



Project MGU – The Useful Plants Project
Review Workshop Report
22-24 July 2014

ANNEXES



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Royal Botanic Gardens, Kew
Richmond,
Surrey
TW9 3AB

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Project MGU – The Useful Plants Project

Review Workshop

22-24 July 2014

Scientific Committee: Tiziana Ulian, Moctar Sacande, Paul Smith and Katherine Willis.

Organizing Committee: Tiziana Ulian, Moctar Sacande, Efisio Mattana, Alex Hudson, Serene Hargreaves, Kathy Gibbs, Mark Davis, Iain Taylor, Andrea Diez de Sollano and Annabel Narayanan.

Introduction

Kew's Millennium Seed Bank partnership is the largest *ex situ* plant conservation programme in the world which focuses on plants most at risk of extinction and which have important potential future use. Seeds are collected and stored in seed banks in their country of origin and duplicated in the Millennium Seed Bank in the UK.

Since 2007 Project MGU¹ - the Useful Plants Project (UPP) has been working with partners in Botswana, Kenya, Mali, Mexico and South Africa to conserve and sustainably use indigenous plants which are important to local communities. During the first phase of the project (2007 – 2010) over a thousand plants (1,223 *taxa*) were identified and prioritised through literature review and consultation with local communities; the seeds of ca. 600 useful plant species were conserved in seed banks; and over one hundred species (132 *taxa*) were propagated and/or planted in community gardens. All the targets set for the first phase of the project were exceeded and a second phase was developed using the recommendations derived from the first project review workshop held in Mali, 20-23 June 2010.

New activities and partners have been added to the project providing opportunities for local communities to develop sustainable income-generating activities and supporting the *in situ* conservation of useful plants through their reintroduction in managed areas. During its second phase (2011-2014) the project has been scaled up by doubling to 25 the number of local communities involved within the existing countries and by the inclusion of additional useful plants in the target list. The project has also been expanded into Burkina Faso and Malawi, where it has been linked to forestry activities.

To date, the project has acquired a reservoir of knowledge of over 1,300 plant species which are important to human well being and have the potential to contribute to poverty alleviation. It has also developed strong partnerships with a wide range of national partners and local

¹The name MGU reflects the generous support provided by the philanthropist who funds the work of the Useful Plants Project.

communities which have contributed to the sustainability of the project. Over half of the species have been secured in seed banks for long term conservation and work is being carried out to ensure they are available to local communities to sustain their daily subsistence needs.

The main objectives of the workshop are:

- To carry out a participatory evaluation of the project's achievements and to analyse its environmental and development impact;
- To discuss initiatives and proposals for future cooperation for tackling the knowledge gaps limiting plant conservation and people's livelihood, by using lessons learnt from initial phases of the project.

Workshop Themes

The workshop will comprise the following components:

- 1) *Presentation of project achievements*: UPP participants will be asked to prepare and send their country's reports in advance (by end of June 2014) and to present their project achievements on the workshop's opening day.
- 2) *Presentation of other relevant Kew projects*: Kew's staff will be presenting similar and/or complementary projects on the second day in order to identify similarities and potential synergies with UPP.
- 3) *SWOT analysis and way forward*: A SWOT (Strengths, Weaknesses, Opportunities and Threats) analysis of UPP will be carried out on the third day to complete the project evaluation and assess the needs and knowledge gaps which would affect significant and sustainable environmental and development impact. The way forward will be discussed in group sessions, including brain storming on initiatives and proposals for future cooperation (phase III of the project). Group findings will be shared with all the participants during a final plenary session.

The workshop will be attended by two external evaluators and their project review will be complemented with a visit to 1-2 project countries in order to assess the project's impact on the ground. The results of the workshop and these visits will form the basis of a Project Review Report.

Workshop Logistics

The workshop will take place on 22-24 July 2014. It will be a three day workshop and will be hosted by the Royal Botanic Garden, Kew, in Richmond (Tuesday 22 July 2014) and in the Millennium Seed Bank (MSB) at Wakehurst Place (23 and 24 July 2014).



Project MGU – The Useful Plants Project (UPP)

Review Workshop

22-24 July 2014

Programme

<p>Tuesday 22 July (Day 1) – RBG Kew, Richmond</p> <p><i>Jodrell Lecture Theatre, Jodrell Laboratory</i></p> <p><i>Chaired by Prof. Katherine Willis</i></p>	
10:30 – 11:00	<i>Tea and coffee</i>
11:00 – 11:05	Welcome (Prof. Katherine Willis, Kew)
11:05 – 11:15	Introduction to the workshop (Dr. Tiziana Ulian, Kew)
11:15 – 11:30	The MGU – Useful Plants Project: conservation and sustainable use of indigenous plants (Dr. Tiziana Ulian, Dr. Efisio Mattana, Alex Hudson, Dr. Moctar Sacande, Prof. Hugh Pritchard, Roger Smith and Dr. Paul Smith, Kew)
11:30 – 12:00	Project MGU-UPP Botswana (Dr. Keadire Mogotsi and Dr. Samodimo Ngwako, BCA)
12:00 – 12:30	Project MGU-UPP México (Dr. Rafael Lira Saade and Dr. Cesar M. Flores Ortiz, FESI-UNAM)
12:30 – 13:00	Discussion
13:00 – 14:00	<i>Lunch</i>
<p><i>Chaired by Prof. Hugh W. Pritchard</i></p>	
14:00 – 14:30	Project MGU-UPP Kenya (William Omondi, KEFRI, and Dr. Desterio Nyamongo, KARI)
14:30 – 15:00	Project MGU-UPP Mali (Abdoul K. Sanogo, Sidi Sanogo, IER, and Prof. Rokia Sanogo, DTM-University of Bamako)

15:00 – 15:30	Project MGU-UPP South Africa (Avhatakali Mamatsharaga and Lucy Shai, LNBG-SANBI)
15:30 – 15:45	Discussion
15:45 – 16:00	<i>Tea and coffee break</i>
16:00 – 16:40	Sustainable Uses of Plants: challenges and opportunities (Prof. Monique Simmonds, Kew)
16:40– 17:00	Optimising the use of pesticidal plants in Africa (Dr. Phil Stevenson, Kew)
17:00 – 17:15	Discussion
Wednesday 23 July (Day 2) – RBG Kew, Wakehurst Place <i>Seminar Room, Wellcome Trust Millennium Building</i>	
<i>Chaired by Dr. Paul Smith</i>	
10:00 – 10:40	The Great Green Wall project (Dr. Moctar Sacande, Kew)
10:40 – 11:00	Restoring soil fertility in the Bolivian Amazon: land tenure, development plans, livelihoods and a Mimosoid legume (Dr. Alex Monro, Kew)
11:00 – 11:30	<i>Tea and coffee break</i>
11:30 – 11:50	Forest and agriculture – a struggle for adaptation to globalized change in Peru (Oliver Whaley, Kew)
11:50 – 12:10	Bridging the knowledge gap between weavers and botanists in Indonesia (Dr. Rogier de Kok, Kew)
12:10 – 12:25	Discussion
12:30 – 13:30	<i>Lunch</i>
<i>Chaired by Dr. Tiziana Ulian</i>	
13:30 – 14:10	Seed Futures (Prof. Hugh W. Pritchard , Dr. Charlotte Seal, Dr. Tiziana Ulian and Ellie Wade, Kew)
14:10 – 14:30	The multidimensional values of useful plants in the Chimanimani TFCA (TransFronteer Conservation Area), Mozambique (Dr. Milagre Nuvunga, Micaia)
14:30 – 14:50	Kew’s Darwin Initiative funded Madagascar Agroforestry Livelihoods Project (Stuart Cable, Kew)
14:50 – 15:00	Discussion
15:00 – 15:30	<i>Tea and coffee break</i>

15:30 – 16:10	Enhancing the use of neglected and underutilised species through a holistic value chain approach: experiences from the IFAD NUS Project in Latin America and South Asia. (Dr. Stefano Padulosi, Bioversity International)
16:10 – 16:50	Towards the harnessing of the potentials of Plant Genetic Resources for Food and Agriculture , PGRFA: The Second Global Plan of Action and National PGRFA Strategy (Dr. Chikelu Mba, FAO)
16:50 – 17:00	Discussion
17:00 – 18:00	Internal meetings (Organizers and Reviewers)
Thursday 24 July (Day 3) – RBG Kew, Wakehurst Place <i>Seminar Room, Wellcome Trust Millennium Building</i> <i>(Chaired by Iain Taylor)</i>	
9:30 – 11:00	SWOT analysis
11:00 – 11:30	<i>Tea and coffee break</i>
11:30 – 13:00	Presentations and discussion of SWOT analysis
13:00 – 14:00	<i>Lunch</i>
<i>Chaired by Dr. Moctar Sacande</i>	
14:00 – 14:15	Monitoring and Evaluation for conservation and livelihoods projects (Catherine Mackenzie, Independent Consultant)
14:15 – 14:45	The Kew Foundation – Successful Fundraising from Trusts & Companies (David Tatham, Kew Foundation)
14:45– 15:15	Statutory fundraising - lessons learnt and case studies from Kew (Iain Taylor, Kew)
15:15 – 15:45	Discussion
15:45 – 16:00	Wrap up and next steps (Dr. Paul Smith)
16:00 – 17:30	<i>Farewell drinks (All)</i>

Background

The MGU - Useful Plants Project (2007 – 2015) uses an applied scientific approach to improve **plant conservation** and people's **livelihoods** across local rural communities in Mexico, Botswana, Mali, Kenya and South Africa. The project has brought together staff from the Royal Botanic Gardens, Kew, and a wide range of national scientific institutions, including Kew's Millennium Seed Bank partners, to help local communities tackle the **environmental challenges** threatening their livelihoods through the conservation and sustainable use of **indigenous plant species**.



Targeting and prioritising useful plants

1620 plant species were selected for importance to local communities through ethnobotanical surveys, literature reviews and community workshops.



Ex situ conservation of useful plants

704 seed collections of 637 species have been quality tested and banked in country and duplicated at the Millennium Seed Bank in the UK.



Propagation and conservation of useful plants in local communities

371 plant species have been propagated in country and 263 planted in local community and school gardens following technical training.



Research to enable conservation and sustainable use of plants

289 plant species are studied for ethnobotany, ecology, physiology, seed biology and biochemistry and phytochemistry and 20 students supervised.



Sustainable use and income generation from useful plants

37 plant species were selected to generate income through their sustainable use and commercialisation by local communities.



Supporting in situ conservation

16 plant species have been planted and are monitored in demonstration woodlots, restoration plots and sacred forests.



Acknowledgements

*The MGU - Useful Plants Project has been funded by MGU, a kind and generous philanthropist based in Spain. Matching funds have been provided by several sources to enhance project activities in country. This work has been possible thanks to our dedicated collaborators and communities in Botswana, Kenya, Mali, Mexico and South Africa, who are very gratefully acknowledged. Several Kew's colleagues have provided valuable technical and scientific support.





The MGU – Useful Plants Project Final Review Workshop

22-24 July 2014



Background

- The MGU – Useful Plants Project (UPP) grown from a proposal made to Kew’s Seed Conservation Department by a philanthropist based in Spain (MGU)
- Funded by MGU



Kew’s Millennium Seed Bank,
Wakehurst Place, UK




Background

- The MGU – Useful Plants Project (UPP) grown from a proposal made to Kew’s Seed Conservation Department by a philanthropist based in Spain (MGU)
- Funded by MGU
- Developed and managed by Kew’s Seed Conservation Department jointly with Millennium Seed Bank partners



Mexico, Mali, Kenya, Botswana and
South Africa




Background

- The MGU – Useful Plants Project (UPP) grown from a proposal made to Kew’s Seed Conservation Department by a philanthropist based in Spain (MGU)
- June 2007 – May 2011 (Phase I)
- 1st Project Review Workshop, Mali, June 2010
- June 2011 – May 2015 (Phase II)



Mali, June 2010




1st Review Workshop Main Conclusions

By Prof. Paul van Gardingen (UNESCO Chair of International Development and Director of Ecosystem Services for Poverty Alleviation Programme) and Dr. Hans H. Wahl (Director INSEAD Social Entrepreneurship Programme -ISEP).

UPP successful in each partner country, the relative achievements reflecting the skills of the national partners.

Two groups:

- Mali, Botswana and Kenya more successful in linking plants (biodiversity) and livelihoods (well-being)
- Mexico and South Africa more successful on the scientific work



1st Review Workshop Main Conclusions

Main challenges:

- Linking science and society (Mexico and South Africa)
- Scaling – up (Mali, Botswana and Kenya)



1st Review Workshop Main Conclusions

- Need of more social & economic skills
- Communities to become involved in the project design and delivery
- Long-term sustainability of project:
 - Economic entrepreneurship
 - Strategic partnerships (civil society, government, private sector)



Final Review Workshop Objectives

-  To carry out a participatory evaluation of the project's achievements and to analyse their environmental and development impact;
-  To discuss initiatives and proposals for future cooperation for tackling the knowledge gaps limiting plant conservation and people's livelihood, by using lessons learnt from initial phases of the project.

Final Review Workshop Themes

Day 1 | Presentation of project achievements by partners

Day 2 | Presentation of other relevant Kew's projects and externally invited speakers (Biodiversity International and FAO)

Day 3 | **SWOT** (Strengths, Weaknesses, Opportunities and Threats) analysis. Discussion on the way forward on initiatives and proposals for future cooperation (Phase III)



Kew **ROYAL BOTANIC GARDENS** **USEFUL PLANTS PROJECT**

The MGU – Useful Plants Project

Conservation and sustainable use of indigenous plants



Tiziana Ulian, Efisio Mattana, Alex Hudson, Moctar Sacande, Hugh Pritchard, Roger Smith and Paul Smith
Seed Conservation Department



Kew **ROYAL BOTANIC GARDENS** **USEFUL PLANTS PROJECT**

Purpose and main outputs

To enhance the capacity of local communities in Latin America and Africa to conserve and use sustainably indigenous plants



- Targeting and prioritizing useful plant species
- Seed collecting and banking
- Plant propagation and conservation in local communities
- Sustainable use and income generation
- Research for conservation and sustainable use

Botswana, Kenya, Mali, South Africa and Mexico

Kew **ROYAL BOTANIC GARDENS** **USEFUL PLANTS PROJECT**

Targeting and prioritizing useful plants

1620 useful plants (*taxa*)



Ethnobotanical surveys, literature review and community workshops

Kew **ROYAL BOTANIC GARDENS** **USEFUL PLANTS PROJECT**

Targeting and prioritizing useful plants

1620 useful plants (*taxa*)



Adansonia digitata (Baobab) Botswana, Kenya & Mali

Kigelia africana (Sausage Tree) Botswana & Kenya

Lippia graveolens (Mexican Oregano) Mexico

Tylosema esculentum (Moringa bean) Botswana

Schizolophyton yourenii (Mongongo nut) Botswana

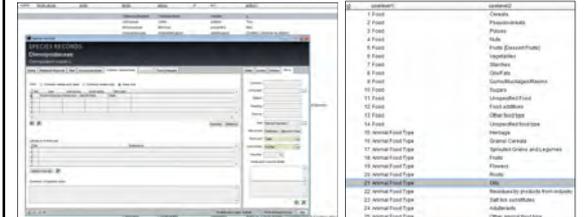
Adenium swazicum South Africa

Kew **ROYAL BOTANIC GARDENS** **USEFUL PLANTS PROJECT**

Targeting and prioritizing useful plants

UPP database 1620 useful plants (*taxa*)

- Categorisation using *Economic Botany Data Standard*
- Development of a uses section for BRAHMS (v 7)



PLANT SCIENCES UNIVERSITY OF OXFORD

Kew **ROYAL BOTANIC GARDENS** **USEFUL PLANTS PROJECT**

Seed collecting and banking

1202 seed collections of plant species made




Bauhinia petersiana Philenoptera violacea Kigelia africana Trichilia emetica

Kew **USEFUL PLANTS PROJECT**

Seed collecting and banking

Seed storage of 704 plant species in country with duplicates in Kew's Millennium Seed Bank (MSB), UK

Bauhinia petersiana *Philenoptera violacea* *Kigelia africana* *Trichilia emetica*

Kew **USEFUL PLANTS PROJECT**

Seed collecting and banking

Seed viability and germination of 610 plant species in partner countries and 452 at Kew's MSB

Jatropha mahajolensis

<http://data.kew.org/sid/>

Seed Information Database — SID

Seed biological trait data

Storage Behaviour, Mean 1000 Seed Weight, Seed Dispersal, Germination, Oil Content, Protein Content, Morphology, Salt Tolerance

Kew **USEFUL PLANTS PROJECT**

Propagation of useful plants

371 plant species propagated

Dioscorea strydomiana *Tylosema esculentum* *Azadirachta indica*

Kew **USEFUL PLANTS PROJECT**

Plant propagation in local communities

371 plant species propagated

Improving propagation facilities and training people in local communities

Kew **USEFUL PLANTS PROJECT**

Planting in local communities

263 plant species (52,305 seedlings) planted

25 rural communities and 36 schools

Kew **USEFUL PLANTS PROJECT**

Supporting *in situ* conservation

16 plant species planted in managed areas

- Demonstration woodlots (Kenya)
- Restoration plots (Mexico)
- Enrichment of sacred forests (Mali)

Prosopis juliflora
Acacia angustissima
Acacia eichlamensis

Kew **USEFUL PLANTS PROJECT**

Sustainable use and income generation

34 plant species selected to generate income for local communities

Kew **USEFUL PLANTS PROJECT**

Research for conservation and sustainable use

289 plant species researched and 20 students supervised

Kew **USEFUL PLANTS PROJECT**

Main outcomes

This project has confirmed the potential of biodiversity conservation to

- Support food security and human health
- Enhance community livelihoods
- Help local communities to face environmental challenges in a more sustainable way

"Biodiversity is the foundation for human well-being."

Millennium Ecosystem Assessment, 2005

The Millennium Development Goals by 2015

Supporting the MDG

- 1. Helping eradicate extreme poverty and hunger** – by working with local communities on livelihoods;
- 6. Combat HIV/AIDS, malaria and other diseases** – through discovery science of medicinal plants;
- 7. Ensuring environmental sustainability** - by reversing the loss of environmental resources through plant conservation and propagation;
- 8. Creating a global partnership for development** - making the benefits of new technologies available, especially information and communications.

1 Setting up nurseries selling plants, including fruit trees; adding value to species and market analysis;

6 Science of and establishing best practice for medicinal plant use;

7 *In situ*, on-farm and *ex situ* conservation; establishing nurseries for planting, including native trees;

8 Capacity building, sharing data, information and knowledge; and technology transfer.

USEFUL PLANTS PROJECT **MILLENNIUM SEED BANK PARTNERSHIP** **Kew**

Acknowledgements

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- This work has been possible thanks to our dedicated collaborators and local communities in Botswana, Kenya, Mali, Mexico and South Africa, who are very gratefully acknowledged.
- Several Kew's colleagues have provided valuable technical and scientific support.



UPP- Botswana
Indigenous Plant Resource Conservation for
Livelihoods Improvement
By
S. Ngwako and K. K. Mogotsi

Presented at UPP2 Review Workshop
21-24 July 2014



Outline

- Introduction
 - Results from UPP1
 - Project Goal, Purpose and Outputs
- Materials and Methods
 - Outputs/Indicators
- Results of the whole project
 - Output 1
 - Output 2
 - Output 3
 - Output 4
 - Output 5
- Conclusions
- Recommendations
- Acknowledgments



Botswana

- Approx 581,730 km²
 - 488,654 km² (84%) dry savanna or Kalahari desert
 - 17 000 km² of wetlands/the Okavango Delta, (Okavango river draining inland from Angola)
 - sand dunes: in south to south west
 - Vegetation: sparse grasslands, *Colophospemun mopane* woodlands in the north and *Acacia* species across the country
 - very fragile ecosystems



UPP Project Sites



Source: FCB (2010)



Botswana

- Mean annual rainfall:
 - 650 mm in the extreme north and north east (Okavango and Chobe districts)
 - 250 mm or below in the south west/western (Kgalagadi District)
- Temperatures :
 - Down to -4°C in winter
 - up to 40°C in summer



Botswana

- 2, 300-3,000 plant species, supporting
 - 164 mammals including 2,5 m humans
 - 157 reptiles,
 - 50 birds species,
 - a large numbers of insects
- Fragile ecosystem to produce food & services leading to
 - high levels of land degradation, deforestation, overgrazing & bush encroachment



Challenges

- Socio economic
- Biophysical

Lack of:

- policy on domestication, cultivation & conservation of indigenous plant species
- knowledge on & proper use for medicines, nutrition, domestication, cultivation & conservation
- markets & marketing (packaging, viability, storage/shelf-life) for those collected from the wild

- Extreme temperature (very cold winters and very hot summers)
- Lack of water around the country
 - Salinity in Tsetseng
- over-exploitation & unsustainable harvesting
- Damage by
 - wildlife
 - frequent forest fires



UPP1 Activities

1. Identification of plant species useful to local communities
2. Seed collection and *ex-situ* conservation
3. Plant propagation and nursery management,
4. Establishment of community gardens
 - ✓ Community Financial Resource Mobilization
5. Investigation of photochemistry and ecophysiology of selected plants
6. School activities to enhance education in:
 - science
 - agriculture
 - environmental education
 - Mathematics.



Community mobilisation - 2008




Community Engagement in the selection of Indigenous Plant Resources for domestication, cultivation and income generation

- Which plants do you desire to work with in your community?
- Do the plants have potential for cultivation?
- Why would you want to cultivate the species?
- Are there any taboos in collection and cultivation of these species?
- What are the uses of the plants?
- Which parts of the plants do you use?
- Which products do you expect to get from the plants?
- How do you want to work (individuals, groups?)
- Who is going to buy your products?
- How much would you sell the products?
- What should be role of government or the private sector?



