



PLANTS PEOPLE
POSSIBILITIES

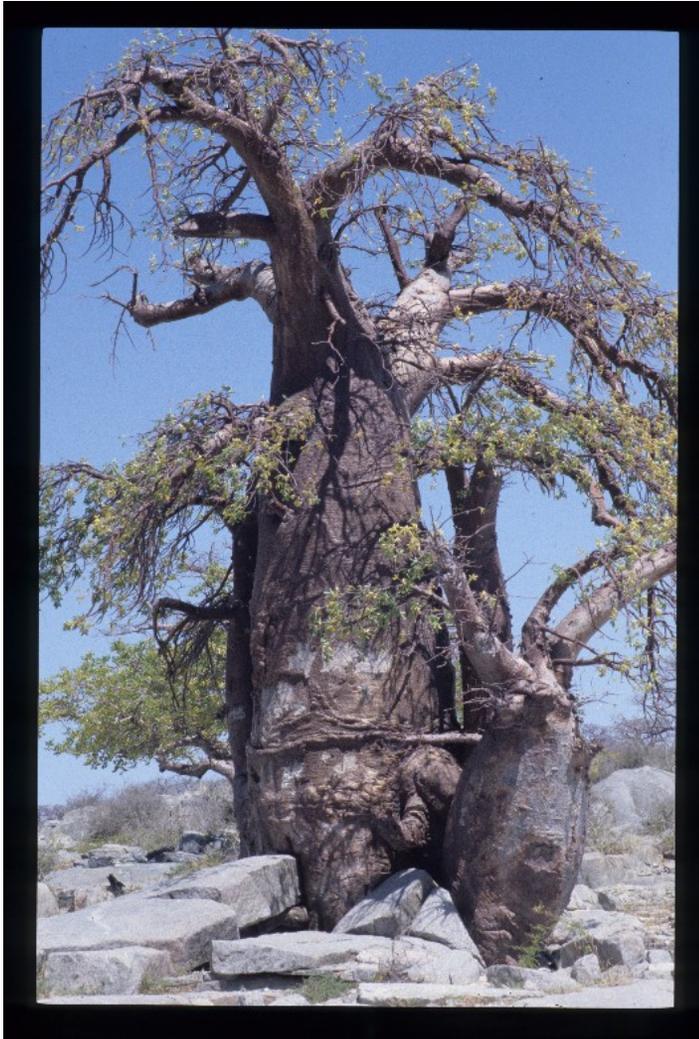
The Millennium Seed Bank Partnership: conserving and enabling the use of plant diversity

Dr Paul Smith

Head of Kew's Millennium Seed Bank



Outline of talk



- Threats to plant diversity
- Why plant diversity is important
- Kew's mission
- The Millennium Seed Bank Partnership
- Conserving seed from 25% of the world's plant species
- Enabling the sustainable use of plant diversity
- Conclusions

Threats to plant diversity: deforestation



- One fifth of the world's tropical forests were destroyed between 1960 and 1990.
- Current deforestation rates are 13 million hectares per year.
- In Africa 28 trees are felled for every tree that is planted.
- Deforestation accounts for 20% of global carbon emissions.

Threats to plant diversity: climate change



- Doubling of atmospheric CO₂ concentrations expected to occur in the next 100 years.
- >50% of Europe's plant species vulnerable or threatened by 2080.
- Ca. 60% species loss in montane ecosystems predicted.

*Ref. Climate change threats to plant diversity in Europe.
Thuiller et al., PNAS, June 2005*



Threats to plant diversity

60,000 to 100,000 plant species are currently threatened with extinction

For plants, the current extinction rate is at least 100 times the background rate.

www.millenniumassessment.org

Why plant diversity is important

All life depends on plants

Provisioning services

Food, medicine, fuel, construction,
clothing, etc.

Regulating services

Climate moderation, disease
regulation, flood regulation

Cultural services

Spiritual, recreational, aesthetic,
inspirational, educational

Supporting services

Soil formation, nutrient cycling, primary production.

Economic value \$30-40 trillion per annum.



Why plant diversity is important



Oryza sativa L.

Globally, **80%** of our plant-based food intake comes from just **12** domesticated plant species, **8** cereals and **4** tubers.

At least **30,000** species of plant are edible.

Can we continue to rely on such a tiny fraction of edible plant diversity for all our future needs?

Why plant diversity is important



Do we have all the medicines we need?

Only **1 in 5** plants have been screened for pharmaceutical activity

75% of the world's population relies on traditional medicines.

