sup>
- In many parts of India, the promotion of a few favored species has been carried out to an extreme through the “enrichment plantation”, in which a single native species has been encouraged by eliminating other species.<sup>101</sup>

India's domesticated biodiversity, with the loss of possibly thousands of varieties of crops that its farming communities have developed over many millennia, is under stress. Habitat destruction, hunting and other forms of over-exploitation, poisoning, displacement or predation by exotics, and other factors have been the immediately apparent causes of this decline in both wild and domestic biodiversity. *“Deeper down the causes relate to inequities in control over resources, allowing wasteful consumerist utilization by the elite, and forcing over utilization by a desperately impoverished population, a trend greatly aggravated by a development process which has treated both natural resources and poor people as expendable.”*<sup>102</sup>

The underlying causes of biodiversity loss, however, are poverty, macroeconomic policies, international trade factors, policy failures, poor environmental law/weak enforcement, unsustainable development projects and lack of local control over

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<sup>100</sup> Kothari A. (1999), “Agro-biodiversity: the future of India's agriculture”, *MCAER Book*, February 7

<sup>101</sup> *ibid*

<sup>102</sup> Kothari A. (1997), “Biodiversity, people and the proposed Forest Act,” *Kurukshetra*, Jan-Feb 1997, page3-7.

resources.<sup>103</sup> Population pressures and concomitant increases in the collection of fuel wood and fodder, grazing in forests by local communities too take their toll on the forests, and consequently its biodiversity.

The flora of the country is hence considerably threatened. About 10 % of the 45,000 species of wild plants found in the country are today threatened with extinction, with an unknown number already having passed into oblivion.<sup>104</sup> These wild plants act as repositories of genes for the domesticated species and, therefore, are very important from the point of view of evolution and conservation of Agro-biodiversity.

Table 7.5: Wild relatives of some crops

<u>Crop</u>	<u>No. of wild relatives</u>
Millets	51
Spices and Condiments	27
Vegetables and Pulses	55
Fiber crops	24
Oil seeds, tea, coffee, tobacco and sugarcane	12

Source: Anonymous (1999), “National Policy and Micro-level Action Strategy on Biodiversity”, Ministry of Environment and Forests, Government of India.

By 2005, India is expected to produce 75 percent of its rice with just 10 varieties compared with the 30,000 varieties traditionally cultivated.<sup>105</sup> More than 90% of crop varieties have been lost from farmers’ fields in the past century. Urgent actions will be required to reverse these trends *in situ*, also, to protect the genetic resources stored in *ex*

<sup>103</sup> Wood A., P.Stedman-Edwards and J.Mang (2000) (Eds.), “The root causes of biodiversity loss”, UK: World Wide Fund for Nature. Earthscan Publications, 399 pp.

<sup>104</sup> Ministry of Environment and Forest, Government of India, 1994.

<sup>105</sup> Khor M. (2000), “Development: Time for a paradigm shift”, *The Hindu: Survey of the environment, 2000*, page 37-44.

*situ* public gene bank. The loss of diversity is accelerating the slide down the slippery slope of food insecurity that today sends more than 1.2 billion people to bed, hungry.<sup>106</sup> The next chapter analyses the implications, of the international regulations and the unique biodiversity status of the country, on the policy framework adopted by India.

## 8. AGRO-BIODIVERSITY POLICIES IN INDIA

### 8.1 Organizational Environment

The organizational structure that has been developed by the country as a response to the treaties that it has ratified, viz. CBD and TRIPS, gives an overview of the situation, which has a large number of players involved in the area of biodiversity. A number of Ministries and Departments are involved in this, sometimes with overlapping interests, at other times with conflicting ones. Many of the issues get lost in this complex structure, important issues can not be discussed and decided upon rapidly.

The Ministries of Agriculture, Environment & Forests, Chemical & Fertilizers and Food Processing Industries are all directly related to the area of agriculture and biodiversity. Still, four ministries dealing with one issue leads to duplication of efforts and increased time consumption, leading to inefficiency.

The Ministries of Rural Development and Human Resource Development play a role in this whole structure as they are concerned with the human capital involved in the conservation, development and utilization of this biodiversity. It is the rights of the people that are being discussed along with the resources available, so they have their roles cut-out for that. Similarly, the Commerce Ministry is responsible for the trade of agro-products, the grant of patents and representing the nation at WTO forum, which is basically a trade forum.

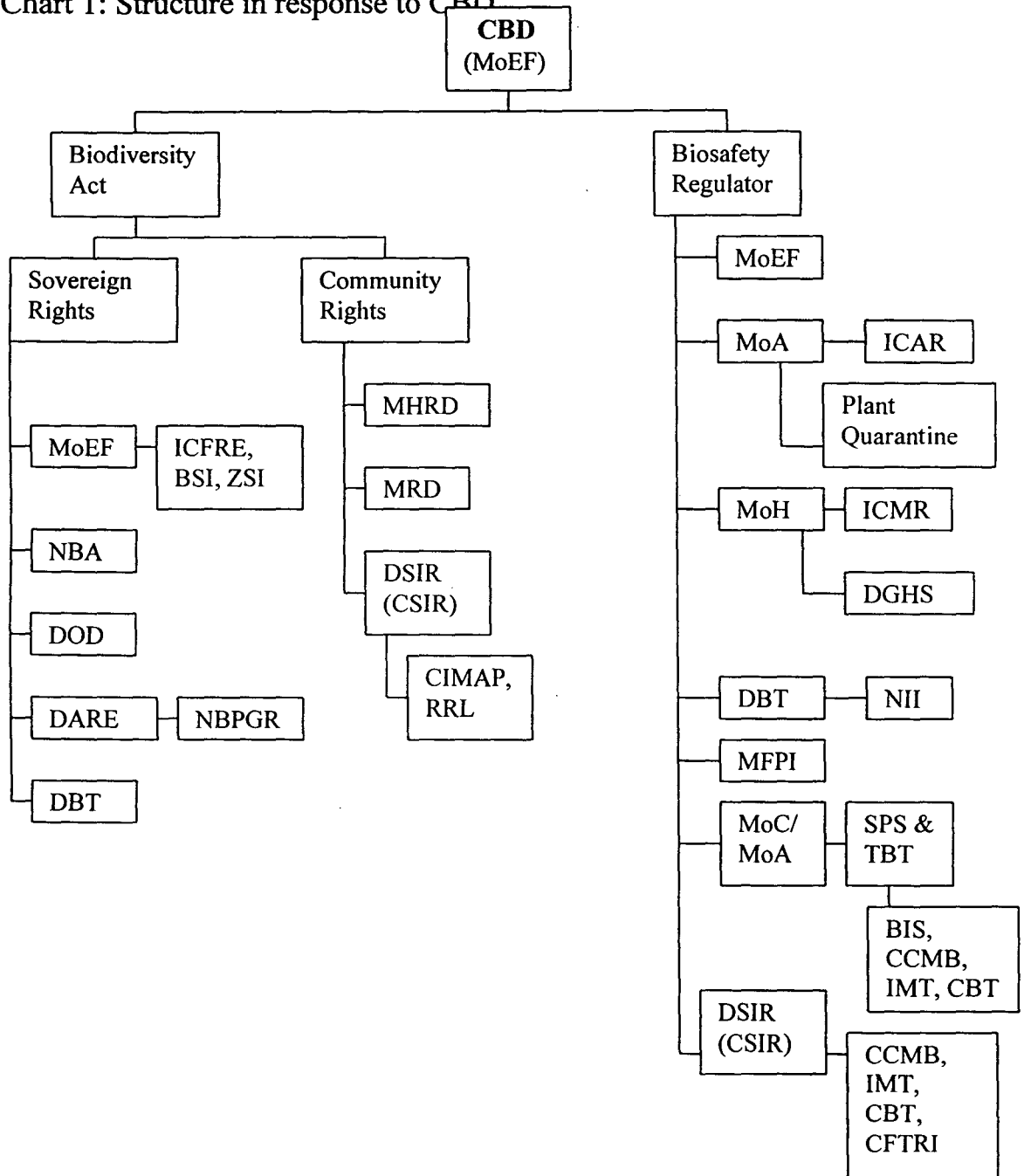
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<sup>106</sup> Anonymous (2002), *“Sustaining agricultural biodiversity - and the integrity and free flow of genetic resources for food for agriculture”*, ITDG, GRAIN and etc group, May.

The Ministry of External Affairs comes in the picture as the Treaties are international in character and much of international politics influences the outcomes of these Treaties. The response of the country to various issues has to be represented on the international for a in a forceful way for them to be considered, this requires canvassing by the Ministry to gain all the support it can get from other parties as well.

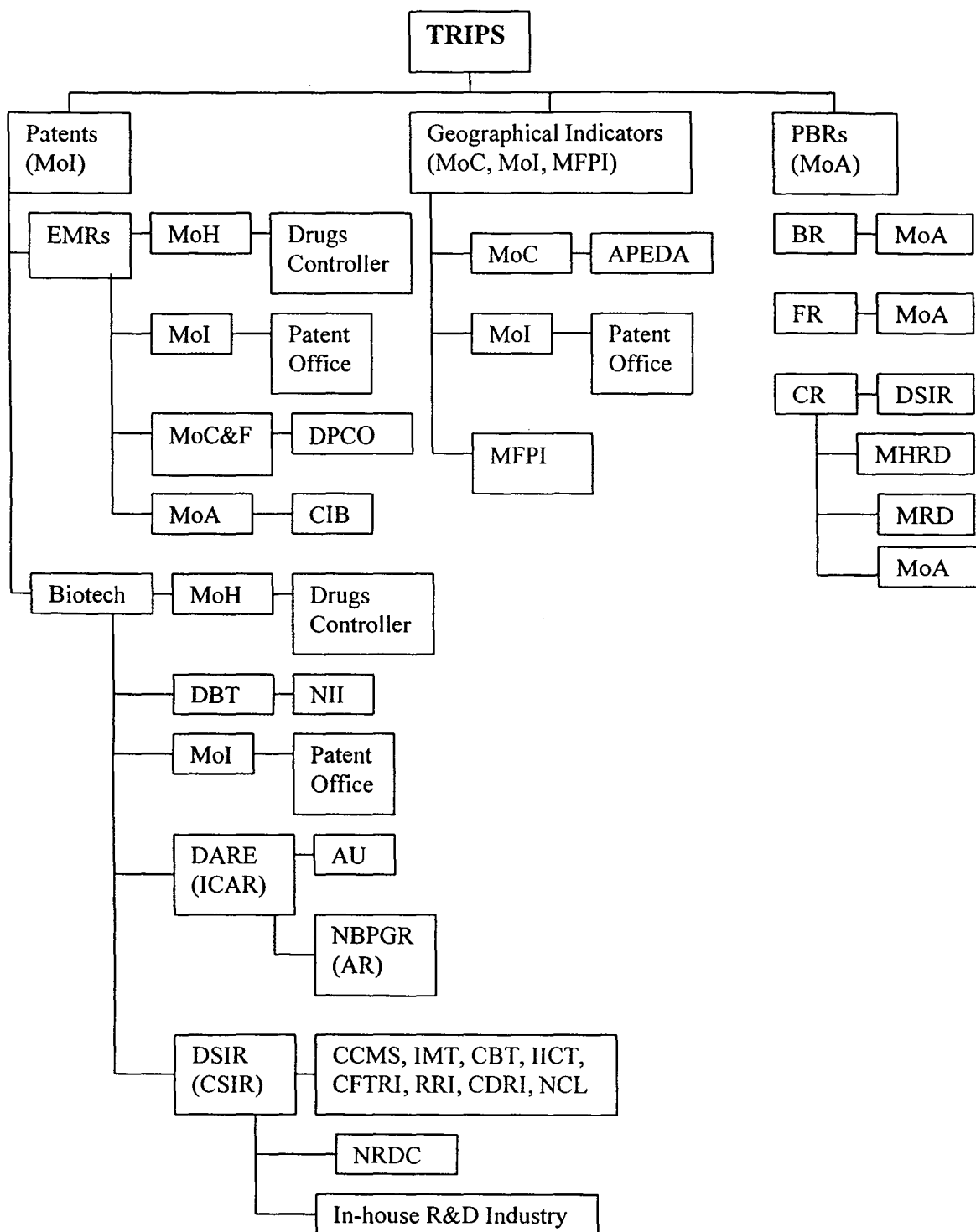
The interrelations and interactions of these Ministries in a basic structure, as according to CBD requirements and TRIPS compulsions, are detailed in the following charts.

Chart 1: Structure in response to CBD



Note: See legend on page 80.

Chart 2: Structure in response to TRIPS



Note: See legend on page 80.

