**Pluto is now a plutoid – a new class of planetary objects**

The International Astronomical Union (IAU)\(^1\) has recently placed Pluto into a new category of planetary objects called ‘plutoids’. In 2006, Pluto was deprived of its planethood and was classified as a ‘dwarf planet’. With much controversy over this, the IAU decided to reconsider the classification of Pluto while declaring it as a ‘prototype of a new category of planetary objects’. Now finally in 2008, the IAU has named and classified Pluto as a ‘plutoid’. According to the IAU, ‘Plutoids are celestial bodies in orbit around the Sun at a semimajor axis greater than that of Neptune that have sufficient mass for their self-gravity to overcome rigid body forces so that they assume a hydrostatic equilibrium (near-spherical) shape, and that have not cleared the neighbourhood around their orbit’. In addition to Pluto, Eris is also classified as a plutoid and more discoveries are expected.


Abhay S. D. Rajput

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**Wellcome Trust and DBT to boost biomedical research in India**

To promote and fund cutting-edge biomedical research in India, the Wellcome Trust and the Government of India have announced a £80 million partnership for a Biomedical Research Career Programme. This project will also support public health research in the country.

Jointly funded by the Department of Biotechnology (DBT), New Delhi and the Wellcome Trust, the partnership will provide fellowship programmes to Indian researchers to strengthen the biomedical research base in the country. These fellowships will help build excellent career pathways in India for scientists working in basic biomedical, clinical and veterinary research.

The announcement was recently made jointly by M. K. Bhan, Secretary, DBT and Mark Walport, Director of the Wellcome Trust in New Delhi.

The two partners of this programme have established an independent New Delhi-based public charitable trust, the Wellcome Trust/DBT India Alliance. This Alliance will be awarding around 40 early career fellowships, 20 intermediate fellowships and 15 senior research fellowships using a peer-reviewed funding process.

The Wellcome Trust has also offered Strategic Awards worth £15 million for biomedical research in the country. These include creating a new Indian Institute of Public Health in partnership with the Public Health Foundation of India; a new South Asia Centre in India for high quality research and control of chronic diseases (e.g. diabetes, mental illness, cancer); and reducing maternal, and child mortality and morbidity by improving policy and practice for maternal and child survival.

Abhay S. D. Rajput (S. Ramaseshan Fellow), H. No. 59, L. No. 1, Munshi Chak, Opp. Old Chungi, Camp Road, Talab Tilgo, Jammu 180 002, India.

e-mail: abhaydsr@yahoo.co.in

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**MEETING REPORT**

**Conservation and stewardship of agricultural biodiversity in an era of climate change**

Climate change has a profound impact on the dynamics of agricultural and natural ecosystems, particularly sustainability of agricultural biodiversity. The loss of biodiversity in agricultural landscapes affects not just the production of food, fuel and fibre, but also a range of ecological services supporting clean water supplies, habitats for wild species, human health, long-term security and resilience. The world’s population of 6.3 billion people is projected to grow to 9 billion by 2050. The observed climate change, especially warmer regional temperatures, has already affected biodiversity and ecosystems, causing changes in species distribution, population size, the timing of reproduction or migration events and an increase in the frequency of pests and diseases. Conservation of biodiversity and maintenance of ecosystem integrity appear to be imperatives for improving the adaptive capacity of poor groups to cope with climate change. As biodiversity is lost, options for change are diminished and human society becomes more vulnerable.

Meeting food security cannot be addressed by the usual approach of increasing or converting more land for agriculture and intensification. It needs a holistic approach, adaptation and mitigation strategies that help reduce the potential nega-
tive and adverse impacts of climate change on agricultural and natural ecosystems. Given the expected growth in human population and predicted climate change/variability, practical approaches on conservation and stewardship of agricultural biodiversity are the need of the hour.

Most biodiversity research and studies are now supported by recent scientific, technical and policy developments. The genomic structure of major crop species and their wild relatives is now being described, and this provides a wealth of information and analyses that can be used for describing biodiversity at the genetic level and for increasing crop production. Significant progress in agronomic research and adoption of systems approach show the benefits of biodiversity-based practices such as cover crops, intercrops, rotations and hedgerows for increasing agricultural productivity and environmental quality. New ecological research has shown that greater number of species result in higher productivity of ecosystems. Using satellite-imaging systems, the distribution of ecosystems in agricultural landscapes can now be described with high resolution, yielding information on how to better manage agricultural species, invasive and wild species. New efforts to merge biological and economic approaches are generating information on how policies can affect the conservation and use of agrobiodiversity for enhancement of human well-being. International conventions and global initiatives are being launched to recognize the stewardship of biodiversity by farmers and indigenous communities, and devising incentive mechanisms for sustainable use and conservation of biodiversity. The loss of every species and genes will limit our options and capacity to produce food and maintain ecosystem services (e.g. pollinators) with the increased threats of climate change, global warming and sea-level rise.