UPP1 Results- 15 Plant Species Prioritized by Tsetseng and Pilikwe Communities

Plant Resources	Part Used	Use
<i>Tylosema esculentum</i>	Seeds, leaves and tuber	Food, medicine, environmental services
<i>Citrullus lanatus</i>	Fruit, seeds	Food, medicine, environmental services
<i>Ximenia caffra</i>	Fruits, leaves, stem, seeds	Food, environmental services
<i>Grewia flavescens</i>	Fruits, stem	Food, environmental services
<i>Kalaharietuber pfeilli</i>	fruiting body	Food, medicine, environmental services
<i>Cassia abbreviata</i>	Bark, leaves, roots,	Medicine, environmental services
<i>Elaeodendron transvaalense</i>	Bark, stem, and leaves	Medicine, environmental services
<i>Stomatostemma montivrae</i>	Fruits & tuberos roots	Food, medicine, environmental services
<i>Myrothamnus flabellifolia</i>	Leaves and twigs	Medicine, food, environmental services
<i>Sclerocarya birrea</i>	Fruits, barks, stem, seed, pulp	Food, medicine, environmental services
<i>Cucumis africanus</i>	Fruits	Food, environmental services
<i>Strychnos coccoloides</i>	Fruits, stem	Food, environmental services
<i>Adansonia digitata</i>	Fruits, stem, leaves, seeds	Food, fodder, medicine, cosmetics
<i>Schinus molle</i>	Fruits, barks and twigs, stem, seeds	Food, fuel, medicine, environmental services
<i>Colophospermum mopane</i>	Stem and twigs	Firewood, animal feed, environmental services



UPP1 Results

- 52 species planted (UPP, NTSC, Forestry, MSBP1) in the gardens:
 - ✓ 33 at Ithuseng Community Development Trust (Tsetseng)
 - ✓ 11 at Moselewapula Trust (Pilikwe),
 - ✓ 12 at Pilikwe Primary,
 - ✓ 10 at Tsetseng Primary
 - ✓ 30 at BCA
- 108 seed collections made
- 26 plant species propagated from seeds or cuttings
- 14 expeditions conducted
 - ✓ 6 with the MSBP1 team
 - ✓ 4 with communities
 - ✓ 4 with schools
- 14 government, and local and international NGO partnerships established
 - ✓ Some as a source of funds

 **UPP1 Results**  



Tsetseng Chief planting the first seedling of *Sclerocarya birrea*- morula - on 13 Feb 2009



Village Chief's seedling healthy and surviving on 20 March, 2009

 **UPP1 Results: Financial Resource Mobilization**  

Forest Conservation Botswana (FCB)

- **Ithuseng Community Development Trust (Tsetseng)**
 - Funded P318 080.00 (3 years)- Cultivation of Multipurpose trees using saline water in Kweneng West (2010)
 - Established a new garden and fence
 - Provided additional funds in 2012/2013
 - ✓ P196 008.00 to drill a borehole for water
 - ✓ P108 084.00 to equip the borehole with solar panels
 - ✓ **Total funding P622, 172.00**
- **Moselewapula Trust (Pilikwe)**
 - Funded P276 880.00 (3 years)- Cultivation and value addition of medicinal plants in Tswapong
 - New garden established
 - Additional P30,000.00 for storeroom (2012)
 - ✓ **Total funding P306, 880.00**

 **UPP1 Expedition with Tsetseng community**  





 **UPP2 :Goal, Purpose and Outputs**  

GOAL

- To ensure that
 - welfare of local communities is improved
 - useful important plants are safeguarded from extinction in Botswana

Purpose

- Conservation and sustainable use of plants for human wellbeing in Botswana.

 **UPP2 Summary**  

- 10 strategic partnerships formed at national and international levels.
- 30 plant species banked (*ex-situ*) at RBG Kew's Millennium Seed Bank (MSB); 65 banked in Botswana.
- 59 germination tests conducted using three protocols at BCA (sand, compost, and 50% sand:50% compost mixture).
- 54 plant species planted and maintained in community gardens.
- 15 more plant species prioritized for domestication, value adding and income generation in Shaikarawe & other communities across.
- Borehole drilled and equipped in Tsetseng, co-funded by UPP & FCB.

 **Material & Methods**  

Output 1: Project Planned, monitored & effectively implemented

- Existing partnerships consolidated and at least 1 new relevant partnership established and integrated into the project.
- The project documents, log-frame, budget, management structure and work plan agreed and finalized by November 2011.
- Mid and annual country reports submitted to RBG Kew every six months.
- In addition to UPP, other sources of funds mobilized for project activities.



Material & Methods



Output 2: Species conserved ex situ

UPP-Botswana targeted:-

- 150 useful species compiled into a cumulative list.
- 80 seed collections of priority useful plant populations made and held at international standards in Botswana and duplicated in RBG Kew's MSB.
- 80 seed collections assessed through seed testing (viability, germination & storability tests).



Material & Methods



Output 3: Species propagated & conserved in the communities

- 80 priority useful species propagated in community/school gardens.
- 2 additional communities/community groups (to the existing two (2) incorporated into the Project.
- 10 priority useful species (50,000 seedlings) planted and maintained in 4 local communities/schools.
- 2 additional school programmes enhanced through the involvement of 4 schools and 400 children in the communities.
- At least 25 priority useful plant species to be planted *in-situ*.
- Research on at least 25 useful plant species to enhance their conservation and sustainable use in local communities.



Material & Methods



Output 4: Sustainable use and income generation from useful plants

- Partnerships strengthened for scaling up UPP activities: financial support, and human resource development in the communities as well as staff for Project and community engagement to improve sustainability.
- Sustainable use and marketing (product, pricing, place) of at least 30 useful plants (seeds/seedlings/part of plants) or their plant products promoted for income generation in the communities.



Material & Methods



Output 5: Information disseminated & project promoted

- Information derived from the project compiled, updated, organized and disseminated at the local, national and international level through workshops, posters, participation in fairs and public activities, journals, press releases, etc.
- Project exposure enhanced through the generation of publicity material at the local, national and international level



Results



Output 1: Project Planned, monitored & effectively implemented

- UPP1 : 14 partners
- UPP 2: 10 new partnerships established (Target was 1)
- Total 24 national and international partners



Results



Output 2: Species conserved ex-situ

- UPP2- Botswana collated cumulative list of 244 useful plant species - 94 more than the target.
- The total cumulative target list achieved by the project (UPP1 +UPP2) is 352 plant species (15% of the Botswana flora).
- 178 total (UPP1+UPP2) seed collections made:
 - 133 have been banked in country.
 - 48 have been banked at RBG, Kew.
 - 55 were dispatched to RBG, Kew in July 2014



Results

Output 3: Species propagated and conserved in the communities

- 4197 seedlings of 53 plant species propagated in UPP gardens
 - ✓ Target not achieved due to lack/saline water
- Shaikarawe & Kacgagae (New Xade) incorporated in UPP
- Communities training Communities
 - ✓ Tsetseng training other community in modern seed oil extraction, soap making (value adding) & vegetative propagation
 - ✓ Shaikarawe community exchanged indigenous knowledge on cracking of *Schinziophyton rautanenii* (mungongo) seed

Indigenous knowledge: *Schinziophyton Rautanenii* (mungongo) processing-57% oil

School Projects

- Enhancing learning in science, agriculture and environmental science for grade 5 pupils
- Darwin's celebration of 200 Birthday (2009)
- The Great Plant Hunt
- Three schools:
 - Tsetseng
 - Pilikwe
 - Kacgae
- Activities undertaken are: Seed collection, seed cleaning, propagation, planting and conservation in the Great plant Hunt Treasure toolkit.
- Maintenance of the garden by pupils and use of the garden as teaching aid.
- Improvement in school results in grade 7.

Pupils and learning

Output 4: 4- 10 plant species prioritized by communities for domestication, cultivation and commercialization

Community	District	Year Consulted	Top 4- 10 prioritized plant species for domestication, cultivation and commercialization
Tsetseng	Kweneng	2008	<i>Tylosoma esculentum</i> , <i>Citrullus lunatus</i> , <i>Ximenia coffra</i> , <i>Grewia retinervis</i> , <i>Kalahariuber pfeilli</i>
Pilikwe	Tswapong	2009	<i>Cassia abbreviata</i> , <i>Elaeodendron transvaalense</i> , <i>Stomatostema monterroae</i> , <i>Myrothamnus flabellifolius</i> , <i>Sclerocarya birrea</i> , <i>Strychnos cocculoides</i> , <i>Adansonia digitata</i>
Ditshagwane	Kweneng	2011	<i>Tylosoma esculentum</i> , <i>Citrullus lunatus</i> , <i>Boscia aibitrunca</i> , <i>Bauhinia petersiana</i>
Shaikarawe	Ngamiland	2012	<i>Schinziophyton rautanenii</i> , <i>Securidaca longipedunculata</i> , <i>Shakawe</i> , <i>Pterocarpus angolensis</i> , <i>Ochna pulchra</i> , <i>Strychnos pungens</i> , <i>Strychnos cocculoides</i> , <i>Guibourtia coleosperma</i> , <i>Grewia flavescence</i> , <i>Dialium englerianum</i>
Tsomyane	Southern	2012	<i>Tylosoma esculentum</i> , <i>Grewia flava</i> , <i>Grewia retinervis</i> , <i>Kalahariuber pfeilli</i> , <i>Harpagophytum procumbens</i> , <i>Bauhinia petersiana</i> , <i>Boscia aibitrunca</i>
Lefhoko	Southern	2012	<i>Tylosoma esculentum</i> , <i>Grewia flava</i> , <i>Grewia retinervis</i> , <i>Boscia aibitrunca</i> , <i>Kalahariuber pfeilli</i> , <i>Strychnos cocculoides</i>
Maokane	Southern	2012	<i>Tylosoma esculentum</i> , <i>Grewia flava</i> , <i>Opuntia species</i>
Thankane	Southern	2012	<i>Tylosoma esculentum</i> , <i>Grewia flava</i> , <i>Harpagophytum procumbens</i> , <i>Boscia aibitrunca</i>
MEKGATSI Trust of 11 villages	Southern	2012	<i>Tylosoma esculentum</i> , <i>Grewia flava</i> , <i>Grewia retinervis</i> , <i>Kalahariuber pfeilli</i> , <i>Harpagophytum procumbens</i> , <i>Bauhinia petersiana</i> , <i>Boscia aibitrunca</i>

 **Output 4: Some oil seeds**  

Tylosema esculentum *S. rautanenii* Tree: 57% oil seed
 Perennial tuber, 42% oil seed



 **Output 5: Information disseminated & project promoted**  

- Information dissemination through:
 - ✓ shows, workshops, national dialogues, press release, television appearances, and meetings at project sites
 - ✓ national and international conferences
 - ✓ articles on useful plants such as publication in conference proceedings and journal articles
 - ✓ Policy fora such Vision 2016 engagement
 - ✓ Strategic partners at national and international levels

 **Conclusions**  

- UPP Botswana has made an impact in development of knowledge, skills, empowerment and conservation, for utilization (cultivation, value adding and income generation) of indigenous plant resources.
- Policy development institutions such as Vision 2016 Council and Botswana Institute for Development Policy Analysis (BIDPA) have been attracted to and adopted UPP activities in their strategies.

 **Conclusions**  

- Communities (Tsetseng, Pilikwe, Shaikarawe and New Xadi) have been highly involved with the projects.
- Pilikwe, Tsetseng and Kacgae Primary Schools' Primary School Leaving Examination (PSLE) results (Grade 7) have improved due to participation in UPP school activities.
- Communities in the marginal areas of Botswana have gained knowledge and skill in the modern/scientific methods of research, cultivation, value adding, processing, packaging and marketing of products derived from indigenous plants

 **Recommendations**  

- The UPP Botswana recommends continuation of UPP in order to ensure project sustainability in community livelihoods improvement as well as infrastructural development.
- UPP continues to support national and international institutions that support government of Botswana in poverty eradication efforts using indigenous plant resources.
- UPP Botswana therefore, plans to continue its involvement with for example Vision 2016 activities and MSPB2 as well as other issues on conservation and sustainable development of indigenous plant resources.

 **Acknowledgments**  

- MGU, RBG, Kew for funding this project
- Communities of Tsetseng, Pilikwe, Shaikarawe, New Xadi, and Tsetseng, Pilikwe and Kacgae primary schools for engaging in the project.
- Government of Botswana through various ministries and departments, non-governmental organizations and international organizations for supporting UPP financially and in kind.
- Without the help of all the above, the UPP activities would not have been achieved.



THANK YOU







MGU/Useful Plants Project (UPP 1 and UPP 2) – Mexico 2007-2014

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Introduction

Rational

The Project is lead by the Facultad de Estudios Superiores Iztacala-UNAM,. It has been carried out in three communities that form the Comisariado Ejidal San José Tilapa (Guadalupe Victoria/Pueblo Nuevo with 437 inhabitants, San Rafael with 261 inhabitants and San José Tilapa with 1977 inhabitants). This is located in the semiarid region of Coxcatlán Municipality in the state of Puebla. This is also part of the Tehuacán-Cuicatlán Biosphere Reserve, which is located in the states of Puebla and Oaxaca in South-Central Mexico.




The region was chosen because of its ethnobotanical importance, the teams area of expertise (ca. 10 years of ethnobotanical, phytochemical and physiological work), and especially because of its relevance in the biological and archaeological history of the domestication of corn.

860-910 m.a.s.l. climate semi-arid to arid, mean annual temperature 22 °C annual precipitation 394.6 mm, dominant vegetation thorn scrub forest




Introduction

UPP1 Results



Activities only in the community of San Rafael - seed collection, ethnecology, phytochemical and physiological studies, propagation training to local people, construction of a rural greenhouse.

Phytochemical studies on 19 medicinal plants which proved the existence of plant compounds which justify their use in traditional medicines in San Rafael

Physiological studies on 5 species completed with the optimal conditions for seed germination established and the effects of different irradiation levels and watering regimes on metabolites discovered.

132 plant species collected (96 are useful plants, and 17 recognized as high priority species by the people)

Ethnecological studies documented the distribution, abundance and availability in space and time of useful plants.

22 students participated in field and/or laboratory activities (6 bachelor and 2 masters degrees obtained), with our results published in 3 papers

Poor results in propagation and training to local people





Introduction

Goal and Purpose

1. To document the ethnecological information of useful plants in the area and to collect seeds for their cultivation and conservation in seed banks. The most important useful native plant species are selected jointly with the communities, considering mainly their medicinal use but also some other important uses.
2. To support the conservation and sustainable use of selected species through research to: 1) Determine the biological activity and different phytochemical compositions of the species in order to contribute to the validation of the associated traditional knowledge in the communities, 2) Study the physiology and propagation of the species in greenhouses and orchards.
3. To generate infrastructure in the communities and to train local people in plant conservation and propagation techniques.
4. To propagate endemic plant species of high importance to local people, especially those species with high conservation priority – i.e. with a low population density or a fragmented population distribution.
5. To reintroduce selected species to the wild and to develop restoration projects in the region, as well as to promote ecotourism activities linked to the sustainable use of the plants.





Introduction

Outputs

Output 1: Project planned, monitored and implemented effectively
Output 2: Species conserved ex situ
Output 3: Species propagated and conserved in the communities
Output 4: Sustainable use and income generation
Output 5: Research and capacity building
Output 6: Information disseminated and project promoted







Material & Methods

Output / Indicators 1/2

Output 1: Project planned, monitored and implemented effectively
 Existing partnerships consolidated and at least one new relevant partnerships established and integrated into the project within 6 months.

Output 2: Species conserved ex situ
 Target list of 100 useful species with relevant information agreed within 1 year.

At least 200 seed collections of priority useful plant populations made and held according to international standards in seed banks in Mexico and duplicated in RBG, Kew's Millennium Seed Bank (MSB) in the UK by the 3rd year of the project.

A total of 100 seed collections assessed through seed testing (viability, germination, storability).

Material & Methods Output / Indicators 2/2



Output 3: Species propagated and conserved in the communities

20 priority useful species (20,000 seedlings) propagated by the 3rd year of the project.

Reintroduction assays for, at least, six propagation protocols.

Capacity building to local people by means of 5-6 workshops in three communities, to propagate and conserve plants through training and the improvement of local facilities.

School programme enhanced through the involvement of three schools and 100 children in the communities.

Output 4: Sustainable use and income generation

At least 20 priority useful plant species promoted for income generation.

Output 5: Research and capacity building

At least 5 priority useful species will be studied.

Output 6: Information disseminated and project promoted

Scientific papers, one field guide, one press article, six technical sheets of useful species, three posters, one diffusion paper and one chapter in the book about UPP 1 will be produced.

Results of the whole project



Output 1: Project planned, monitored and implemented effectively

October 13 / 2011 we signed the agreement to develop the project during three years in the communities of San Rafael, San José Tilapa, and Guadalupe Victoria / Pueblo Nuevo (latter are two are the two new communities) to

- 1) Collect seeds and specimens of useful plants
- 2) Carry out research activities (Plant Physiology, Phytochemistry, Ethnobotany, Ecological Restoration)
- 3) Train in propagation and conservation (adults, teachers, children and young people of 9 schools were involved)

San José Tilapa: Frida Kahlo and Rubén Darío Kinder Gardens; Francisco Ferrer Guardia Elementary School; Secundaria Técnica No. 95 and Preparatoria Fray Pedro de Gante High Schools.

San Rafael: Niño Artillero Kinder Garden and Aquiles Serdán Elementary School.

Guadalupe Victoria / Pueblo Nuevo: Nezahualpilli Kinder Garden and Florencio Villarreal Elementary School.



Results of the whole project



Output 2: Species conserved ex situ

216 seed collections (182 useful species of the region)
Germination tests for 139 of these species

In 2013, the authorities of the Comisariado Ejidal unilaterally banned the access to collect, whilst allowing the continuation of other Project activities. Seed collection continued in different parts of the Tehuacan-Cuicatlan Biosphere Reserve.



Results of the whole project



Output 3: Species propagated and conserved in the communities

Propagation. 28,932 plants (21 spp.) propagated/6,019 (16 spp.) survived/1,530 planted by children and young students in homegardens and in a new Botanic Garden

Species	2012		2013		2014	
	Seedlings generated	Survived plants	Seedlings generated	Survived plants	Seedlings generated	Survived plants
1. <i>Agave attenuatus</i>	120	60	80	80	200	10
2. <i>Agave attenuatus</i>	80	40	400	80		
3. <i>Alphitonia glabra</i>	80	40	100	10		
4. <i>Andropogon scoparius</i>						
5. <i>Andropogon scoparius</i>	200	0			400	10
6. <i>Andropogon scoparius</i>			400	70		
7. <i>Andropogon scoparius</i>			1000	100		
8. <i>Andropogon scoparius</i>			1000	200		
9. <i>Andropogon scoparius</i>	1000	0			400	0
10. <i>Andropogon scoparius</i>	100	100			200	10
11. <i>Andropogon scoparius</i>	100	10				
12. <i>Andropogon scoparius</i>	100	10				
13. <i>Andropogon scoparius</i>	100	10				
14. <i>Andropogon scoparius</i>	100	10				
15. <i>Andropogon scoparius</i>	100	10				
16. <i>Andropogon scoparius</i>	100	10				
17. <i>Andropogon scoparius</i>	100	10				
18. <i>Andropogon scoparius</i>	100	10				
19. <i>Andropogon scoparius</i>	100	10				
20. <i>Andropogon scoparius</i>	100	10				
21. <i>Andropogon scoparius</i>	100	10				
TOTAL	15000	1000	10000	800	7000	1000

Results of the whole project



Output 3: Species propagated and conserved in the communities

Reintroduction assays. Although it was not possible to carry out the reintroduction assays, two diagnostic projects for restoration were finished. One of them, developed by the two people of the Universidad de Alicante and one UNAM Professor, proposed an active restoration strategy, while the other, performed by the two professors and students of Facultad de Ciencias, UNAM, proposed a passive restoration strategy.



The results and conclusions of both projects were presented to the authorities of the Comisariado Ejidal. Which strategy to focus on has not been selected.

Results of the whole project



Output 3: Species propagated and conserved in the communities

Capacity building of local people. 87 workshops and similar activities have been held in the three communities. These focused on plant propagation and conservation activities, as well on the preparation of natural products and food.

The workshops were carried out in the local community greenhouse located in San Rafael, as well in the schools or sometimes in the field.

In total, more than 2,500 people (children, young adults and adults) attended these workshops.



Conclusions



4. Our academic production was on average the same in the two phases, although slightly better in UPP 2 in regards to thesis and scientific publications. Physiological and phytochemical studies allowed us to significantly expand our knowledge and understanding on how to propagate several species in rural conditions, and allowed us to confirm the traditional knowledge of several plants used as medicinal plants through the existence of phytochemical compounds.

5. Regarding seed collection and banking, although we had collection problems, we believe that the objectives of the number of species was almost achieved. Nevertheless, we are convinced that the useful plants of the region are still poorly represented in the seed banks of Mexico and RBG, Kew.

6. The main issue we could not resolve was with the commercialization of plants and other plant products. Internal political problems in the region has been the main obstacle which could not be resolved. As previously mentioned this objective might be completed in future but is currently difficult to complete.



Acknowledgments



To the people (especially the children, women and school teachers) and authorities of the three communities (San Rafael, Guadalupe Victoria / Pueblo Nuevo and San José Tilapa) of the Comisariado Ejidal de San José Tilapa who allowed us to carry out the project

To the authorities of the Biosphere Reserve Tehuacán-Cuicatlán for their help to solve different problems with people in the communities.