**Legend for charts 1 and 2:**

APEDA: Agro-Processed Foods Export Development Authority

AU: Agricultural University

BR: Breeders' Rights

BSI: Botanical Survey of India

BIS: Bureau of Indian Standards

CCMB: Centre for Cellular and Molecular Biology

CBD: Convention on Biological Diversity

CBT: Centre for Biotechnology

CDRI: Central Drug Research Institute

CFTRI: Central Food Technological Research Institute

CIMAP: Central Institute of Medicinal and Aromatic Plants

CR: Community Rights

CSIR: Centre for Scientific and Industrial Research

DARE: Department of Agricultural Research and Education

DBT: Department of Biotechnology

DGHS: Director-General Health Services

DOD: Department of Ocean Development

DPCO: Drugs Price Control Order

DSIR: Department of Scientific and Industrial Research

FR: Farmers' Rights

IARI: Indian Agricultural Research Institute

ICAR: Indian Council for Agricultural Research

ICFRE: Indian Council of Forestry Research and Education

ICMR: Indian Council of Medical Research

IICT: Indian Institute of Chemical Technology

IMT: Institute of Microbial Technology

MFPI: Ministry of Food Processing Industry

MoA: Ministry of Agriculture

MoC: Ministry of Commerce

MoC&F: Ministry of Chemicals and Fertilizers

MoEF: Ministry of Environment and Forests  
MoH: Ministry of Health  
MoI: Ministry of Industry  
MHRD: Ministry of Human Resource Development  
MRD: Ministry of Rural Development  
NBA: National Biodiversity Authority  
NBPGR: National Bureau of Plant Genetic Resources  
NCL: National Chemical Laboratories  
NII: National Immunology Institute  
NRDC: National Research Development Corporation  
RRL: Regional Research Laboratories  
SPS: Sanitary and Phyto-sanitary Standards  
TBT: Technical Barriers to Trade  
TRIPS: Trade Related Intellectual Property Rights  
ZSI: Zoological Survey of India

## 8.2 Regulatory Environment

The policies and acts related to the issue of agro-biodiversity in India, trace their history back to 1986, which evidenced the passage of the Environment (Protection) Act in the parliament. With the evolution of varied aspects of the issue, the policies also evolved and presently, India has regulations covering Biodiversity, farmers' rights, agro-biotechnology, biopiracy, etc.

### 8.2.1. Environment (Protection) Act, 1986:

It was in 1989 that the first rules pertaining to Genetically Modified Organisms (GMO) were legislated in India. These rules related to the manufacture, use, import, export and storage of hazardous microorganisms and genetically engineered organisms under the Environment (Protection) Act, 1986.<sup>107</sup>

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<sup>107</sup> Kaushik A. (2000), "India and the biosafety protocol", *RIS Biotechnology and Development Review*, Vol.3, No. 2, December, page72-83.



A major handicap in implementation of this Act was, and still is, insufficient information about the likely risks of GMOs to the environment. Such information needs to be generated on a priority basis as, taking into account the commitments made by India at international fora, the country has to analyze and revise the existing regulating mechanisms related to unknown adverse impacts on biodiversity and environment.<sup>108</sup>

The second policy, one which was specifically concerned with agriculture, was the National Agriculture Policy, in 2000. This policy is discussed in the next section.

### 8.2.2. National Agricultural Policy of India, 2000:

This was the first policy to be drafted specifically for the agricultural sector. It recognizes that erosion and narrowing of the base of India's plant and animal genetic resources in the last few decades has been affecting the food security of the country. The main attributes of this policy, as regards agricultural biodiversity, are:

- Over the next two decades, it aims to attain:
  - Growth that is based on efficient use of resources; and
  - Conserve the country's soil, water and bio-diversity.
  - The policy seeks to promote technically sound, economically viable, environmentally non-degrading and socially acceptable use of country's natural resources – land, water and genetic endowments to promote sustainable development of agriculture.
- Survey and evaluation of genetic resources and safe conservation, of both indigenous and exogenous genetic variability, in crop plants and their wild relatives.
- The use of biotechnologies to be promoted for evolving plants, which consume less water, are drought resistant, pest resistant, contain more nutrition, give more yields and are environmentally safe. Conservation of bio-resources through their *ex situ* preservation in Gene Banks, as also *in situ* conservation in their natural

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<sup>108</sup> Chaturvedi S. (1997), "Biosafety policy and implications in India", *Biotechnology and Development Monitor*, No. 30, page 10-13.

habitats through biodiversity parks, etc., to receive a high priority to prevent their extinction.

- Specific measures to be taken to conserve indigenous breeds facing extinction and a time bound programme to list, catalogue and classify country's vast agro-biodiversity.
- Concerted efforts to be made to pool, distill and evaluate traditional practices, knowledge and wisdom and to harness them for sustainable agricultural growth.
- A very high priority to be accorded to evolving new location specific and economically viable improved varieties of agricultural and horticultural crops, livestock species and aquaculture as also conservation and judicious use of germplasm and other biodiversity resources.
- Protection to plant varieties through a *sui generis* legislation to be granted to encourage research and breeding of new varieties particularly in the private sector in line with India's obligations under TRIPS Agreement. The farmers will, however, be allowed their traditional rights to save, use, exchange, share and sell their farm saved seeds except as branded seeds of protected varieties for commercial purposes.
- The interests of the researchers will also be safeguarded in carrying out research on proprietary varieties to develop new varieties.<sup>109</sup>

However, it is evident that the Government has neglected significant issues of concern regarding agricultural bio-diversity, in this policy. In fact, the government policies of supporting and promoting modern farming, on the cost of traditional farming practices, has proved detrimental to the cause of agro-biodiversity. Even in the case of Integrated Pest Management (IPM) programmes, where crop diversity is seen as an integral element in the management practices for pest control, much attention has not been paid to the cultural and economic dimensions of agro-biodiversity. Overall, the government has been aggressively promoting mono-cultural practices and the use of modern seeds and chemical fertilizers, on the cost of the agricultural biodiversity of the country.

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<sup>109</sup> Anonymous (2000), 'National Agriculture Policy', Department of Agriculture & Cooperation, Ministry of Agriculture, Government of India, July.

There has not been much significant effort in any of the Government policies to involve farmers in the management of genetic resource collections and conservation, which could be done by pursuing a policy of on-farm conservation. An information-gap divides the scientific knowledge that exists with the researchers, extension workers, plant breeders etc and the local knowledge-systems of the people in villages, which form an integral part of their agriculture. This void has to be filled up to provide a new perception on the biodiverse farming system, from the farmers' perspective, to the policy makers and implementers, the farm scientists, extension personnel and agricultural bureaucrats. Besides, the R&D (including breeding) needs to become much more participatory, to harness the traditional knowledge available with the farmers. A radical shift in attitude and methodology is required, with modern agriculture scientists treating farmers as scientists and researchers in their own right, and working towards collaborative R&D<sup>110</sup> to integrate traditional Indian agricultural sciences, with the modern practices for optimal results.

An interesting development towards revival and sustenance of agro-biodiversity is the move to help villagers to document the diversity. Several Non-Governmental Organizations and individuals are currently involved in building up Community/People's Biodiversity Registers, which record the variety of uses that communities make of biological resources. These documents are not only evidence of diversity, but also the means whereby communities can assert their rights to the knowledge and resources recorded therein.<sup>111</sup> The document would be critical in operationalising the provisions of the CBD that commits all signatories, including India, to equitably share, with local communities, the benefits of commercial utilization of biological diversity and people's knowledge of their uses.<sup>112</sup> The Agriculture Policy also envisages their documentation,

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<sup>110</sup> Sperling, L. and M. Loevinsohn (1996) (eds.), "*Using diversity: enhancing and maintaining genetic resources on-farm*", Proceedings of a Workshop Held on 19-21 June 1995, New Delhi, India. International Development Research Center, New Delhi.

<sup>111</sup> Kothari A. (1999), "Agro-biodiversity: the future of India's agriculture", *MCAER Book*, February 7.

<sup>112</sup> Gadgil M. (2000), "Conservation: taking care of all life", *The Hindu: Survey of the environment, 2000*, page 69-76.

however, clear guidelines have not been laid as to the process, legal status and utilization of such documents.

Besides, some omissions from the policy document are glaring, as a case in point, policy makers overlooked the fact that the exclusion of traditional dry-land crops from the Public Distribution System (PDS) would lead to their decline. This also meant an increase in the number of fallow lands, since it became more expensive to grow millets rather than buy subsidized rice. Widening the narrow food security basket to include local cereals, millets, grain legumes, tuber crops and vegetables could be an effective strategy to combat hunger. The Food and Agriculture Organization (FAO), the Chennai Declaration insists, should classify millets as 'nutritious cereals' instead of 'coarse cereals' and should increase the economic stake in the conservation and cultivation of such crops.<sup>113</sup> Also, the rural processing industry development policy should study the scarcity of enterprises that support traditional crops. These will give a definite fillip to many minor types of millet, which are highly nutritious, but difficult to process, and therefore are slowly being lost from the fields.

Not only the distribution system and the rural processing industries, but even the credit system, biased towards tractors and Green Revolution inputs, is a major disincentive for biodiverse agriculture. The policy fails to reorient it towards such forms of farming, which can combine diversity and productivity and which help farmers to become as self-reliant as possible in the availability of essential inputs. The question of subsidies (e.g. on organic manure, indigenous seeds) is less clear, since over a long period, subsidies are not sustainable and do not encourage self-reliance. However, many small and marginal farmers may require some form of subsidies to help them switch over to organic farming, with the clear understanding that these are for a temporary period only.

The points raised till now concern the sustainability of biodiverse agriculture, however, the policy raises the issue of conservation of genetic resource in *ex-situ conditions*, as well. The National Bureau of Plant Genetic Resources and the Indian Council of

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<sup>113</sup> Refer to Appendix 5 for a table of all India production, yield and area under cultivation of coarse cereals.

Agricultural Research, in their network of gene banks, have several hundred thousand accessions. Such *ex-situ* collections are important, as they are able to store material which may no longer be possible to grow in the field, and as they make available the base material for genetic upgradation of agriculture. But such collections also suffer from severe limitations:

- they are very expensive;
- lack adequate space to store the complete genetic diversity found in agriculture;
- suffer loss of viability of stored germplasm;
- freeze evolution, since the environmental conditions, which crops are constantly adapting to, cannot be recreated in the icy chills of the gene bank; and
- Farmers experience considerable difficulty in accessing the genetic material, which is relatively easily accessible to formal sector breeders and corporations, who use the material for commercial benefit.

There is, thus, no alternative to the conservation and continued use of crop and livestock diversity *in-situ*, *ex-situ* conservation may only complement it.

Species do not reconstitute themselves; extinction is a one-way process. Any effective policy response to species extinction must be on, both, scientific and educational levels. At the same time, the process of diffusing the factual data and the arguments to the public needs to be more sophisticated if policy-makers are to be given the political support they ultimately need. Continued support to hard science, notably taxonomy, remains a priority, as many questions of direct relevance to policy remain unresolved. Without a more informed public, shriller voices will continue to dominate the debate, making it difficult to institutionalize effective conservation.<sup>114</sup>

While the agriculture policy was specific on agriculture, a related Act was notified in 2000, which was specific on biological diversity. This act covered biodiversity in all its dimensions, including crop-biodiversity. A brief analysis of the Act follows in the subsequent section.

### 8.2.3. Biological Diversity Act, 2000

The Biological Diversity Bill was framed with the intention of protecting India's rich biodiversity and associated knowledge against the use by foreign individuals and organizations without sharing the benefits that arise out of such use.<sup>115</sup> Government of India, in a follow-up action to the CBD, passed the Biological Diversity Act. The Act aims to conserve biodiversity, achieve sustainable use of biological resources, and ensure equitable sharing of the benefits arising from such uses. Amongst its important provisions, in regard to agro-biodiversity, are the following:

- Prohibits transfer of Indian genetic material outside the country, without specific approval of the Indian Government through a due process;
- Stipulates that anyone wanting to take a patent or other IPR over such material, or over related knowledge, will have to seek permission in advance; and also provides for the levying of appropriate fees and royalties on such transfers and IPRs;
- Regulates access to such material by Indian national also to ensure that there is control over over-exploitation (e.g. of medicinal plants) and that there is some sharing of benefits to all concerned parties;
- Provides some relaxation in the case of research;
- Provides for measures to conserve and sustainably use biological resources, including habitat and species protection, conservation in gene banks, environmental impact assessments of all projects which could harm biodiversity, and so on;
- Empowers local communities to have a say in the use of resources and knowledge within their jurisdiction, and to enter into negotiations with parties who want to use these resources and knowledge;
- Provides for the development of an appropriate legislation or administrative steps, including registration, to protect indigenous and community knowledge;

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<sup>114</sup> Blench R. (1998), "*Biodiversity conservation and its opponents*", Overseas Development Institute, London, Number 32, July.

<sup>115</sup> Rao S.R. (2002), "Indian biotechnology developments in public and private sectors- status and opportunities", *Asian Biotechnology and Development Review*, Vol.5, No. 1, November, pp1-14.

- Empowers governments to declare Biodiversity Heritage Sites, as areas for special measures for conservation and sustainable use of biological resources, as also notify threatened species to control their collection and use;
- Stipulates that risks associated with biotechnology (including the use of genetically modified organisms), will be regulated or controlled through appropriate means; provides for the designation of repositories of biological resources, at national and other levels.<sup>116</sup>

The Biological Diversity Act, thus, aims:

- to conserve and sustainably use biological diversity;
- to respect and protect knowledge of local communities related to biodiversity;
- to secure sharing of benefits with local people as conservers of biological resources and holders of knowledge and information relating to the use of biological resources;
- to conserve and develop areas important from the standpoint of biological diversity by declaring them as biological diversity heritage sites;

Although the Act aims to protect the interests of local communities, the case for the rights of conservers of agro biodiversity and holders of traditional knowledge has not been suitably highlighted. A definite procedure leading to the introduction of a fair and transparent reward and recognition system has not been identified.

In the field of agriculture, there has been an aggressive thrust towards commercialization. Cash cropping, already a threat to the small-scale biodiverse farm, has been given a major boost. New trends include floriculture, industrial aquaculture, and other forms of intensive farming which leave little scope for biologically diverse production systems. Furthermore, the provisions in the TRIPS agreement of WTO, especially those seeking to harmonize IPR regimes across the globe and to enforce patentability of life forms, could have severe implications for biodiversity and farmers' rights. IPRs are expensive, and corporations would try to push their protected seeds over as wide an area as possible to

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<sup>116</sup> Anonymous, '*The Biological Diversity Bill-2000*', Bill No. 93 of 2000, Government of India.

recover costs and make profits. Further displacement of traditional diversity and homogenization would result. Additionally, innovations by farmers, which result in expanding diversity, may be hindered if IPR regimes favor the formal sector breeder at the cost of the farmer. Besides, the Act implicitly gives acceptance to the issue of granting IPR on living organisms, which is still a hotly debated issue.

