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Sustainable Food Security Through Conservation Of Biodiversity

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Abstract:

A good environmental sense has been one of the fundamental features of India's ancient philosophy. The civilisation of India has grown up in close association with the nature. There has always been a compassionate concern for every form of life in the Indian mind. This concern is projected through the doctrine of Dharma. The cosmic vision of earth is based on the concept of 'vasudev Kutumbakam'.

Biodiversity ultimately provides us with a source of food, medicines, materials and opportunities. The earth's biological resources are vital to humanity's economic and social development. As a result, there is a growing recognition that biological diversity is a global asset of tremendous value to present and future generations. At the same time, the threat to species and ecosystems has never been as great as it is today. Species extinction caused by human activities continues at an alarming rate, reduction of the earth's biodiversity as a result of human activities is a matter of great concern. Solving the problem of environmental threats and a dwindling biodiversity has been on the international agenda for some decades now. The formulation of environmental questions, however, is changing slowly

On the eco-system dimension of bio-diversity there is already a high degradation. In history there were many natural extinction of species, but the current rates of extinction are estimated to be roughly 100- times higher than typical rates in the fossil record. There are estimations that the increase will be 1000- 10,000 times higher in the future. Quantifying loss of genetic diversity is difficult, but it is clear that the extinction of species and declines of population lead to a loss of genetic diversity.

The importance of biodiversity to food security is well recognized. About three-quarters of the varietals genetic diversity of agricultural crops have been lost over the last century and that hundreds of the animal breeds are threatened by extinction. Just twelve crops and fourteen animal species now provide most of the world's food. Furthermore, as biodiversity used in food and agriculture declines, the food supply becomes more vulnerable and unsustainable. Reduction of biodiversity entails a reduction of options for ensuring more diverse nutrition, enhancing food production, raising incomes, coping with environmental constraints and managing ecosystems. Recognizing, safeguarding the potential and diversity of nature is critical for food security and sustainable agriculture.

The biodiversity is not a easy task. It requires a scientific approach to understand how different forms of agricultural biodiversity contribute to the goals of improved food and nutrition security and sustainability, and recognition that while some principles and practices will be globally applicable, others may be constrained by locality and culture. This is a critical moment in earth's history, a time when humanity must choose its future. Our planet earth is perhaps the only human habitat in the vast universe and we owe it to posterity to preserve the divine heritage of our biosphere without pollution, degradation and destruction. The long term perspective for sustainable development requires the broad-based participation of various stakeholders in policy formulation, decision-making and implementation at all levels in particular of issues of biological diversity and this must be encouraged. While progress towards sustainable development has been made through meetings, agreements and changes in environmental governance, real change has been slow.

Key words: Biological diversity, Food Security, Sustainable development and Ecosystem

1.Introduction

Conservation and sustainable use of biodiversity is fundamental to ecologically sustainable development. Biodiversity, both wild and domesticated, provide a range of livelihood support to local communities. Biodiversity is part of our daily lives and livelihood and constitutes resources upon which families, communities, nations and future generations depend. Every country has the responsibility to conserve, restore and sustainably use the biological diversity within its jurisdiction. Biological diversity is fundamental to the fulfilment of human needs. Biodiversity ultimately provides us with a source of food, medicines, materials and opportunities.

A good environmental sense has been one of the fundamental features of India's ancient philosophy. The civilisation of India has grown up in close association with the ¹nature. There has always been a compassionate concern for every form of life in the Indian mind. This concern is projected through the doctrine of Dharma. The cosmic vision of earth is based on the concept of 'vasudev Kutumbakam'. India is a mega biodiversity country, while following the path of development, has been sensitive to needs of conservation and hence is still rich in biological resources. Ethos of conservation and harmonious living with nature is very much ingrained in the lifestyles of India's people.²

2. Meaning Of Biodiversity

Biodiversity is the variety of life forms we see around us. It encompasses the whole range of mammals, birds, reptiles, amphibians, fish, insects and other invertebrates, plants, fungi and micro-organisms such as protists, bacteria and viruses. Article 2 of the Biodiversity Convention defines biological diversity to mean: 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.⁷

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3. Food Security Today And Tomorrow

Most definitions related to food security refer to the availability of food and one's access to it. For example, the World Bank defines food security as "access by all people at all times to sufficient food for an active, healthy life". The most commonly accepted and used definition for food security, agreed upon at the World Food Summit is as follows: "Food security exists when all people, at all times, have physical and economic access to sufficient, safe and nutritious food to meet their dietary needs and food preferences for a healthy and active life".