Special thanks to "Mrs. MGU" for the financial support but especially for the idea to do a project like this in our country.



Useful Plants Project (UPP)



Kenya component

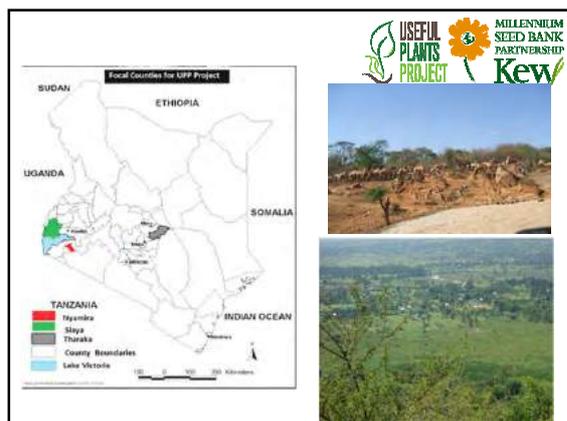
Review workshop
22-24 July 2014

William Omondi and Desterio Nyamongo

Outline



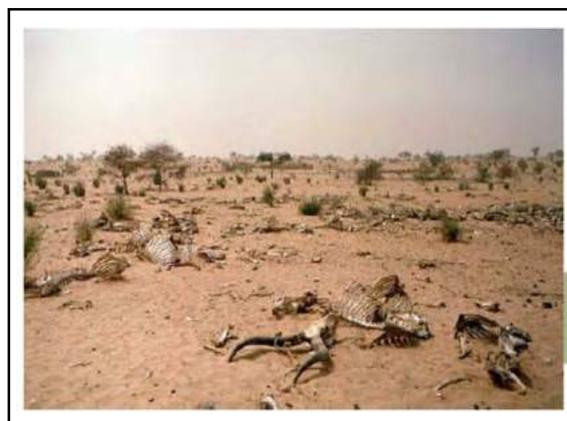
- Introduction
 - Rational
 - Results from UPP1
 - Project Goal, Purpose and Outputs
- Materials and Methods
 - Outputs/Indicators
- Results of the whole project
 - Output 1
 - Output 2
 - Output 3
 - Output 4
 - Output 5
- Conclusions
- Acknowledgments



Introduction Rational



Threats : habitat loss, over-harvesting, charcoal burning, poverty, poor land use and policy



Local partners



- Kenya Forestry Research Institute (KEFRI)
- Kenya Agricultural Research Institute (KARI)
- National Museums of Kenya (NMK)
- Communities

Introduction UPP1 Results



1. Medicinal plant species in Kenya documented and prioritized
2. 318 seed accessions collected out of which 160 accessions duplicated at the MSB.
3. Studies on screening of active ingredients and tissue culture on two plant species developed



Introduction UPP1 Results



4. Data and protocols necessary for commercial exploitation of selected medicinal plants compiled
5. Networking among stakeholders enhanced
6. Project activities disseminated through print and electronic media



Introduction



Goal

•Welfare of local communities improved and useful important plants safeguarded from extinction in Latin America and Africa

Purpose:

•Conservation and sustainable use of plants for human wellbeing

Material & Methods Output 1 / Indicators



Project planned, monitored and implemented effectively

- Existing partnerships consolidated and at least 3 new relevant partnerships established
- Project documents (logframe, budget, management/staff structure and work plan) agreed and finalized with partners
- Country biannual reports submitted to RBG Kew every six months
- Project reviewed by the 2nd year of the project

Material & Methods Output 2 / indicators



Species conserved ex situ

•Target list of 300 useful species with relevant information developed in-country within 1 year by the end of the first year

•At least 600 seed collections comprising 300 species collected and effectively conserved and duplicated by third year of the project

•Quality of 150 seed collections assessed through seed testing (germination and storage potential) in-country and at Kew's MSB by the end of the project

Material & Methods Output 3 / Indicators



Species propagated and conserved in the communities

- 60 priority useful species (120,000 seedlings per site) propagated by the third year of the project
- At least 6 additional community groups engaged and integrated into the project by June 2012
- 60 priority useful species (120,000 seedlings per site) planted and maintained in at least 6 local community groups by the 3rd year of the project
- 12 experimental woodlots established and monitored at each of the project sites (4 at each site) initiated by year 1
- Capacity of 120 local community members to propagate and conserve plants enhanced through training and the improvement of local facilities

Material & Methods

Output 3 / Indicators



Species propagated and conserved in the communities

- 12 experimental woodlots established and monitored at each of the project sites (4 at each site) initiated by year 1
- Capacity of 120 local community members to propagate and conserve plants enhanced through training and the improvement of local facilities
- School programme enhanced through involvement of 15 schools totaling 3000 children in communities

Material & Methods

Output 4 / Indicators



Support to in situ conservation and use

- At least 40 priority useful plant species (2000 per species) planted (80,000 seedlings) *in situ* (managed areas) in 3 project sites
- Rehabilitation protocols developed for degraded sites in each of the 3 project sites

Material & Methods

Output 5 / Indicators



Sustainable use and income generation from useful plants

- Sustainable use and marketing of at least 6 plant based enterprises and 2 livelihood options (seeds / seedlings / part of plants) promoted for income generation (fish ponds, bee hives, dyes and basketry) in 3 project sites by end of project.

Material & Methods

Output 6 / Indicators



Information disseminated & project promoted

- Information derived from the first phase of Project MGU updated and disseminated to all project partners
- Awareness of project enhanced through the generation of publicity material at the local, national and international levels by the end of project



Results of the whole project

Output 2

Species conserved ex situ

- Cumulative target list with 491 useful species identified out of which 442 seed collections of priority species made
- All the seed collections tested (viability, germination, storability)



Results of the whole project

Output 3

Species propagated and conserved in the communities

- 20 priority useful species propagated and 5 propagation protocols developed
- 100,000 seedlings produced in community nurseries
- 20,000 seedlings planted and maintained in 11 schools



Results of the whole project

Output 3

Species propagated and conserved in the communities

- 6 training programmes, 4 workshops and 10 nurseries established in community land
- Supported 40 vulnerable children by paying fees and providing uniforms



Results of the whole project

Output 4

Support to in situ conservation and use

- Exercise put on hold pending legal issues



Results of the whole project

Output 5

Sustainable use and income generation from useful plants

- Community groups linked to various user groups such as the Traditional Healers Association, County governments, NGO'S and other tree planting programmes.
- 30,000 seedlings of assorted species worth Ksh 260,000 (\$ 3,500) sold by communities.

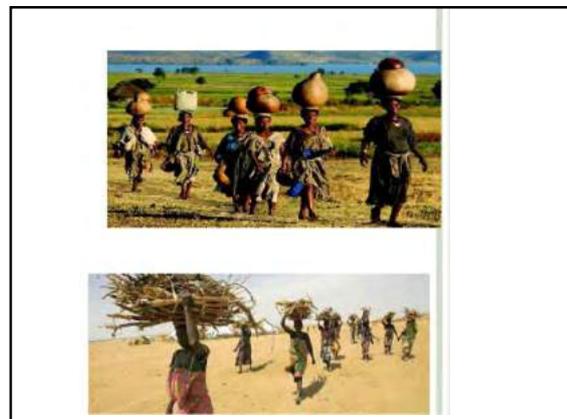


Results of the whole project

Output 5

Sustainable use and income generation from useful plants

- Some community groups sold seed of to KEFRI through the public private partnership policy of the Institute
- Demand for fruits of *Garcinia buchananii* and *Dovyalis macrocalix* and several plants with proven medicinal and food value such as Moringa enhanced after demonstrating their use to members.





Conclusions
The project

Contributed to increase in tree cover by promoting tree planting culture

Improved the knowledge and capacity of target communities in the propagation use and value of plants



Way forward

1. Upscale activities
1. Involving more schools
2. Focus on markets and value addition
4. Train through exchange programmes




Acknowledgments



1. Local communities and elders

1. All Institutional partners

2. International co-ordinator and staff

3. Donor

Project MGU /Useful Plants Project (UPP)

Review Workshop
22-24 July 2014; Wakehurst, UK

Country : MALI
Collaborator(s) : A. K. Sanogo, S. Sanogo , Prof. R. Sanogo

Introduction

Rational

Rural populations of Mali still depend on plants to satisfy their primary needs for medication, food, fuel wood and construction.

Despite the dependence of the local communities on natural resources, climate change combined with over exploitation mean that ecosystems are weakened and biodiversity reduced. Since 2007, seed conservation and propagation, reforestation and sustainable management of plants has been introduced to the rural communities by Project MGU-the Useful Plants Project (UPP) of RBG Kew's (MSB)



Introduction

UPP1 Results

During the first phase (UPP1) :

- 323 useful plant species (woody and herbaceous) were identified through surveys.
- 5 ha of arboretum were planted with 45 woody and herbaceous species.
- 2 sacred forests were restored and enriched by planting 12 species.
- To improve medicinal plant exploitation, the chemical composition studies were completed of 10 medicinal plants, frequently used by the traditional healers
- All the local communities and organisations included in the project have been trained in plant propagation techniques, planting and the uses of the parts of medicinal plants.



Introduction

Goal, Purpose and Outputs

The aim of the «Useful Plants Project» is the sustainable management of plants by local communities and the preservation of biodiversity

The objectives of the project are to:

- Identify useful and/or threatened plants, according to the desires and needs of local communities;
- Collect and conserve plant material (seeds, plants, cuttings, bulbs, etc.) of those useful plants;
- Install and maintain arboreta containing medicinal plants, food plants and plants used to produce other plant products;
- Restore and enrich natural habitats with the support and the participation of local communities and organisations;
- Determine the chemical constituents of the medicinal plants and study their biological activity in order to improve harvesting practices.

Material & Methods

Output / Indicators 1/2

Output 1. Project implementation and planning

In UPP2, meetings were undertaken with targeted communities to identify and plan activities. It was determined that UPP2 consolidate the achievements of UPP1 with continued regular monitoring of new and old activities.

Output 2. Species conserved *ex situ*

The approach and protocol outlined by the RBG, Kew's MSB programme was used for seed collection and conservation activities. Targeted species were identified through the surveys. Harvested seeds have been used for seedling production and to supply village nurseries. Samples of seeds were conserved in freezers and in ventilated rooms in the laboratory. Germination tests were conducted in the laboratory and nurseries.

Output 3. Species propagated and conserved in the communities

Partner communities were retained based on their commitment, their level of organisation and on the availability of secure land. The project supplied seeds and seedlings to the forestry service, NGOs, schools, associations and individuals in the regions covered. Experimental designs of field activities depended on the species and objectives. Plots were monitored and maintained by communities. Survival rates and growth rates were assessed at the beginning and end of rainy seasons.

Material & Methods

Output / Indicators 2/2

Output 4. Sustainable use and income generation from useful plants

Income generation activities consisted of intercropping (cash crops cultivated within plantations) and fruit processing. At Ifola, the women associations produced peanuts, soya and sesame between lines of trees. They were also trained on to process *Carapa procera* and *Khaya senegalensis* and to make soap. Two women's groups from Filamana and Kokélé were trained to harvest seeds and to dry leaves of *Lippia multiflora*. In the DMT laboratory 10 medicinal plants were tested for efficacy and biological action of their chemical compounds.

Output 5. Information, dissemination and promotion of the project

Project results have been disseminated at IER and CNRA annual meetings (Program Committee and Scientific Commission), at dissemination workshops, through written biannual reports submitted to for RBG, Kew and during inter-community visits. All communities and organisations were trained in plant propagation techniques, planting and the uses of the parts of medicinal plants.



Results of the whole project Output 1



Survey and identification of medicinal plants

An ethnobotanical survey has been carried out with several socio-professional organisations (therapists, herbalists, nurserymen, gardeners, artisans, farmers, etc.) to produce a target list of species important for the local communities. The data from this survey have been compiled into a bibliographic review. In total, 323 woody and herbaceous species have been listed: 98% are medicinal and food plants, 2% are fodder species and 26% are crafts plants (dyeing, sculpture and carpentry). Among medicinal plants the most used plant parts are the leaves, roots and bark.



Results of the whole project Output 2



Establishment of useful plant gardens and copses in the communities

Sites	Year	Area (ha)	Number of species	Number of plants	Note
Zégoua	2008	1	25	702	Medicinal plants garden
Kougué	2008	1	23	642	Medicinal plants garden
Ifola Men	2009	1	19	614	Medicinal plants garden
Yanfolilla	2009	1	18	418	Medicinal plants garden
Tori	2009	0,5	12	120	Useful plants copse
Ifola Women	2011	2	2	416	Useful plants copse
Katéle	2011	1	9	225	Useful plants copse
Sesso	2012	1,5	9	230	Useful plants copse
Kokélé	2012	1	5	660	Useful plants copse
Total		10		4027	

Results of the whole project Output 2



Restoring the sacred forests in the village territories

Sites	Year	Area (ha)	Number of species	Number of plants
Zégoua	2008	8	6	180
Founa	2009	30	9	650
Fourou	2011	11,5	11	950
Kolôgo	2012	4,5	8	285
Koumantou	2012	6,8	7	640

The sacred forests are local natural plots which have been demarcated for public or individual ritual ceremonies in villages. These sacred forests are of conservation value and are threatened as a result of the negative impacts of climate change and the extension of people's habitations. With the communities' participation, 5 sacred forests of 61 hectares have been restored with enrichment planting of 15 useful species.

Results of the whole project Output 2



Three years after planting some species have started to fruit



Anthocleista kerstingii in fruit in Zégoua



Acacia senegal in fruit in Yanfolilla

Results of the whole project Output 3



Sustainable use and income generation from useful plants

- Two stands of *Lippia multiflora* were identified in Filamana (Yanfolilla) and are being harvested by the women's association.
- Ifola women were trained to process *Carapa procera* and *Khaya senegalensis* and to make soap from these species. Cash crops like peanuts, soya and sesame were intercropped within arboretums allowing women to get money for their associations' savings fund.
- At Yanfolilla and Kougué, products of *Andropogon gayanus* and *Cymbopogon giganteus* were sold and the income used to maintain plots and for their associations' small expenditures.



Results of the whole project Output 4



Efficiency and biological actions of chemical groups of studied plants

In collaboration with the Department of Research on Traditional Medicine (University of Bamako), the chemical compositions of ten frequently used medicinal plants were studied. Phytochemical analysis confirmed the presence of chemical groups such as flavonoids, coumarins and saponosides, which effectively treat the most frequent illnesses in local communities in Mali.

Species	Studied organs	Pathology		
		Pain	Fever	Malaria
1. <i>Strychnos spinosa</i>	Roots	X		X
2. <i>Swartzia madagascariensis</i>	Leaves, roots			X
3. <i>Erythrina senegalensis</i>	Trunk barks, roots	X		
4. <i>Vitex simplicifolia</i>	Leaves, roots	X		
5. <i>Anthocleista djalonensis</i>	Trunk barks, leaves		X	
6. <i>Alchornea cordifolia</i>	Leaves			X
7. <i>Evolvulus alsinoides</i>	Entire plant	X	X	
8. <i>Gymnosporia senegalensis</i>	Leaves			X
9. <i>Moghania faginea</i>	Leaves			
10. <i>Stylosanthes erecta</i>	Leaved stems	X		

Results of the whole project Output 5



Information disseminated, training local communities & project promoted

- 3 research reports were written for IER's annual meetings.
- 5 biannual reports were produced and submitted to RBG, Kew.
- An article on the conservation of medicinal plants in Mali was published in RBG, Kew's Samara magazine.
- To celebrate the International Year of the Forest, 2011, a planting day was organised in Zégoua community.
- A presentation on the UPP activities was done by therapists at the 11th African day of Traditional Medicine.
- All communities and organisations have been trained in plant propagation and plantation techniques.
- 5 groups have been employed to monitor the forests and to fight against bush fires.



Conclusions



The project's results during its two phases revealed the real importance of useful plants in rural communities in Mali. The Project identified many useful plants and their uses. Seeds of the most important useful plants were harvested and conserved.

Communities of the three regions of Mali (Sikasso, Ségou, Mopti) were assisted in the creation of arboretums of important species. More scientific knowledge on medicinal plants has been discovered and transferred to therapists decreasing the pressure on some plants. Capacity building in communities has been very important when encouraging some social groups (women for instance) to participate in the management and promotion of useful plants.

Very high survival rates (> 70%) were observed after 4 years in all the planted plots.

Mean height and mean diameter at base height varied a lot according to species

Acknowledgments



At the end of this second phase of UPP, we thank Kew Gardens and MGU a lot for their financial and technical supports. We would also like to thank the different partner communities (women and men) for their collaboration and their willingness to carry out the Project's activities.



**Thank you
for your attention**

SANBI
Sustainable Use of Biodiversity

Kew
ROYAL BOTANIC GARDENS

USEFUL PLANTS PROJECT

MGU-UPP South Africa



Taki Mamatsharaga and Lucy Shai

Kew
ROYAL BOTANIC GARDENS

USEFUL PLANTS PROJECT

Introduction Rationale

- Targeted communities
- Threats
- Medicinal trade
- Formal traditional healers association
- Stakeholders
- Environmental clubs
- Appreciation




2

Kew
ROYAL BOTANIC GARDENS

USEFUL PLANTS PROJECT

Introduction UPP1 Results

Output 1 – Project planning and implementation

Period (Nov 2007–March 2008–March 2011)
Personnel (1 contract and 2 permanent)

Output 2 – Targeted species.

116/120 priority species

Output 3 – Seed collected and conserved.

116 collections
100 banked.





Kew
ROYAL BOTANIC GARDENS

USEFUL PLANTS PROJECT

Introduction UPP1 Results

Output 4 (Propagation and *in-situ* conservation support).

- 115 propagated
- 99 germination tests and 101 propagation protocols
- DNA profiling of 12 species
- 27 planted in the LNBG (for community education)
- 523 plants (15 species) donated to schools.





Kew
ROYAL BOTANIC GARDENS

USEFUL PLANTS PROJECT

Introduction UPP1 Results

Output 5 - Information produced disseminated / community education and plant donations

- 17 Workshops
- Propagation manuals (English and siSwati)
- Plants donated to six other community schools
- Interpretative posters.

Bulb traditionally used as an ointment for wound healing, to treat sprains, fractures, boils and sores. Decoctions are taken as enema for female infertility, and treatment for chest and kidney troubles.

Family: Hyacinthaceae
Menilla plumbea
Blue squill (English)
Bloubergielie (Afrikaans)
Inguduza (SiSwati)






Kew
ROYAL BOTANIC GARDENS

USEFUL PLANTS PROJECT

Introduction

Aim

To enhance the *ex-situ* conservation of useful plants by raising the capacity of local communities to store and propagate these plants.

Goal

Welfare of local communities improved and useful important plants safeguarded from extinction in Latin America and Africa.

Purpose

Conservation and sustainable use of plants for human wellbeing.

6

Material & Methods Output/ Indicators 1/3



- Existing partnerships consolidated and at least 5 new established and integrated
- Target list of 20 (additional to UPP1)
- At least ten (20) (additional to UPP1) seed collections
- 20 priority useful species (5,000 seedlings) propagated .

7

Material & Methods Output/ Indicators 2/3



- 20 species (5,000 seedlings) propagated
- 2 additional communities
- 20 priority useful species (5,000 seedlings) planted and maintained in 3 (additional to UPP1) local communities
- Capacity of local communities enhanced (training and the improvement) .

8

Material & Methods Output/ Indicators 3/3



- School programme enhanced (3 schools and 2,000 children)
- 2 species planted *in-situ*
- Research (2 species)
- Information (compiled and disseminated)
- Project exposure enhanced.

9

Results Output 1 Project planning and Implementation



- **Personnel (PMU)**
 - 3 permanent and 3 contract
 - Finance and Admin excl.
- **Platform**
 - Seed processing and delivery
 - Finance and IT.
- **Partnerships**
 - Education, associations, authorities, civic
 - Property owners.



Results Output 1 Project planning and Implementation



Partners	Collaborators	Project management	Activities	Period
Commercial Timber Company	York Timbers	Research PSG on the locality of <i>Argyrobolium tomentosum</i>	<i>Argyrobolium tomentosum</i> collection	2012-2014
Department of Water Affairs (DWA)	Kwena Dam	Pretoria herbarium collection data	<i>Hemmonia depressa</i> collection	2012-2013
Limpopo Tourism Parks Agency (LTPA)	Legalameetse Nature resort		<i>Trichilia dregeana</i> monitoring	2012-2014
Mpumalanga Tourism Parks Agency (MTPA)		Collection Permit applications	Issuing of collection permit, information on plants localities	2007-2014
Plants Specialist Group (PSG)	Buffelskloof Nature Reserve	Research on plants localities		2012-2014
Department of Education	Targeted schools		Planting in the schools	2007-2014
MTPA	Mountainland Nature Reserve	Plants localities by MTPA	Plants monitoring	2013-2014

11

Results Output 2 Targeted species



- 134 Collected
- Consultation
 - 3 tribal groups.
- Selection considerations
 - Scarcity
 - Commonality
 - Endemism.



Results Output 3 Seed collected and conserved

- 134 Species collected
- 112 banked
 - 111 in country; and,
 - 112 MSB
- 114 Propagation protocols
- 99 Seed testing (?)
- Research (On-going) .



13

Results Output 4 Propagation and *in situ* conservation support

- 134 propagated
- 99 germination tests
- 114 propagation protocols
- DNA profiling of 12 species
- >50 species planted (at the LNBSG)
- 5,147 seedlings (80 species) donated to schools.



