

A white paper

on

'Agro-biodiversity hot spots'

To be discussed in the

National level consultation

on

1-2 June 2007

at

*North Eastern Hill University
Shillong, Meghalaya*

Organized by

Protection of Plant Varieties & Farmers' Rights Authority
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With the Intellectual Property Right becoming a major socio-political issue of concern under 'Trade Related' discussions and access to benefit sharing becoming a monologue, it has become necessary to develop a home grown procedure to recognize rural communities' and/or farmers for protecting and sustaining the valuable agro-biodiversity. Logically, it has become necessary to understand the intentions, provisions and actions suggested in various Acts and the legal instruments that are now in place.

1.0 Hot spots and Heritage sites

'Hot spots' are earth's biologically richest places with high number of species found nowhere else. Loss of diversity in these shrinking hot spots are gradually reaching to a threatening level and is likely to affect agriculture, by reducing the availability of diverse genes for crop improvement activities. Access to rich and diverse genes is essential for a continuing plant breeding programme.

Russell Mittermeier in 1988, developed a concept to prioritize biological diversity conservation action covering diverse living organisms. This subsequently led to the identification of seventeen 'Biologically wealthiest nations' of which India is one. The Western Ghats and the Himalayas are the two biologically rich areas identified at global level.

The regions of 'Biosphere Reserve' are protected from human interference and are nature's play ground wherein, dynamic evolution of organisms are kept undisturbed. The natural competition in such reserves through struggle for existence promotes the evolution of new variation and death of the unfit combinations. There are twelve declared Biosphere

Reserve in India, where the evolutionary factory of all kinds is kept at work. In these sites, natural biological diversity is at work, rather the economic plant diversity, wherein human intervention has happened.

Under the 'World Heritage sites' a 'Gene Sanctuary' for preserving Citrus and Musa species has been established by the MoEF in the Tura Range in Gora Hills of Meghalaya. Similarly, for Rhododendron and orchids there exists a Gene Sanctuary in Sikkim. The 'Heritage Sites' and the 'Gene sanctuary' are concepts and action plan in naturally conserving the biodiversity of certain species where they occur in adequate number and in diversity. These sites conserve, and enable natural evolution of the protected species.

Based on agroclimatic conditions and species variability a biographic classification of India has been proposed, which is as follows:-

- **Trans-Himalayas.** An extension of the Tibetan plateau, harboring high-altitude cold desert in Laddakh (J&K) and Lahaul Spiti (H.P) comprising 5.7% of the country's landmass.
- **Himalayas.** The entire mountain chain running from north-western to north eastern India, comprising a diverse range of biotic provinces and biomes, 7.2% of the country's landmass.
- **Desert.** The extremely arid area west of the Aravalli hill range, comprising both the salty desert of Gujarat and the sand desert of Rajasthan 6.9% of the country's landmass.
- **Semi-arid.** The zone between the desert and the Deccan plateau, including the Aravalli hill range accounts for 15.6% of the country's landmass.

- Western ghats. The hill ranges and plains running along the western coastline, south of the Tapti river, covering an extremely diverse range of biotic provinces and biomes and represents 5.8% of the country's landmass.
- Deccan peninsula. The largest of the zones covering much of the southern and south central plateau with predominantly deciduous vegetation amounting to 4.3% of the country's landmass.
- Gangetic plain. Defined by the Ganges river system, these plains are relatively homogenous and cover 11% of the country's landmass.
- North-East India. The plains and non-Himalayan hill ranges of northeastern India, with a wide variation of vegetation and is 5.2% of the country's landmass.
- Islands. The Andaman and Nicobar Islands in the Bay of Bengal, with a highly diverse set of biomes and is 0.03% of the country's landmass.
- Coasts. A large coastline, distributed both to the west and east, with distinct differences between the two; Lakshadweep islands are included in this with the percent area being negligible.

2.0 Biodiversity:

Biodiversity includes all organisms, species and populations; the genetic variation amongst these; and all their complex assemblages of communities and ecosystems. 'Biodiversity hot spots' are areas that support natural ecosystems that are largely intact and where native species and communities associated with these ecosystems are well represented. Biodiversity hot spots are areas that are unusually rich in species, most of which are endemic and are under constant threat of being over exploited.

The term biodiversity also refers to the inter-relatedness of genes, species and ecosystems and their interaction with the environment. In other words there are three clear strata of diversity namely:-

- Ecosystem Diversity
- Species Diversity
- Genetic Diversity

The Agro-biodiversity as we understand is more relevant to the genetic diversity.