Global food security is one of the major challenges for society now and in future. Food availability of individuals is influenced by a limited supply, unequal allocation and also by an increased global demand of food. While the supply side faces negative effects of climate change on agricultural production, the demand side is strongly influenced by population growth but also by changing consumption habits especially in transition economies like China. Bad agricultural practices have negative effects on the environment, as well as on long-term agricultural productivity. In this light, the IAASTD (2008) indicated that a sustainable increase of agricultural productivity will be the main challenge for the coming decades. At the same time the conservation of biodiversity especially agricultural biodiversity, needs to be ensured, as it plays a vital role in farming. It is the origin of all species of crops and domesticated livestock and the variety within them; and is also the foundation of ecosystem services essential to sustain agriculture and human well-being.⁴

The FAO⁵ provides a useful analytical framework by distinguishing four dimensions of food security: availability, access, utilisation, and stability. Food availability refers to the availability of sufficient quantities of food of appropriate quality. Individuals need to have access to adequate resources for acquiring appropriate food for a nutritious diet. The utilisation of food needs to be ensured through adequate diet, clean water, sanitation and health care; to reach a state of nutritional well-being. Stability is crucial in order not to risk losing access to food as a result of sudden shocks or cyclical events. Thus, the concept of stability refers to both the availability and access dimension of food security.⁶

4. Factors Affecting Global Food Security

The causes for food crises are manifold and interrelated in a complex system. While natural catastrophes and political unrest have led to food insecurity in the past, the recent crises are aggravated by drastic increasing commodity and food prices. Food availability and access of individuals is influenced both by a limited and unequal supply, but also by an increased global demand of food.

On the supply side climate change is having negative effects on overall agricultural production through changes of local climatic conditions, including water availability and loss of biodiversity. Food security depends to a large extent on water availability. According to Kreul the amount of food produced globally through irrigation is growing continually and today uses about 70% of the world's fresh water supply available to mankind. Furthermore, the increasing production of crops for bio-energy generation, encouraged through the rising oil prices and policy shift, is competing with food production for agricultural land. Growing land

² Arvind Jasrotia, Environmental Protection and Sustainable Development: Exploring the Dynamics of Ethics and Law, Journal of the Indian Law Institute, Vol.49 , p.34

³ www.czp.cuni.cz/vcsewiki/index.php/Loss_of_Biodiversity_caused_and_solved_by_Globalisation%3F

⁴ Simone Schiller, Nadja Kasperczyk, Fostering Synergies between Biodiversity Conservation and Food Security, Project Report, 21. June 2010, http://www.ifls.de/uploads/media/BfN_Final_report_Food_Security_Biodiversity_Conservation_Synergies.pdf,

⁵ FAO (2008): The State of Food Insecurity in the World 2008. High food prices and food security—threats and opportunities; <http://www.fao.org/docrep/011/i0291e/i0291e00.htm>

⁶ Supra Note 3, P.7

consumption for built-up areas and degradation of agricultural land are further limiting the availability of land for food production. Some countries have started to compensate land shortage for agricultural production in their own country through purchase of land in other countries, mainly in Africa.

On the demand side, population growth is the most prominent factor leading to food shortages. However, not only the number of people to be fed but also the consumption habits are relevant. Changing consumer behaviour in transition countries like China have led to a much higher share of meat and dairy products in the diet of people, causing increased competition for agricultural land for animal production, thus reducing the overall energy efficiency of the food produced⁷.