Traditional Chinese medicine uses **5000** plant species. **7000** species are used for medicine in India.

Why plant diversity is important



‘If the biota, in the course of aeons, has built something we like but do not understand, then who but a fool would discard seemingly useless parts? To keep every cog and wheel is the first precaution of intelligent tinkering.’

Aldo Leopold. *Round River*. Oxford University Press

Kew's mission

Kew's mission is to inspire and deliver science-based plant conservation worldwide to enhance the quality of life

Kew's role, and that of other plant science institutions, is to develop relationships with society that enable human **innovation, adaptation and resilience.**

Our role is primarily in providing plant-based solutions to the environmental challenges that we all face.



Kew's mission



PLANTS PEOPLE
POSSIBILITIES

Kew's Breathing Planet Programme 2010-2020

1. Driving discovery and global access to **essential information**
2. Identifying highly **threatened species and regions**
3. Helping global conservation programmes **on the ground**
4. Safeguarding **25%** of species through the Millennium Seed Bank partnership
5. Building a global network to **restore damaged habitats**
6. Growing **locally appropriate** species for a changing world
7. Using botanic gardens to **inform and inspire**



The Millennium Seed Bank Partnership 2010-2020

Purpose

To combat potentially catastrophic threats to human wellbeing by safeguarding wild plant diversity and enabling its sustainable use through global partnership.



The Millennium Seed Bank Partnership 2010-2020

Output 1

Secure in safe storage **25%** of the world's plant species by **2020**.

Output 2

Enable the sustainable utilisation of plants, and the repair and re-establishment of damaged vegetation.

Output 3

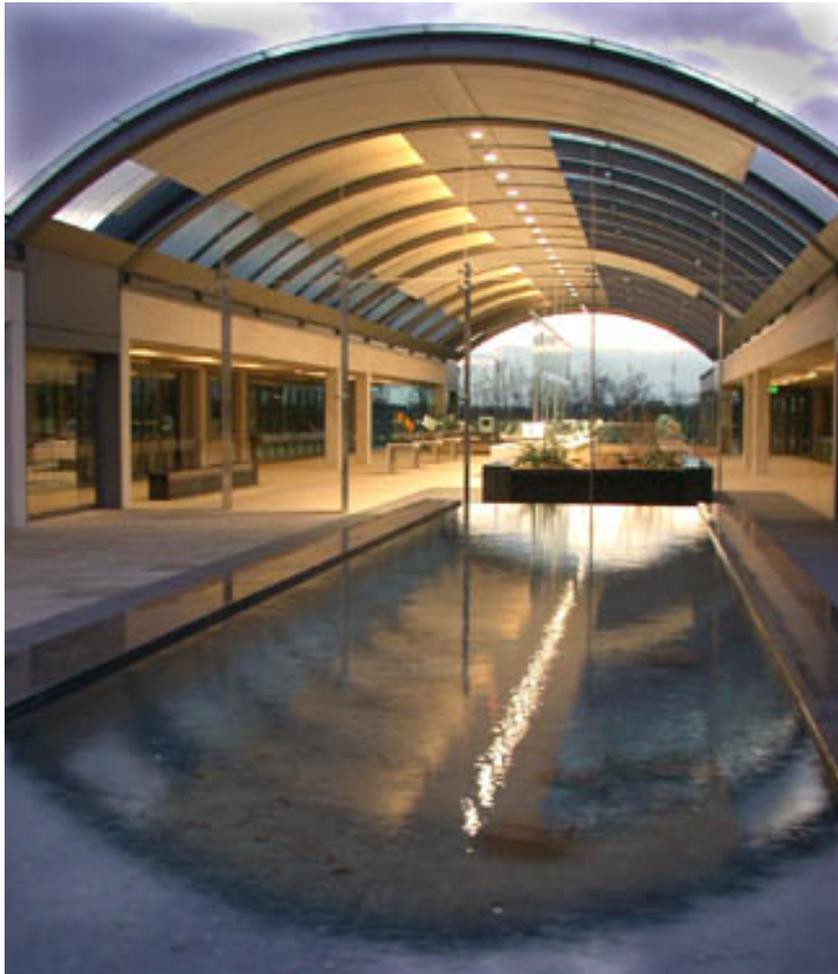
Ensure the long term financial security of seed banking efforts.