2.1 The ecosystem diversity:

This is a mega variation concept perceived taking larger global issues in mind. Twelve mega biodiversity regions have been identified world wide, cover Brazil, Peru, Equator, Columbia (South America), Mexico (North America), Zaire, Madagascar (Africa), India, China, Malayasia, Indonesia (Asia) and Australia are the bioresources rich nations. Excepting probably Australia none of the highly industrialized nations come under the endowed group. Logically, the developed world is not keen to meet the cost of sustaining this resource. Global effort by the poor and bioendowed nations in arriving at a 'Treaty' to conserve and sustain biodiversity fell through and the Rio Declaration has left it to the sovereign nations to take care of their respective biodiversity. However, the developed world have retained the profit making clauses of 'patenting' genes, live forms and novel products from biological diversity as this rightly suits their industrial interests. The diversity of life enriches the quality of life in ways that are not easy to quantify. Narrowing down of diversity by way of loss of individuals, populations and species

decrease the variety of genes needed for crop improvement activities for Harvest plus and efforts against climate change.

Agro biodiversity is an essential component of the FAO propelled International Treaty on Plant Genetic Resources for Food and Agriculture. The pluralistic cultural society that India is and the diverse climatic conditions and the fact that India is a center of origin of a wide range of species of plants has made it all the more necessary to properly take care of these valuable resources.

2.2 Global interest on this issue:

The future harvest in agriculture and allied sector hinges on the availability of genes from the agro biodiversity areas for various useful genes that are still available in the wild species and farmer selected/evolved material. These are to be conserved protected and documented in a manner that we continue to design new plant varieties.

The CGIAR institutions that hold the largest collection of plant germplasm during the last decade has re-asserted its growing concern and interest in sustaining biodiversity and distantly linking it with the millennium development goals. The CGIAR system that deal primarily with annual food crops focus their effort on agro biodiversity rather than on wild plant biodiversity, to harness various useful genes and traits for their "Future Harvest Programs". These useful genes mined out of the material conserved by the tribal and woman population will be used by the Future Harvest Program to address the global issue of poverty and malnutrition through transgenic and Patent/ITPGR related systems. The global concern and the

emphasis to exploit the useful agro biodiversity is too obvious to understand. Through 'Biodiversity Hotspots Alliance' the CGIAR inclusive institutions plan to foster their restricted innovations in balancing livelihood needs with biodiversity conservation.

3.0 The Indian Laws:

Emphasis given for the conservation and sustainable use of genetic resources in the PPV&FR Act, 2001 and Rules thereunder is to be viewed in the above discussed context. Rule 70 of the PPV&FR, 2003 allows the Authority to pay the amount of benefit sharing compensation required for use of genetic resources involved in the development of new or essentially derived variety. It has to be tailored in a manner that it meets the expenditure incurred in the conservation and sustainable use of genetic resources. There is also a provision for framing schemes related to benefit sharing, from out of the Gene Fund (Section 45 of the Act). The 'Gene Fund' under the PPV&FR Act is meant to support tribal and rural communities for their efforts in the conservation, improvement and preservation of genetic resources and their wild relatives of plants that have economic implications, particularly in areas identified as agro-biodiversity hot spots. The question is whether the 'Agro-biodiversity hot spots' is different from the other such ones under the Biological Diversity Act, 2002 and other environment related rules. The agro biodiversity hot spots it appears, is only a sub system under the over all biodiversity hot spots.

4.0 Centers of origin of crop plants

Based on the evolutionary trend of plants and the associated systems, eight main centers of origin of domesticated plants have been identified by N.I. Vavilov. India figures as a major center of evolution of crop plants. The evolutionary centers of crop plants and the twelve biodiversity centers identified world wide overlap with each other but they are not exactly identical.

South Asia is a center of origin or diversity for several crops such as:

- Rice, Sugarcane
- Yam, Taro, bread fruit, several types of bean
- Bamboo, lemon grass, nutmeg, clove, beetelnut, sandal wood, ginger, cardamom, turmeric
- Coconut, Arecanut, Pinus spp.
- Maize, mango, coffee, sweet potato, cassava and several crops as diploid cotton etc.

But what is of great economic significance is the domesticated diversity of plant species made by farmers in these evolutionary centers that are rich in agro biodiversity. The long farming tradition, soil features, topography and rainfall variation have permitted the development of diverse agricultural ecosystems and enormous biodiversity in the region.

4.1 About agro-biodiversity hot spots.

Since agro-biodiversity relates to areas where plants and animals concerned with man's economic interest, such areas can be delineated. Obviously, these agro-biodiversity areas will not

account for all living organisms connected with man's needs but would cover the important one and a substantial amount of it.

It is also to be understood that such agro-biodiversity areas in India cover vast stretch of land, cutting across state boundaries, habitation of different communities, ecological and climatic conditions. Therefore, wherever farmers/farming communities have conserved, shared and sustained these valuable resources at their own initiative for a larger cause, there all, they can be recognized and rewarded for their efforts through the Gene Fund.