14

Results Output 4 Propagation and *in situ* conservation support

Adenium swazicum



Hypoxis hemerocallidea



Dioscorea strydomiana



15

Results Output 5 Information produced disseminated

- 27 Workshops
- Propagation manuals (English and siSwati)
- Plants donated to six community schools
- 2 Interpretative posters produced for schools
- 8 Community Information Boards produced and distributed to schools
- Species pamphlets.



16

Results Output 5 Information produced disseminated



17

Results Output 5 Information produced disseminated



18

Conclusions



- Time frame
- Deliverables
- Research on the two species
- Impact
- If possible

19

Acknowledgments



- MGU
- RBG, KEW – MSBP
- SANBI
- Lowveld NBG colleagues
- Stakeholders



Great Green Wall for the Sahara and the Sahel initiative



Africa's Great Green Wall Initiative

A model for restoration success
Dr. Moctar Sacande (RBG Kew)

The Africanwall



MILLENNIUM SEED BANK PARTNERSHIP Kew Africa's Great Green Wall



- Coordinated by the African Union Commission (AU)
- Drylands' development issues (environment & socio-economic challenges)
- Resilience of human & natural ecosystems to climate change
- 17 vicinity countries around the Sahara, but over 20 countries involved



MILLENNIUM SEED BANK PARTNERSHIP Kew Africa's Great Green Wall

More than a wall of trees, the GGW is a metaphor for '...a mosaic of ecological and societal interventions addressing the challenges facing the people in the Sahel and the Sahara' (AU, 2012).

A people-centred approach to land management - dynamic linkages in the landscape;

Drylands are not just problems but can be opportunities;

Building on experiences and communities' initiatives



MILLENNIUM SEED BANK PARTNERSHIP Kew Africa's Great Green Wall

Since its approval in 2005 ...

Major supports from international donors (e.g. World Bank, EU, FAO) to the African Union and to 13 partner countries to produce their **National GGW Action Plans**

Restoration of dryland forests & agrosilvopastoral landscapes is one of major priority interventions



MILLENNIUM SEED BANK PARTNERSHIP Kew Kew's commitments in the GGW

Kew's MSBP expertise is relevant to the success of the entire GGW restoration programme:

- 1) Because of the efforts to conserve the world's flora (25% flora by 2020);
- 2) The plant knowledge gleaned on the way made MSBP scientists (*seedologists*) among the best at addressing propagation of native species.



MILLENNIUM SEED BANK PARTNERSHIP Kew Africa's wild species collections at the MSB



- Ca. **51,000** wild species in Africa – **25% banked at MSB**
- **> 1,000 species** are important to local communities and forestry

MILLENNIUM SEED BANK PARTNERSHIP
Kew

MSB and forest seeds

State of the World's forests (FAO, 2014)

World forest species reported (>100 countries)	8,000	
Seeds banked at MSB	1,848	25% total
13 GGW vicinity countries' species reported (except Djibouti, Eritrea)	805	
Seeds banked at MSB	513	65% of the total

MILLENNIUM SEED BANK PARTNERSHIP
Kew

Enabling use through research

Development of germination protocols are vital for the success of a restoration programme

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

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




MILLENNIUM SEED BANK PARTNERSHIP
Kew

Afforestation and restoration

Monoculture planting for restoration are prone to disease, pests, extreme weather events and climate change.

More complex ecosystems need to be constructed in the landscape or put back in order to ensure resilience.

The right SPECIES in the right PLACE



Great Green Wall for the Sahara and the Sahel initiative

2. Kew's involvement in the GGW

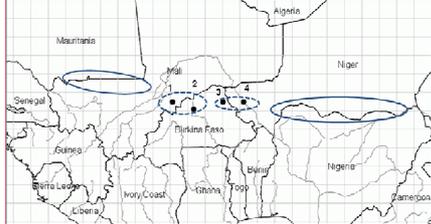
The Africanwall



MILLENNIUM SEED BANK PARTNERSHIP
Kew

Africa's Great Green Wall

Since 2012 ...



Beneficiary Communities in the trans-frontier Regions:

- **Bankass**, South-east Mali (1 on the map)
- **Djibo**, North-west Burkina (2)
- **Dori**, North-east Burkina (3)
- **Tera**, West Niger (4)

GGW restoration model: technical management & delivery team

	Mali (Mopti Region - East)	Burkina (West - Soum Region)	Burkina (Sahel Region - East)	Niger (West - Tillabery Region)
1- National Tree Seed Centres	Leader - IER	Leader - CNSF	Leader - CNSF	Leader - CNSF-N
2- GGW National Focal Points	National Focal Point	National Focal Point	National Focal Point	National Focal Point
3- Local Administrations + Communities' representatives	Bankass	Djibo	Dori	Tera
4- NGOs Environment & Development	SAHEL ECO	Tree Aid	SOS Sahel	SOS Sahel
5- Forestry Departments	Forestry Service (Bankass District)	Forestry Service (Djibo Province)	Forestry Service (Dori Province)	Forestry Service (Tillabery Region)
6- International facilitating organisations		Leader - Kew FAQ & WFP		

GGW restoration model: the approach

Communities

- consult with communities and assess their **commitment and motivation**
- understand local **needs and requirements** for restoration
- gather information** on species and their uses

Research

- be **authenticated** and be able to **survive long-term**
- knowledge, expertise** and **quality material** available
- be locally adapted and **economically** useful to communities
- Multi-diverse** (trees/shrubs/grasses)

Procedures

- collecting **quality seeds, seedling production** and **soil preparation**
- restoration** - planting trees, direct seeding and assisting natural regeneration at the best of and during the rainy season.

Monitoring

Monitor and evaluate field performance:

- of planted seedlings, including collecting data on their **maintenance and management**
- of committed **activities** with and by **communities**

Capacity building

Train and strengthen the capacity of village technicians in:

- the development of **plant products, marketing** and local business management
- seed collecting and nursery **techniques**
- planting, maintenance and **management of plantations**

SOIL PREPARATION AND PLANTING

Manual digging

Mechanised scarification

GGW restoration model: achievements so far

Country	Region	2013			2014		
		Villages	Areas (ha)	Species	Villages	Areas (ha)	Species
Burkina	Dori/Djibo	11	200	15	40	1100	20
Mali	Bankass	5	65	10	7	130	25
Niger	Tera	5	55	1	20	75	15
Total	4	21	320	15	67	1305	40

Top 10 tree species include: *Acacia nilotica*, *A. tortilis sbsp raddiana*, *A. senegal*, *Adansonia digitata*, *Balanites aegyptiaca*, *Bauhinia rufescens*, *Faidherbia albida*, *Khaya senegalensis*, *Lannea microcarpa*, *Tamarindus indica* and *Ziziphus mauritiana*

Top 5 herbaceous species include: *Andropogon gayanus*, *Cymbopogon giganteus*, *Digitaria horizontalis*, *Panicum laetum* and *Pennisetum pedicellatum*

MILLENNIUM SEED BANK PARTNERSHIP
Kew

Africa's Great Green Wall

- 2013 planting: on average, **65-75% survival** for planted seeds and seedlings.
- 2014 planting: > **500,000 seedlings** (in pots + **100 kg seeds** of herbaceous species for direct sowing) to cover **1,300 ha** of degraded land; benefiting **67 communities/villages**.
- GGW species database established
- 50 GGW farmers trained** in seed collecting and nursery techniques.



Great Green Wall for the Sahara and the Sahel initiative



3. Moving forward

The Africanwall



Seed mobilisation capacity for the GGW still low !!!

Country	Institution	Capacity (kg)	Species (trees & grasses)
Burkina	Centre National de Semences Forestières (CNSF, BF - OECD)	3,000	50
Mali	Unité de Semences Forestières (USF)	1,000	50
Niger	Centre National de Semences Forestières (CNSF, Niger)	500	20
Senegal	Programme National de Semences Forestières (ProNaSeF)	2,500	20
Kenya	National Tree Seed Centre (KEFRI-NTSC - OECD)	10,000	40
Ethiopia	Forestry Research Centre (EIAR- FRC)	8,000	20
Total	6	25,000	200

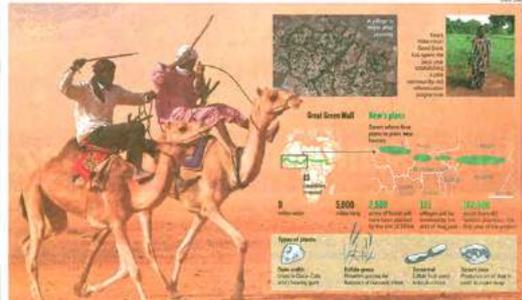
MILLENNIUM SEED BANK PARTNERSHIP Kew

Africa's Great Green Wall

Since 2012 ...

Scaling – up

- 1) Kew's GGW restoration model in 3 countries to be used to inform the pan-African initiative on model protocols and strategies.
- 2) Strengthen National forest seed programmes, including trained/certified farmer Seed Collectors.
- 3) Return on planting investments in GGW



Kew's Great Green Wall to hold back Saharan terror

Sunday Times, UK, 20.07.2014

Restoring soil fertility in the Bolivian Amazon: land tenure, development plans, livelihoods and a Mimosoid legume

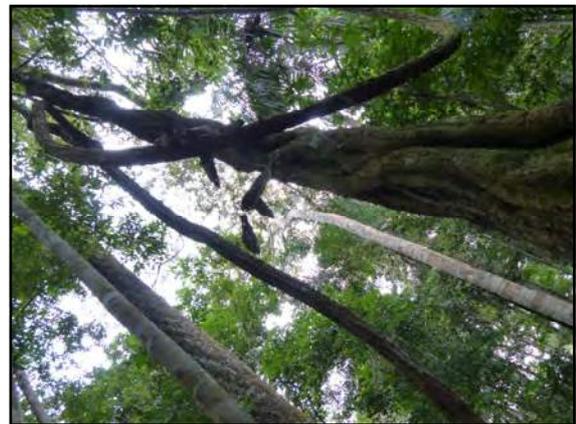
Alex Monro, Rolman Velarde*, William Milliken, Amélia Baracat, Juan-Fernando Reyes*, Terry Pennington, Bente Klitgaard

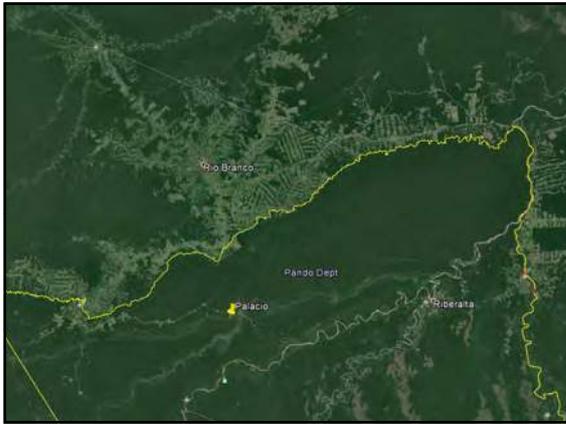
*Herencia ONG, Pando, Bolivia



Project Summary

- One component of DI Forest Futures project which started in October 2013 and finishes September 2016.
- The project is a collaboration between the Royal Botanic Gardens, Kew, the Pando NGO Herencia and the Museo Noel Kempf of Santa Cruz
- It seeks to reduce the pressures on natural forest in the through the establishment of agroforest systems to rehabilitate degraded soils
- But also to quantify, highlight and promote the Natural Capital in forest
- and increase non timber forest products for the region





Restoring fertility to damaged soils

- using the roots, leaves and shade of *Inga edulis* to:
- increase available soil nitrogen
- increase soil organic matter content
- shade out invasive weeds (a major driver of slash-and-burn)
- develop an active insect community (for biocontrol)

Adapting *Inga* agroforestry systems to the Bolivian Amazon





The key to impact (we think)

- Rural communities and cattle ranchers adopt these techniques (assuming they work)
- They have tenure ship (control) over their land
- Agroforest or silvopasture systems meet their perceived development needs
- Adopting these techniques does not entail perceived unjustified risk

Tenure ship of the land

- Rural Communities is a legal designation in Bolivia
- Each family granted 500 ha of land held communally
- Deforestation regulated (1-2 ha pa)



Agroforest / silvopasture systems meets perceived needs

- Needs have been identified and articulated (through partner / development plans)
- Expectations have been managed (presentations)
- Presentation of impact tailored to meet local needs (weeding / clearance not climate change / conservation)



Adopting these techniques must not entail a perceived risk

- Balance of investment vs return vs risk is understood and is acceptable
- Subsistence farmers do not have bank accounts, assets or savings and have a very low risk threshold
- Subsistence farmers often have little capacity to manage money
- Ranchers do have bank accounts and may have savings & assets to leverage against risk



How we perceive the risks to our success

- It can take 2 years for agroforest to restore fertility
- First year requires bimonthly weeding
- Technique is at an experimental stage- may not work first time
- Rural communities may not understand the principles which underlie the technique
- We are inexperienced in participative monitoring
- There is limited local capacity in participative monitoring



These risks could neutralise our impact

- Rural communities may not engage with these techniques because:
- techniques challenge pre-conceived ideas about agriculture in the region
- communities may not perceive long-term sustainability as desirable
- there are a number of cultural differences between our community partners and us



Communities may not perceive long-term sustainability as desirable

- Sustainability is an inherently complex concept and it can be seen to encompass an almost unmanageable array of sub-issues,
- Recent immigrant communities do not have the same 'tie' to the land
- Something we are (or will be) tackling through a different component of the project 'awareness raising and environmental education'



Communities may not understand the principles behind the technique

- Understanding is shaped by perception and efficiency of communication- this is being managed through presentations with mixed results



The challenges in monitoring engagement in a participative manner

- Local capacity
- Our capacity and experience
- Interpretation of the results
- Fluidity of perceptions



Mitigating those risks

- Selecting a partner whose vision we share and whose capacity we can evaluate
- Setting demonstration plots selecting communities where there is a relationship of trust
 - that have worked with our partner to produce participative development plans
 - and activities within a context that is a high priority: 'Forest of the children'
- Getting project commitments approved and enacted in community assemblies
- Monitoring engagement in a participative manner (Amelia – which in turn presents other challenges and array of sub-issues)
- Designing outreach for community: school's productive module, visit to established agroforest in Peru



- Over 15 years in Bolivian Amazon
- Specialise in participative development plans
- And mapping- GIS
- Jointly produced Millennium Development Goals for the Bolivian-Peruvian-Brazilian Amazon

Selecting communities where there is a relationship of trust & development plans



Have worked with our partner to produce participative development plans



Activities within a context that is a high priority: 'Forest of the children'





Designing outreach for community: school's productive module



...and visit to established agroforest in Peru

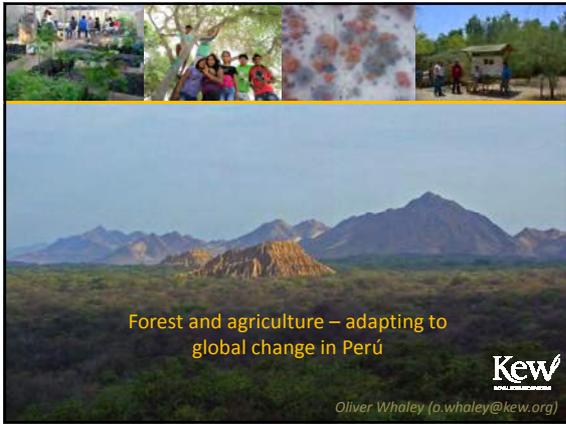
Acknowledgements

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Our communities: Palacio,
Motacusal, San José, Pimpollo,
Irak

Our institutional partners:
Herencia, Museo Noel Kempf,
Universidad Autónoma del Pando





Talk outline

- Peru's arid Pacific seaboard - W of the Andes
- Overview of plant use - development of agriculture & culture
- Adapting to global changes
 - 1. Climate change and forest die-back
 - 2. Globalisation of the agriculture & landscape

Perú overview

- 55 % of population live on coast in cities (c.16.5 m)
- 80 % of world's ecosystem types
- Megadiversity c. 18,000 plants
- Coastal ecosystems
 - Dry forest
 - Riparian oasis forest
 - Lomas
 - Saltmarsh
 - Xerophytic scrub
 - Cactus rich valleys
 - Huerta

Coast Sierra Selva

Peruvian Arid Pacific

- Sechura desert
- Atacama desert
- Arid diagonal
- Andean 'wall'
- Fog
- El Niño

Source: 'Sustainable Africa of the World', International Geographical Institute, 2009. Image Credit: National Geographic (Photography)

Neoraimondia arequipensis var. *arequipensis*

Armatocereus procerus var. *armatus*

Nazca culture c.1800 BP





Programme approach

Recognising culture, agriculture and biodiversity are closely interdependent

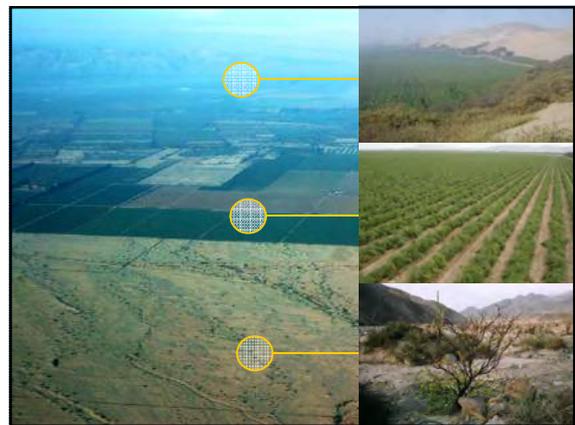
- Cataloguing and mapping biodiversity
- Conservation of relicts
- Building Nurseries
- Ecosystem approach – people as central to conservation and restoration
- Flooding and El Niño
- Historical threats
- Plant conservation through use – a bridging solution...

Huge global challenges – rapid change is now the norm

1. Climate change and forest die-back
2. Globalisation of the agriculture & landscape

Agroindustry – corporate / community partnership
Ecosystem function/ sustainability & loss of agrobiodiversity

Watershed restoration for sustainable lucrative livelihoods
livestock & forest restoration
multipurpose plants - food, fuel, forage





Nursery and plants centres

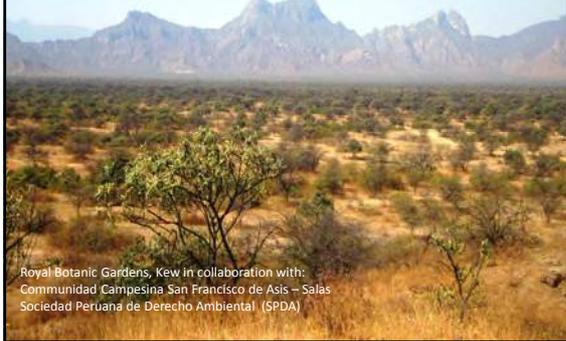
- Small seed banks
- Food production land – (huerta & ecosystem)
- Mapping and databasing agrobiodiversity
- Training for grafting
- Seed and plant sharing
- Schools and women's groups
- From philanthropy to business model

Primary Threats to Northern dry forest Peru

- Agroindustrial expansion set to rise to 5 % /yr
- Climate change & forest die-back
- Inward migration

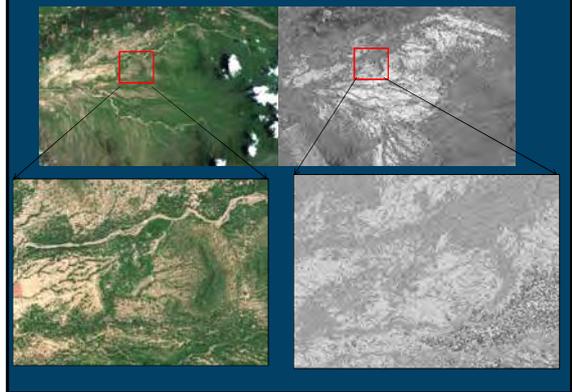
Models of ecosystem scale restoration

Setting up a community dry forest reserve (11,000 Ha) for livelihoods and ecosystem. Lambayeque, Northern PERU



Royal Botanic Gardens, Kew in collaboration with: Comunidad Campesina San Francisco de Asis – Salas Sociedad Peruana de Derecho Ambiental (SPDA)

La Peña watershed 2012 & 1960

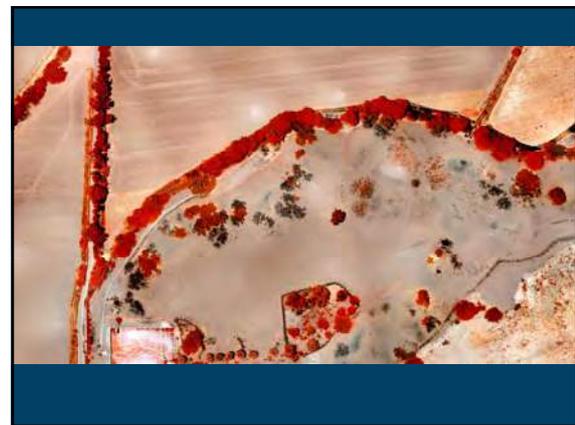
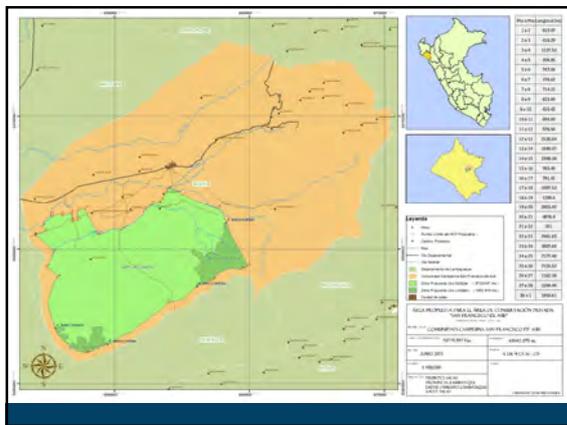


Arboreal foragers..