Similarly, the world’s seed collections are also vulnerable to a wide range of threats – civil strife, war, natural catastrophe in the emerging era of climate change, and more routinely because of poor management, lack of adequate funding and equipment failures. Unique varieties of our most important crops are lost whenever any such disaster strikes, and therefore securing duplicates of all collections in a global facility provides an insurance policy for the world’s food supply. In an effort to preserve global crop-diversity resources, the Svalbard Global Seed Vault has come into effect recently. However, ex situ conservation of agricultural biodiversity does not guarantee continued evolution, sustainability, neither viability nor ensuring food security and rural livelihoods. Conservation and stewardship of agricultural biodiversity should address complementary methods of both in situ and ex situ conservation to guarantee dynamic evolution of genetic resources and diversity to changing environmental conditions.

An International Forum was recently organized to discuss and develop a strategy to conserve and mobilize agricultural biodiversity for mitigating and managing adverse changes in temperature, precipitation and sea-level rise leading to severe droughts, floods and coastal sea-water intrusion. Forty-five people from seven countries participated in the Forum, representing UN agencies, international organizations, national government institutions, non-government organizations, academics and civil society organizations. After considering different aspects of dynamic conservation, improvement and sustainable and equitable use of agricultural biodiversity ranging from local to global issues, such as the challenge of mitigating the adverse impacts of climate change and the enormous socio-economic problem of how to attain food and rural livelihood security, the participants developed the following Nine-Point Charter to mobilize the national and international community to enhance the resilience of small farmers and agricultural systems to the impacts of climate change through the stewardship and conservation of agro-biodiversity systems and their biodiversity and genetic resources.

**Nine-Point Charter**

1. Conservation and adaptive management of ‘Globally Important Agricultural Heritage Systems (GIAHS)’. The GIAHS initiative aims to identify and ensure recognition of unique, traditional, agricultural systems and their agricultural biodiversity, knowledge systems, food and livelihood security and culture throughout the world. In many of these systems and sites, the prosperity of nature and the poverty of people co-exist. Hence dynamic conservation of globally important agricultural heritage systems is an innovative strategy to empower small-holder farmers, traditional farming communities and indigenous people. The initiative should be scaled up and include more systems and sites to cover traditional farming communities adapting to climate change and at the same time creating an economic stake in the conservation of agricultural biodiversity, so that nature and people prosper together.

2. Platform for Agro-biodiversity Research (PAR): Biodiversity International together with other stakeholders, and with the support of the Conference of Parties of the Convention on Biological Diversity, and FAO has developed a PAR. This is a timely initiative, since seemingly impossible tasks can be accomplished only by mobilizing the power of partnership among researchers, farmers, communities and indigenous people to provide a strong context for future efforts and for creating an agrobiodiversity knowledge base responding effectively and quickly to the great challenge of climate change. This will help increase support for the conservation and sustainable use of agrobiodiversity, to improve the welfare of vulnerable communities and their environments. PAR should involve concurrent attention to in situ conservation, ex situ preservation, and community conservation through in situ on-farm conservation and ex situ sacred groves. It should also address the importance of maintaining both directly useful and associated agrobiodiversity. Steps should be initiated to revitalize the in situ on-farm conservation traditions of tribal and rural communities through appropriate recognition and reward systems, i.e. the Genome Saviour Awards instituted by the National Plant Variety Protection Authority of India.

3. Community conservation approaches involving concurrent attention to conservation, cultivation, consumption and sustainable marketing of agricultural produce can make an important contribution to achieving the UN Millennium Development Goals relating to the reduction of hunger and poverty, and environmental sustainability. Community conservation approaches provide small-holder farmers and indigenous communities with the tools to manage, monitor and benefit from their own natural and available resources, while shaping flexible programmes with greater likelihood of achieving long-term success, self-reliance and community well-being. The MSSRF pattern of promoting local-level gene–seed–grain and water banks
replication in all agro-biodiversity-rich sites, since they can help achieve at the village-level food, water and ecological security at the same time.

4. Biovalleys: These provide a pathway for converting biodiversity into remunerative jobs and income in an environmentally sustainable manner. Major watersheds in biodiversity-rich areas can be developed into biovalleys by linking biodiversity, biotechnology and business in a mutually reinforcing manner. Biovalleys shall promote application of information technology. Biovalley enterprises (mostly micro-enterprises supported by micro-credit) are based on the principle of ‘good ecology is good business’. Biovalleys help strengthen both conservation and new livelihood opportunities.