Kew

PLANTS PEOPLE
POSSIBILITIES

The Millennium Seed Bank Partnership 2010-2020



The concept of global seed banking has been proved by the Millennium Seed Bank Project, and it is based on:

Partnerships

Seed collections

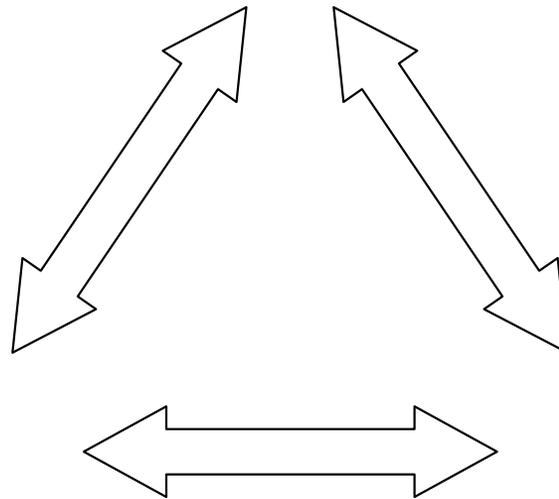
Enabling use of plant diversity



PLANTS PEOPLE
POSSIBILITIES

Partnerships

Conservation



Fair and equitable
sharing of benefits

Sustainable
use



The value of a network

- Advocacy and influencing policy
- Meeting global targets (e.g. GSPC)
- Technical information exchange
- Joint activities (e.g. fieldwork, research)
- Sharing collections
- Achieving consistency through agreed standards
- Supporting each other with funding bids
- Etc.



Collections: conserving seed from 25% of the world's plant species



The key indicator for Output 1 is that MSB-2 will aim to have collected and secured in safe storage one quarter of the world's plant species by 2020. This equates to a total of **75,000** species - **30,000** species by 2010, and a further **45,000** species collected and conserved by 2020.

Aim to collect high genetic diversity

Associated collections (soil, symbionts, pollen, DNA)

Adjusting procedures to better enable use (e.g. for restoration)

Kew

PLANTS PEOPLE
POSSIBILITIES

Enabling the use of plant diversity



Doubling of atmospheric CO₂
concentrations expected to occur
in the next 100 years.

Food security is threatened by shifting
growing zones, shifting habitats of
pests and diseases, CO₂, rainfall
and temperature effects.

Invasive species, pests and diseases
likely to emerge

Agriculture, horticulture and forestry
will be fundamentally affected, and
new species and varieties will
need to be utilized

Kew

PLANTS PEOPLE
POSSIBILITIES

Enabling the use of plant diversity

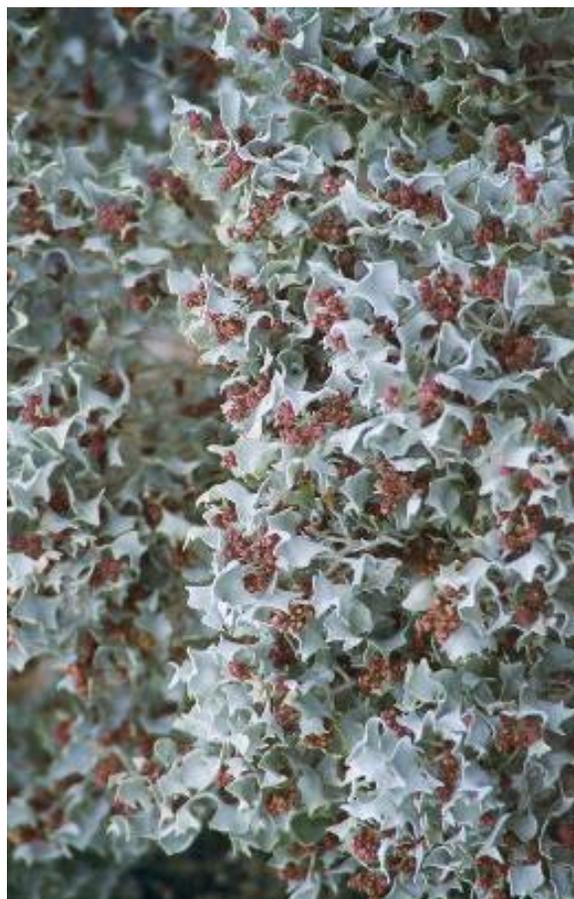


Development of germination protocols are a vital and novel output of the Millennium Seed Bank

Currently >10,000 germination tests carried out each year. For most species the methods are new.