FAMILIA	Nº de Personas	GANADERIA					Aves De Corral
		Caprinos	Ovinos	Vacuno	Porcinos		
BULNES RODRIGUEZ	2	14	11	7	x	20	
SANCHEZ BANCES	6	6	x	x	2	20	
JUAREZ MAYANGA	6	x	20	2	3	20	
VELAZQUEZ MAYANGA	3	3	x	2	3	30	
BULNES RUFINO	4	30	80	8	10	35	
ARCE REYES	3	8	20	x	2	20	
REYES JARCO	5	20	40	x	7	20	
BULNES MENDO	4	40	30	10	3	20	
MIO BVAZENTERA	3	30	30	20	10	30	
LIBARTE BULNES	7	20	40	3	2	25	
ARCE FERNANDEZ	5	200	x	20	3	15	
JUAREZ CHUNGA	4	110	x	8	7	30	
MANRAY DE LA CRUZ	4	30	x	20	4	20	
CARGOS DE LA CRUZ	3	20	10	15	5	30	
LIBARTE YOVERA	6	15	8	30	8	35	
REYES ROSQUIN	4	3	x	9	3	15	
VALENTE MESONES	1	5	40	5	x	x	
MIO REYES	6	15	15	12	5	25	
LEON ALVARADO	6	12	x	5	3	14	
TOTAL	82	573	324	178	78	444	

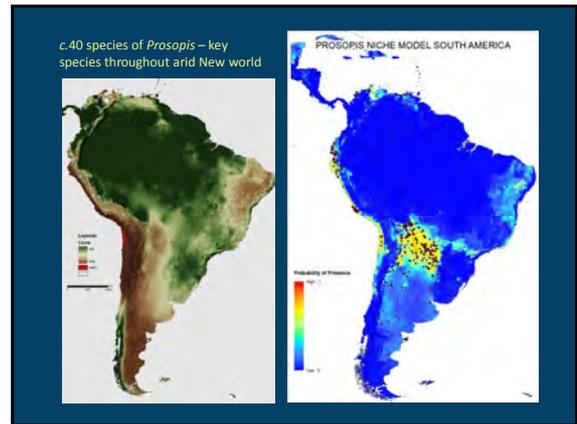
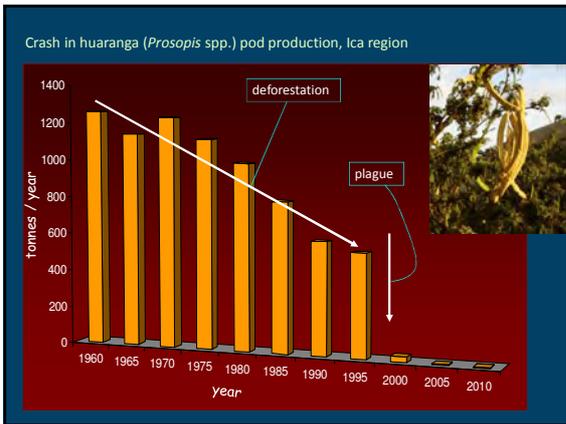
PRINCIPALES ESPECIES NATIVAS DE PASTOS ARBUSTIVAS Y ARBOREAS USADAS EN LA ALIMENTACION DEL GANADO	
ESPECIES NATIVAS DE PASTOS NATURALES DE HOLA LARGA	<p>NOBRE COMON</p> <ul style="list-style-type: none"> Calandula o calavento Cudillo Tucubato o grambo Puncho Cudillo Paja <p>NOBRE CIENTIFICO</p> <ul style="list-style-type: none"> Alysicarpus amplexicaulis Cercaria pallas Chamaecrista Astragalus caryocarpus Caryocarpus l. Tagetes sp.
ESPECIES NATIVAS DE HOLA ANCHA	<p>NOBRE COMON</p> <ul style="list-style-type: none"> Paja de monte Paja o paja Corchillo Yedaboga Almorboli Yajo Yamunabulo Almop Paja de paja Almorboli Berbero <p>NOBRE CIENTIFICO</p> <ul style="list-style-type: none"> Azadirachta indica Panicum Memecylon Panicum aduncum Lithospermum Amorpha fruticosa Lantana sp. Tribulus terrestris L. Bufo bufo Sida Wedelia Macaranga
ESPECIES ARBOREAS	<p>Algarrobo</p> <p>Overo</p> <p>Zapalo</p> <p>Bichayo</p> <p>Falque</p> <p>Palo Santo</p> <p>Hualfaco</p> <p>Cerecillo</p> <p>Prosopis pallida</p> <p>Cordia lutea</p> <p>Capparis scabrifolia</p> <p>Capparis ovalifolia</p> <p>Acacia macracantha</p> <p>Busera graveolens</p> <p>Loxopilegium huasango</p> <p>Muntingia calabura</p>

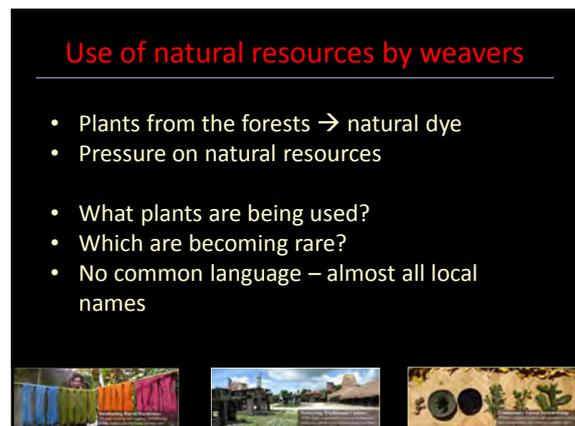




Defoliating plague

Enallodiplosis discordis Gagne 1994
(Diptera: Cecidomyiidae)





Bridging the knowledge gap between weavers and botanists



Made by Marie Briggs

Village of Lo'neke



Mama Rosa

Dye Plant – technique for red

Morinda sp. (Rubiaceae – coffee family)

- How many different *Morinda* species are used?
- Are some better dye plants than others?



Dye Plant – technique for red

- Root cut and used in dyeing process
- Limited resources → trees need their roots to survive!



Dye Plant – technique for red



Dye Plant – technique for red



!!Key ingredient!! Addition of *Symplocos*



Dye Plant – technique for red



Dye Plant – technique for red



Dye Plant – technique for red

- 21 cycles of dying
 - fresh *Morinda* root
- experiments with different *Symplocos* species
 - key ingredient in fixing
 - Al accumulator



Dye Plant – technique for red

- Which species are used?
- Which are the most effective?
- Can they be grown with success?
- Trials by Kew Horticultural student



Some interesting collections



Village of Boti



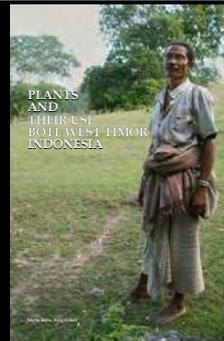
Collecting Specimens



Collecting Specimens



Boti Book



Thank you



Acknowledgements

Kew: Alison Moore, Marie Briggs, Clare Drinkell, Justin Moat, Steve Bachman, Tim Utteridge. Bentham-Moxon Trust.

Indonesia: Staff at the LIPI - Bogor Herbarium, Manokwari Herbarium, Yayasan Pecinta Budaya Bebal (YPBB), LIPI – Bali Botanical Gardens, Weaving cooperatives & people of the villages of Boti, Lo'neke, Amarasi

London: Royal Horticultural Society, Anglo-Indonesian Society, Indonesia Embassy.





Seed Futures



.....functional and chemical traits of neglected and underutilised species (NUS)

Hugh W. Pritchard, Cesar Ordenez, Amanda Moreno, Cecilie Christensen, Karin van der Walt, Cesar Flores, Raphael Lira, Louise Colville, Tiziana Ulian, Efisio Mattana, Jayanthi Nadarajan, Alex Monro, Geoff Kite, Lulu Rico, Gill Challen, Jesus Cuevas, Ellie Wade, Li Zhijun, Charlotte Seal

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Science Themes

Stress and Survival



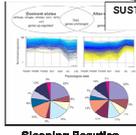
Ageing

Frozen Planet



CONSERVATION

SLEEPING BEAUTIES



SEED FUTURES



Sarcocyzium sp.

SUSTAINABLE USE

FUNDAMENTAL SCIENCE TRANSLATIONAL SCIENCE



Outline

- Why seeds?
- Policy context (international, UK)
- UPP objectives
- 'Seed Futures'
 - Chemical traits
 - Functional traits
- Summary



'In Peace and Harmony with Nature'
Leo Tanguma



Why seeds?

Non-woody forest products, 7 m tonnes (2005, FAO)

Country → Product ↓	Africa	Asia#	World total (tonnes)
Food*	88,823	3,562,991	4,278,035
Medicine / aromatics	20,400	90,181	121,505
Exudates	12,575	1,495,663	1,566,684
Other products	11,175	606,782	1,296,819

*mainly oilseeds and nuts # Asia = 74% removal

Global trade in seeds is US\$ 37 billion per annum
 (International Seed Foundation)

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Policy context:



Projected Impacts of Climate Change

Global temperature change (relative to pre-industrial)

	0°C	1°C	2°C	3°C	4°C	6°C
Food		Falling crop yields in many areas, particularly developing regions	Possible rising yields in some high latitude regions		Falling yields in many developed regions	
Water		Small mountain glaciers disappear → water supplies threatened in several areas		Significant decreases in water availability in many areas, including Mediterranean and Southern Europe		Sea level rise threatens major cities
Ecosystems		Extensive damage to Coral Reefs		Rising number of species face extinction		
Extreme Weather Events		Rising intensity of storms, forest fires, droughts, flooding and heat waves				
Risk of Abrupt and Major Irreversible Changes						Increasing risk of dangerous feedbacks and abrupt, large-scale shifts in the climate system

30-50% more water, food and energy needed by 2050

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Policy context: The evidence challenge




Sustainable Food Production: Which seed metabolites contribute to **seed function and nutritional traits**, and what will be the **sustainable oilseeds of the future?**

Climate Change Adaptation & Protecting ESS: Which **native species** have seed quality traits to cope with **climate change** (temperature, drought, salt stress)?

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Policy context:
In situ and *ex situ* conservation
 Nagoya 2010
<http://www.cbd.int/sp/targets/>



Strategic Plan for
 Biodiversity 2011–2020
 and the Aichi Targets
 "Living in Harmony with Nature"



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Strategic Goal C (targets 11-13):
 Improve the status of biodiversity by safeguarding
 ecosystems, species and genetic diversity

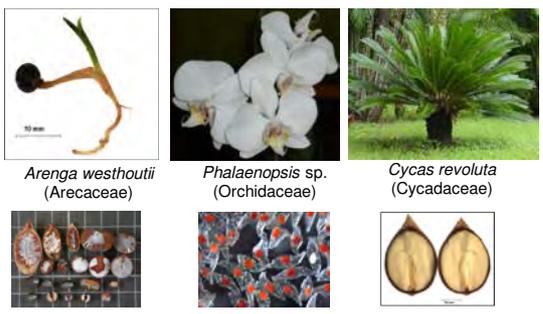
Target 12: By 2020 the extinction of known threatened species has been prevented and their conservation status, particularly of those most in decline, has been improved and sustained.

Target 13: By 2020, the genetic diversity of cultivated plants and farmed and domesticated animals and of wild relatives, including other socio-economically as well as culturally valuable species, is maintained, and strategies have been developed and implemented for minimizing genetic erosion and safeguarding their genetic diversity.

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Socio-economic & culturally valuable species (NUS)



Arenga westhoutii
 (Arecaceae)

Phalaenopsis sp.
 (Orchidaceae)

Cycas revoluta
 (Cycadaceae)

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Encephalartos whitelockii

Joint Ethnobotanical Research Advocacy, Uganda;
 SANBI, RSA; Nong Nooch Tropical Garden, Thailand
 Fairy Lake Botanical Garden, China; De La Salle Univ., Philippines
 WCMC, UK



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Encephalartos whitelockii
 Uganda



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UPP

USEFUL PLANTS PROJECT

Targeting and prioritising

Ex situ conservation

Propagation and conservation of useful plants in local communities

Research to enable conservation and sustainable use of plants

Sustainable use and income generation from useful plants

Supporting in situ conservation



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289 plant species are studied for ethnobotany, ecology, physiology, seed biology and biochemistry and phytochemistry and 20 students supervised.

Chemical traits (biochemistry)

Amanda Moreno (Mexico) - Antioxidants in *Lippia graveolens*;
Cecilie Christensen (Denmark) – *Jatropha* seed oil



Functional traits (ecophysiology)

Cesar Ordonez (Mexico) - cactus germination;
Karin van der Walt (Republic of South Africa) - germination of *Adenium swarzicum*.

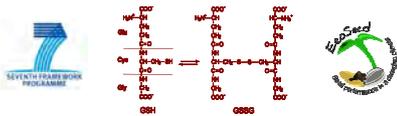
For sustainable food production, which metabolites contribute to **seed function and nutritional traits**, and what will be the **sustainable oilseeds** of the future?



Time Domain NMR



Differential scanning calorimeter



- Seed longevity- vitamin E in plants (42 sp.);
 - Marker for seed viability - GSH in legumes (68 sp.)
- EcoSeed (EU FP7) – how environment affects seed quality*

- Flavonoids – Amanda Moreno
- Oilseeds – Cecilie Christensen

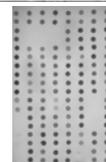


21 flavonoids in leaves

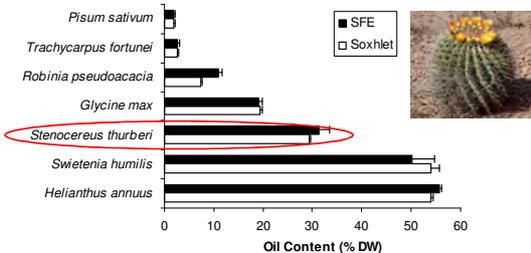
Moreno et al., in press

Abiotic factor	chs
Mechanical damage	> 3h
Water stress	> day 4 and 7
High intensity light	> 1h
UV	>12h

Chalcone synthase (flavonoid biosynthesis) highly responsive to environmental conditions

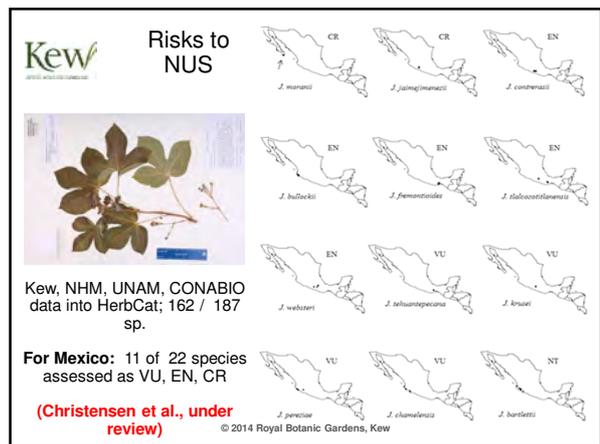
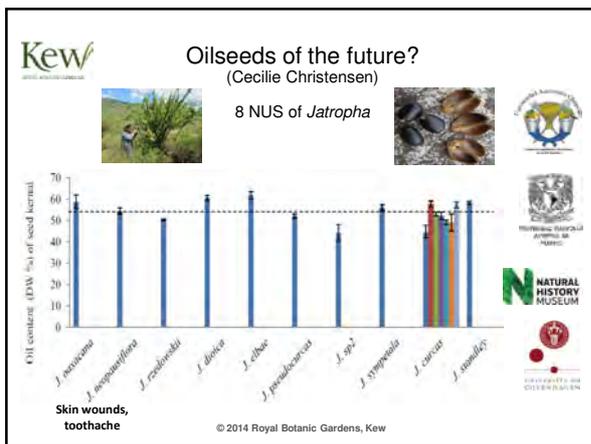
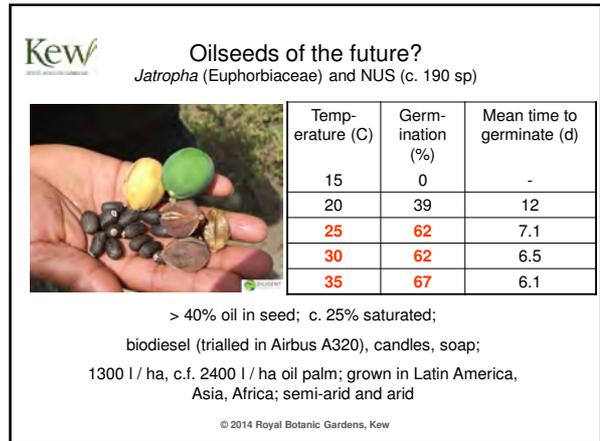
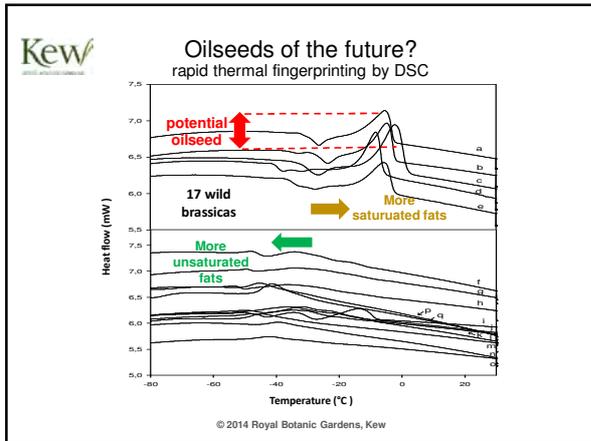


Family	Species (uses)	Number of species banked (in family)
Asteraceae (sunflowers)	Sunflower (oil), <i>Vernonia</i> (oil), lettuce (vegetable), asters (horticulture)	3420 (c. 21,000)
Fabaceae (legumes)	Pea (crop), soybean (crop and oil)	3232 (c. 16,400)
Poaceae (grasses)	Rice, barley, wheat (crops), bamboo (horticulture)	1686 (c. 9,000)
Myrtaceae (myrtles)	Eucalyptus (timber, oil)	1307 (c. 3,900)



- Cactus: *Stenocereus thurberi* seeds as source of amino acids and minerals and highly nutritious oils; (Seal et al., 2008 Phytochemical Analysis)

- <15% of cacti characterised for seed oil (c. 1800 sp in family)



Kew Summary

Chemical traits -

1. Seed chemistry affects seed quality traits, such as lifespan, and chemical content is affected by environment;
2. Native oilseeds can contribute to sustainable energy needs as the local scale

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Kew Seed futures – functional traits (germination)

Which **native species** have seed that can cope with **climate change** (temperature, drought, salt stress)?

Sarcozygium sp., Zygophyllaceae, NW China

Approach: widescale screening of germination capability and development of robust biological models

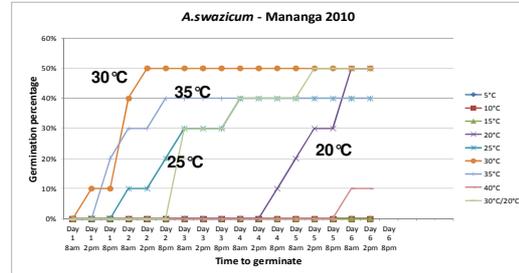
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Adenium swazicum
(Karin van der Walt)

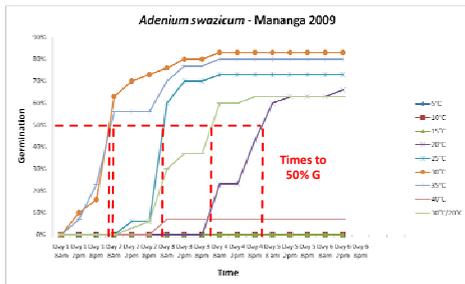
- Shrub species in Apocynaceae
- Large underground tuber of medicinal value – stomach ailments (+cardiac glycosides?)
- CR in RSA (Lowveld of Mpumalanga region)
- 50% individuals flowering produce seed 'capsules', but c. 20% reach maturity;
- Germination may be high



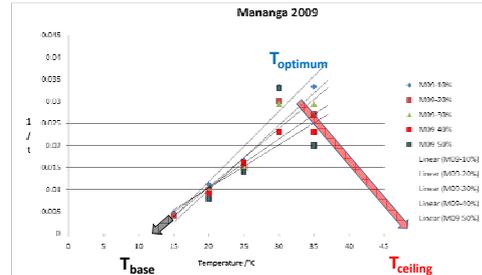
Germination
(Karin van der Walt)



Inter-seasonal variation in germination
(Karin van der Walt)



Germination rate and threshold models
(Karin van der Walt)



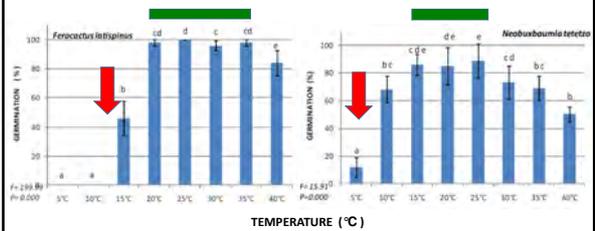
Cardinal temperatures (T_b , T_o , T_c) describe the population response

Cactus seed germination / propagation
(Cesar Ordenez)



What controls efficient germination and determines niche competitiveness?