5. Identifying and protecting fragile ecosystems: Concerted efforts are required to identify agro-biodiversity-rich areas through resource mapping and understanding changes in agricultural landscapes as a result of anthropogenic and climate factors. The role of agroforestry in reducing vulnerability and supporting maintenance of agrobiodiversity should be recognized. Thus in vulnerable regions such as coastal areas, mangrove and non-mangrove bioshields should be promoted in order to minimize the loss of life and livelihoods due to tsunami and coastal storms. Non-mangrove bioshields could include casuarina species and bamboo. Bamboo affords great opportunities to save forest trees and meet a wide range of domestic and industrial needs. Germplasm resources of bamboo, casuarina, atriplex, etc. should be conserved. Agro-forestry systems will help achieve simultaneously the long-term goal of conservation and short-term goal of income and work security. Similarly, crops with potential contribution to economic and livelihood security (e.g. food crops, fruit trees, vegetables, etc.) require special attention for germplasm conservation and utilization.

6. Multi-lateral system and farmers’ right provisions of the ‘International Treaty on Plant Genetic Resources for Food and Agriculture’: The multi-lateral system of germplasm exchange is an important provision of the Treaty to access plant genetic resources and benefit-sharing, which will help local farmers ‘purchase time’ in the breeding of new varieties of crops of importance to the nation’s food and health security, and will contribute significantly to improved conservation and use of agrobiodiversity. The multi-lateral system currently applies to 64 most important crops. It is heartening that over 100,000 germplasm transfers took place within the first 9 months of the operation of the Treaty. Similarly, all nations should implement the farmers’ rights provisions of the Treaty. The Government of India is to be congratulated on enacting an Integrated Protection of Plant Varieties and Farmers’ Rights Act (2001). This example needs to be emulated by other countries.

7. Energy security: The photosynthetic pathway of energy security will require the conservation and breeding of energy-rich crops. Biomass, biofuels, bio-oils and other crop-based fuels can help in developing decentralized, rural-energy security systems and at the same time, under appropriate conditions, may increase the income of farmers. Genes for energy security should become an important national and international research and development programme. Land-use planning at the national level should ensure an appropriate balance between food and fuel security.

8. Save the dying wisdom and vanishing crops and protect the intellectual property rights of primary conservers – genetic and legal literacy: There is need for legal, genetic and nutrition literacy programmes which will empower tribal and local communities with knowledge on issues like Intellectual Property Rights, farmers’ rights, climate change and the importance of enlarging the food basket by conserving ‘orphan crops’ and revitalizing their earlier culinary traditions. Participatory breeding and knowledge management systems should be promoted so that there is an appropriate blend of traditional wisdom and frontier science. Island ecosystems will need special attention to protect them from the impact of sea-level rise. As an education tool, genome and DNA clubs could be organized in schools of agro-biodiversity-rich areas, to make schools and students participate in the creation of both in situ and ex situ gene banks.

9. Empower farmers and local communities and affirm their right to food and well-being in an era of climate change: Farm and fisher families will be severely affected by adverse changes in precipitation, temperature and sea level. It is anticipated that climate change would also particularly adversely affect the livestock population. There could also be new pest and disease epidemics, which will affect the health security of plants, farm animals and human beings. Improved use of agrobiodiversity can contribute significantly to support the development and implementation of farmer-based adaptation strategies. Climate-change adaptation and mitigation measures should take full account of the importance of agrobiodiversity in the livelihood strategies of small-scale farmers throughout the world.

The way forward

The participants in the Forum were of the view that every country should develop a three-pronged strategy and people-centred focus for managing and mitigating the adverse consequences of climate change.

(i) Defend the gains: We must strengthen on-going efforts to preserve genes for posterity through the GIAHS programme, Biosphere Reserves, National Parks, Protected Areas, Botanical and Zoological Gardens and Gene Banks (including the Svalbard Gene Vault). The loss of every gene/species limits our options for the future. The existing Agricultural Heritage Sites must be safeguarded by creating an economic stake in their conservation. There has to be an integrated programme of education, social mobilization and regulation for defending the gains already made in saving genes for saving lives and livelihoods. Every village and community should be assisted to establish water banks, gene banks, seed banks, grain banks and knowledge banks in order to ensure preparedness for overcoming future threats to sustainable livelihoods, particularly for the poor.

(ii) Extend the gains: We should extend the benefits of genetic resources conservation to arid, semi-arid, mountain and coastal areas as well as to small islands. Extending the gains should also cover below-ground and less-understood biodiversity, especially bacteria, fungi, algae, lichens, etc. Microbial biodiversity...
will be extremely important for bio-remedia-
tion and bio-monitoring.