5. Food Security And Biodiversity

Ever since human beings first began domesticating plants and animals some 12,000 years ago, agricultural biodiversity has played a pivotal role in sustaining and strengthening food, nutrition, health and livelihood security all over the world. In spite of enormous progress made in enhancing productivity through the sustainable use of genetic resources for food and agriculture, more than 800 million people remain under-nourished. Our food production and consumption need to continuously adapt to changing demands of society, and biodiversity provides the basis to confront change.

5.1. Agro biodiversity

Biodiversity is the basis of agriculture, is the origin of all species of crops and domesticated livestock and the variety within them. It is also the foundation of ecosystem services essential to sustain agriculture and human well-being. The term 'agricultural biodiversity' includes all components of biological diversity relevant to food and agriculture and constituting the so-called agro-ecosystems: the variety and variability of animals, plants and micro-organisms, at the genetic, species and ecosystem levels, which are necessary to sustain key functions of the agro-ecosystem, its structure and processes. Agricultural biodiversity is the result of the interactions among the environment, genetic re-sources and the management systems and practices used by farmers⁸.

Agricultural biodiversity performs essential ecosystem services such as nutrient cycling, rehabilitation of degraded soils, water conservation, maintenance of soil fertility and biota, pollination, and regulation of pests and diseases. In addition, genetic diversity of agricultural biodiversity provides species with the ability to adapt to, for example, high temperature, drought and water deficiency, as well as to particular diseases and pests. Diverse agro-ecosystems provide niches for wild biodiversity to coexist with crops and livestock and opportunities for people to harvest a variety of biodiversity-based products alongside.

Agriculture contributes to the conservation and sustainable use of biodiversity, and is at the same time a major driver of biodiversity loss mainly through agricultural expansion, both in area farmed and intensity of management. Agricultural biodiversity itself is under threat: the diversity of animal breeds, and plant/crop varieties are declining (genetic erosion) and the genetic vulnerability of specialised crops and livestock are increasing⁹.

According to estimations, the global population will reach 8 billion by 2025, and 9 billion in 2050. In particular, the cultivated area in developing countries will not be sufficient to nourish a growing population. FAO states that strengthening the agricultural sectors of developing countries and expanding food production in poor countries through enhanced productivity should be one important cornerstone of policies and programmes aiming at a sustainable solution for food security. A sustainable increase of agricultural productivity will be the main challenge, indicates the IAASTD (2008)¹⁰. Agricultural knowledge, science and technology are needed that maintain productivity while protecting the natural resource base and ecological provisioning of agricultural systems.

5.2. Marine Biodiversity

A growing body of research reveals that changing biodiversity can influence several properties of marine food webs and ecosystems, including nutrient use and cycling, productivity, transfer of energy and materials between tropic levels, and the stability of these processes. The experimental evidence, mostly based on small-scale studies, thus suggests several important links between biodiversity and marine ecological processes. These generalizations have potential implications for fisheries, and consequently for human wellbeing.

Blue fin tuna have been severely over fished and some scientists believe they are in danger of extinction. To answer this question, it's worth first specifying what is meant by biodiversity loss. It's easy to understand that extinction of a fish species would be detrimental to the fisheries that target it directly. But complex interactions among species can also produce important rippling influences of loss of a species on the structure and dynamics of ecosystems. For example, the blue crab (*Callinectes sapidus*) is one of the largest fisheries in the Chesapeake Bay, USA, with a value of almost 19 \$M in Virginia alone in 2004. Blue crabs have declined in abundance in recent decades, partly as a direct result of fishing, but also as an indirect consequence of loss of seagrasses that provide nursery habitat for young crabs. Similarly, when wasting disease decimated eelgrass (*Zostera marina*) throughout the North Atlantic in the 1930s, the

⁷ Supra Note 3, P.8

⁸ Ibid

⁹ Ibid

¹⁰ IAASTD (2008): International Assessment of Agricultural Knowledge, Science and Technology for Development; Executive Summary of the Synthesis Report. Synthesis Report; <http://www.agassessment.org>

Maryland and Virginia fisheries for bay scallops, which depend on eelgrass, crashed and never rebounded. These examples show how loss of a major habitat-forming species, eelgrass, can have important indirect consequences for other species¹¹.