Temperature and germination total
(Cesar Ordenez)



Temperature for maximum germination and minimum germination vary between species

Cardinal temperatures for cacti (Cesar Ordóñez)

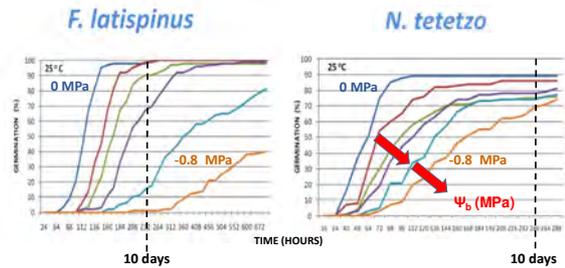
	T_b	T_o	T_c
<i>F. latispinus</i>	12.59 ± 0.62 ^a	31.18 ± 0.21 ^c	45.71 ± 2.1 ^b
<i>H. undatus</i>	8.45 ± 0.40 ^b	26.12 ± 0.11 ^a	41.02 ± 2.5 ^a
<i>M. carnea</i>	11.25 ± 0.35 ^c		
<i>N. tetetzo</i>	4.13 ± 0.56 ^c	29.08 ± 0.18 ^b	41.78 ± 1.8 ^a
<i>P. chende</i>	11.23 ± 0.80 ^c	31.46 ± 0.18 ^c	54.5 ± 2.9 ^c
<i>P. chichipe</i>	12.00 ± 0.56 ^a	31.38 ± 0.28 ^c	51.3 ± 3.9 ^c

Values followed by a different letter within species are significantly different $P < 0.05$

Ordóñez et al (under review)

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Water stress (PEG) and temperature (Cesar Ordóñez)



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Seeds and salt



- Survive to reproduce in environments ~ 200 mM NaCl
- Control uptake and compartmentalisation of ions; synthesis of compatible organic 'solutes'
- ~ 2400 species OR 1% of world flora [Flowers, Colmer (2008)]

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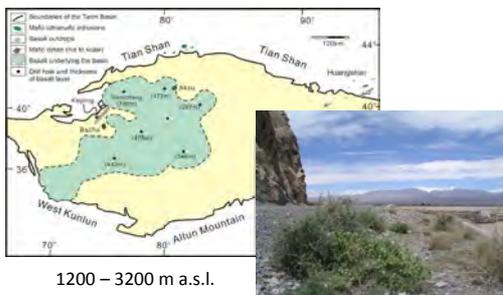
Halophyte families

8 families = 723 species = 30% of halophytes

Family	Halophyte species in family (n)	Representative genera
Aizoaceae	52	<i>Mesembryanthemum</i>
Avicenniaceae	19	<i>Avicennia</i>
Brassicaceae	19	<i>Thellungiella</i>
Chenopodiaceae	381	<i>Atriplex</i> , <i>Suaeda</i>
Plumbaginaceae	60	<i>Limonium</i>
Poaceae	143	<i>Distichlis</i>
Rhizophoraceae	31	<i>Rhizophora</i>
Zosteraceae	18	<i>Zostera</i>

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Salt stress in the Tarim Basin, Xinjiang, NW China



1200 – 3200 m a.s.l.

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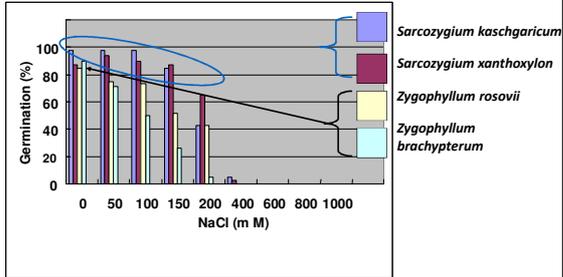
Salt tolerance in Zygophyllaceae



Land stabilisation; dominant shrubs; tolerate saline soil; fleshy leaves (eaten by animals)

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Zygophyllaceae germination (%)



Summary

Functional traits - germination



1. Understanding the limits to germination under temperature, water and salt stress is important for propagation success
2. and (limits) thresholds models provide insights to niche competitiveness under various climate scenarios

Seed Futures and UPP - summary

- NUS species have traits of potential socio-economic significance;
- Market opportunities will depend on the seed supply chain and an understanding of seed biology and NDF (sustainable methods)



Acknowledgements



Researchers

- Dr Louise Colville – oxidative stress biochemistry
- Dr Tim Marks – *in vitro* biotechnology
- Dr Jayanthi Nadarajan – cryobiology
- Dr Rose Newton – ecology
- Dr Charlotte Seal – biochemistry and germination modelling
- Dr Peter Toorop – gene expression and dormancy
- Dr Anne Visscher – stress biology and molecular phylogeny
- Ellie Merrett Wade – oilseed science



2013-14: Co-supervise 29 students - 6 BSc, 5 MSc, 18 PhD

13 countries: Bolivia, Brazil, Cuba, Mexico; Belgium, Denmark, France, Italy, Spain, UK; South Africa; Australia, China



Lead for Kew on two EU FP7 Grants (EcoSeed, €2.9 million; NASSTEC, €2 million)
 Publish c. 20 peer-review journal papers p.a. (c. 40% CIF > 2)
 Referee and edit c. 85 manuscripts p.a.
 Advise ISTA, IUCN SSC, Global Crop Diversity Trust, ITF



Future research on NUS



13 February 2014, New Delhi, India (2014-19)



24 June 2014, Kew (2014-24)






MICAIA

The multidimensional value of useful plants.
Chimanimani TFCA,
Mozambique




MOZAMBIQUE




MICAIA – Working for local prosperity in a sustainable world




MICAIA

- MICAIA is a hybrid organization consisting in Mozambique of :
 - an operating foundation (**MICAIA Foundation**) and
 - a social enterprise (**Eco-MICAIA Ltd**).
 - a volunteer-run charity support group (**MICAIA UK**) was established in the UK.

MICAIA – Working for local prosperity in a sustainable world



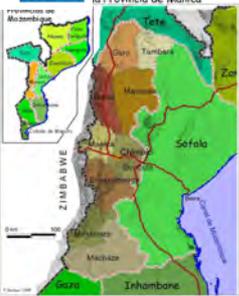
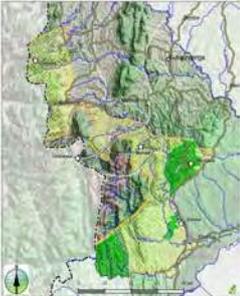

MICAIA

- **MICAIA Foundation** is an operating foundation, registered in Mozambique, governed by a local board made up of experienced professionals from fields relevant to our work. The Foundation works mostly in Manica Province.
- **Eco-MICAIA Ltd** is a social enterprise, providing services and access to investment to help diversify rural economies and support development of viable sustainable livelihoods.
- A volunteer-run charity support group (**MICAIA UK**) is established in England
- MICAIA's purpose is "to enable people to prosper in strong local economies and healthy vibrant communities"
- MICAIA started work in Mozambique, Manica Province, in early 2008

MICAIA – Working for local prosperity in a sustainable world




MANICA PROVINCE and the Chimanimani TFCA

MICAIA – Working for local prosperity in a sustainable world






Chimanimani

MICAIA in the Chimanimani TFCA

- In partnership with local communities, develop and implement local development models based on the sustainable use of natural resources, including plants,
 - In keeping with rules and regulations of the TFCA
 - Aiming to increase the income levels of forest communities

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The Chimanimani TFCA

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Moribane Forest Reserve Chimanimani TFCA

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MICAIA in the Chimanimani TFCA

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MICAIA in the Chimanimani TFCA

- Methodology used
 - Learn about and record local knowledge of local plants and local uses (food, medicinal, etc.)
 - Verify local knowledge and uses against existing information and/or undertake new botanical studies with **relevant partners** (Kew – CEPF, Darwin..) and bring this information back to local communities
 - Develop participatory management plans to enable communities to use these plants in a more sustainable (contributing to the enhancement of biodiversity) and profitable manner
 - Where appropriate, identify market led opportunities for the development of natural products processing industries

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MICAIA in the Chimanimani TFCA

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MICAIA in the Chimanimani TFCA

- In our work on useful plants we consider their multiple dimensions in terms of value, and the wealth associated to it, particularly the

- Individual
- Social
- Environmental
- Financial, and
- Political

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MICAIA in the Chimanimani TFCA

- **Individual wealth/value** – *increasing capabilities and wellbeing:*

- Enabling individuals to increase their knowledge of useful plants and their properties as this allows people to use them more effectively as food, medicine, etc. and for improve their wellbeing

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- **Social wealth/value:**

- Enabling communities to improve traditional systems and institutions to increase their effectiveness in the management and utilization of natural resources, thus strengthening their social capital

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- **Environmental wealth/value:**

- Enabling people and communities to better understand the interrelationship between their systems of natural resource use and the quality of their lives and livelihoods now and in the future (their ability to sustain/improve lives and livelihoods – impact on biodiversity; water systems, soil quality, etc..)

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- **Financial wealth/value:**

- enabling people to understand the current and potential market value of useful plants within and outside their community and help them secure the required investments to develop natural resource based enterprises (Mozambique Honey Company, Moribane Forest Products, Baobab Products Mozambique...)

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Ximenia caffra





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Ximenia americana





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Multidimensional value of useful plants



- "...study allows the classification of the Olacaceae as a very highly nectariferous and highly polliniferous bee plant. The installation of *A. m.adansonii* colonies near the populations of *X. americana* is recommended to improve fruit and honey production in the region."
- Quote from 'Foraging and pollination activities of *Apis mellifera adansonii* Latreille (Hymenoptera: Apidae) on *Ximenia americana* (Olacaceae) flowers at Ngaoundéré (Cameroon)', Denis Djonwangwe, Fernand-Nestor Tchuengue fohou, and Jean Messi. International Research Journal of Plant Science (ISSN: 2141-5447) Vol. 2(6) pp. 170-178, June, 2011 (Accepted 17 June, 2011):

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MICAIA in the Chimanimani TFCA



- **Political wealth/value:**
 - Enabling individuals and local communities to identify mechanisms and spaces to express their 'voice', and influence decision-making and resource allocation processes (*participation in the management of the TFCA management, but also link with local decision-making about logging licenses etc*)

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Knowledge of local useful plants - A basis for inclusive businesses

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The Honey value-chain



poor quality local honey

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Mozambique Honey Company



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Tourism



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Tourism



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**Ndzou Camp
Moribane Forest**



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**Ndzou Camp
Moribane Forest**



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Tourism and learning



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Ndzou Camp



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Concluding remarks

- **Values** and not just **value**
- Useful plants have multiple values – individual, social, environmental, financial, etc.. and through our work we can help local communities achieve their wellbeing objectives

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MUITO OBRIGADA



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Madagascar Agroforestry Livelihoods Project

2013-2016

Sustainable agriculture
Healthy ecosystems
Improved livelihoods

Kew
ROYAL BOTANIC GARDENS



Putting trees back into the landscape



30 communities restoring productivity on deforested land

Food shapes the landscape



Fires >1000 m²
Oct-Dec 2013



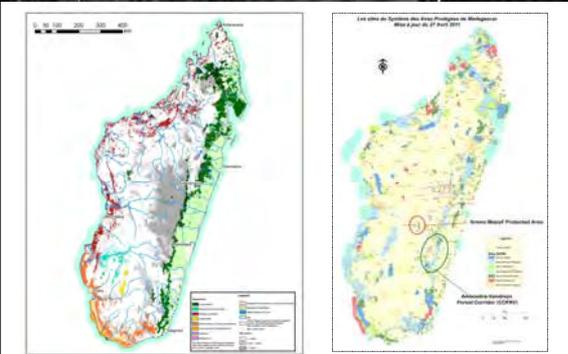
Challenges for conservation

- 13,000+ species... globally important hotspot
- >90% of plant species are endemic
- many species have narrow distributions
- 40% of forest destroyed in last 40 years
- highest soil erosion in world (up to 400 t/ha/yr)
- UNDP GDP per capita ranking: 147 out of 152
- 80% of population subsistence farmers
- slash and burn agriculture (*tavy*) widespread
- increasing population, decreasing farm sizes
- extreme poverty, seasonal malnutrition
- farmers are risk averse

Conservation cannot subsidise 3m farmers



Vegetation and protected areas (2012)



Itremo Massif Protected Area KMCC, 250 km², 650+ plant-species



COFAV Protected Area

Conservation International - 2,800 km² humid forests
 Slash and burn agriculture - forest loss 0.25% per year
 Aim is to establish static cultivation around communities



Mahavanona (outside protected areas)



Yams – conservation through cultivation

40 native yams (all endemic)
 30 edible (12 threatened)
 Seasonal famine food

Work at COFAV:

12 communities (320 households)
Dioscorea alata (non-native)
 6t tubers 2011
 50t tubers 2012
 100t tubers 2013
 adoption by new communities

Next steps:

enoblement of wild species
 integration with agroforestry
 improved storage & processing
 climate change modelling
 endangered species in north



Project purpose

Sustainable agroforestry:

simple and effective
 low cost
 viable for communities
 adoption farmer to farmer
 (own momentum)

Locally adapted Inga system:

ecological principles
 alley cropping
 forest gardens
 plantations
 forest restoration



Indigenous species



Albizia spp.

Viguieranthus spp.

Millettia spp.

Aim to find local species of legume trees that are:
 quick growing, fix-N², coppice and create mulch (large, thick leaves)

KMCC – surveys and monitoring

family	species	habit	height (m)	COFAV	Itremo	J	F	M	A	M	J	J	A	S	O	N	D
Cannabaceae	Trema orientalis	Tree	20	occurs	occurs												
Fabaceae	Adenanthera mantaroa	Tree	30	possible													
Fabaceae	Albizia adianthifolia	Tree	35	occurs													
Fabaceae	Albizia gummifera	Tree	25	occurs													
Fabaceae	Albizia mainaeae	Tree	15		possible												
Fabaceae	Albizia perrieri	Tree			possible												
Fabaceae	Albizia viridis	Tree	20	possible													
Fabaceae	Cadia pubescens	Shrub	4		occurs												
Fabaceae	Cynometra commersoniana	Tree	12		E (low alt)												
Fabaceae	Dalbergia emirrensis	Tree	15		occurs												
Fabaceae	Dalbergia monticola	Tree	20	occurs													
Fabaceae	Dalbergia orientalis	Tree	12	occurs													
Fabaceae	Dichrostachys tenuifolia	Shrub	4	possible													
Fabaceae	Entada chiripoatichys	Tree	10	occurs													
Fabaceae	Entada louvelii	Tree	10	occurs													



Ny Tanintsika – community engagement





Conservation & development hand-in-hand

Working in COFAV for 20 years

- integrated development and conservation
- network of extension workers
- building capacity in health, agriculture, forest management, education and income generation
- refined participatory approach

Developing silk industry in Amoron'i Mania

Silo National des Graines Forestières



MSB Partner since 2000

Target (2010-19): 1500 species, 4500 collections

- endemic families & genera
- ecologically important species
- culturally significant species
- economically important species
- endangered species known from very few sites
- endangered species not found in protected areas

Systematic targeting from the whole orthodox flora

GSPC Target B: 75% of threatened species in ex-situ collections with 20% available for restoration programmes

Agroforestry project:

- seed collecting
- tree nurseries
- tree planting
- rehabilitation
- restoration



Project outputs

Output 1	Baseline data, monitoring systems and skills developed within the 30 community associations (COBAs) and project extension workers for forest management under agreed management plans.
Output 2	30 communities engaged in the conservation and sustainable utilisation of 5 wild species with livelihoods or income generating potential.
Output 3	30 communities engaged in agroforestry with community demonstration plots managed by the COBAs and benefits shared by all households.
Output 4	30 communities engaged in seed collecting and tree propagation for land rehabilitation and forest restoration , covering 100 ha each.

Project results – year 1




Itremo (10 communities):

- training ongoing
- 10 tree nurseries
- 70,000 seedlings (35% of target)
- harvesting of silk

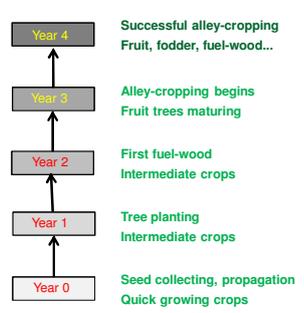
COFAV (20 communities):

- training ongoing
- 20 tree nurseries
- 112,000 seedlings (28% of target)
- production of essential oils
- production of vanilla

Some problems encountered:

- few seeds & low survival of seedlings
- no native *Inga* analogues found so far
- time (households still have to farm)
- preference for Eucalyptus
- distance to the forest
- no market for *ravensara* essential oil

The main agroforestry challenge – TIME!



Year 4: Successful alley-cropping
Fruit, fodder, fuel-wood...

Year 3: Alley-cropping begins
Fruit trees maturing

Year 2: First fuel-wood
Intermediate crops

Year 1: Tree planting
Intermediate crops

Year 0: Seed collecting, propagation
Quick growing crops



Local species grow slowly
So do we use *Inga edulis*!?

Thank you

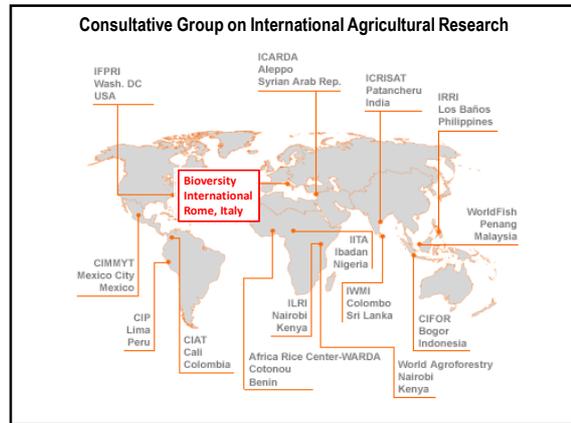


Enhancing the use of neglected and underutilized species through a holistic value chain approach
experiences from the IFAD NUS Project in Latin America and South Asia

Stefano Padulosi




Useful Plants Project Workshop, RBG Kew, Wakehurst Place, UK 22-24 July 2014




Livelihoods Nutrition
Sustainability Productive & Resilient Ecosystems

www.biodiversityinternational.org



Neglected and Underutilized Species (NUS)

PROS:

- Hardiness, good adaptability and resilience to biotic/abiotic stresses
- Nutritional value (often superior of that of major crops)
- Versatility in use (meeting many livelihood needs)
- Rich associated food culture and traditions (safeguarding identity)

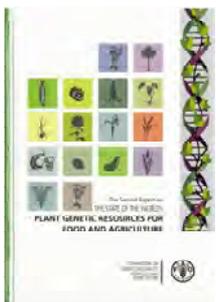
CONS:

- Poor economic competitiveness with commodity crops
- Lack of improved vars. or poor cultivation practices
- Often drudgery in value addition
- Disorganized/ non-existent market chains
- Perception of being "food of the poor"
- Scarcely represented in ex situ collections

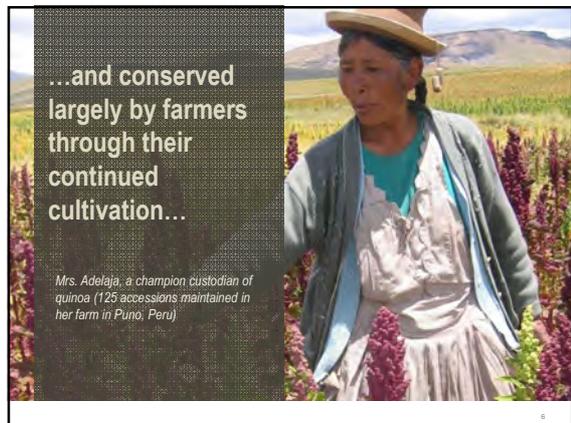
NUS: scarcely represented in ex situ collections...

7.4 millions accessions in 1,740 ex situ gene banks:

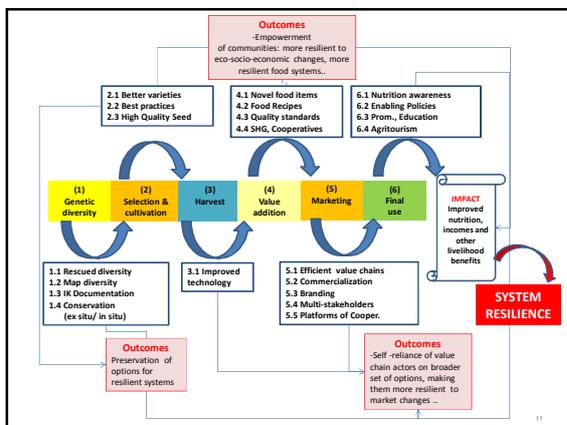
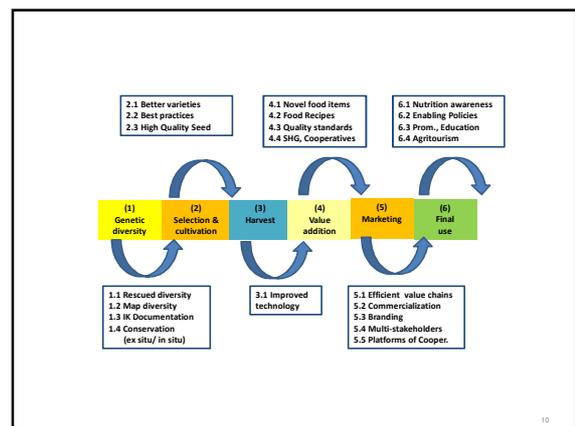
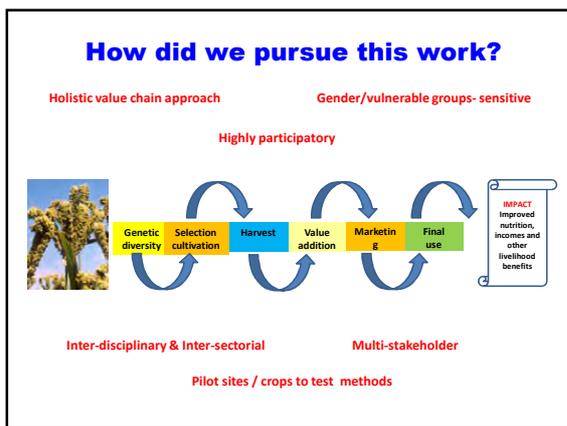
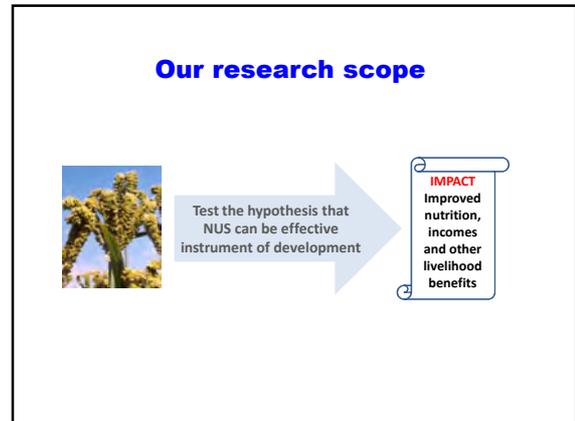
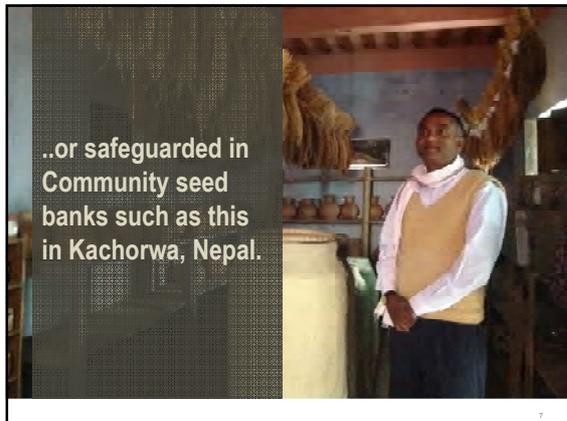
- major crops well covered, gaps for landraces, CWR, neglected and underutilized species
- 70% gene bank accessions are duplicates (FAO 2010)
- Disparity to increase because of the attention of the FAO Treaty/Global Conservation Trust on staple crops.