Also, as against the rice genome background, there is much noise being made about a “biotechnological revolution”. What the ‘experts’ perceive as benefits in the commercial exploitation of the traditional resources and knowledge, must encompass a wider meaning in ensuring the role of common property rights -- still important in many rural communities to fulfill basic food and health needs.<sup>117</sup> Given the strong link between biological resources control and food security, it is imperative that related laws, such as the Biological Diversity Act, take a wider view of the situation and recognize the importance of these resources for the survival of people, rather than just trade and markets.

The Plant Varieties Protection Act synthesizes the twin areas considered under the agriculture policy and the biodiversity act, viz. agriculture and biodiversity, also taking into account the issue of farmers’ rights.

#### 8.2.4. Plant Varieties Protection and Farmer’s Rights Act, 2001.

For decades, India did not allow patents on seeds of plants and had no system of protection for plant varieties. India, along with other developing countries, adhered to the policy of ‘common heritage of mankind’, i.e., the agricultural resources are to be freely used and shared by all.<sup>118</sup>

The Plant Varieties Protection and Farmer’s Rights Act, of 2001, seeks to protect currently unprotected plant varieties that are novel, distinct, uniform and stable, for a

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<sup>117</sup> Nair K. P. P. (2001), “Agriculture: Unyielding sector?”, *Business Line*, March 08.

<sup>118</sup> Ramanna A. (2001), “India’s policy on IPRs and agriculture- relevance of FAOs new international treaty”, *Economic and Political Weekly*, December 22, pp 4689-92.



period of 15 year from the date of registration. The major provisions of the Act, in brief are:

- Breeders or farmers can claim IPR for their varieties provided that it meets the criteria of novelty, distinctiveness, uniformity and stability.
- This IPR comes in the form of plant breeder's right defined as the "*exclusive right to produce, sell, market, distribute, import or export the variety*".
- Farmers' rights: a farmer can save, use, sow, resow, exchange, share or sell his farm produce, including seeds of the protected variety, in the same manner as before except 'branded seeds', i. e. seeds in a package or container and labeled as a protected variety.
- Benefit sharing: after receiving a claim and examining the case, the authority would decide the amount of compensation that a breeder must pay and this would be deposited in the National Gene Fund. Farmers who provide material that has been used in varieties that are registered would be given recognition and reward through this Fund.<sup>119</sup>
- It also emphasizes the role of tribal and rural women in conserving and improving biodiversity.
- The limitation on the rights of breeders' include:-
  - the term of IPR is limited to 18 years for trees and vines and 15 years for extant varieties and all other fields
  - allows others to use the variety for conducting research
  - does not allow protection in areas that would harm public health
  - no protection for any genera or species involving genetic use restriction technology and/or terminator technology.<sup>120</sup>

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<sup>119</sup> Anonymous (2001), "*Protection of Plant Varieties and Farmers' Rights Bill*", Lok Sabha, August 9.

<sup>120</sup> India, one of the first governments to publicly reject Terminator, explicitly prohibits Terminator gene in the Act- 'Plant Varieties Protection and Farmers rights', Section 14(2): "*..no variety shall be registered under this Act if such variety contains any gene or gene sequence involving any technology including terminator technology which is injurious to life or health of human beings, animals or plants.*"

The government argues that the Act, which promotes conservation and protects traditional knowledge through a three-level regulatory structure, provides important safeguards against misuse of India's biological resources by multinational corporations and, also, paves the way for equitable sharing of benefits from these resources by local communities. "It is a step in the right direction," Ashish Kothari, "the bill gives the framework to strictly regulate the transfer of Indian resources and knowledge and to reduce biopiracy. It's now up to the government and citizens to use it proactively." However, the critics point-out that the three-tier management structure (of the National Biodiversity Authority, headquartered at Chennai) is confusing, and will increase the amount of bureaucracy. Suman Sahai argues that the bill will create more confusion by either duplicating or contradicting existing laws such as the Forest Conservation Act and the Environment Protection Act and is also inadequate in terms of IPRs, as it does not take a clear stand on the kinds of patents that should be allowed on biological materials.

The act's major weakness concerns access to and use of indigenous resources and knowledge by foreign companies and institutes. It stipulates that the National Biodiversity Authority will deal with access by foreigners. However, a clause that 'access restrictions for foreign institutes will not apply to research collaborations approved by the federal government' may turn into a loophole. Subsidiary rules and guidelines will be required to introduce transparency, plug loopholes and ensure public involvement in the screening of biodiversity project proposals, and to ensure that the rights of indigenous communities are respected.

Besides, the legislation accords a low key acknowledgement to the role of farmers as breeders. This poses a risk that the farmers' ability to breed varieties according to their own criteria would be jeopardized. This would lead to an increased reliance on the formal breeding sector, which often does not address the seed needs of small and marginal farmers.

8.2.4.1. The Plant Varieties Act - Breeder vs. Farmer: The Plant Varieties Protection and Farmers' Rights Act purports to protect the rights of both formal sector breeders (scientists, corporations, organizations) and farmers. However, it leans heavily

towards the former. Farmers' rights are restricted to the ability to save, use, exchange, share, or sell (except sale for the purpose of reproduction under commercial marketing arrangements), varieties, which are given IPR protection. While providing breeders the possibility of receiving IPRs (and thereby exclusive marketing rights for a specified period), the Act does not provide corresponding protection to the varieties and knowledge developed by farmers over the millennia. It gives no incentives to farmers to continue innovating. The national authority, which is to be set up under the Act, does not have any provision for containing a single farmer as its member.

However, the Act does try to balance the rights of these two parties. Apart from the farmers' exemptions mentioned above, there are critical clauses which allow the government to exclude plant varieties from the purview of IPRs if necessary in public interest, or to compulsorily license protected varieties to other breeders if it is felt that the IPR holder is acting against public interest. Farmers' can appeal to the relevant authority if they feel that an IPR holder has used their variety, and receive appropriate compensation if their appeal is upheld. Still, a more explicitly farmer- and biodiversity-oriented legislation is necessary. So too are mandatory clauses to conduct environmental impact assessments to ensure that new varieties do not displace traditional biodiversity. Finally, even as India gives in to the requirements of the TRIPS Agreement that plant variety protection be introduced, the country must continue debating the ethical, political and other issues surrounding IPRs on life forms and critical knowledge sectors, and leading a struggle against such IPRs.<sup>121</sup>

### 8.3 International Regulations and India

India signed the Convention on Biological Diversity on 5th June 1992, ratified it on 18th February 1994 and brought it into force on 19th May 1994. This convention provides the framework for the sustainable management and conservation of India's natural

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<sup>121</sup> Kothari A. (1999), "*Intellectual property rights and biodiversity: are India's proposed Biodiversity Act and Plant Varieties Act compatible?*", Paper presented at Workshop on Biodiversity Conservation and Intellectual Property Rights, 29-31 January, 1999, Research and Information System, Kalpavriksh, and IUCN - The World Conservation Union, New Delhi.

resources.<sup>122</sup> Beside, India joined WTO in January 1995 and is therefore under contractual obligation to fulfill the terms set by TRIPS Agreement, as regards plant genetic resources.

Diversity and perenniality is India's culture of the seed. IPRs (which are a contractual obligation for India under TRIPS) on seeds are however making seed saving and seed exchange illegal. The attempt to prevent farmers from saving seed is not just being made through new IPR laws, it is also being made through the new genetic engineering technologies. What are weeds for Monsanto (the transnational seed company) are food, fodder and medicine for Third World women. In Indian agriculture women use 150 different species of plants for vegetables, fodder and health care.<sup>123</sup> The spread of Round-Up Ready crops would destroy this diversity and the value it provides to farmers. It would also undermine the soil conservation functions of cover crops and crop mixtures, thus leading to accelerated soil erosion. On the other hand, the agriculture based on diversity, decentralization and improving small farm productivity through ecological methods is sustainable and is based on renewal of the earth's fertility and renewal and regeneration of biodiversity and species richness on farms to provide internal inputs

However, India's food security needs and the pattern of agriculture show that use of biotechnology is almost certain in India. The benefits of biotechnology have been explicitly extolled in the National Agricultural Policy, as has been the need for biosafety. The Biosafety Protocol has given India an internationally accepted framework for biosafety. The Protocol has a number of grey areas, which may take many years to resolve, but its relevance lies in providing a framework for action, at the national level, that may be less vulnerable to challenge on free trade principles. The requirement now is to put the biosafety procedures in place rapidly, so that India can benefit from biotechnology without having to compromise on biosafety. Presently, various Non-

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<sup>122</sup> Anonymous, '*Biodiversity profile of India*', <http://www.wcmc.org.uk/>.

<sup>123</sup> Shiva V. (1998), "*Masculinisation of agriculture*", Workshop on 'Women's knowledge, biotechnology and international trade - fostering a new dialogue into the millennium', The International Conference - 'Women in Agriculture', Washington, June 28 - 2 July.

Governmental Organizations criticize the bio-safety policy of the country for ignoring specific Indian needs and environmental conditions. This they claim on the basis of the fact that the current bio-safety guidelines are copied from the United States of America's legislation and do not address the issue of cross-fertilization, nor take into account India's biological richness compared to the weak biodiversity base of the US.<sup>124</sup>

India could, also, address the issue of farmers' rights, food security, and bargain for restricted IPRs on agricultural resources through the International Seed Treaty. The bargaining powers of the country could be strengthened by its negotiating multilaterally for royalty payments and transfer of technology. In terms of domestic policy, India could redefine the principle of common heritage in the light of food security perhaps even drawing up a list of crops significant for India's food security, on which there could be some form of multilateral rather than bilateral deals, as a response to such a crop list by the Seed Treaty.

A report by the London-based Commission on Intellectual Property Rights recommends that digital libraries should form part of the minimum search documentation for prior art for national patent offices. But it also cautions that traditional knowledge holders should have the final say as to whether their knowledge should be included in databases. Regarding benefit sharing, the report states that patent applicants should disclose the geographical origin of genetic materials and associated traditional knowledge, and should provide evidence of prior informed consent for use of the material and equitable sharing of benefits. India's plans to document and protect traditional knowledge in a digital library are coming under fire from critics who warn that the initiative could inadvertently help promote bio-piracy. The critics argue that the library may be playing into the hands of foreign companies by providing easy access to India's traditional knowledge. But proponents of the library respond that it is the only way to stop foreign companies from exploiting India's traditional knowledge through the patent system.<sup>125</sup>

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<sup>124</sup> Chauhan K.P.S. and R.K.Tyagi (2000), "Implications of the protocol on biosafety – an Indian perspective", *RIS Biotechnology and Development Review*, Vol.3, No. 2, December, page10-38.

<sup>125</sup> Jayaraman K.S, "*Biopiracy fears cloud Indian database*", [www.scidev.net](http://www.scidev.net)

The position today is that on the one hand there are developed countries which have the cutting edge technology in the field of genetics but little or no germplasm. On the other hand are the developing countries, like India, which are the repositories of the genetic wealth of the world. In almost all the cases, technological strength of germplasm owning countries is weak but there are a few exceptions and India is the most outstanding. It is one of those germplasm owning countries that also has good indigenous technology stand. This is because of enormous investments made in agricultural research especially during the days of the Green Revolution created a strong scientific cadre. The combination of technology with germplasm puts India in a unique position to take advantage of the field of biotechnology and emerge as a global player in this field.<sup>126</sup>

In the final analysis, agricultural biodiversity can only be saved if the country's path of development undergoes fundamental changes. Currently, the development policies of countries like India appear to be heading further into the direction of unsustainability, fueled by its own internal contradictions and by being sucked into international homogenizing forces like WTO.

The need for coherence at national level, between relevant ministries and other sectoral bodies, is a key issue and provides an opportunity to achieve integration of agricultural biodiversity concerns in overall biodiversity, environmental and agricultural policies, strategies and action plans. Cross-sectoral coordination, joint planning initiatives and integrated approaches to the development of policy are seen as essential for progress in this area. They may include:

- national environmental action plans and conservation policies and plans;
- agricultural policies strategies and action plans including those pertaining to in situ and on-farm conservation;
- land-use policies;
- trade and marketing policies and regulations;
- wildlife and forest policies;
- plant variety protection laws;

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<sup>126</sup> Sahai S.(1996), "Genes become money-spinners", *The Hindu*, Sept 1.

- legal framework for pollution control, quarantine laws and safe minimum standards.

The biggest question obviously is: can a growing population be fed with organic, biologically diverse agriculture? Alternatively, can farmers be given livelihood security through diversity? The solution may lie in developing the right mix of strategies based on revival of diversity to increase and sustain food production, this may involve the use of traditional varieties which have shown high productivity, of new varieties which build upon these without displacing them, and, also, of agricultural systems which mix grain, fruit, nut, animal, and other sources of nutrition rather than concentrate only on grain production.

The question of providing food security through biodiverse agriculture is ultimately related to larger economic and social issues: where and what kind of incentives and support measures can be devised for such agriculture, what kind of consumer demand can be generated for wholesome organic food, what land-and-water management systems can be evolved so that fertile agricultural lands are not sacrificed for urban or industrial use, how much can the trend towards converting food cropping lands to short-term cash cropping be reversed, and how to effectively respond to the processes of globalization.

The Indian policies accept that erosion and narrowing of the base of India's plant and animal genetic resources in the last few decades has been affecting the food security of the country. To safeguard against this loss, survey and evaluation of genetic resources and safe conservation, of both indigenous and exogenous genetic variability, in crop plants and their wild relatives is forwarded as an effective strategy. It has also been accepted that concerted efforts need to be made to pool, distill and evaluate traditional practices, knowledge and wisdom and to harness them for sustainable agricultural growth.