For the industries that harvest seafood, and the human societies that are obliged to manage these public resources, the implication of these results is one that has not yet been widely integrated into fishery management, namely that productive fisheries that are sustainable over the long term depend on a normally functioning ocean ecosystem. This in turn depends on a variety of less conspicuous, easily ignored species of microscopic plankton, small invertebrates, coastal wetland plants, and so on. Growing evidence from a variety of sources indicates that loss or reduction of such species often has consequences that ripple out through the food web, degrading the ocean's capacity to provide not only fish harvests, but other services to humanity such as coastal erosion control and water purification. If such interactions are indeed general and the concordance of theory, experiments, and observed trends in global fishery catches suggest that continuing erosion of ocean biodiversity has real potential to compromise food security, particularly for the developing nations and small island states whose populations and economies depend heavily on wild fish harvests¹².

6. International Policy Developments In The Field Of Biodiversity

Nutritionists and food experts need to be aware of the complex policy landscape governing the sustainable management of biodiversity at both national and international level, which often entangle developments in various sectors including agriculture, environment, trade, research and health. Two particular forums are now looking at ways to integrate the nutrition dimension into the priority setting related to biodiversity: the FAO of the United Nations and the CBD. The work developed at the international level is often translated into national programmes, policies or legislations that regulate the use of genetic resources.

In the early 1980s, FAO members felt that the political, economic and ethical dimensions surrounding the conservation and sustainable use of genetic resources for food and agriculture needed to be tackled at the level of the UN system, beyond the technical work already being carried out by FAO and other international organizations. The FAO conference established the first intergovernmental forum specifically dealing with agricultural genetic resources: the Commission on Genetic Resources for Food and Agriculture. It now includes 166 member countries. The Commission aims to reach international consensus through negotiations on areas of global interest in relation to all components of biodiversity of relevance for food and agriculture. It monitors and coordinates the development of the Global System on Plant Genetic Resources and the Global Strategy for the Management of Farm Animal Genetic Resources to ensure the safe conservation and promote the availability and sustainable use of plant and farm animal genetic resources by providing a flexible framework for sharing the benefits and burdens.

The Commission negotiated a new international agreement dedicated to plant genetic resources, which are so crucial in feeding the world's population. The International Treaty on Plant Genetic Resources for Food and Agriculture (FAO, 2001) was adopted by the FAO conference in November 2001 and came into force in June 2004. As of April 2006, it has been ratified by 100 countries. These genetic resources are the raw material that farmers and plant breeders use to improve the quality and productivity of crops. The future of agriculture depends on international cooperation and the open exchange of the crops and their genes that farmers all over the world have developed and shared for more than 10,000 years. No country is entirely self-sufficient; all depend on crops and the genetic diversity within these crops from other countries and regions. The treaty is vital in ensuring the continued availability of the plant genetic resources to feed the world (FAO, 2006c).¹³

The Convention on Biological Diversity (CBD, 1992) was signed by 150 government leaders at the United Nations Conference on Environment and Development (UNCED), Rio de Janeiro, 3–14 June 1992. The CBD's conference of the parties has initiated work on a number of crosscutting issues and thematic work programmes addressing priorities for biodiversity management in different biomes, from marine to forest, from island to dry and sub humid lands or mountain biodiversity. Within the programme of work on agricultural biodiversity it has recently launched a crosscutting initiative on biodiversity for food and nutrition. The initiative will focus future work on various areas: developing and documenting knowledge; integration of biodiversity, food and nutrition issues into research and policy instruments; conserving and promoting a wider use of biodiversity for food and nutrition; and public awareness. The initiative is to be led by FAO and IPGRI.