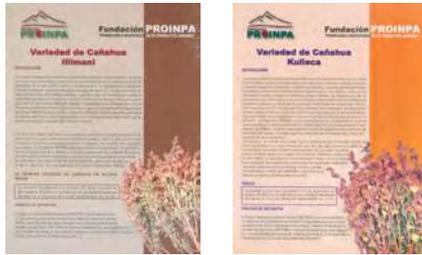
...and conserved largely by farmers through their continued cultivation...



Mrs. Adelaja, a champion custodian of quinoa (125 accessions maintained in her farm in Puno, Peru)



Bolivia: first ever cañihua vars. released!



As a whole several tons of high quality seeds produced by farmers trained by the project and distributed to communities..



Resilient local markets & income generation activities..



Capacity building



- Training covering all activities and targeting all stakeholders
- Emphasis on women –map/ strengthen roles in value chain
- Social networking, access to microcredit..

Nutritional benefits: evidence from raw and processed food

Analyzing nutritional information and selecting the best material from genebanks

AMARANTH Genebank	BNGA 045	BNGA 013	BNGA 043	BNGA 006	BNGA 018	BNGA 038
Calories (Kcal./100 g)	390	392	383	395	430	430
Protein (%)	13.5	13.5	13.3	13.5	12.4	20.1
Fat (%)	6.50	6.80	6.76	7.51	10.0	11.8
Carbohydrates (Tot %)	65.0	68.1	67.8	68.3	66.4	56.3
Fibre (g/100 g)	4.74	4.11	3.77	4.59	3.95	3.05
Ca (mg./Ca/100 g)	86.2	81.1	105	97.4	52.5	68.3
Fe (mg./Fe/100 g)	15.6	13.0	22.7	14.3	20.5	4.20
Vit C (mg/100 g)	1.30	2.08	1.82	2.80	1.82	7.14

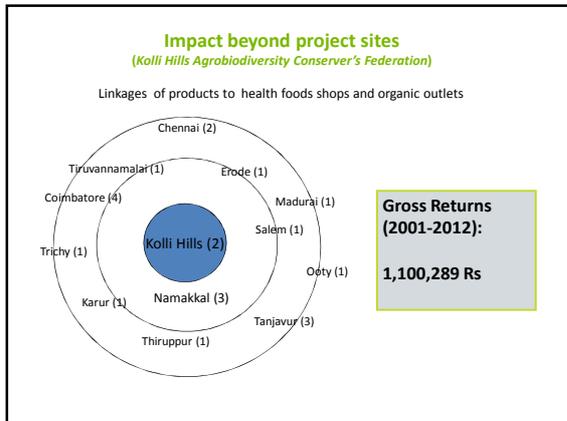
Providing nutritional information of processed material

AMARANTH Processed	Cereal Amarantho casavital	Pap de amarantado	Kulpa energética amarantado masa	Gulitas de amarantado	Barras energéticas masa amarantado	Barras energéticas quinoa, masa amarantado
Calories Kcal./100 g	401	422	391	468	414	378
Protein %	20.1	19.2	18.1	9.22	9.28	5.97
Fat %	11.8	10.4	5.47	17.0	8.18	1.95
Carbohydrates Tot %	58.3	69.1	75.0	67.5	75.8	66.4
Fiber g/100 g	3.05	5.15	4.20	2.98	4.89	1.27
Ca mg./Ca/100 g	68.3	60.7	107	36.1	68.4	21.8
Fe mg./Fe/100 g	4.20	5.23	7.18	1.31	2.95	1.31
Vit C mg/100 g	7.14	3.42	9.30	6.50	10.1	4.42

Cost-benefit analysis for minor millets in India

Value-added products from minor millets	Ingredient Cost	Recovery in kg	Gross income in Rs	Expenditure in Rs	Net Income in Rs	Margin per Kg
Finger Millet Malt (Ragi Malt)	3718	100	9000	5600	3400	37.78
Thinai Payasa Mix	6050	100	12000	7600	4400	36.67
Thinai Laddu	8984	100	23345	13340	10005	42.86
Samai Bajji Mix	6050	100	12000	7600	4400	36.67
Samai Uppuma Mix	6490	100	12800	7200	5600	43.75
Samai Rava Dosa Mix	5610	100	12000	7600	4400	36.67

(*When 100 kg produced)



More attractive food & nutritious items

> **Output:** Increased number of food items (18 quinoa; 15 cañahua and 10 amaranth –e.g. albondigas, queques, jugos, torta, magdalenas, panqueques, humintas); Characterization of varieties for their food technology aptitude..

> **Outcome:** Identification of vars most suited to specific processing, food items..



Mainstreaming nutritious millets into school meals



Project with the Univ. Bangalore and the Dept. of Women & Child Welfare, Govt. of India.

Millet-based recipes with better overall nutritional profile, and of competitive costs.

Recipes submitted to the Dept of Women and Child Welfare for approval and adoption. Impact opportunity in Karnataka State: 3.5 M children (on going work that will be now facilitated by the **newly approved Food Security Bill/revised PDS in India**)

Changing the *food-of-the-poor* stigma through strategic partnership with private sector-Bolivia (Alexander Coffee)



Conservation Outcome..

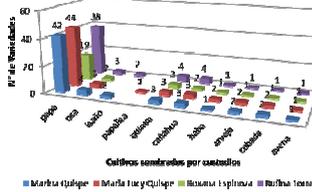
The big gap to fill:
Linkages between ex situ & in situ



Seed and Culinary Fair Mandla, Madhya Pradesh (India), 20 Nov 2012



Documenting crop diversity in Coromata Media, Bolivia (2013)



Community Gene Bank in Coromata Media (2013)

Se estableció con 45 variedades de papas nativas, compuesta de seis especies, de las cuales 18 variedades corresponden a la especie *Solanum tuberosum* subsp. *Andigena*, 19 variedades de *Solanum stenotum*, 4 variedades de la especie *Solanum juzepzukii*, una variedad de *Solanum goniocalix*, una variedad de *Solanum ajanhiri* y dos variedades de *Solanum cortilobum*.



Documenting and monitoring

1. Numero de orden
2. Fecha de registro
3. Cultivo o especie
4. Nombre local
5. Tipo de cultivo
6. Características distintivas
7. Ubicación en el agroecosistema.
8. Año de la primera siembra
9. De donde obtuvo las semillas/plántulas
10. Partes y productos utilizados
11. Usado/valorado para que (detalles)
12. Detalles del proceso de cultivo.
13. Técnicas de usadas
14. Valor económico
15. Quienes participan en los procesos
16. Estado de conservación
17. Tendencia de desarrollo
18. Persona que tiene el cultivo/
19. Fotografía del cultivo planta
20. Observaciones



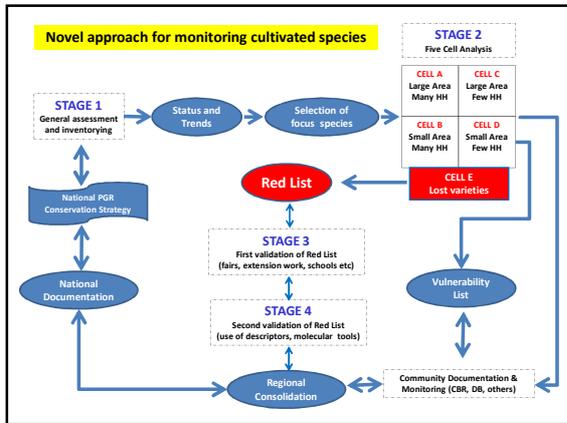
Access and exchange



Cantidad de especies y variedades expuestas por los participantes en la Feria de Biodiversidad de Coromata Media

Nombre de participantes	Especies									Total
	Papa	Quina	Callaburo	Oca	Isato	Pogonito	Callabudo	Avana	Tingo	
Encarna Quenta	13	-	-	-	-	-	-	-	-	13
Julia Quispe	8	5	9	2	5	4	1	3	3	15
Alberto Flores	13	-	-	-	-	-	-	-	-	6
Peltrona Ronquillo	24	1	1	-	-	-	-	1	1	29
Felipa Mamani	10	-	-	-	-	-	-	-	-	10
Regina Pasanico	26	-	-	-	-	-	-	-	-	26
Sonia Quispe	36	1	1	-	-	-	-	-	-	38
Antonio Choquehuanca	24	1	1	-	-	-	-	1	2	29
Solome Espinoza	40	1	2	7	-	1	3	1	2	5
Teodora Quenta	20	-	-	-	-	-	-	-	-	20
Roxana Quispe	24	1	2	4	-	1	-	1	3	1
Maximo Quispe	23	1	2	2	-	1	-	-	3	1
Maria Asencia Quispe	10	-	-	-	-	-	-	-	-	11
Vicenta Miranda	27	2	1	2	-	-	1	1	2	2
Isatiqua Quispe	25	1	1	-	-	-	-	-	-	27
Emiliano Quispe	29	-	-	-	-	-	-	-	-	29
Marina Quispe	61	-	-	-	-	-	-	-	-	41
Antonita Miranda	11	1	1	1	3	-	-	-	1	1
Maritza Miranda	19	-	-	3	-	-	-	-	-	22
Juana Rosa Miranda	6	-	2	4	-	-	-	-	-	16
Taribio Quispe	27	-	-	-	-	-	-	-	-	27
Rufino Torrez	4	17	-	3	-	-	-	-	-	4
Mauricio Quispe	46	9	7	-	-	-	2	2	3	9
Rosemary Quispe	14	1	1	-	-	-	1	-	-	17





Threats and loss in potato diversity as emerged through 5CA

Comunidad	Areas pequeñas – Pocas Familias	Variedades perdidas
Coromata Media	Queta, Manzana Imilla, Sacampaya Negro, Cuchi Jipilla, Morado Chuquipitu, Chiyara Taraco, Sapallu, Wila Taraco, Janqu Imilla, Janqu Kaisalla, Holandesa, Sacampaya, Chuquipitu Nairan Morado, Chiji Yurima, Leke Cayu, Wila Surimana, Koyu, Tonko Puya Blanco, Kaka Surimana, Condor Piqui, Papa Garri Blanco, Papa Chirito, Wila Piñu, Papa Kealla, Pepino, Camara, Kalla Pitikilla, Saitu Luki, Morado Kaisalla, Janqu Ajawiri, Choclitto, Holandes Sapallu, Loka, Wisla Paqui, Janqu Polo, Wila Wisla, Chiyara Surimana Largo, Janqu Yurima, Luki Taraco, Sani Imilla, Wisla Wisla, Peruano, Papa Garri Rojo, Chiyara Isla, Wila Koyu, Yurima, Janqu Sicha, Amajayu, Wila Nairan Peruano, Pureja Blanco, Huancu Callu, Chiji Pitikilla, Tonko Puya, Janqu Pitikilla (55 variedades)	Papa Milagro, Papa Criolla, Morado Kullo (3 variedades)
Cachilaya	Kullo, Wila Nairan Polo, Waca Lajra, Wila Piñu, Papa Rosado, Pitikilla (6 variedades)	Luki, Piñu, Warisaya, Waylacha Llocallito, Janqu polo (5 variedades)

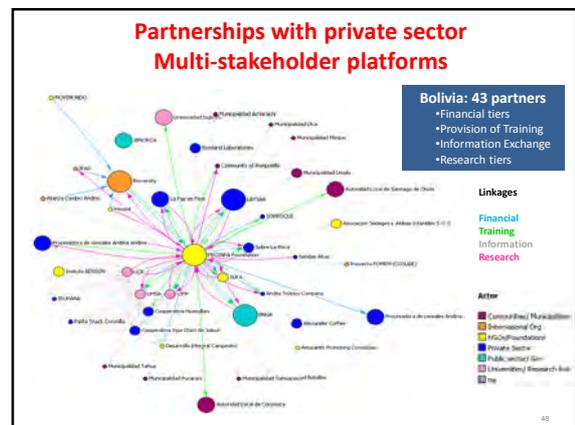
NOVEL APPROACH: AGRITOURISM

- Output:** 10 families trained and facilities created (e.g. lodges, museum; agritourism circuit); Extra donor funds raised; Bolivia Lonely Planet, web page; etc.
- Outcome:** SdeO has diversified its incomes taking advantage of its rich agricultural and food traditions;
- Outcome:** establishment of 'Asociación de Turismo- ATISOL' to ensure self-sustainability of work.
- Impact:** 389 tourists have visited SdeO (2007-2010) generating an average of 1,079 USD/ family.

Bi-lingual web site for the Community

Ex situ-In situ linkage and mainstreaming into Governments' policies and frameworks..

<http://bit.ly/RfCvRc>



 **Neglected and Underutilized Species**

HOME ABOUT US RESEARCH RESOURCES MEDIA CONFERENCE



NEGLECTED AND UNDERUTILIZED SPECIES

Thousands of edible plant species have been central to traditional food cultures throughout history but fields and diets are dominated by a small selection of staple and commodity crops.

[Read More](#)

<http://www.nuscommunity.org/>

Bolivia: Crazy for Quinoa

4 min video

<https://www.youtube.com/watch?v=z4oZtVmWgOw>



Thank you!

Towards the Harnessing of the Potentials of PGRFA: The Second GPA and National PGRFA Strategy

Plant Genetic Resources and Seeds Team
Plant Production and Protection Division

Food and Agriculture Organization of the United Nations
for a world without hunger

Outline

- In Context
 - Food security: drivers, interventions
 - Imperative for harnessing PGRFA
- PGRFA as global commonwealth
 - Norms, instruments, mechanisms
- Second Global Plan of Action for PGRFA
- National PGRFA Strategy
 - Ongoing activities regarding the development of National PGRFA Strategies in Africa
- Perspectives
 - PGRFA Management Continuum

Plant Production and Protection Division **AGP**

Profiling Food (In)Security

- Wake up call in the recent food price increases
 - Post-green revolution complacency
- 1 billion people go hungry today
- At current rates, population by 2050 estimated at 9 billion
 - Need to produce 70% more food
- Uncertainties exacerbated, odds lessened by:
 - climate change and variations
 - demographics, changing dietary patterns
 - competing diversions of foodstuff to bioenergy, livestock feeds, fibers

Plant Production and Protection Division **AGP**

Profiling Food (In)Security

Proportion of people who are undernourished, 1990-1995 and 2002-2012 (Percentage)

Quick facts

- Poverty rates have been halved, and about 700 million fewer people lived in conditions of extreme poverty in 2010 than in 1990.
- The economic and financial crisis has widened the global job gap by 67 million people.
- One in eight people still go to bed hungry, despite major progress.
- Globally, nearly one in six children under age five are underweight, one in four are stunted.
- An estimated 7 per cent of children under age five worldwide are now overweight, another aspect of malnutrition; one quarter of these children live in sub-Saharan Africa.

More than 100 million children under age five are still undernourished and underweight

Proportion of children under age five who are underweight or severely underweight, 1990 and 2011 (Percentage)

The Millennium Development Goals Report 2013

Plant Production and Protection Division **AGP**

Crunching the Numbers --

Crop	Area (10 ⁶ ha)	Production (10 ⁶ tons)	Yield (t/ha)
Maize	158	792	5.0
Rice	156	890	4.2
Wheat	214	836	2.8

Total global cereal production (millions of tons)

Total cereal production (millions tons)

Developing countries Industrial countries Transition countries

1970 1980 1990 2000 2030 2050

Tester and Langridge, 2010, Science 327:818-822

Plant Production and Protection Division **AGP**

Increasing Crop Production ----

- Finite natural resources base
 - Available water and arable land either stagnant or dwindling
 - Prohibitive cost of agricultural inputs
- So, increased productivity is the most viable option!
 - Genetic gain accounts for 50% of increased crop yield
 - Balance is due to improved agronomic practices

CIAT

Plant Production and Protection Division **AGP**

Its All About Nature and Nurture!

- Re-enact the drivers for agriculture
 - Evolution, Domestication, Speciation
 - Green revolution
- Plant Breeding
 - science of altering the genetic pattern of plants in order to increase their value
- Sources of heritable variations



Scientific American, Jan. 2009

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Obstacles to realizing potentials

Breeding better & resilient crops complicated by

- narrow genetic base of breeding materials
- poor policy frameworks
- sub-optimal human & material resources



CIAT

Plant Production and Protection Division AGP

Very, very narrow genetic base

Genetic Resources and Crop Evolution (2006) 33: 379-386 © Springer 2006
DOI: 10.1007/s10722-004-9372-2

Genealogical analysis of diversity of Russian winter wheat cultivars (*Triticum aestivum* L.)

S.P. Martynov* and T.V. Dobrotvorskaya

The overwhelming majority (96%) are the descendants of cultivars Bezostaya 1 and/or Mironovskaya 808.

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Plant Genetic Resources as global commonwealth

- International Plant Protection Convention 1952
- Convention on Biological Diversity, 1992
 - contracted rather than facilitating exchange and hence, use?
- Global Plan of Action for PGRFA, 1996; 2011
- The International Treaty on Plant Genetic Resources for Food and Agriculture, 2001
 - Article 6 on use of PGRFA
- Global Crop Diversity Trust, 2004



Facilitating Mechanism for the implementation of the Global Plan of Action

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Global Plan of Action (GPA)

- Internationally **agreed framework (1996)** for activities related to conservation and sustainable use of PGRFA
- **Supporting component** to the International Treaty (Art. 14) and the **priority basis for its Funding Strategy** (Art.17)
- Consists of **20 Priority Activity Areas** for national, regional and global activities to:
 - conserve and use PGRFA sustainably,
 - promote the fair and equitable sharing of the benefits arising from the use of PGRFA,
 - assist countries and institutions to identify priorities for action,
 - strengthen programmes and enhance institutional capacity.




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Since the GPA (1996)

- The GPA has helped catalyze a series of global and national initiatives for management of PGRFA
 - About 15 regional or crop specific **networks established**
 - Over 300 new **genebanks** established and large increase in the number of **accessions** (20% increase)
 - New **instruments and legislations** on plant breeders rights, seeds, biosafety and farmers rights in place
 - Greater protection for crop wild relatives with expansion of **protected areas**
 - Global increase in **awareness**, international **collaborations** and **partnerships**





Plant Production and Protection Division AGP

Remaining Challenges

→ The Second Report on the State of the World's PGRFA (SoW) 2010 identified:

- Significant global, regional and national **achievements** in management of PGRFA.
- A **changing policy environment** with regard to PGRFA
- New and emerging **trends and challenges** with large impacts on PGRFA, including requirement for increased food production, climatic changes and depletion of the natural resource base.
- **Major gaps and needs require urgent attention**

↓

PGRFA are more important than ever

Plant Production and Protection Division

Second GPA - Addressing the Challenges

→ FAO's Commission on GRFA at its 12th Session in 2009, agreed to update the Global Plan of Action for PGRFA

- Review to be based on gaps and needs identified in the SoW Report (2010), contributions from Governments and inputs from regional consultations
- Regional consultations for Europe; Africa; Latin America & Caribbean; Asia; North America; Near East, North Africa and Central Asia; and the South Pacific held in 2010
- E-Consultation; Joint Bureau Meetings; and 4th Session of the Governing Body of the Commission in 2011.

→ The Second Global Plan of Action (Second GPA) adopted by the FAO council in November 2011

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The Second GPA

→ Provides an **updated PGRFA framework**, where gaps, needs, new challenges, and policy developments are taken into consideration

→ **18 Priority Activities** in four **main groups**:

1. *In Situ* Conservation and Management
2. *Ex Situ* Conservation
3. Sustainable Use
4. Building Sustainable Institutional and Human Capacities

→ Will **strengthen the implementation of the ITPGRFA** and ensure conservation and sustainable use of PGRFA at national, regional and global levels.