All germination protocols are available on Kew's website at <http://www.kew.org./data/sid>

Enabling the use of plant diversity



>5000 collections sent out for research into water, energy, health, agriculture and biodiversity:

154 collections of salt tolerant pasture species sent to Australia;

34 collections of drought tolerant forage species sent to Pakistan and Egypt;

32 collections of photosynthetically efficient C4 species sent to Pullman, USA;

5 collections of *Phleum* and *Lolium* supplied to New Zealand for pasture breeding

Developing C4 photosynthesis in
crop species

C4 plants account for 20-30%
global terrestrial productivity but
are only 3% of angiosperms

Washington State University,
Pullman

MSB supplied 32 seed
collections of 13 genera of C4
families for screening for c4
photosynthesis without Kranz
anatomy.



Behaviour of invasive species in
the USA

National Wetlands Research
Centre/ Cornell University/
Portland State University

MSB supplied collections of
purple loosestrife (*Lythrum
salicaria*), mugwort (*Artemesia
vulgaris*) and false brome
(*Brachypodium sylvaticum*)



Image: Bonnie Harper-Lore, Federal Highway
Administration, www.forestryimages.org

217 'difficult' species

51 crop species (maize, millet, rice etc.)

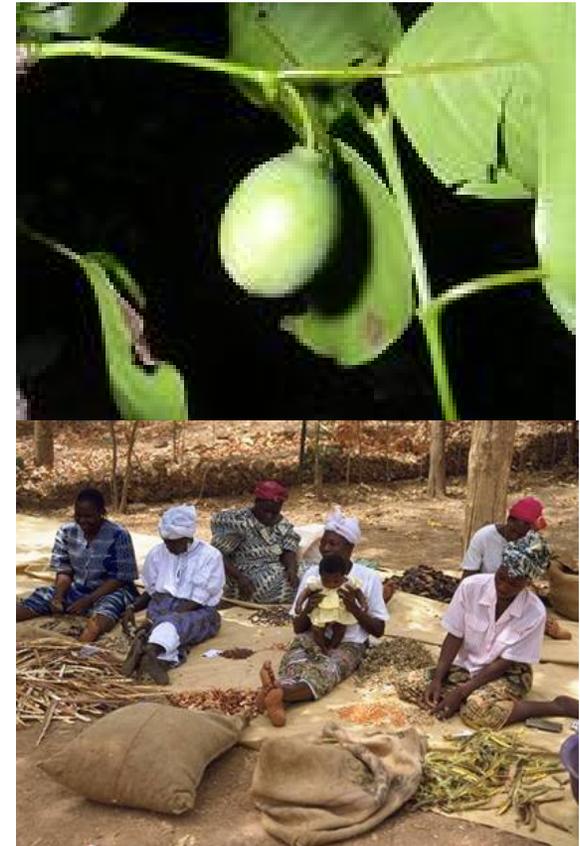
40 fruit trees (33 native)

151 native species (vegetables, medicinal,
ornamental etc.)

38% (82) of the species had
handling/storage problems

52% (112) had germination problems

For 46 of the 112 species with germination
problems we already have protocols that
deliver >75% germinability



Kew

PLANTS PEOPLE
POSSIBILITIES

Enabling the use of plant diversity



Seed and expertise from the MSBP is currently being employed in restoration and reintroduction programmes in the **U.K., USA, Australia, Madagascar and South Africa.**

Restoration of natural capital will become an increasingly important technology as the effects of climate change become more marked. **Botanic gardens are uniquely placed to enable these efforts.**

Kew

PLANTS PEOPLE
POSSIBILITIES

Enabling the use of plant
diversity



Rio Tinto subsidiary Quebec
Madagascar Minerals Littoral
Forest Restoration Programme

Training and advice in seed
collection, germination and on site
storage.

Species conservation plans and
long term storage for rare plants
on the mining path.

Conclusions

We have the ability to develop and share our skills with society to enable human **innovation, adaptation and resilience.**

Our challenge is to mobilise our global network of plant scientists in order to provide plant-based solutions to the environmental challenges that we all face.



