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[1], '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.

1. http://www.iau.org/public_press/news/release/iau0804/, accessed on 17 June 2008.

Abhay S. D. Rajput

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.

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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-

*A report on International Forum on 'Conservation and Stewardship of Agricultural Biodiversity in an Era of Climate Change' organized by the M.S. Swaminathan Research Foundation (MSSRF), Chennai in collaboration with the United Nations' Food and Agriculture Organization; Protection of Plant Variety and Farmers' Rights Authority of the Government of India, and XV Genetic Congress Trust at Chennai from 7 to 9 August 2008.

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 global to local 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 agricultural heritage 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 smallholder 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 needs

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 biotechnology in the form of the manufactured biological products essential for sustainable agriculture. Some examples of biological products include bio-fertilizers, bio-pesticides, vermiculture, bioremediation agents and post-harvest processing. The concept of 'Biovalley for biotechnology (non-GMO)' is similar to the idea of the Silicon Valley for 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-remediation and bio-monitoring.

(iii) Make new gains: Wild genetic resources 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 improvement. This has to come from the safe and responsible use of recombinant DNA technology leading to the creation of novel genetic combinations, which can confer tolerance to drought, flood, salinity, heat, pest and decease 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 participatory breeding mode so that genetic diversity and genetic efficiency can be combined. This is essential for sustainable agriculture.

The above Nine-Point Charter provides a road map for fostering stewardship in the conservation, sustainable use and equitable sharing of the benefits of agricultural biodiversity in an era of climate change. This is the pathway towards ushering in an era of biohappiness, characterized by the sustainable use of bioresources for strengthening and safeguarding harmony between humanity and environment.

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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 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. Genetic modification (GM) technologies can offer a multitude of sustainable development solutions. However, the adoption 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, considerations in the adoption of GM technologies, 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 satellite event to the Malaysia Agriculture, Horticulture and Agrotourism exhibition 2008 (MAHA 2008), the region's largest exhibition that showcases the latest technologies and innovations in the agriculture, agro-based, horticulture and agrotourism industry. The conference included thirteen invited speakers, four sessions and was attended by about 300 participants, 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 government are pro-biotechnology; the Malaysian Biotechnology Corporation (Biotechcorp), the lead agency for biotechnology development 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% contribution 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 incentives are the key drivers in the biotech 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 (University 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 limited water. For this, GM technologies offer sustainable solutions.

According to Leaver, our main challenges are: to find what level of population 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, cereals and edible oil by affluence; to reduce our dependence on and ultimately replace 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/

*A report on 'GM Technologies: Addressing Global Sustainability Needs and Challenges', held at Palace of the Golden Horses, KL, Malaysia on 18–19 August 2008, and jointly organized by the Malaysian Biotechnology Corporation; Malaysian Agriculture Research and Development Institute; Universiti Putra Malaysia; Academy of Science, Malaysia; Malaysian Bio-industry Organisation, and Malaysian Biotechnology Information Centre.