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The Second GPA

<i>In situ</i> conservation and management	<ol style="list-style-type: none"> 1. Surveying and inventorying plant genetic resources for food and agriculture 2. Supporting on-farm management and improvement of plant genetic resources for food and agriculture 3. Assisting farmers in disaster situations to restore crop systems 4. Promoting <i>in situ</i> conservation and management of crop wild relatives and wild food plants
<i>Ex situ</i> conservation	<ol style="list-style-type: none"> 5. Supporting targeted collecting of plant genetic resources for food and agriculture 6. Sustaining and expanding <i>ex situ</i> conservation of germplasm 7. Regenerating and multiplying <i>ex situ</i> accessions

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The Second GPA

Sustainable use of PGRFA	<ol style="list-style-type: none"> 8. Expanding characterization, evaluation and further development of specific subsets of collections to facilitate use 9. Supporting plant breeding, genetic enhancement and base-broadening efforts 10. Promoting diversification of crop production and broadening crop diversity for sustainable agriculture 11. Promoting development and commercialization of all varieties, primarily farmers' varieties/landraces and underutilized species 12. Supporting seed production and distribution
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Plant Production and Protection Division

The Second GPA

Building Sustainable Institutional and Human Capacities	<ol style="list-style-type: none"> 13. Building and strengthening national programmes 14. Promoting and strengthening networks for plant genetic resources for food and agriculture 15. Constructing and strengthening comprehensive information systems for plant genetic resources for food and agriculture 16. Developing and strengthening systems for monitoring and safeguarding genetic diversity and minimizing genetic erosion of plant genetic resources for food and agriculture 17. Building and strengthening human capacity 18. Promoting and strengthening public awareness on the importance of plant genetic resources for food and agriculture
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Plant Production and Protection Division

The Second GPA: Country Commitment

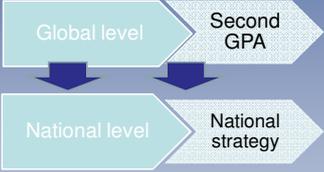
- Adopt a **strategic approach** to PGRFA management, ensuring the participation of all relevant stakeholders
- Link in situ** and **ex situ** conservation to use and seed systems
- Ensure **cooperation** between the environmental, agricultural and food sectors
- Adopt and implement adequate PGRFA-related **policies, legislation and activities**
- Promote **R&D and technology** transfer and **strengthen capacities**
- Raise **public awareness** on the importance of PGRFA
- Improve **information sharing mechanisms** and **monitoring systems** to support decision making
- Provide **adequate resources** in accordance with their specific priorities and development goals



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A Strategic Approach to PGRFA Management

→ The Second GPA sets the **conceptual bases** for the development and adoption of **national policies, strategies and legislation** for the conservation and sustainable use of PGRFA



→ A **National Strategy** for PGRFA is a **plan of action** that outlines the scope and direction of a country's management of PGRFA

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National Strategy for PGRFA

- Provides a **single overarching framework** for PGRFA, mainstreaming it within a country's overall agricultural policy,
- Prescribes means for **strengthening linkages and coordination** between conservation, sustainable use and the seed sectors,
- Prescribes **specific goals** for PGRFA management in the country,
- Prescribes **priority activities** and their timeframes,
- Identifies relevant **stakeholders**, assigns responsibilities



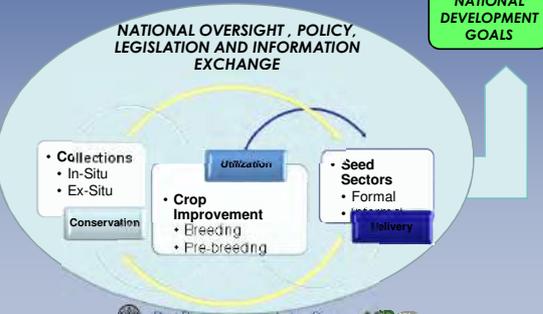
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Measures in a National PGRFA Strategy

- Efficient conservation of PGRFA
- Strengthened linkages between PGR collection holders and users
- Improved PGRFA use to address national crop improvement goals
- Strengthened linkages between crop improvement and the seed
- Implementation of national rules and legislations
- Increasing public awareness

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Conceptualizing a National PGRFA Strategy



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National PGRFA Strategy Development - Africa

- Strategies developed under the framework of SPGR regional program, FAO program on PGRFA and the FAO TCP involving 6 SADC countries
- Six participating countries
 - Botswana, Malawi, Mozambique, Lesotho, Tanzania, Zambia
- Emanated from the SPGR Annual Review & Planning meeting, 2011
- Another country -- Rwanda

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National PGRFA Development Process

- ❑ Consultative process involving SPGRC, FAO and the National Programs
- ❑ Follow up to project involving the status report on PGRFA in Rwanda
- ❑ Iterative consultations and discussions with national PGRFA stakeholders through country visits
- ❑ Literature searches

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National PGRFA Development Process

- ❑ Development of the draft strategies
- ❑ Presentation and discussion of draft strategies in national stakeholders workshops
- ❑ Revision of the draft strategies
- ❑ Finalization of the strategies

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Content

- Introduction and background
 - Agricultural statistics
 - Food security policy related issues
 - Situation analysis
- ❑ National PGRFA strategy
 - Definition and importance
 - Goal and objectives
 - National PGRFA in the context of agricultural R & D
- ❑ The target/priority food crops
 - Key production statistics

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Content

- ❑ Crop specific elements of the strategy
 - Germplasm conservation and characterization
 - Pre-breeding to generate novel variants for use in breeding
 - Breeding
 - Production of breeder seeds
 - Specific elements
 - ❖ Brief description of what will be done
 - ❖ Responsibilities
 - ❖ Timeline
 - ❖ Capacity building (institutional and human)

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Content

- Guidelines and process of varietal release and seed delivery
- Information dissemination and public awareness
- Governance structure, policies and national coordination mechanisms for implementation
- Implementation plan and institutional frameworks
- Monitoring and evaluation
- Annexes
 - List of people contacted
 - List of references

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Progress

- Country visits for consultations conducted
- Draft strategies for the countries developed
- Stakeholders workshops to discuss draft strategies held in six countries
- Comments for improvement made during workshops
- 3-5 team members in each country to help finalize the strategies

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Guidelines for Developing a National PGRFA Strategy

CGRFA-14/13 Report

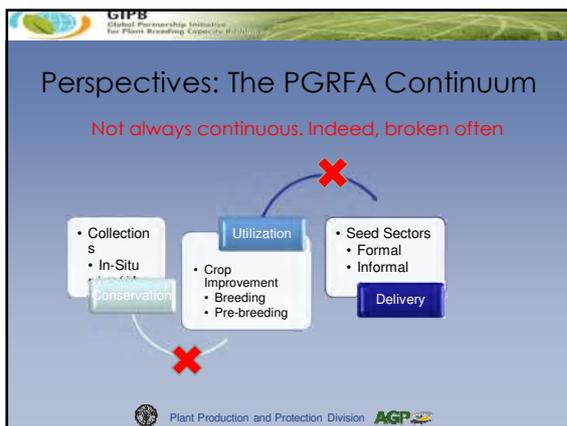
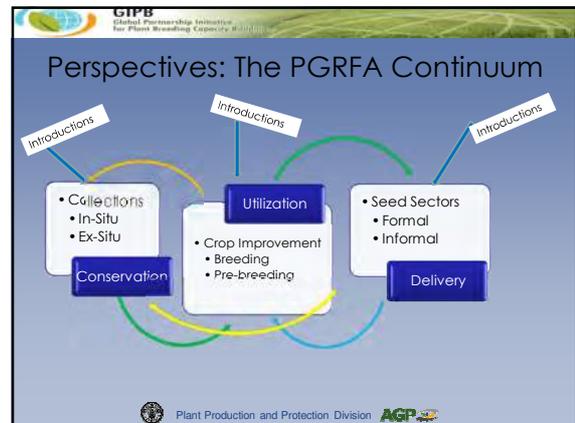
Fourteenth Regular Session of the Commission on Genetic Resources for Food and Agriculture

Rome, Italy, 15 – 19 April 2013

Food and Agriculture Organization of the United Nations

99. The Commission expressed its appreciation for FAO's assistance to countries in developing national plant genetic resources strategies, best practices and tools for the implementation of the Second GPA. It requested FAO to prepare draft guidelines for national plant genetic resources strategies for review by the Working Group on Plant Genetic Resources and the Commission at their next sessions.

Plant Production and Protection Division **AGP**



Thank you very much!!!

Plant Production and Protection Division **AGP**

Monitoring and Evaluation (M&E) for Conservation Livelihood Projects

Review Workshop
RBG Millennium Seed Bank,
WakehurstPlace
24 July 2014
Catherine Mackenzie

Topics

- Rationale and introduction to this M&E exercise
- Conservation livelihoods projects
- Recap: Quick definitions of M&E
- More detail and reflections on community project
 - Elements of monitoring plan
 - OECD Evaluation criteria
- Take-home messages and next steps

Rationale

Kew's mandate:

- Increasing appreciation of plant conservation as a “people-centred issue” with strong links to development
- Enhance Kew's contribution & strengthen its applied science & society links

Project funding:

- UPP's current “soft funding” is ending; options for new funding include big development statutory donors (DFID, EU etc.)
- A lot of competition, donors have strict and standardised M&E/ accountability practices; want IMPACT and EVIDENCE of impact

Above All: Project performance

- Sustainable community development and NRM are not easy. Effective M&E improves project performance / impact. Help you get most from your hard work

Introducing the present evaluation

- Independent evaluation: Paolo Ceci and me
- Purpose
 - help UPP team learn lessons
 - inform the final extension year of Phase 2
 - inform planning for next steps/new directions
 - Expose team to more formal M&E methods
 - (NB: not been requested by donor and not included in original project – so “soft version” primarily for learning)
- Process
 - desk review of reports, other outputs
 - observing workshop
 - interviewing teams from Kew, Mexico and RSA
 - field visits to Mali, Kenya and Botswana
 - Report by November

Conservation Livelihood Projects: some cautions

- Conservation problems are mostly about people
 - Over-exploitation of resources
 - Destruction of habitat
 - Links to poverty – but certainly not always (mining, agroindustry, climate change)
- Conservation livelihood projects are very challenging:
 - As many of you are aware: typically complex, multi-dimensional. Require a deep and shared understanding of communities and associated systems. Usually involve promoting a behaviour/ social/ economic change. People stop doing something, and start doing something else and improve livelihoods at the same time. Very sensitive.
- For example :
 - Its one thing getting some trees planted
 - Quite another designing a planting programme that benefits participants appropriately and sufficiently to ensure the trees grow on and produce in the long term.

Conservation Livelihoods Projects

- To have an impact (most) community conservation interventions will require participatory research and planning, very active project facilitation and community participation, capacity building, strategic partnerships and extreme creativity over the medium-long term
- Very well-established methods for all this exist
- M&E is vital part of it, integrated from the start

Monitoring

- Continuous assessment of project and its environment with regard to the planned objectives, results, activities and means/inputs.
- Why: track progress; ID successes and problems to permit “adaptive management” - change to implementation strategy if necessary
- Who: Usually internal by project managers/stakeholders (participatory monitoring) but can be external
- When: on-going, monthly, quarterly, annually
“Little and often” to avoid last minute crises!

Evaluation

- Systematic and objective assessment of project’s design, implementation, outcomes
- Why: i) lesson learning ; ii) validation, and accountability, to donors, public, beneficiaries
- When: usually a final evaluation, often a mid-term too. Sometimes ex-post (long term impact)
- Who: usually external/independent agents

Typical Elements of Monitoring Plan

Element	Scope /considerations
Logframe	Goal >> Purpose >> Outputs >> Activities
Indicators /targets	Quality/Quantity/Time ; Objective/Subjective ; Outcome and Process
Work Plans	Monthly/Annual with targets
Data Collection and Analysis (EVIDENCE)	Baseline surveys relevant project objectives Re-surveys/Case Studies/Focus Groups / process documentation
Reporting	Consider: Frequency, Format, Audience
Responsible Parties	Implementers/researchers/managers/funders /beneficiaries (participatory M&E)
Budget	Typically 5-10% of project’s total budget often a project output in own right Underscores its importance

Log-frames and Indicators

- LF is both a planning tool and monitoring tool – v useful, deserve a lot of attention
- First column describes Goal, Purpose, Outputs and Activities and establish project’s internal logic
- Next column - Indicators – for the outputs you want to achieve
- Rule of thumb: if you want it then you gotta put an indicator on it
 - Quality/Quantity/Time – adoption plant pesticides/50% /by yr 5
 - Outcomes/Targets
 - People-focused indicators (as well as your plant indicators)
 - If your target is a change (health, income, behaviour), you probably need a baseline study at project start up.
 - Process Indicators
 - Use in order to define your process / methodologies – aiming at best practices – indicators to ensure they are followed (eg PRA exercises completed in all villages by end of month 6)

Some examples of people-focused indicators

- Process
 - PRA reports completed and reported back
 - Frequency of project staff interaction in community
 - % of community regularly participating
- Outcomes: (depends on objectives, context)
 - % people changing the key behaviour
 - Slash and burn to alley cropping
 - changes key “livelihood assets”: financial, social, physical, natural, human.
 - % change in access to useful plants
 - % change per capita income from selling useful plants
 - % change nutritional status from eating useful plants
 - % of people with improved knowledge and practice
- All of these would require baseline data and resurvey
- This is what development donors want to see

OECD/DAC Evaluation Criteria

Criterion	Meaning
Relevance	Are the objectives of the project (still) consistent with beneficiaries’ requirements, country needs, global priorities and partners’ and donors’ policies.
Effectiveness	Have the project’s objectives/outputs been achieved? What were the major factors influencing the achievement or non-achievement of the objectives?
Efficiency	Have the objectives been achieved in the most timely and cost-effective way?
Impact	What changes (positive/negative) have the project produced (directly/indirectly, intended/unintended), esp relating to project goal. Are they significant?
Sustainability	Are the positive effects or impacts likely to be maintained once project intervention ends?

Take-home messages

- Community development/IGA are very challenging
 - Think about benefits/incentives for community participation
- Fundamental links between:
 - Project's design and its M&E: build in incentives/benefits and track them
 - situation analysis: deep/shared community
- M&E generates evidence for decision-making and accountability, credibility and future funding
 - It is vital for ADAPTIVE PROJECT MANAGEMENT, build it in from start
- Develop people-focused indicators
 - If you want livelihood impacts, you need livelihood indicators and probably baselines studies
- Monitor processes as well as targets

Next steps

- Final session today – ideas for future collaboration
 - Begin with the end (evaluation questions) in mind:
 - Are the objectives you propose RELEVANT (to peoples' problems/needs)? Have you done a diagnosis?
 - Will your proposed methods be EFFECTIVE in delivering the objectives?
 - Does the budget represent EFFICIENT use of funds?
 - What will the IMPACTS be on peoples' lives and how will you demonstrate them?
 - Will the impacts be SUSTAINABLE 1,5,10 years after the project ends?
 - Build in M&E system from the start
- Paolo and I look forward to meeting with you!

The Kew Foundation – Successful Fundraising from Trusts & Companies

David Tatham – Interim Associate Director,
Corporate and Foundation Partnerships



Effective fundraising is about developing **positive and honest relationships** with funders, and engaging them as **partners** in your work



Spotlight on:

- The Fundraising function at Kew
- Kew's main sources of funding
 - The Fundraising Process
- Tips for applying to Trusts and Companies



The Foundation & Friends of the Royal Botanic Gardens, Kew (Kew Foundation)

- Separate legal entity, the sole purpose of which is to raise funding to further Kew's work
- Have our own Board of Trustees, Senior Management and staff structure
- Fundraising is prompted by Kew's process of signing off new projects





Kew Income

Income 2012/13 totalled £ 58.341M

	£'000
Grant-in-aid -	32,475
Grants and donations -	11,670
(Kew Foundation)	
Income from activities -	14,134
Investment income -	62
	<u>£58,341,000</u>



Kew Foundation

- Individual giving – High Net Worth
- Legacies
- Grants - Trusts & Foundations
- Membership
- Corporate support



Kew Foundation

	£'000
• Individuals - donations	3,266
• Legacies	302
• Grants (Trusts & F'dts)	4,257
• Memberships	3,745
• Corporate income*	100
	£11.67M

Statutory/research funding not a Foundation function

*Corporate sponsorship not shown in Foundation Accounts



The Fundraising Process



Strategy

- What funding is needed – how much, what types of activities, when?
- Where funds will come from? Companies? Trusts? Individuals? Membership? etc.
- What activities need to happen to raise funds, when do they need to happen and who will do them?



Identification

- Your competitors
- Local & National funding resources, e.g:
 - UK - Directory of Social Change www.dsc.org.uk
 - US – Foundation Centre <http://foundationcenter.org>
 - Europe – European Foundation Centre www.efc.be



Cultivation

- Cultivation is where you start a relationship and develop it through to the point where you ask for support (solicitation)
- Have a plan – how you will engage them & develop relationship – invite to events, workshops etc.
- Engage, enthuse about your work, and keep them engaged and enthused. **ENGAGE & INVOLVE THEM!**
- Most funders give to work which has **IMPACT**.



Solicitation

- Don't be ashamed to ask for financial support – you are inviting them to be a partner in your work. It's an honour for both of you
- Know what you want to ask them for, but base it on thorough research on what is likely to interest them
- Have other things in mind if they tell you your first suggestion isn't of interest



Stewardship

- Thank for their support
- Visits, tours, events, refined by donor
- Project updates
- Look to develop the relationship - ultimate aim is to make them feel part of the organisation's success, and keep giving



Analysis

- What has worked and what hasn't (e.g. corporate membership)
- Update Fundraising Strategy to reflect learning



The Fundraising Process



Your funding proposal

- Align v. closely with aims of the funder
- Introduction
- The problem
- Your solution – what you will do
- How you will do it
- Outcomes
- Timeframes & reporting
- Budget & funding secured/needed
- The ask – also in cover letter
- Conclusion





The proposal

- Don't give them reason to throw your funding proposal in the bin!
- Keep it as brief as possible
- Avoid jargon
- Spelling
- Read it, re-read it, go away, then re-read it before it goes out
- Double check all figures/stats
- Be prepared to answer questions



Effective fundraising is about developing **positive and honest relationships** with funders, and engaging them as **partners** in your work



Its tough, but its worth it!



Any questions?

d.tatham@kew.org





Statutory Fundraising: lessons learnt & case studies from Kew

Useful Plants Project workshop, MSB, 24th July 2014
Iain Taylor, Statutory & Research Funding Manager





Contents

- How funding agencies work
- Costs / benefits of statutory funding
- Typical evaluation process for bids
- How to find funding

- Case study – the Darwin Initiative

- ### Funding Agencies
- Similarities of all funding agencies:**
- Fund projects that help them meet their *own* aims
 - They can only afford to invest in a few projects
 - They select projects that best meet their criteria

 - They make speculative investments and therefore need evidence of likely success beforehand

Costs / benefits

+	-
Large grants	Complex applications
Multi-year funding	Low success rates
Drives quality in project design and M&E	Matched funding
Influence	Administrative burden (T&Cs)

- ### The four key propositions of funding applications
- IMPORTANCE**
- The subject is important to the funder
- SUCCESS**
- The project is likely to be successful
- VALUE**
- The resources requested are necessary and appropriate
- COMPETENCE**
- The applicant and team are capable of delivering the project

- ### The four key propositions of funding applications
- IMPORTANCE**
- Give evidence of importance, links to funder policy
- SUCCESS**
- Explain methods, give evidence that they will work
- VALUE**
- Demonstrate that the outputs are worth the grant
- COMPETENCE**
- Give evidence of previous success and track record

Finding funding opportunities

- Sign up to email alerts from potential funders and professional bodies
- Check funder websites
- Who is funding the work of your peers?
- **Build relationships with funding stakeholders**

Case study: The Darwin Initiative



- Funded by DFID and Defra
- Aims to assist countries that are rich in biodiversity but poor in financial resources to meet their objectives under the CBD, CITES (and CMS)
- It funds collaborative projects which draw on UK biodiversity expertise
- Darwin funds projects which are “win-wins” for conservation and livelihoods

Case study: The Darwin Initiative



Darwin-funded Kew projects

- Madagascar Agroforestry Livelihoods Project (£263k)
- Forest Futures: livelihoods and sustainable forest management in Bolivian Amazon (£259k)
- Balancing conservation and livelihoods in the Chimanimani Forest belt, Mozambique (£291k)
- Pesticide plants for organic cotton, livelihoods and biodiversity in Mali (£258k)
- Protecting Ugandan Endemic Cycads from Biodiversity Loss and Trafficking (£193k)

The Logical Framework approach

	INDICATORS	VERIFICATION	ASSUMPTIONS
IMPACT			
OUTCOME			
OUTPUTS			
ACTIVITIES			

Case study: The Darwin Initiative



Mali pesticide plants project

- Partnership with Institut d'Economie Rurale du Mali (IER) and MOBIOM (Mouvement Biologique Malien)

Outcome: “The sustainable use and cultivation of pesticide plants for organic cotton production leads to increased income generation among target communities, and reduces the loss of plant biodiversity in southern Mali.”

Outputs:

1. Identification and authentication of pesticide species
2. Active compounds identified and effectiveness assessed
3. Farmer field visits and guidebook
4. Small-scale organic pesticide producers established
5. Demonstration gardens set up

Features of winning applications

- Outstanding... or high quality and lucky
- They provide evidence relevant to the evaluation criteria
- Can be understood by non-specialists
- Have clear “intervention logic”
- Can be remembered easily and explained quickly by non-specialists
- They are often re-submissions

Questions?

**Project MGU – The Useful Plants Project (UPP)
Review Workshop
22-24 July 2014**

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