Still, the government policies of supporting and promoting modern farming, on the cost of traditional farming practices, has proved detrimental to the cause of agro-biodiversity. There has not been much significant effort in any of the Government policies to involve

farmers in the management of genetic resource collections and conservation, which could be done by pursuing a policy of on-farm conservation.

The Biological Diversity Act aims to conserve biodiversity, achieve sustainable use of biological resources, and ensure equitable sharing of the benefits arising from such uses. It was framed with the intention of protecting India's rich bio-diversity and associated knowledge against the use by foreign individuals and organizations without sharing the benefits that arise out of such use. A definite procedure leading to the introduction of a fair and transparent reward and recognition system has yet not been identified.

The Plant Varieties Protection and Farmer's Rights Act, of 2001, seeks to protect currently unprotected plant varieties that are novel, distinct, uniform and stable. The Act's major weakness concerns access to and use of indigenous resources and knowledge by foreign companies and institutes. Besides, the legislation accords a low key acknowledgement to the role of farmers as breeders. This poses a risk that the farmers' ability to breed varieties according to their own criteria would be jeopardized. Farmers' rights are restricted to the ability to save, use, exchange, share, or sell varieties, which are given IPR protection, while providing breeders the possibility of receiving IPRs, the Act does not provide corresponding protection to the varieties and knowledge developed by farmers over the millennia.



## 9. CONCLUSIONS

The analysis done in the study brings out the following conclusions:

- ♦ Agriculture serves as an instrument of income and livelihood opportunity. Sound environmental policies need to provide the foundation of agricultural sustainability and agro-biodiversity. An evergreen revolution is required to increase output in an economically viable, socially equitable and environmentally sustainable manner. Macro-economic policies in the areas of pricing, trade and investment should be based on environmental sustainability as well as gender and social equity.
- ♦ The term 'biodiversity' encompasses within itself not just the diversity of life forms, but also cultures, livelihoods, uses and knowledge that accompanies this diversity. Planning for biodiversity should then be a critical component of India's future. Also, such planning needs to keep in mind the principles of both ecological security and the livelihood security of the people whose lives are intrinsically linked with it. There is a danger in 'Biodiversity Planning' to focus on the measures needed to 'protect' biodiversity and ensure sustainable use and benefit sharing. In work on agricultural biodiversity, it is not so much its 'protection' as it is about 'development' through diverse management practices incorporating local knowledge, which becomes key. It can be said that agricultural biodiversity is the 'product' of a healthy sustainable agro-ecological production system, as well as being its base component, and the highly dynamic system has 'people' at its centre. There is a need to emphasize the importance of agricultural biodiversity and people first and then to show how it fits into the overall picture of biodiversity planning and therefore how policy, plans and programmes can be modified to enhance agro-ecosystem functions.
- ♦ ***Property rights and benefit-sharing:*** The Indian Acts respond to international treaties ratified by India, in particular with regard to the property rights model which they endorse. They reflect the trend towards the appropriation by states and private actors of a multiplicity of property rights, the gradual dismissal of common property rights regime and the denial of the principle of free exchange of

resources and knowledge as the basic premises for managing genetic resources. These developments are clearly related to the new opportunities offered by genetic engineering and the consequent increase in economic value ascribed to biological resources.

It has been time and again agreed that states have sovereign rights over their biological resources. However, biological resources can be relatively easily taken out of any given country. Further, there have been extensive exchange of resources, the ownership of which can not be ascertained by any means. The insistence of the Biodiversity Bill on India's sovereign rights is thus surprising. This reflects that the country has not found better ways to assert control over its genetic resources. Besides, as the state's control over biological resources is relatively weak, it is likely that other property rights established under the bill, mainly IPRs, will be pre-eminent. This implies that the main beneficiaries of this regime will be the private sector, partly the local industry but also – and maybe mainly – multinational companies. However, although the introduction of IPRs has been strongly encouraged concerning the products of research based on biological resources, there has been a significant resistance in the research and business communities to giving property rights on biological resources and knowledge used as the basis for research in laboratories. The consequence is that farmers, local communities and other managers of biodiversity are not given IPRs on their knowledge. In exchange, the concept of benefit-sharing has been introduced in a bid to recognize the contribution of these actors while usually denying them property rights.

In the case of plant variety bill, benefit-sharing is only associated with monetary compensation. This type of benefit-sharing is a direct response to the imposition of monopoly rights which imply that only one actor gets all the benefit concerning a given invention. This constitutes the denial of the fact that biological resources are tended by a variety of actors. In fact, the response should be to establish a property rights system where different actors can get different property rights instead of providing monopoly rights to some and only financial compensation to others.

- ♦ ***Coordination between the bills:*** The various regulations pertaining to agro- bio diversity deal in part with the same subject matter and one could find considerable overlapping. For instance, plant varieties are only a subset of biological resources. It is therefore surprising that the biodiversity bill's definition of biological resources does not exclude plant varieties given the existence of separate plant variety legislation. Overlaps do not stop at the level of definitions, the biodiversity and plant variety bills which both deal with the fundamentally similar issues and subject matters each seek to set up their own national authority instead of providing a single common body.

Further, both biodiversity bill and plant varieties bill adopt benefit-sharing as a compensatory mechanism but they set up benefit-sharing mechanisms that are unrelated and specifically distinct. As noted, the plant variety bill talks of only financial compensation while the biodiversity bill includes a number of other possibilities, including the sharing of property rights. In practice, this may lead to considerable difficulties given the overlapping mandate of the two bills. Further, while the procedure for granting benefit-sharing is set out in some details in the more specific plant variety bill, the biodiversity bill is much less clear in this regard.

In effect, the overlap and inconsistencies between the different bills range from conceptual to technical implementation issues. The lack of coordination between the bills can be traced back to the fact that the government is seeking to implement different international treaties in each case. However, if the international law is scattered in different treaties dealing with different fields such as trade and environment, this cannot constitute an excuse for overlooking the fact that these treaties address a single ground reality, the conservation and use of agricultural biodiversity for sustainable food-security.

- ♦ ***TRIPS and Indian biodiversity laws:*** TRIPS cannot be read independently from domestic or international human rights instruments. Indeed it imposes some fundamental changes to the country's current property rights framework, it is essential to recognize that the property rights framework will also have significant social and human impacts. The biological resources are not only economic

resources but also constitute the primary food supplies of all individuals. There is, thus, a direct link with some fundamental human rights, such as the right to food and health, whose fulfillment is intrinsically related to the enacted property right framework.

The new IPR regime also contributes to genetic erosion through its requirement that new varieties should be uniform and stable, therefore discouraging the introduction of varieties that are not phenotypically uniform. This encourages the private sector to develop only uniform varieties and therefore leads to genetic erosion and loss of biodiversity.

To conclude, it can be summed up that the current set of bills reflect the difficulties that the country is having in responding to the existing contradictory international obligations. However, a large part of the regime proposed through these bills is not specifically called for by the treaties themselves. Overall, even if India must adopt to a new environment which does not favor the sharing of knowledge and resources, it is essential that the agricultural biodiversity be managed in a sustainable way for the fulfillment of basic needs of the majority of the population and it is also equally important that the basic human rights are not sidelined in the process.

#### Further areas of research

The study has tried to analyze the policies that have been enunciated on the international and national level but the implementation of these policies and the practical problems for their implementation needs to be studied.

- The response of other developing countries to the international regulations and the reasons behind their responses requires to be studied to search for options available for India.
- The nature of relationship of conservation of agricultural biodiversity with the issue of food-security needs to be studied in greater detail for testing the theory that the prime concern of the developing countries should be the issue of food-security and the conservation of biodiversity aspect should thus be left to the developed countries, for them having more resources.

- A comprehensive study requires to be done to gauge the influence and effect of these regulations, policies and programmes at a local level e.g. on the farmers who are the targeted populace.
- An empirical analysis needs to be carried out to study the effect of these policies on the conservation efforts. Comparative study of status of agro-biodiversity before and after the enunciation of these policies can help analyze the efficacy of the policies.

## BIBLIOGRAPHY:

Altieri M and L Merrick (1987), "In-situ conservation of crop genetic resources through maintenance of traditional farming systems", *Economic Botany*, Vol. 41 (1).

Altieri M.A. (1990), "Why study traditional agriculture?", C.R. Carroll, J.H. Vandermeer and P. Rosset (Eds.)(1992), '*Agro-ecology*', McGraw- Hill Publishing Company, New York.

Alvares C. (Ed.) (1996), "*The organic farming sourcebook*", The Other India Press and Third World Network, Mapusa, Goa.

Anonymous (1971), '*The Human Environment New Challenge for the United Nations*', UN Office of Public Information, New York.

Anonymous (1980), '*World Conservation Strategy, Living resources conservation for sustainable development*', International Union for Conservation of Nature and Natural Resources.

Anonymous (1983), '*Flora and vegetation of India - an outline*', Botanical Survey of India, Howrah. 24 pp.

Anonymous (1990), '*Statistical Handbook*', Government of India, New Delhi.

Anonymous (1992), '*Global biodiversity: status of the earth's living resources*', World Conservation Monitoring Centre, Chapman and Hall, London.

Anonymous (1993), '*Cultivating diversity: biodiversity conservation and the politics of the seed*', Report No. 1, Navdanya, Research Foundation for Science, Technology and Natural Resources Policy, Dehra Dun.

Anonymous (1994), '*Conservation of biological diversity in India: an approach*', Ministry of Environment and Forests, Government of India, New Delhi.

Anonymous (1996), '*Farmers safeguarding agricultural diversity through their crop husbandry*', Booklet in Dynamic Diversity series, Intermediate Technology Development Group (ITDG), Rugby.

Anonymous (1996), '*Biological Diversity of Gujarat: Current Knowledge*', Gujarat Ecology Commission, Vadodara.

Anonymous (1996), '*Report of the International Technical Conference on Plant Genetic Resources*', Leipzig, Germany, 17-23 June, Food and Agricultural Organization of the United Nations, Rome.

Anonymous (1997), '*Farming Systems Approaches for the Sustainable Use and Conservation of Agricultural Biodiversity and Agro-Ecosystems*', FAO/CBD Workshop report.

Anonymous (1997), '*National Action Plan for Biodiversity*', Ministry of Environment and Forests, Government of India, New Delhi.

Anonymous (1998), '*Convention of farmers and breeders: a forum for implementing farmers and breeders rights in developing countries*', A Draft Treaty Presented as an Alternative to UPOV, Gene Campaign, New Delhi.

Anonymous (1998), '*Plant Varieties and Farmers Rights Protection Bill, 1998*', Ministry of Agriculture, Government of India, No. 18-136/97/SD-IV.

Anonymous (1998), '*Note on Agricultural Biodiversity*', including extract from the Thammasat Action Plan (December 1997), published by UNED-UK, March.

Anonymous (1999), '*Agricultural Biodiversity*', FAO Multifunctional Character of Agriculture and Land: Conference Background Paper No. 1, Maastricht, Sept.

Anonymous (2000), '*Annual Report 2000-2001*', Ministry of Environment and Forests, Government of India, New Delhi.

Anonymous (2001), '*Agriculture biotechnology, poverty reduction and food security*', Staff working paper, ADB, Manila.

Anonymous (2001), '*FAO Committee on Food security*', Rome, March.

Anonymous (1980), '*Model law on plant variety protection*', UPOV, Geneva (UPOV/INF/6)

Anonymous (1992), '*Records of the diplomatic conference for the revision of the international convention for the protection of new varieties of plants*', UPOV, Geneva.

Anonymous (1992), '*International convention for the protection of new varieties of plants*', UPOV, Geneva.

Anonymous (2000), '*National Agriculture Policy*', Department of Agriculture & Cooperation, Ministry of Agriculture, Government of India, July.

Arora R.S. (1995), '*Consideration leading towards formulation and introduction of Plant Variety Protection in India*', Paper presented at 'Asian seed, 1995', New Delhi, Sept 27-29, Seed Association of India.

Bellon M. (1996), "The dynamics of crop intraspecific diversity: a conceptual framework at the farmer level", *Economic Botany*, Vol.50.

Bhattacharjee A. (1988), "New seed policy: whose interest will it serve", *Economic and Political Weekly*, October 8.

Blochlinger K. (2000), "A variety of interpretations of plant variety", *CASRI Newsletter*, Vol. 7, Issue 1.

Bisby F.A. and J.Coddington (1995), "*Biodiversity from a taxonomic and evolutionary perspective*", V.H.Heywood (Ed), Cambridge University Press, Cambridge.

Brenner C. (1998), "*Intellectual Property Rights and technology transfer in developing country agriculture: rhetoric and reality*", OECD Technical Paper, No. 133.

Byerlee D. (1996), "Modern varieties, productivity and sustainability", *World Development*, 24(4).

Cohen J.I., (1999) (Ed), "*Managing agricultural biotechnology- addressing research program needs and policy implications*", CAB International, Oxon, UK.

Conway G. (1997), "*The doubly Green Revolution: food for all in the twenty-first century*", Penguin Books, London.

Dahlberg K. (1979), "*Beyond the Green Revolution: the ecology and politics of global agriculture*", Plenum Press, New York.

De Janvry A, G.Graff, E.Sadoulet, D.Zilberman (1999), "*Agricultural biotechnology and poverty: can the potential be made a reality?*", University of California, Berkeley.

---- (2000), "*Technological change in agriculture and poverty reduction*", concept paper for World Development Report on poverty and development, 2000/01, World Bank, Washington D.C.

Dhar B and C.Niranjan Rao (1992), "Dunkel draft on TRIPs: complete denial of developing countries interests", *Economic and Political Weekly*, Vol.27, No.6, February 8.