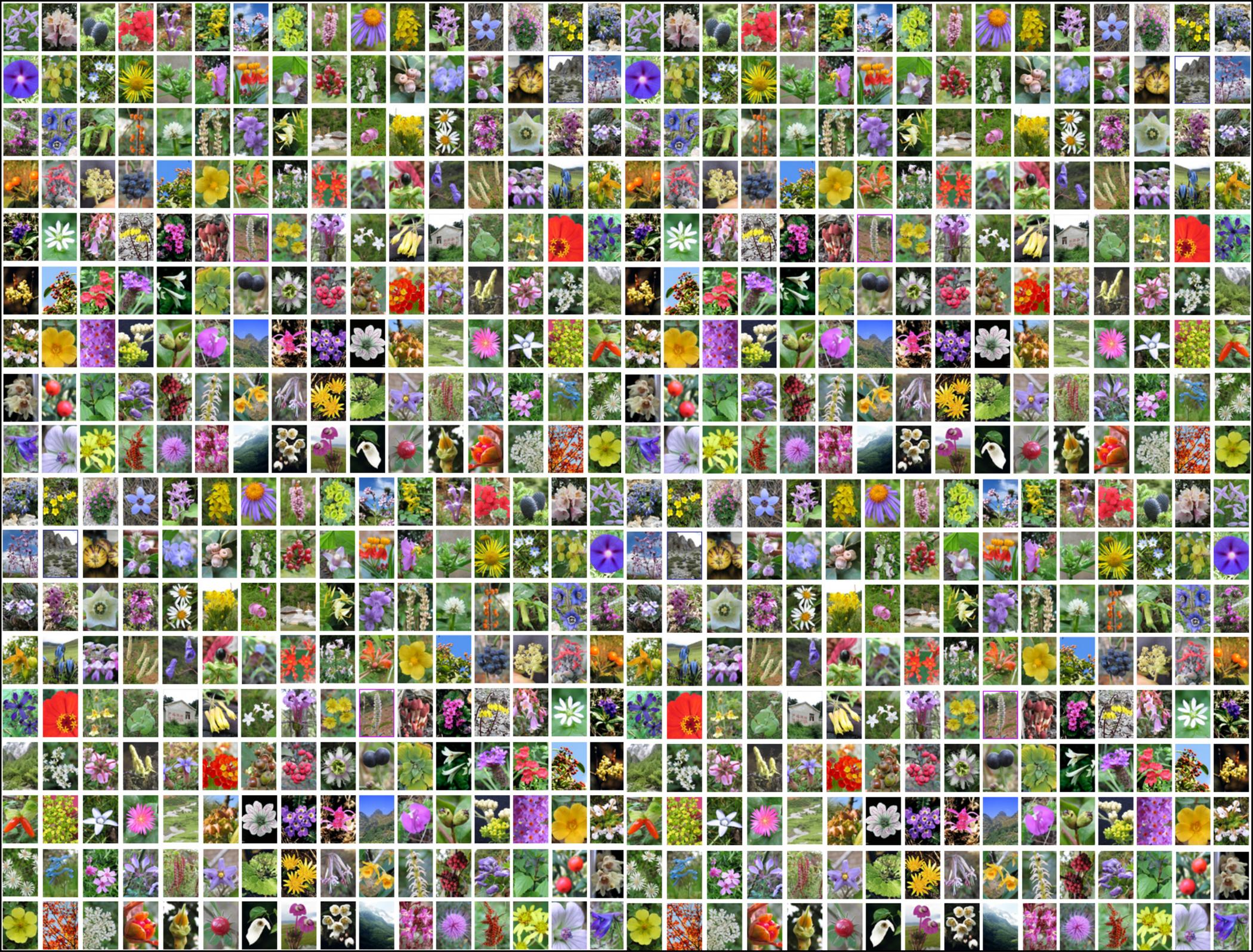
Conclusions

Give fools their gold and knaves their
power

Let fortune's bubbles rise and fall
Who sows a field or trains a flower
Or plants a tree is more than all

John Greenleaf Whittier (1807-1892)







PLANTS PEOPLE
POSSIBILITIES

Where is MSB-2?



- Full Business Case developed (£77 million over 10 years)
- Diverse funding model developed
- Restructuring of Seed Conservation Department planned
- Consultation with partners ongoing
- Fund raising campaign under way
- Scoping workshop for restoration ecology June 2008
- MSB strategy for restoration ecology being developed
- Scoping workshop for sustainable use November 2009
- MSB strategy for sustainable use being developed
- Key performance indicators being developed
- Project cycle management procedures being developed
- Transition planning and implementation on going
- Delivery of MSB-1 December 2009
- Commencement of MSB-2 January 2010.



PLANTS PEOPLE
POSSIBILITIES

Key questions for SoS



What role do you see the Millennium Seed Bank playing in Seeds of Success?

- No role at all
- Technical information exchange
- Duplicate curation, storage and testing of seeds
- Research collaboration
- Joint expeditions
- Joint enabling use initiatives (e.g. restoration projects)
- Policy support and advocacy
- Supporting each other in funding bids
- etc.

How should that role be formalized (or not)?