(iii) Make new gains: Wild genetic re-
sources of plants and livestock, including
underutilized crops with the resilience and
adaptability to the emerging climate
change need to be conserved and used as
a potential resource for crop/breed im-
provement. This has to come from the
sustainable use of recombinant
DNA technology leading to the creation
of novel genetic combinations, which
may confer tolerance to drought, flood,
salinity, heat, pest and disease outbreaks.

The work in progress at MSSRF using
genes for mangrove species is an example.
Public good research institutions should
serve as pre-breeding centres and work
with farming communities in a participa-
tory breeding mode so that genetic diver-
sity and genetic efficiency can be com-
bined. This is essential for sustainable
agriculture.

The above Nine-Point Charter pro-
vides a road map for fostering steward-
ship in the conservation, sustainable use
and equitable sharing of the benefits of
agricultural biodiversity in an era of cli-
mate change. This is the pathway towards
ushering in an era of bioproduce, char-
acterized by the sustainable use of
resources for strengthening and safe-
guarding harmony between humanity and
environment.

Ajay Parida* and M. S. Swaminathan,
M.S. Swaminathan Research Foundation,
III Cross Street, Institutional Area,
Taramani, Chennai 600 113, India.
*e-mail: ajay@msrasf.res.in

MEETING REPORT

GM technologies*

As of 20 August 2008, the world’s
estimated population was 6.689 billion.
The challenges of the world’s population
growth, global warming, and constantly
increasing prices of fuel and food are
putting us into the biggest crisis. This
http://www Current Science.in

NEWS

This crisis warrants the need to take a serious
look at the technologies that can help us
address these new challenges. Millions of
people in different parts of the world
are facing starvation due to food shortage
and also increasing prices of food. Gen-
etic modification (GM) technologies
can offer a multitude of sustainable de-
velopment solutions. However, the ado-
ption rate of GM technologies by
developing nations lags behind that of
the developed world, most probably due
to lack of awareness of their applications
or because of a cautious approach in the
adoption of GM technologies.

A conference was recently organized
in Malaysia to look at the propositions
offered by GM technologies, considera-
tions in the adoption of GM technolo-
gies, the way for optimum utilization and
delivery of GM technology benefits, and
the public and private perspective on the
way forward. This conference was a sat-
elite event to the Malaysia Agriculture,
Horticulture and Agrotourism exhibition
2008 (MAHA 2008), the region’s largest
exhibition that showcases the latest tech-
nologies and innovations in the agri-
culture, agro-based, horticulture and agro-
tourism industry. The conference included
thirteen invited speakers, four sessions
and was attended by about 300 partici-
pants, including scientists from private and
public institutions, representatives from
key government agencies, private sector,
industry, non-government organizations
and other stakeholders of the biotech
industry. Some views which provide a
flavour of the conference are highlighted
here.

The policies of the Malaysian govern-
ment are pro-biotechnology; the Malaysian
Biotechnology Corporation (Biotechcorp),
the lead agency for biotechnology de-
velopment in Malaysia, is working hard to
ensure that the objectives and strategies
under the National Biotechnology Policy
are fully deployed and goals achieved.
Malaysia aims to become a biotech hub
and is targeting to have at least 5% con-
tribution from the biotech sector to the
national gross domestic product by 2020.
This was echoed in opening remarks by
Y. B. Dato Iskandar Mizal Mohmood
(CEO, Biotechcorp). He also highlighted
that research and development, funds for
research and commercialization, and in-
centives are the key drivers in the bio-
tech industry.

In the opening talk, an in-depth review
on the sustainability challenges facing
the world today and appropriate solutions
was presented by C. J. Leaver (Uni-
versity of Oxford). He highlighted that
by 2050 the world population will be
more than 9 billion. Currently, more than
50% of the world’s population lives in
urban areas and the largest increases in
population will occur in the cities of Asia
and Africa. To meet the demand for food
in 2050, it will be necessary to double
the total production of food, triple the
crop yield per hectare and do it on the
same area of agriculture land with lim-
ited water. For this, GM technologies
offer sustainable solutions.

According to Leaver, our main chal-
enges are: to find what level of popula-
tion is truly sustainable; to address the
global food security in order to avoid
predicted deficits as early as 2020 and to
deliver an environmentally sustainable
doubling of crop production by 2050 on
essentially the same area of land; to meet
the increased consumption of meat, cere-
als and edible oil by affluence; to reduce
our dependence on and ultimately re-
place petrochemicals with renewable
chemical feed stocks from plants and to
combat climate change, global warming
and drought and ameliorate its impact on
crop productivity. He also highlighted
that limited resources, low agricultural
productivity, diminishing productive land/