---- (1996) "Trade relatedness of intellectual property rights: finding the real connections", *Science Communication*, Vol.17, No.3, March



Doyle J. and G. Persley (1996), “*Enabling the safe use of biotechnology: principles and practice*”, World Bank, Washington, D.C.

Ehrenfeld D. (1988), “Why put value on diversity?”, E.O. Wilson and F.M. Peter (Ed.) ‘*Biodiversity*’, National Academy Press, Washington, DC, pp 212-16.

Ehrlich P.R. and A.H. Ehrlich (1992), “The value of diversity”, *Ambio*, No.21, pp219-226.

Evenson R, P.E.Waggoner, V.Ruttan (1979), “Economic benefits from research: the case of agriculture”, *Science*, 205.

Gadgil M. (1994), “Biodiversity: reckoning with life”, The Hindu- *Survey of the environment*, N.Ravi (Ed.), National press, Madras.

---- (1996), “People's biodiversity register: a record of India's wealth”, *Amruth*, Vol. 1 No. 5, October.

Goeschl T and T.Swanson (2000), “Genetic use restriction technologies and the diffusion of yield gains to developing countries”, *Journal of International Development*, 12.

Groombridge B. (Ed.) (1992), “*Global diversity: status of the Earth's living resources*”, Chapman and Hall, London.

---- M.D.Jenkins (2000), “*Global Biodiversity: Earth's living resources in the 21<sup>st</sup> century*”, World Conservation Monitoring Centre, UK.

Guleria A. (Ed) (1990), “*Plant variety protection: pros and cons*”, Seed Association of India.

Heywood V.H. (1995) (Ed.), “*Global Biodiversity Assessment*”, Cambridge University Press, UK.

Hileman B. (1995), “Views differ sharply over benefits, risks of agricultural biotechnology”, *Chemical and Engineering News*, August 21.

Jarvis D. and T. Hodgkin (1996), “*Wild relatives and crop cultivars*”, Paper presented at the International symposium on in-situ conservation of plant genetic diversity, Antalya, Turkey, November.

Joshi A.P. (1995), “Developing peoples' participation in community forestry and landslide control: the experience of HESCO”, V.K.Damodaran (Ed.), ‘*Science, Technology and Development: People's participation*’, STEC Publication, Kerala,

- Khoshoo T.N. (1986), "*Environmental priorities in India and sustainable development*", Presidential Address, Indian Science Congress Association, New Delhi.
- Kling J. (1996), "Could transgenic supercrops one day breed superweeds?", *Science*, 274.
- Kothari A. and M. Kothari (1995), "*Sacrificing our future: the new economic policy and the environment*", Consumer Unity and Trust Society, Calcutta.
- N.Pathak, M.Rangarajan (1996), "Changing India's conservation laws", *Lokayan Bulletin*, Vol.12, No.6.
- N.Singh, S.Suri (1996), "*People and protected areas: towards participatory conservation in India*", Sage publication, New Delhi.
- (1997), "*Understanding biodiversity, life, sustainability and equity*", Orient Longman, Hyderabad.
- N.Pathak, R.V.Anuradha and B.Taneja (Ed.) (1998), "*Communities and conservation: natural resource management in south and central Asia*", Sage Publication, New Delhi.
- Kumar N. (1992), "Biological pest control becomes established technique in Asia", *Biotech and Development Monitor*, No.13.
- Lal J.B. (1989), "*India's forests: myth and reality*", Natraj Publishers, New Delhi.
- Lawton J. and R. May (Ed.) (1995), "*Extinction rates*", Oxford University Press, Oxford.
- Lenné J. (1999), "*Conservation of agro-biodiversity and global food security*", University of Greenwich, London.
- Leskien D. and M. Flitner (1997), "*Intellectual property rights and plant genetic resources: options for a sui generis system*", Issues in Genetic Resources, International Plant Genetic Resources Institute, Rome, No. 6.
- Lesser W.H. and R.T.Masson (1993), "*An economic analysis of the plant variety protection act*", American Seed Trade Association, Washington D.C.
- Longley C and P Richards (1998), "*Farmer Seed Systems and Disaster*", Paper presented at an international workshop on The Development of Institutional Agreements and Capacity To Assist Farmers In Disaster Situations To Restore Agricultural Systems, 3-5 October 1998, FAO, Rome.

Maikhuri R.K., R.L. Semwal, K.S. Rao, S. Nautiyal and K.G. Saxena (1997), "Eroding traditional crop diversity imperils the sustainability of agricultural systems in Central Himalaya", *Current Science*, Vol. 73, No. 9, November 10.

Maredia M.K. (1998), "The economics of biosafety: implications for biotechnology in developing countries", *Biosafety*, Vol. 4, Paper 1.

McKibben B. (1989), "*The end of nature*", Random House, New York.

Mehra K.L and R.K. Arora (1982), "Plant genetic resources of India: their diversity and conservation". *NBPGR Science Monograph*, No. 4, ICAR, New Delhi.

Mikkelsen T.R., B. Andersen and R.B. Jorgensen. (1996), "The risk of crop transgene spread", *Nature*, 380, page 31.

Mooney P.R. (1996), "The parts of life: agricultural biodiversity, indigenous knowledge and the role of the third system", Special issue of *Development Dialogue*, Dag Hammarskjöld Foundation, Uppsala.

Mulvany P. (1998), "*Developing diversity: European NGOs' PGRFA activities*", paper presented to the 1998 European PGRFA Symposium, Braunschweig, 30th June.

---- (1998), "*TRIPs, biodiversity and commonwealth countries: capacity building priorities for the 1999 review of TRIPs Article 27.3(b)*", Paper prepared for the Commonwealth Secretariat and Quaker Peace & Service by Intermediate Technology Development Group

Myers N. (1988), 'Threatened biotas: 'hotspots' in tropical forests', *Environmentalist*, 8.

---- R A Mittermeier, C. G. Mittermeier, G A B da Fonseca, J. Kents(2000), 'Biodiversity hotspots for conservation priorities', *Nature* 403, pp 853-858.

Nand N. (1994), "Patentable subject matter in biotech in India", *Intellectual Property in Asia and Pacific*, No.47, December.

Nayar M.P. and K.R.Vinod (1987-88), '*Red Data Book of Indian Plants*', Botanical Survey of India, Calcutta.

---- A.R.K.Sastry (1987) (Ed), "*Red data book of Indian plants, Vol. I*", Botanical Survey of India, Calcutta.

Nijar G.S. (1996), "*In defence of biodiversity and indigenous knowledge: a conceptual framework and the essential elements of a rights regime?*", Third World Network, Penang.

Pinstrup-Anderson P (2000), "Food policy research for developing countries: emerging issues and unfinished business", *Food Policy*, Vol.25, No.2, April.

Posey D. A. (1995), "*Indigenous peoples and traditional resource rights: a basis for equitable relationship?*", Green College, Oxford University.

---- (1996), "*Traditional resource rights: international instruments for the protection and compensation for indigenous people and local communities*", IUCN - The World Conservation Union, Gland, Switzerland.

Prakash C. S. (2000), "Monocultures, monopolies, myths and the gene revolution-II; Potential Benefits, Hypothetical Risks", *Observer of Business and Politics*, March 3.

Prasun K. (Ed.) (1996), "*Beejon ki Virasat*", (In Hindi), Chipko Prakashan, Tehri Garhwal, U.P.

Prescott-Allen R. and C. Prescott-Allen (1983), "*Genes from the wild*", Earthscan, London.

Putterman D.M (1994), "Trade and biodiversity convention", *Nature*, 371.

Qaim M., A.Krattiger, J.Von Braun (Ed), '*Agricultural biotechnology in developing countries: towards optimizing the benefits for the poor*', Kluwer academic publishers, Dordrecht.

Ramakrishnan P.S. (1992), "Shifting agriculture and sustainable development: an interdisciplinary study from North-east India", *Man and Biosphere Series*, Vol. 10, UNESCO and Parthenon Publishing Group.

Ramprasad V. (1994), "Conserving Biodiversity", *Economic and Political Weekly*, October 22.

Richharia R.H. and S. Govindaswamy (1990), "*Rices of India*", Academy of Development Sciences, Karjat, Maharashtra.

Rao C. Niranjan (1997), "*Plant variety protection and plant biotechnology patents: options for India*", Allied Publishers Ltd.

Rao S.R. (2002), "Indian biotechnology developments in public and private sectors-status and opportunities", *Asian Biotechnology and Development Review*, Vol.5, No. 1, November.

Sahai S. (1993), "Dunkel draft is bad for agriculture", *Economic and Political Weekly*, June 19.

---- (1996), "Protecting plant varieties: UPOV should not be our model", *Economic and Political Weekly*, Oct. 12-19.

Sahgal J.L., D.K. Mandal, C. Mandal and S. Vedivelu (1992), "Agro-ecological regions of India", *Technical Bulletin, National Bureau of Soil Survey and Land Use Planning*, Indian Council of Agricultural Research, New Delhi, and Oxford and IBH Pub. Co.

Severino R. (1968), "Technology and the underdeveloped world", William R.Gwald and Jr. Bloongton (ed.), '*Environment and Change: The next fifty years*', Indiana University Press.

Shantharam S. and J.F.Montgomery (1999) (Ed.), "*Biotechnology, Biosafety and Biodiversity*", Oxford and IBH Publishing Co., New Delhi and Calcutta.

Shiva V. (1991), "*The violence of green revolution*", Third World Agriculture Ecology and Politics, Third World Network, Malaysia.

---- V. Ramprasad and R. Holla-Bhar (1994), "*Sustaining diversity: renewing diversity and balance through conservation*", Navdanya, New Delhi

---- V. Ramprasad, P. Hegde, O. Krishnan and R. Holla-Bhar (1995), "*The seed keepers*", Navdanya, New Delhi.

---- A.H. Jafri, G. Bedi and R. Holla-Bhar (1997), "*The enclosure and recovery of the commons*", Research Foundation for Science, Technology and Ecology, New Delhi.

Simmonds N. (1962), "Variability in crop plants, its use and conservation", *Biological Review*, Vol. 37.

---- (1993), "Introgression and incorporation: strategies for the use of crop genetic resource", *Biological Review*, Vol. 68.

Singh T. and P.Bhattacharya (1994), "Biodiversity and agriculture- threat and conservation", *Kissan World*, Vol.21, No.10.

Singh S. (2002), "Balancing the approaches of environmental conservation by considering ecosystem services, as well as biodiversity", *Current Science*, Vol.82, June 10.

Srinivas K.R. (1994), "Power without accountability: draft on Plant Breeders' Rights", *Economic and Political Weekly*, Vol.29, No.23, March 26.

Srivastava J., N. Smith and D. Forno (1996), "*Biodiversity and agriculture: implications for conservation and development*", World Bank Technical Paper No. 321, World Bank.

Swaminathan M.S. (1994), "The extract of Indian Science Congress held at Varanasi in January 1968", *The Hindu, Survey of Indian Agriculture*.

---- (Ed.) (1995), "*Farmers' Rights and Plant Genetic Resources, Recognition and Reward: A Dialogue*", Macmillan India, Madras.

---- (Ed.) (1996), "*Agrobiodiversity and Farmers' Rights: Proceedings of a technical consultation on an implementation framework for Farmers' Rights*", Konark Publisher, New Delhi, India.

---- (1996), "Compensating farmers and communities through a global fund for biodiversity conservation for sustainable food security", *Diversity*, Vol. 12, No.3.

---- (1998), "Farmers' Rights and Plant Genetic Resources". *Biotechnology and Development Monitor*, No. 36, pp. 6-9.

Tilman D. and J.A. Downing (1994), "Biodiversity and stability in grasslands", *Nature*, No.367.

Tripp R (1996), "Biodiversity and modern crop varieties: sharpening the debate", *Agriculture and Human Values*, Vol. 13, No. 4.

---- W. van der Heide (1996), "The erosion of crop genetic diversity: challenges, strategies and uncertainties", *ODI Natural Resources Perspectives (7)*, London.

Watal J. (2000), "*Intellectual property rights: in the WTO and developing countries*", Oxford University Press, New Delhi.

Wood A., P.Stedman-Edwards and J.Mang (2000) (Ed.), "*The root causes of biodiversity loss*", World Wide Fund for Nature, Earthscan Publications, UK, 399 pp.

Zamora C. and S. M. Thomas (1997), "Ownership of plant genetic resources: screening and industrial utilization", *Science and Public Policy*, No.24.

## APPENDIX 1

Undernourished people (as % of total population): People whose food intake is chronically insufficient to meet their minimum energy requirements.

Country

Undernourished people (as % of total population)

1990-92

1998-2000

India

25

24

Developing countries

21

18

Least developed countries

37

38

South Asia

25

24

Sub-Saharan Africa

35

33

Central & Eastern Europe & CIS

9

High human development

..

..

Medium human development

19

15

Low human development

33

31

High income

..

..

Middle income

..

10

Low income

27

25

Source: Human Development Report, 2003.



## APPENDIX 2

### Convention on Biological Diversity: Text

Article 1. Objectives: The objectives of this Convention, to be pursued in accordance with its relevant provisions, are the conservation of biological diversity, the sustainable use of its components and the fair and equitable sharing of the benefits arising out of the utilization of genetic resources, including by appropriate access to genetic resources and by appropriate transfer of relevant technologies, taking into account all rights over those resources and to technologies, and by appropriate funding.