In order to do this, certain agro-biodiversity hot spots are to be identified as shared vision with general acceptance. The following can be considered as agro-biodiversity hot spot areas.

- 1 Travancore/Malabar area
- 2 Nilgiri and Adjoining hills
- 3 Konkan coast
- 4 North Gujarath/Mewar
- 5 Sikkim Hills
- 6 Hills of Meghalaya
- 7 Arunachal Himalaya
- 8 Brahmaputra plains
- 9 Southern Gangetic Delta of Bengal
- 10 Koraput region
- 11 Bastar and adjoining area
- 12 Maliabad area of UP (Mango & fruits)
- 13 Darbanga-Madubani Gorakhpur-Banaras-Bhagalpur (for Cucurbits, Litchi)
- 14 NW temperate Himalaya
- 15 Ladakh
- 16 Andaman islands (coconut)

- 17 Nagaland/Manipur/Tripura
- 18 Karur to cuddalore tract along cauvery (Banana, Mangrooves, Palmyrah)
- 19 Bellary, Sholapur, Aurangabad semi-arid belt
- 20 Arid Jodhpur-Bikaner

With in the agro-biodiversity areas in India, these twenty locations can be examined as potential agro-biodiversity hot spots. The above 20 agro-biodiversity hot spots (agro-biodiversity hot spots) located in the major agro-biodiversity zones of India are given in figure. To begin with these twenty agro-biodiversity hot spots spots can be considered for purposes of the provisions under Gene Fund of the PPV&FR Act, 2001. Periodically the importance of these sites can be reviewed for inclusion or deletion of some sites.

This white paper on the 'Agro biodiversity hot spots' is placed for observations and discussion

