Conserving plant diversity and improving livelihoods
Examples from Latin America, Sub-Saharan Africa and the Mediterranean region

Tiziana Ulian, Efisio Mattana, Alex Hudson, Khaled Abulaila, Michiel Van Slageren, Melanie-Jayne Howes, Hassan Rankou and Gary Martin

8th June 2016
XV OPTIMA Meeting, Montpellier
Outline

Background

1. The MGU – Useful Plants Project (Botswana, Kenya, Mali, South Africa and Mexico)

Kew’s Millennium Seed Bank, Wakehurst Place, UK
2. Toward conserving Jordanian Flora
   • Promoting the conservation and sustainability of the traditional Mediterranean diet in Jordan

Kew’s Millennium Seed Bank, Wakehurst Place, UK
Outline

3. Integrated Approach to Plant Conservation in the Moroccan High Atlas
All life depends on plants

1. Economic plants

“Economic plants” as plants that “are used by man in some way and therefore represent economic value” (Cappers et al., 1999)

2. Useful plants

“Any native plant can be considered a resource for humankind - and for associated animal and plant species - in that it contributes to the health and stability of the ecological community in which it occurs” (Tuxill & Nabham, 2001)
All life depends on plants

- **Provisioning services**
  - Food, medicine, fuel, construction, clothing, etc.

- **Regulating services**
  - Climate moderation, disease regulation, flood regulation

- **Cultural services**
  - Spiritual, recreational, aesthetic, inspirational, educational

- **Supporting services**
  - Soil formation, nutrient cycling, primary production
Conservation of useful plants

A continuum of conservation approaches:

1. **In situ conservation**
   - wild protected areas
   - special management regimes

2. **Ex situ conservation**
   - seed genebanks
   - field gene banks
   - in-vitro tissue culture banks
   - pollen, DNA libraries etc.

3. **On-farm management**
   - Integrated/complementary and community based approaches are vital
1. Case Study

The MGU – Useful Plants Project

Tiziana Ulian, Efisio Mattana, Alex Hudson and Pablo Gomez-Barriero
Background

- Grown from a proposal made to Kew (former Kew’s Seed Conservation Department) by a philanthropist based in Spain (MGU)
- Funded by MGU
- June 2007 – May 2011 (Phase 1)
- June 2011 – May 2016 (Phase 2)
Purpose and main outputs

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

Botswana, Kenya, Mali, South Africa and Mexico
Purpose and main outputs

- Targeting and prioritizing
- Seed conservation
- Plant propagation and conservation in local communities
- Sustainable use and income generation

Botswana, Kenya, Mali, South Africa and Mexico
Targeting and prioritizing

- Literature review
- Ethnobotanical surveys
- Community workshops

Herbarium specimen of *Hoodia currorii* subsp. *lugardii*
Targeting and prioritizing

- Literature review
- Ethnobotanical surveys
- Community workshops

Ethnobotanical survey in Tharaka, Kenya
Targeting and prioritizing

- Literature review
- Ethnobotanical surveys
- Community workshops

Community workshop in Nyamira, Kenya
Targeting and prioritizing

UPP Database

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

1,571 useful plants (taxa)

© RBG Kew
Seed conservation

- Collecting
- Processing
- Testing
- Banking

ca. 1,200 seed collections

Field expedition for seed collecting in Mali
Seed conservation

- Collecting
- Processing
- Testing
- Banking

ca. 1,600 seed collections

Seed processing at IER in Sikasso, Mali
Seed conservation

Seed viability and germination of 637 plant species

- Collecting
- Processing
- Testing
- Banking

Seed testing of *Jatropha mahafalensis* from Mexico at Kew’s Millennium Seed Bank (MSB)
Seed conservation

Seed storage of 869 plant species in country with duplicates in Kew’s MSB

- Collecting
- Processing
- Testing
- Banking

Seed banking at Kew’s Millennium Seed Bank (MSB) in the U.K.
Plant propagation

399 plant species propagated

Plant nursery at Lowveld National Botanical Garden in South Africa
Plant propagation in local communities

- Improving propagation facilities
- Training people

371 plant species propagated

Plant nursery established in the community in Mali
Plant propagation in local communities

- Improving propagation facilities
- Training people

371 plant species propagated

Training workshop in the rural greenhouse in Mexico
Plant conservation in local communities

- Establishment of community and school gardens
- Demonstration woodlots (Kenya)
- Enrichment of sacred forests (Mali)

263 species (52,305 seedlings) planted in 25 rural communities and 36 schools
Sustainable use and income generation

- Seeds and seedlings
- Plant products

34 plant species promoted
Research

289 plant species studied and 20 students supervised
Working in partnership
2. Case Study

Toward conserving Jordanian Flora

Khaled Abulaila, Michiel Van Slageren, Tiziana Ulian, Efisio Mattana and Melanie-Jayne Howes
Background

- Millennium Seed Bank Project (MSB)
- National Centre for Agricultural Research and Extension (NCARE)/Directorate of Biodiversity
- 2001 Agreement between NCARE and RBG Kew
- Two phases: 2001-2006, 2007-2010
Aim and objectives