Article 2. Use of Terms: For the purposes of this Convention:

- "Biological diversity" means the variability among living organisms from all sources including, inter alia, terrestrial, marine and other aquatic ecosystems and the ecological complexes of which they are part; this includes diversity within species, between species and of ecosystems.
- "Biological resources" includes genetic resources, organisms or parts thereof, populations, or any other biotic component of ecosystems with actual or potential use or value for humanity.
- "Biotechnology" means any technological application that uses biological systems, living organisms, or derivatives thereof, to make or modify products or processes for specific use.
- "Country of origin of genetic resources" means the country which possesses those genetic resources in in-situ conditions.
- "Country providing genetic resources" means the country supplying genetic resources collected from in-situ sources, including populations of both wild and domesticated species, or taken from ex-situ sources, which may or may not have originated in that country.

- "Domesticated or cultivated species" means species in which the evolutionary process has been influenced by humans to meet their needs.
- "Ecosystem" means a dynamic complex of plant, animal and micro-organism communities and their non-living environment interacting as a functional unit.
- "Ex-situ conservation" means the conservation of components of biological diversity outside their natural habitats.
- "Genetic material" means any material of plant, animal, microbial or other origin containing functional units of heredity.
- "Genetic resources" means genetic material of actual or potential value.
- "Habitat" means the place or type of site where an organism or population naturally occurs.
- "In-situ conditions" means conditions where genetic resources exist within ecosystems and natural habitats, and, in the case of domesticated or cultivated species, in the surroundings where they have developed their distinctive properties.
- "In-situ conservation" means the conservation of ecosystems and natural habitats and the maintenance and recovery of viable populations of species in their natural surroundings and, in the case of domesticated or cultivated species, in the surroundings where they have developed their distinctive properties.
- "Protected area" means a geographically defined area which is designated or regulated and managed to achieve specific conservation objectives.
- "Regional economic integration organization" means an organization constituted by sovereign States of a given region, to which its member States have transferred competence in respect of matters governed by this Convention and which has been duly authorized, in accordance with its internal procedures, to sign, ratify, accept, approve or accede to it.
- "Sustainable use" means the use of components of biological diversity in a way and at a rate that does not lead to the long-term decline of biological diversity, thereby maintaining its potential to meet the needs and aspirations of present and future generations.
- "Technology" includes biotechnology.

Article 3. Principle: States have, in accordance with the Charter of the UN and the principles of international law, the sovereign right to exploit their own resources pursuant to their own environmental policies, and the responsibility to ensure that activities within their jurisdiction or control do not cause damage to the environment of other States or of areas beyond the limits of national jurisdiction.

Article 4. Jurisdictional Scope: Subject to the rights of other States, and except as otherwise expressly provided in this Convention, the provisions of this Convention apply, in relation to each Contracting Party:

- (a) In the case of components of biological diversity, in areas within the limits of its national jurisdiction; and
- (b) In the case of processes and activities, regardless of where their effects occur, carried out under its jurisdiction or control, within the area of its national jurisdiction or beyond the limits of national jurisdiction.

Article 5. Cooperation: Each Contracting Party shall, as far as possible and as appropriate, cooperate with other Contracting Parties, directly or, where appropriate, through competent international organizations, in respect of areas beyond national jurisdiction and on other matters of mutual interest, for the conservation and sustainable use of biological diversity.

Article 6. General Measures for Conservation and Sustainable Use: Each Contracting Party shall, in accordance with its particular conditions and capabilities:

- (a) Develop national strategies, plans or programmes for the conservation and sustainable use of biological diversity or adapt for this purpose existing strategies, plans or programmes which shall reflect, inter alia, the measures set out in this Convention relevant to the Contracting Party concerned; and
- (b) Integrate, as far as possible and as appropriate, the conservation and sustainable use of biological diversity into relevant sectoral or cross-sectoral plans, programmes and policies.

Article 7. Identification and Monitoring: Each Contracting Party shall, as far as possible and as appropriate, in particular for the purposes of Articles 8 to 10:

- (a) Identify components of biological diversity important for its conservation and sustainable use having regard to the indicative list of categories set down in Annex I;
- (b) Monitor, through sampling and other techniques, the components of biological diversity identified pursuant to subparagraph (a) above, paying particular attention to those requiring urgent conservation measures and those which offer the greatest potential for sustainable use;
- (c) Identify processes and categories of activities which have or are likely to have significant adverse impacts on the conservation and sustainable use of biological diversity, and monitor their effects through sampling and other techniques; and
- (d) Maintain and organize, by any mechanism data, derived from identification and monitoring activities pursuant to subparagraphs (a), (b) and (c) above.

Article 8. In-situ Conservation: Each Contracting Party shall, as far as possible and as appropriate:

- (a) Establish a system of protected areas or areas where special measures need to be taken to conserve biological diversity;
- (b) Develop, where necessary, guidelines for the selection, establishment and management of protected areas or areas where special measures need to be taken to conserve biological diversity;
- (c) Regulate or manage biological resources important for the conservation of biological diversity whether within or outside protected areas, with a view to ensuring their conservation and sustainable use;
- (d) Promote the protection of ecosystems, natural habitats and the maintenance of viable populations of species in natural surroundings;
- (e) Promote environmentally sound and sustainable development in areas adjacent to protected areas with a view to furthering protection of these areas;
- (f) Rehabilitate and restore degraded ecosystems and promote the recovery of threatened species, inter alia, through the development and implementation of plans or other management strategies;

- (g) Establish or maintain means to regulate, manage or control the risks associated with the use and release of living modified organisms resulting from biotechnology which are likely to have adverse environmental impacts that could affect the conservation and sustainable use of biological diversity, taking also into account the risks to human health;
- (h) Prevent the introduction of, control or eradicate those alien species which threaten ecosystems, habitats or species;
- (i) Endeavour to provide the conditions needed for compatibility between present uses and the conservation of biological diversity and the sustainable use of its components;
- (j) Subject to its 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 biological diversity and promote their wider application with the approval and involvement of the holders of such knowledge, innovations and practices and encourage the equitable sharing of the benefits arising from the utilization of such knowledge, innovations and practices;
- (k) Develop or maintain necessary legislation and/or other regulatory provisions for the protection of threatened species and populations;
- (l) Where a significant adverse effect on biological diversity has been determined pursuant to Article 7, regulate or manage the relevant processes and categories of activities; and
- (m) Cooperate in providing financial and other support for in-situ conservation outlined in subparagraphs (a) to (l) above, particularly to developing countries.

Article 9. Ex-situ Conservation: Each Contracting Party shall, as far as possible and as appropriate, and predominantly for the purpose of complementing in-situ measures:

- (a) Adopt measures for the ex-situ conservation of components of biological diversity, preferably in the country of origin of such components;
- (b) Establish and maintain facilities for ex-situ conservation of and research on plants, animals and micro-organisms, preferably in the country of origin of genetic resources;
- (c) Adopt measures for the recovery and rehabilitation of threatened species and for their reintroduction into their natural habitats under appropriate conditions;

- (d) Regulate and manage collection of biological resources from natural habitats for ex-situ conservation purposes so as not to threaten ecosystems and in-situ populations of species, except where special temporary ex-situ measures are required under subparagraph (c) above; and
- (e) Cooperate in providing financial and other support for ex-situ conservation outlined in subparagraphs (a) to (d) above and in the establishment and maintenance of ex-situ conservation facilities in developing countries.

Article 10. Sustainable Use of Components of Biological Diversity: Each Contracting Party shall, as far as possible and as appropriate:

- (a) Integrate consideration of the conservation and sustainable use of biological resources into national decision-making;
- (b) Adopt measures relating to the use of biological resources to avoid or minimize adverse impacts on biological diversity;
- (c) Protect and encourage customary use of biological resources in accordance with traditional cultural practices that are compatible with conservation or sustainable use requirements;
- (d) Support local populations to develop and implement remedial action in degraded areas where biological diversity has been reduced; and
- (e) Encourage cooperation between its governmental authorities and its private sector in developing methods for sustainable use of biological resources.

Article 11. Incentive Measures: Each Contracting Party shall, as far as possible and as appropriate, adopt economically and socially sound measures that act as incentives for the conservation and sustainable use of components of biological diversity.

Article 12. Research and Training: The Contracting Parties, taking into account the special needs of developing countries, shall:

- (a) Establish and maintain programmes for scientific and technical education and training in measures for the identification, conservation and sustainable use of biological diversity and its components and provide support for such education and training for the specific needs of developing countries;

- (b) Promote and encourage research which contributes to the conservation and sustainable use of biological diversity, particularly in developing countries, inter alia, in accordance with decisions of the COP taken in consequence of recommendations of the Subsidiary Body on Scientific, Technical and Technological Advice; and
- c) In keeping with the provisions of Articles 16, 18 and 20, promote and cooperate in the use of scientific advances in biological diversity research in developing methods for conservation and sustainable use of biological resources.

Article 13. Public Education and Awareness: The Contracting Parties shall:

- (a) Promote and encourage understanding of the importance of, and the measures required for, the conservation of biological diversity, as well as its propagation through media, and the inclusion of these topics in educational programmes; and
- (b) Cooperate, as appropriate, with other States and international organizations in developing educational and public awareness programmes, with respect to conservation and sustainable use of biological diversity.

Article 14. Impact Assessment and Minimizing Adverse Impacts:

1. Each Contracting Party, as far as possible and as appropriate, shall:

- (a) Introduce appropriate procedures requiring environmental impact assessment of its proposed projects that are likely to have significant adverse effects on biological diversity with a view to avoiding or minimizing such effects and, where appropriate, allow for public participation in such procedures;
- (b) Introduce appropriate arrangements to ensure that the environmental consequences of its programmes and policies that are likely to have significant adverse impacts on biological diversity are duly taken into account;
- (c) Promote, on the basis of reciprocity, notification, exchange of information and consultation on activities under their jurisdiction or control which are likely to significantly affect adversely the biological diversity of other States or areas beyond the limits of national jurisdiction, by encouraging the conclusion of bilateral, regional or multilateral arrangements, as appropriate;
- (d) In the case of imminent or grave danger or damage, originating under its jurisdiction or control, to biological diversity within the area under jurisdiction of other States or in

areas beyond the limits of national jurisdiction, notify immediately the potentially affected States of such danger or damage, as well as initiate action to prevent or minimize such danger or damage; and

(e) Promote national arrangements for emergency responses to activities or events, whether caused naturally or otherwise, which present a grave and imminent danger to biological diversity and encourage international cooperation to supplement such national efforts and, where appropriate and agreed by the States or regional economic integration organizations concerned, to establish joint contingency plans.

2. The COP shall examine, on the basis of studies to be carried out, the issue of liability and redress, including restoration and compensation, for damage to biological diversity, except where such liability is a purely internal matter.

Article 15. Access to Genetic Resources:

1. Recognizing the sovereign rights of States over their natural resources, the authority to determine access to genetic resources rests with the national governments and is subject to national legislation.

2. Each Contracting Party shall endeavor to create conditions to facilitate access to genetic resources for environmentally sound uses by other Contracting Parties and not to impose restrictions that run counter to the objectives of this Convention.

3. For the purpose of this Convention, the genetic resources being provided by a Contracting Party, as referred to in this Article and Articles 16 and 19, are only those that are provided by Contracting Parties that are countries of origin of such resources or by the Parties that have acquired the genetic resources in accordance with this Convention.

4. Access, where granted, shall be on mutually agreed terms and subject to the provisions of this Article.

5. Access to genetic resources shall be subject to prior informed consent of the Contracting Party providing such resources, unless otherwise determined by that Party.

6. Each Contracting Party shall endeavor to develop and carry out scientific research based on genetic resources provided by other Contracting Parties with the full participation of, and where possible in, such Contracting Parties.



7. Each Contracting Party shall take legislative, administrative or policy measures, as appropriate, and in accordance with Articles 16 and 19 and, where necessary, through the financial mechanism established by Articles 20 and 21 with the aim of sharing in a fair and equitable way the results of research and development and the benefits arising from the commercial and other utilization of genetic resources with the Contracting Party providing such resources. Such sharing shall be upon mutually agreed terms.

Article 16. Access to and Transfer of technology

1. Each Contracting Party, recognizing that technology includes biotechnology, and that both access to and transfer of technology among Contracting Parties are essential elements for the attainment of the objectives of this Convention, undertakes subject to the provisions of this Article to provide and/or facilitate access for and transfer to other Contracting Parties of technologies that are relevant to the conservation and sustainable use of biological diversity or make use of genetic resources and do not cause significant damage to the environment.

2. Access to and transfer of technology referred to in paragraph 1 above to developing countries shall be provided and/or facilitated under fair and most favorable terms, including on concessional and preferential terms where mutually agreed, and, where necessary, in accordance with the financial mechanism established by Articles 20 and 21. In the case of technology subject to patents and other intellectual property rights, such access and transfer shall be provided on terms which recognize and are consistent with the adequate and effective protection of intellectual property rights. The application of this paragraph shall be consistent with paragraphs 3, 4 and 5 below.

3. Each Contracting Party shall take legislative, administrative or policy measures, as appropriate, with the aim that Contracting Parties, in particular those that are developing countries, which provide genetic resources are provided access to and transfer of technology which makes use of those resources, on mutually agreed terms, including technology protected by patents and other intellectual property rights, where necessary, through the provisions of Articles 20 and 21 and in accordance with international law and consistent with paragraphs 4 and 5 below.

4. Each Contracting Party shall take legislative, administrative or policy measures, as appropriate, with the aim that the private sector facilitates access to, joint development and transfer of technology referred to in paragraph 1 above for the benefit of both governmental institutions and the private sector of developing countries and in this regard shall abide by the obligations included in paragraphs 1, 2 and 3 above.

5. The Contracting Parties, recognizing that patents and other intellectual property rights may have an influence on the implementation of this Convention, shall cooperate in this regard subject to national legislation and international law in order to ensure that such rights are supportive of and do not run counter to its objectives.

#### Article 17. Exchange of Information

1. The Contracting Parties shall facilitate the exchange of information, from all publicly available sources, relevant to the conservation and sustainable use of biological diversity, taking into account the special needs of developing countries.