Increasingly it is being recognised by all stakeholders that for sustainable development to take place and for effective biodiversity conservation, all plans have to be grounded in the two important principles of Ecological Security and Livelihood Security. This is primarily because in a country like India, the livelihoods of the vast majority of the rural population are directly dependent on natural resources and elements of biodiversity in them. Ecological security is critical because it provides for the survival of tens of thousands of species of plants and animals, as also the basic ecosystem services upon which human food, health, water, and cultural security are dependent. The intense interdependence between livelihood security and ecological security makes this segment of the rural population the primary rights- holders and stakeholders in biodiversity conservation with sustainable use. The women and men of communities living in biodiversity rich areas have acquired rich indigenous ecological knowledge through generations of interaction

¹¹ Dr. I.Sundar, Food Security through Biodiversity Conservation, a paper presented in International Conference on Asia Agriculture and Animal 2011, <http://www.ipcbee.com/vol13/26-A30007.pdf>

¹² Ibid

¹³ Ivaro Toledo, Barbara Burlingame, Biodiversity and nutrition: A common path toward global food security and sustainable development, *Journal of Food Composition and Analysis* 19 (2006) 477–483

with local ecosystems, which they have shaped, and which, in turn have shaped their cultures, lifestyles and livelihoods. Community based natural resource management (CBNRM) is hence a very vital approach to enabling both the conservation of biodiversity as well as supporting local livelihoods.¹⁴

7. Policy Initiatives At National Level

7.1. Wild Life Protection Act

Wild Life Protection Act is in the final stage of revision and provisions have been made for conservation reserves and community reserves to allow restrictive use to make it more people oriented. Presently Biodiversity Act which is in the final stage, has got the component of National Biodiversity Authority to control access to genetic resources from international community. There will also be State Biodiversity Boards to control access to domestic consumers.

7.2. Biological Diversity Act, 2002

After an extensive and intensive consultation process involving the stakeholders, the Central Government has brought Biological Diversity Act, 2002 with the following salient features:-

- to regulate access to biological resources of the country with the purpose of securing equitable share in benefits arising out of the use of biological resources; and associated knowledge relating to biological resources;
- 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;
- conservation and development of areas of importance from the standpoint of biological diversity by declaring them as biological diversity heritage sites;
- protection and rehabilitation of threatened species and to involve institutions of state governments in the broad scheme of the implementation of the Biological Diversity Act through constitution of committees.¹⁵

8. Constitutional Provisions

The Indian Constitution is among few in the world that contains specific provisions on environmental protection. The Directive Principles of State Policy and fundamental duties chapters expressly enunciate the national commitment to protect and improve the environment.¹⁶ Judicial interpretation has strengthened the constitutional mandate. Though part III of the Constitution does not contain any provision to provide right to pollution free environment as a fundamental right, but in view of the liberal interpretation given to article 21 coupled with articles 48-A and 51-A(g), the Supreme Court interpreted the right life and personal liberty to include the right to wholesome environment.

9. Policy Gaps

- Lack of policies for protection of wetlands, grasslands, sacred grooves and other areas significant from the point of view of biodiversity.
- Lacunae in economic policy, institutional and governance system.
- Inadequate enforcement of existing laws.
- Poor implementation of wildlife protection act 1972 as amended in 1991
- Inadequate implementation of eco-development programmes.
- Need for enhanced role of NGOs and other institutions.
- Need for political commitment and good will.
- Need for providing Institutional Structure.
- Need for more sectoral financial outlay.
- Human resource development – limited local community participation.

10. Conclusion

The biodiversity is not a easy task. It requires a scientific approach to understand how different forms of agricultural biodiversity contribute to the goals of improved food and nutrition security and sustainability, and recognition that while some principles and practices will be globally applicable, others may be constrained by locality and culture. This is a critical moment in earth's history, a time when humanity must choose its future. Our planet earth is perhaps the only human habitat in the vast universe and we owe it to posterity to preserve the divine heritage of our biosphere without pollution, degradation and destruction. The long term perspective for sustainable development requires the broad-based participation of various stakeholders in policy formulation, decision-making and

¹⁴ Ibid

¹⁵ <http://www.nbaindia.org/introduction.htm>

¹⁶ Article 48-a and Article 51-A(g) of the constitution of India.

implementation at all levels in particular of issues of biological diversity and this must be encouraged. While progress towards sustainable development has been made through meetings, agreements and changes in environmental governance, real change has been slow.

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