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Figure 1

National forest vegetation map of India with Biodiversity hotspots

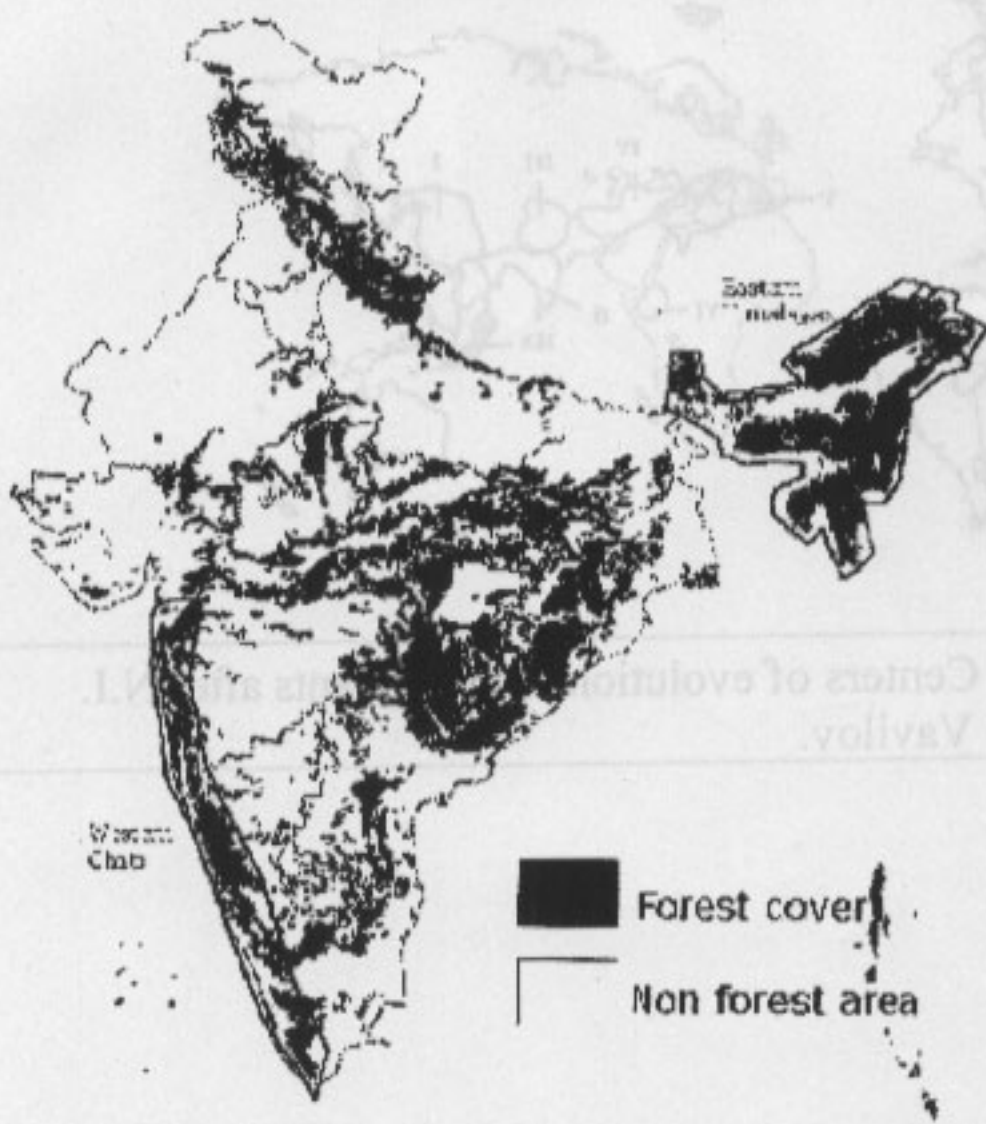




Figure 2: Centers of evolution of crop plants after N.I. Vavilov.

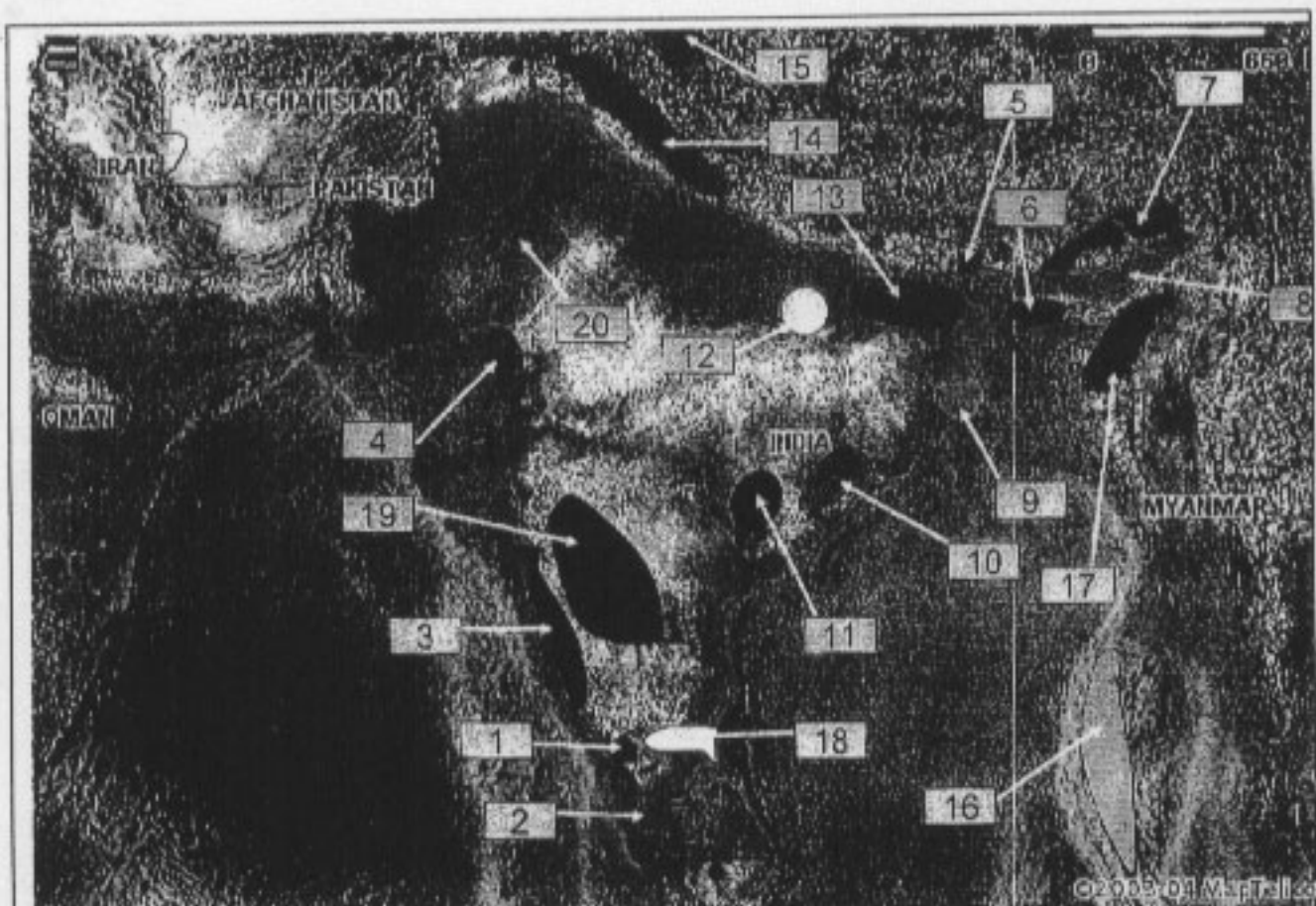


Figure 3: The proposed Agro-biodiversity hot spots