2. Such exchange of information shall include exchange of results of technical, scientific and socio-economic research, as well as information on training and surveying programmes, specialized knowledge, indigenous and traditional knowledge as such and in combination with the technologies referred to in Article 16, paragraph 1. It shall also, where feasible, include repatriation of information.

#### Article 18. Technical and Scientific Cooperation

1. The Contracting Parties shall promote international technical and scientific cooperation in the field of conservation and sustainable use of biological diversity, where necessary, through the appropriate international and national institutions.

2. Each Contracting Party shall promote technical and scientific cooperation with other Contracting Parties, in particular developing countries, in implementing this Convention, inter alia, through the development and implementation of national policies. In promoting such cooperation, special attention should be given to the development and strengthening of national capabilities, by means of human resources development and institution building.

3. The Conference of the Parties, at its first meeting, shall determine how to establish a clearing-house mechanism to promote and facilitate technical and scientific cooperation.

4. The Contracting Parties shall, in accordance with national legislation and policies, encourage and develop methods of cooperation for the development and use of technologies, including indigenous and traditional technologies, in pursuance of the objectives of this Convention. For this purpose, the Contracting Parties shall also promote cooperation in the training of personnel and exchange of experts.

5. The Contracting Parties shall, subject to mutual agreement, promote the establishment of joint research programmes and joint ventures for the development of technologies relevant to the objectives of this Convention.

#### Article 19. Handling of Biotechnology and Distribution of its Benefits

1. Each Contracting Party shall take legislative, administrative or policy measures, as appropriate, to provide for the effective participation in biotechnological research activities by those Contracting Parties, especially developing countries, which provide the genetic resources for such research, and where feasible in such Contracting Parties.

2. Each Contracting Party shall take all practicable measures to promote and advance priority access on a fair and equitable basis by Contracting Parties, especially developing countries, to the results and benefits arising from biotechnologies based upon genetic resources provided by those Contracting Parties. Such access shall be on mutually agreed terms.

3. The Parties shall consider the need for and modalities of a protocol setting out appropriate procedures, including, in particular, advance informed agreement, in the field of the safe transfer, handling and use of any living modified organism resulting from biotechnology that may have adverse effect on the conservation and sustainable use of biological diversity.

4. Each Contracting Party shall, directly or by requiring any natural or legal person under its jurisdiction providing the organisms referred to in paragraph 3 above, provide any available information about the use and safety regulations required by that Contracting Party in handling such organisms, as well as any available information on the potential adverse impact of the specific organisms concerned to the Contracting Party into which those organisms are to be introduced.

#### Article 20. Financial Resources

1. Each Contracting Party undertakes to provide, in accordance with its capabilities, financial support and incentives in respect of those national activities which are intended to achieve the objectives of this Convention, in accordance with its national plans, priorities and programmes.
2. The developed country Parties shall provide new and additional financial resources to enable developing country Parties to meet the agreed full incremental costs to them of implementing measures which fulfill the obligations of this Convention and to benefit from its provisions and which costs are agreed between a developing country Party and the institutional structure referred to in Article 21, in accordance with policy, strategy, programme priorities and eligibility criteria and an indicative list of incremental costs established by the Conference of the Parties. Other Parties, including countries undergoing the process of transition to a market economy, may voluntarily assume the obligations of the developed country Parties. For the purpose of this Article, the Conference of the Parties, shall at its first meeting establish a list of developed country Parties and other Parties which voluntarily assume the obligations of the developed country Parties. The Conference of the Parties shall periodically review and if necessary amend the list. Contributions from other countries and sources on a voluntary basis would also be encouraged. The implementation of these commitments shall take into account the need for adequacy, predictability and timely flow of funds and the importance of burden-sharing among the contributing Parties included in the list.
3. The developed country Parties may also provide, and developing country Parties avail themselves of, financial resources related to the implementation of this Convention through bilateral, regional and other multilateral channels.
4. The extent to which developing country Parties will effectively implement their commitments under this Convention will depend on the effective implementation by developed country Parties of their commitments under this Convention related to financial resources and transfer of technology and will take fully into account the fact that economic and social development and eradication of poverty are the first and overriding priorities of the developing country Parties.
5. The Parties shall take full account of the specific needs and special situation of least developed countries in their actions with regard to funding and transfer of technology.

6. The Contracting Parties shall also take into consideration the special conditions resulting from the dependence on, distribution and location of, biological diversity within developing country Parties, in particular small island States.

7. Consideration shall also be given to the special situation of developing countries, including those that are most environmentally vulnerable, such as those with arid and semi- arid zones, coastal and mountainous areas.

#### Article 21. Financial Mechanism

1. There shall be a mechanism for the provision of financial resources to developing country Parties for purposes of this Convention on a grant or concessional basis the essential elements of which are described in this Article. The mechanism shall function under the authority and guidance of, and be accountable to, the Conference of the Parties for purposes of this Convention. The operations of the mechanism shall be carried out by such institutional structure as may be decided upon by the Conference of the Parties at its first meeting. For purposes of this Convention, the Conference of the Parties shall determine the policy, strategy, programme priorities and eligibility criteria relating to the access to and utilization of such resources. The contributions shall be such as to take into account the need for predictability, adequacy and timely flow of funds referred to in Article 20 in accordance with the amount of resources needed to be decided periodically by the Conference of the Parties and the importance of burden-sharing among the contributing Parties included in the list referred to in Article 20, paragraph 2. Voluntary contributions may also be made by the developed country Parties and by other countries and sources. The mechanism shall operate within a democratic and transparent system of governance.

2. Pursuant to the objectives of this Convention, the Conference of the Parties shall at its first meeting determine the policy, strategy and programme priorities, as well as detailed criteria and guidelines for eligibility for access to and utilization of the financial resources including monitoring and evaluation on a regular basis of such utilization. The Conference of the Parties shall decide on the arrangements to give effect to paragraph 1 above after consultation with the institutional structure entrusted with the operation of the financial mechanism.

3. The Conference of the Parties shall review the effectiveness of the mechanism established under this Article, including the criteria and guidelines referred to in paragraph 2 above, not less than two years after the entry into force of this Convention and thereafter on a regular basis. Based on such review, it shall take appropriate action to improve the effectiveness of the mechanism if necessary.

4. The Contracting Parties shall consider strengthening existing financial institutions to provide financial resources for the conservation and sustainable use of biological diversity.

#### Article 22. Relationship with Other International Conventions

1. The provisions of this Convention shall not affect the rights and obligations of any Contracting Party deriving from any existing international agreement, except where the exercise of those rights and obligations would cause a serious damage or threat to biological diversity.

2. Contracting Parties shall implement this Convention with respect to the marine environment consistently with the rights and obligations of States under the law of the sea.

#### Article 23. Conference of the Parties

1. A Conference of the Parties is hereby established. The first meeting of the Conference of the Parties shall be convened by the Executive Director of the United Nations Environment Programme not later than one year after the entry into force of this Convention. Thereafter, ordinary meetings of the Conference of the Parties shall be held at regular intervals to be determined by the Conference at its first meeting.

2. Extraordinary meetings of the Conference of the Parties shall be held at such other times as may be deemed necessary by the Conference, or at the written request of any Party, provided that, within six months of the request being communicated to them by the Secretariat, it is supported by at least one third of the Parties.

3. The Conference of the Parties shall by consensus agree upon and adopt rules of procedure for itself and for any subsidiary body it may establish, as well as financial rules governing the funding of the Secretariat. At each ordinary meeting, it shall adopt a budget for the financial period until the next ordinary meeting.

4. The COP shall keep under review the implementation of this Convention, and, for this purpose, shall:

(a) Establish the form and the intervals for transmitting the information to be submitted in accordance with Article 26 and consider such information as well as reports submitted by any subsidiary body;

(b) Review scientific, technical and technological advice on biological diversity provided in accordance with Article 25;

(c) Consider and adopt, as required, protocols in accordance with Article 28;

(d) Consider and adopt, as required, in accordance with Articles 29 and 30, amendments to this Convention and its annexes;

(e) Consider amendments to any protocol, as well as to any annexes thereto, and, if so decided, recommend their adoption to the parties to the protocol concerned;

(f) Consider and adopt, as required, in accordance with Article 30, additional annexes to this Convention;

(g) Establish such subsidiary bodies, particularly to provide scientific and technical advice, as are deemed necessary for the implementation of this Convention;

(h) Contact, through the Secretariat, the executive bodies of conventions dealing with matters covered by this Convention with a view to establishing appropriate forms of cooperation with them; and

(i) Consider and undertake any additional action that may be required for the achievement of the purposes of this Convention in the light of experience gained in its operation.

5. The UN, its specialized agencies and the International Atomic Energy Agency, as well as any State not Party to this Convention, may be represented as observers at meetings of the COP. Any other body or agency, whether governmental or non-governmental, qualified in fields relating to conservation and sustainable use of biological diversity, which has informed the Secretariat of its wish to be represented as an observer at a meeting of the COP, may be admitted unless at least one third of the Parties present object. The admission and participation of observers shall be subject to the rules of procedure adopted by the COP.

#### Article 24. Secretariat

1. A secretariat is hereby established. Its functions shall be:

- (a) To arrange for and service meetings of the COP provided for in Article 23;
- (b) To perform the functions assigned to it by any protocol;
- (c) To prepare reports on the execution of its functions under this Convention and present them to the Conference of the Parties;
- (d) To coordinate with other relevant international bodies and, in particular to enter into such administrative and contractual arrangements as may be required for the effective discharge of its functions; and
- (e) To perform such other functions as may be determined by the COP.

2. At its first ordinary meeting, the COP shall designate the secretariat from amongst those existing competent international organizations which have signified their willingness to carry out the secretariat functions under this Convention.

#### Article 25. Subsidiary Body on Scientific, Technical and Technological Advice

1. A subsidiary body for the provision of scientific, technical and technological advice is hereby established to provide the COP and, as appropriate, its other subsidiary bodies with timely advice relating to the implementation of this Convention. This body shall be open to participation by all Parties and shall be multidisciplinary. It shall comprise government representatives competent in the relevant field of expertise. It shall report regularly to the COP on all aspects of its work.

2. Under the authority of and in accordance with guidelines laid down by the COP, and upon its request, this body shall:

- (a) Provide scientific and technical assessments of the status of biological diversity;
- (b) Prepare scientific and technical assessments of the effects of types of measures taken in accordance with the provisions of this Convention;
- (c) Identify innovative, efficient and state-of-the-art technologies and know-how relating to the conservation and sustainable use of biological diversity and advice on the ways and means of promoting development and/or transferring such technologies;
- (d) Provide advice on scientific programmes and international cooperation in research and development related to conservation and sustainable use of biological diversity; and



(e) Respond to scientific, technical, technological and methodological questions that the Conference of the Parties and its subsidiary bodies may put to the body.

3. The functions, terms of reference, organization and operation of this body may be further elaborated by the Conference of the Parties.

Article 26. Reports: Each Contracting Party shall, at intervals to be determined by the COP, present to the COP, reports on measures which it has taken for the implementation of the provisions of this Convention and their effectiveness in meeting the objectives of this Convention.

#### Article 27. Settlement of Disputes

1. In the event of a dispute between Contracting Parties concerning the interpretation or application of this Convention, the parties concerned shall seek solution by negotiation.

2. If the parties concerned cannot reach agreement by negotiation, they may jointly seek the good offices of, or request mediation by, a third party.

3. When ratifying, accepting, approving or acceding to this Convention, or at any time thereafter, a State or regional economic integration organization may declare in writing to the Depositary that for a dispute not resolved in accordance with paragraph 1 or paragraph 2 above, it accepts one or both of the following means of dispute settlement as compulsory:

(a) Arbitration in accordance with the procedure laid down in Part 1 of Annex II;

(b) Submission of the dispute to the International Court of Justice.

4. If the parties to the dispute have not, in accordance with paragraph 3 above, accepted the same or any procedure, the dispute shall be submitted to conciliation in accordance with Part 2 of Annex II unless the parties otherwise agree.

5. The provisions of this Article shall apply with respect to any protocol except as otherwise provided in the protocol concerned.

#### Article 28. Adoption of Protocols

1. The Contracting Parties shall cooperate in the formulation and adoption of protocols to this Convention.

2. Protocols shall be adopted at a meeting of the Conference of the Parties.

3. The text of any proposed protocol shall be communicated to the Contracting Parties by the Secretariat at least six months before such a meeting.

#### Article 29. Amendment of the Convention or Protocols

1. Amendments to this Convention may be proposed by any Contracting Party. Amendments to any protocol may be proposed by any Party to that protocol.

2. Amendments to this Convention shall be adopted at a meeting of the Conference of the Parties. Amendments to any protocol shall be adopted at a meeting of the Parties to the Protocol in question. The text of any proposed amendment to this Convention or to any protocol, except as may otherwise be provided in such protocol, shall be communicated to the Parties to the instrument in question by the secretariat at least six months before the meeting at which it is proposed for adoption. The secretariat shall also communicate proposed amendments to the signatories to this Convention for information.

3. The Parties shall make every effort to reach agreement on any proposed amendment to this Convention or to any protocol by consensus. If all efforts at consensus have been exhausted, and no agreement reached, the amendment shall as a last resort be adopted by a two-third majority vote of the Parties to the instrument in question present and voting at the meeting, and shall be submitted by the Depositary to all Parties for ratification, acceptance or approval.

4. Ratification, acceptance or approval of amendments shall be notified to the Depositary in writing. Amendments adopted in accordance with paragraph 3 above shall enter into force among Parties having accepted them on the ninetieth day after the deposit of instruments of ratification, acceptance or approval by at least two thirds of the Contracting Parties to this Convention or of the Parties to the protocol concerned, except as may otherwise be provided in such protocol. Thereafter the amendments shall enter into force for any other Party on the ninetieth day after that Party deposits its instrument of ratification, acceptance or approval of the amendments.

5. For the purposes of this Article, "Parties present and voting" means Parties present and casting an affirmative or negative vote.

#### Article 30. Adoption and Amendment of Annexes

1. The annexes to this Convention or to any protocol shall form an integral part of the Convention or of such protocol, as the case may be, and, unless expressly provided otherwise, a reference to this Convention or its protocols constitutes at the same time a reference to any annexes thereto. Such annexes shall be restricted to procedural, scientific, technical and administrative matters.
2. Except as may be otherwise provided in any protocol with respect to its annexes, the following procedure shall apply to the proposal, adoption and entry into force of additional annexes to this Convention or of annexes to any protocol:
  - (a) Annexes to this Convention or to any protocol shall be proposed and adopted according to the procedure laid down in Article 29;
  - (b) Any Party that is unable to approve an additional annex to this Convention or an annex to any protocol to which it is Party shall so notify the Depositary, in writing, within one year from the date of the communication of the adoption by the Depositary. The Depositary shall without delay notify all Parties of any such notification received. A Party may at any time withdraw a previous declaration of objection and the annexes shall thereupon enter into force for that Party subject to subparagraph (c) below;
  - (c) On the expiry of one year from the date of the communication of the adoption by the Depositary, the annex shall enter into force for all Parties to this Convention or to any protocol concerned which have not submitted a notification in accordance with the provisions of subparagraph (b) above.
3. The proposal, adoption and entry into force of amendments to annexes to this Convention or to any protocol shall be subject to the same procedure as for the proposal, adoption and entry into force of annexes to the Convention or annexes to any protocol.
4. If an additional annex or an amendment to an annex is related to an amendment to this Convention or to any protocol, the additional annex or amendment shall not enter into force until such time as the amendment to the Convention or to the protocol concerned enters into force.

#### Article 31. Right to Vote

1. Except as provided for in paragraph 2 below, each Contracting Party to this Convention or to any protocol shall have one vote.

2. Regional economic integration organizations, in matters within their competence, shall exercise their right to vote with a number of votes equal to the number of their member States which are Contracting Parties to this Convention or the relevant protocol. Such organizations shall not exercise their right to vote if their member States exercise theirs, and vice versa.

Article 32. Relationship between this Convention and Its Protocols

1. A State or a regional economic integration organization may not become a Party to a protocol unless it is, or becomes at the same time, a Contracting Party to this Convention.

2. Decisions under any protocol shall be taken only by the Parties to the protocol concerned. Any Contracting Party that has not ratified, accepted or approved a protocol may participate as an observer in any meeting of the parties to that protocol.

Article 33. Signature: This Convention shall be open for signature at Rio de Janeiro by all States and any regional economic integration organization from 5 June 1992 until 14 June 1992, and at the UN Headquarters in New York from 15 June 1992 to 4 June 1993.

Article 34. Ratification, Acceptance or Approval

1. This Convention and any protocol shall be subject to ratification, acceptance or approval by States and by regional economic integration organizations. Instruments of ratification, acceptance or approval shall be deposited with the Depositary.

2. Any organization referred to in paragraph 1 above which becomes a Contracting Party to this Convention or any protocol without any of its member States being a Contracting Party shall be bound by all the obligations under the Convention or the protocol, as the case may be. In the case of such organizations, one or more of whose member States is a Contracting Party to this Convention or relevant protocol, the organization and its member States shall decide on their respective responsibilities for the performance of their obligations under the Convention or protocol, as the case may be. In such cases, the organization and the member States shall not be entitled to exercise rights under the Convention or relevant protocol concurrently.

3. In their instruments of ratification, acceptance or approval, the organizations referred to in paragraph 1 above shall declare the extent of their competence with respect to the

matters governed by the Convention or the relevant protocol. These organizations shall also inform the Depositary of any relevant modification in the extent of their competence.

#### Article 35. Accession

1. This Convention and any protocol shall be open for accession by States and by regional economic integration organizations from the date on which the Convention or the protocol concerned is closed for signature. The instruments of accession shall be deposited with the Depositary.
2. In their instruments of accession, the organizations referred to in paragraph 1 above shall declare the extent of their competence with respect to the matters governed by the Convention or the relevant protocol. These organizations shall also inform the Depositary of any relevant modification in the extent of their competence.
3. The provisions of Article 34, paragraph 2, shall apply to regional economic integration organizations which accede to this Convention or any protocol.

#### Article 36. Entry Into Force

1. This Convention shall enter into force on the ninetieth day after the date of deposit of the thirtieth instrument of ratification, acceptance, approval or accession.
2. Any protocol shall enter into force on the ninetieth day after the date of deposit of the number of instruments of ratification, acceptance, approval or accession, specified in that protocol, has been deposited.
3. For each Contracting Party which ratifies, accepts or approves this Convention or accedes thereto after the deposit of the thirtieth instrument of ratification, acceptance, approval or accession, it shall enter into force on the ninetieth day after the date of deposit by such Contracting Party of its instrument of ratification, acceptance, approval or accession.
4. Any protocol, except as otherwise provided in such protocol, shall enter into force for a Contracting Party that ratifies, accepts or approves that protocol or accedes thereto after its entry into force pursuant to paragraph 2 above, on the ninetieth day after the date on which that Contracting Party deposits its instrument of ratification, acceptance, approval or accession, or on the date on which this Convention enters into force for that Contracting Party, whichever shall be the later.

5. For the purposes of paragraphs 1 and 2 above, any instrument deposited by a regional economic integration organization shall not be counted as additional to those deposited by member States of such organization.

Article 37. Reservations: No reservations may be made to this Convention.

Article 38. Withdrawals

1. At any time after two years from the date on which this Convention has entered into force for a Contracting Party, that Contracting Party may withdraw from the Convention by giving written notification to the Depositary.
2. Any such withdrawal shall take place upon expiry of one year after the date of its receipt by the Depositary, or on such later date as may be specified in the notification of the withdrawal.
3. Any Contracting Party which withdraws from this Convention shall be considered as also having withdrawn from any protocol to which it is party.

Article 39. Financial Interim Arrangements: Provided that it has been fully restructured in accordance with the requirements of Article 21, the GEF of the UNDP, the UNEP and the International Bank for Reconstruction and Development shall be the institutional structure referred to in Article 21 on an interim basis, for the period between the entry into force of this Convention and the first meeting of the COP or until the COP decides which institutional structure will be designated in accordance with Article 21.

Article 40. Secretariat Interim Arrangements: The secretariat to be provided by the Executive Director of the UNEP shall be the secretariat referred to in Article 24, paragraph 2, on an interim basis for the period between the entry into force of this Convention and the first meeting of the COP.

Article 41. Depositary: The Secretary-General of the UN shall assume the functions of Depositary of this Convention and any protocols.

## APPENDIX 3

### FAO Resolution 5/89 on Farmers' Rights (Adopted on 29 November 1989)

The Food and Agricultural Organization Conference, recognizing that:

- (a) Plant genetic resources are a common heritage of mankind to be preserved, and to be freely available for use, for the benefit of present and future generations,
- (b) full advantage can be derived from plant genetic resources through an effective programme of plant breeding, and that, while most such resources, in the form of wild plants and old landraces, are to be found in developing countries, training and facilities for plant survey and identification, and plant breeding, are insufficient, or even not available in many of those countries,
- (c) plant genetic resources are indispensable for the genetic improvement of cultivated plants, but have been insufficiently explored, and in danger of erosion and loss,

Considering that:

- (a) In the history of mankind, unnumbered generations of farmers have conserved, improved and made available plant genetic resources,
- (b) the majority of these plant genetic resources come from developing countries, the contribution of whose farmers has not been sufficiently recognized or rewarded,
- (c) the farmers, especially those in developing countries, should benefit fully from the improved and increased use of the natural resources they have preserved.
- (d) there is a need to continue the conservation (*in situ* and *ex situ*), development and use of the plant genetic resources in all countries, and to strengthen the capabilities of developing countries in these areas.

Endorses the concept of Farmers' Rights (Farmers' Rights mean rights arising from the past, present and future contributions of farmers in conserving, improving, and making available plant genetic resources, particularly those in the centers of origin/diversity. These rights are vested in the International Community, as trustee for present and future generations of farmers, for the purpose of ensuring full benefits to farmers, and supporting the continuation of their contributions, as well as the attainment of the overall purposes of the International Undertaking) in order to:

- (a) ensure that the need for conservation is globally recognized and that sufficient funds for these purposes will be available;
- (b) assist farmers and farming communities, in all regions of the world, but especially in the areas of origin/diversity of plant genetic resources, ...
- (c) allow farmers, their communities, and countries in all regions, to participate fully in the benefits derived, at present and in the future, from the improved use of plant genetic resources, through plant breeding and other scientific methods.



## APPENDIX 4

### List of crops covered under the International Seed Treaty

#### Food crops: (Crop Genus Observations)

1. Breadfruit *Artocarpus* Breadfruit only.
2. Asparagus *Asparagus*
3. Oat *Avena*
4. Beet *Beta*
5. Brassica complex *Brassica* et al. Genera included are: *Brassica*, *Armoracia*, *Barbarea*, *Camelina*, *Crambe*, *Diplotaxis*, *Eruca*, *Isatis*, *Lepidium*,
6. *Raphanobrassica*, *Raphanus*, *Rorippa*, and *Sinapis*. This comprises oilseed and vegetable crops such as cabbage, rapeseed, mustard, cress, rocket, radish, and turnip. The species *Lepidium meyenii* (maca) is excluded.
7. Pigeon Pea *Cajanus*
8. Chickpea *Cicer*
9. Citrus *Citrus*, Genera *Poncirus* and *Fortunella* are included as root stock.
10. Coconut *Cocos*
11. Major aroids *Colocasia*, *Xanthosoma*. Major aroids include taro, cocoyam, dasheen and tannia.
12. Carrot *Daucus*
13. Yams *Dioscorea*
14. Finger Millet *Eleusine*
15. Strawberry *Fragaria*
16. Sunflower *Helianthus*
17. Barley *Hordeum*
18. Sweet Potato *Ipomoea*
19. Grass pea *Lathyrus*
20. Lentil *Lens*
21. Apple *Malus*
22. Cassava *Manihot*, *Manihot esculenta* only.

23. Banana / Plantain *Musa* Except *Musa textilis*.
24. Rice *Oryza*
25. Pearl Millet *Pennisetum*
26. Beans *Phaseolus* Except *Phaseolus polyanthus*.
27. Pea *Pisum*
28. Rye *Secale*
29. Potato *Solanum* Section *tuberosa* included, except *Solanum phureja*.
30. Eggplant *Solanum* Section *melongena* included.
31. Sorghum *Sorghum*
32. Triticale *Triticosecale*
33. Wheat *Triticum* et al. Including *Agropyron*, *Elymus*, and *Secale*.
34. Faba Bean / Vetch *Vicia*
35. Cowpea et al. *Vigna*
36. Maize *Zea* Excluding *Zea perennis*, *Zea diploperennis*, and *Zea luxurians*.

#### Forages

##### LEGUME FORAGES

1. *Astragalus chinensis*, *cicer*, *arenarius*
2. *Canavalia ensiformis*
3. *Coronilla varia*
4. *Hedysarum coronarium*
5. *Lathyrus cicera*, *ciliolatus*, *hirsutus*, *ochrus*, *odoratus*, *sativus*
6. *Lespedeza cuneata*, *striata*, *stipulacea*
7. *Lotus corniculatus*, *subbiflorus*, *uliginosus*
8. *Lupinus albus*, *angustifolius*, *luteus*
9. *Medicago arborea*, *falcata*, *sativa*, *scutellata*, *rigidula*, *truncatula*
10. *Melilotus albus*, *officinalis*
11. *Onobrychis viciifolia*
12. *Ornithopus sativus*
13. *Prosopis affinis*, *alba*, *chilensis*, *nigra*, *pallida*
14. *Pueraria phaseoloides*

15. *Trifolium alexandrinum, alpestre, ambiguum, angustifolium, arvense, grocicerum, hybridum, incarnatum, pratense, repens, resupinatum, rueppellianum, semipilosum, subterraneum, vesiculosum*

#### GRASS FORAGES

1. *Andropogon gayanus*
2. *Agropyron cristatum, desertorum*
3. *Agrostis stolonifera, tenuis*
4. *Alopecurus pratensis*
5. *Arrhenatherum elatius*
6. *Dactylis glomerata*
7. *Festuca arundinacea, gigantea, heterophylla, ovina, pratensis, rubra*
8. *Lolium hybridum, multiflorum, perenne, rigidum, temulentum*
9. *Phalaris aquatica, arundinacea*
10. *Phleum pratense*
11. *Poa alpina, annua, pratensis*
12. *Tripsacum laxum*

#### OTHER FORAGES

1. *Atriplex halimus, nummularia*
2. *Salsola vermiculata*



## APPENDIX 5

Table: All-India Area, Production and Yield of Coarse Cereals from 1950-51 to 2000-01.

Year	Area(in Million Hectares)	Production(in Million Tones)	Yield(in Kg./Hectare)
1950-51	37.67	15.38	408
1955-56	43.45	19.49	449
1960-61	44.96	23.74	528
1965-66	44.34	21.42	483
1970-71	45.95	30.55	665
1975-76	43.8	30.41	694
1980-81	41.78	29.02	695
1985-86	39.47	26.2	664
1990-91	36.32	32.7	900
1995-96	30.88	29.03	940
2000-01	30.33	31.62	1042

Source: <http://agricoop.nic.in/stats.htm>