To enhance ex situ conservation and sustainable utilization of plant species indigenous to Jordan
Toward conserving Jordanian Flora

Aim and objectives

- Collection and conservation of up to 10% of the world’s seed bearing flora (some 24,000 species), principally from the dry lands by the year 2010.
- Develop bilateral research, training and capacity-building relationships world-wide in order to ensure and support this conservation effort.
Biogeography of Jordan

Humid Zone Forests-Jordan
Mediterranean

Saharo-Arabian

Irano-turranean

Sudanian
Toward conserving Jordanian Flora

Seed Conservation activities
Results

1. Collected Families = 83
2. Collected species = 774

Useful plants
- Medicinal: 91 seed accessions
- Human Food: 26 species (vegetables, cereals and legumes)
- Animal Food: 22 forage species
Promoting the conservation and sustainability of the traditional Mediterranean diet in Jordan

Purpose and main outputs

To combine ethnobotanical studies on the inventory and promotion of the traditional knowledge and activate science based conservation and cultivation of wild edible plants which constitute the basis of the Mediterranean diet in Jordan
Purpose and main outputs

1. Establishing knowledge of rural communities on Mediterranean wild edible plants;
2. Conservation of Mediterranean wild edible plants; and
3. Research to support the conservation and sustainable use of Mediterranean diet plants.
Promoting the conservation and sustainability of the traditional Mediterranean diet in Jordan

Impact of climate change on seed germination of wild edible plants

Objective 1. Seed dormancy and germination requirements characterization

Outputs
• Identify seed dormancy and germination requirements of the investigated species.
• Support plant propagation by seeds of the investigated species.
• At least one paper on seed germination and dormancy characteristics of the investigated species to be submitted.

Objective 2. Modelling of seed germination according to different climate change scenarios

Outputs
• Understand if and how the predicted climate change scenarios will impact on natural regeneration by seed of the investigated species.
• At least one paper on seed germination and dormancy characteristics of the investigated species to be submitted to a journal with CIF > 2.
Promoting the conservation and sustainability of the traditional Mediterranean diet in Jordan

**Phytochemical Traits**

- **Chemical authentication**
- **Comparison of wild and cultivated species**
- **Chemical variation within species**
- **Plant uses**
  - Micronutrients
  - Commercial traits

**Chemical characterisation**

**COLLECTIONS**
- Living collections
- Herbarium collections

**CHEMICAL ANALYSIS**
- LC-MS
- TD-GC-MS

**PHYTOCHEMISTRY**
Some examples

*Gundelia tournefortii* in the wild

Akub floral buds sold at market

Akub heads with lamb cooked in yoghurt

Akub fried with eggs

*Cyclamen persicum* in the wild

Stuffed and cooked *C. persicum*

*Salvia hierosolymitana* in the wild and stuffed and cooked leaves of *S. hierosolymitana*
3. Case Study

Integrated Approach to Plant Conservation in the Moroccan High Atlas

Hassan Rankou and Gary Martin
Background

- GDF-MAVA project
- January 2016-December 2018
- In collaboration with Global Environments Network
Purpose and main outputs

To establish an integrated biodiversity-hydrology-agroecology approach to plant conservation that tackles climate change, water mismanagement, plant overharvesting, overgrazing, market integration, migration, etc.
Purpose and main outputs

1. Conservation of Important Plant Areas in the Moroccan High Atlas
2. Documentation, dissemination, promotion and coordination
3. Development and testing of model for an integrated biodiversity-hydrology-agroecology approach

Moroccan High Atlas
Objective 1: Conservation of Important Plant Areas in the Moroccan High Atlas using an integrated biodiversity-hydrology-agroecology approach

- Etudes écologiques et floristiques
- Etat de conservation des Zones Importantes pour les Plantes
- Pas de traduction disponible
- Gestion des ressources en eau
- Pépinières communautaires pour plantes sauvages
- Renforcement des capacités
Objective 2: Documentation, dissemination, promotion and coordination of regional initiatives on cultural practices of conservation (CPCs) and community-based resource and landscape management systems

- Recherche sur les pratiques culturelles pour la conservation
- Recherche sur le potentiel pour renforcer la gestion communautaire des agdals
Objective 3: Development and testing of a scalable and adaptable model for an integrated biodiversity, hydrology-agroecology approach that promotes cultural practices of conservation.
Summary

- Indigenous useful plants selected and prioritized according to communities’ preferences
- Long term *ex situ* conservation implemented through seed banking
- Propagation and planting activities to support *in situ* conservation
- Income generation in the communities supported through the propagation and planting of indigenous plants and the production of plant products;
- Complementary research (ethnobotany, seed science, phytochemistry, plant ecophysiology) to support project activities
- Participative approach with local institutional partners and rural /indigenous communities
- Need for social and economic skills to generate income - holistic approach!
Plant Conservation and Development

  - Targeting plant conservation activities
  
  70 per cent of the genetic diversity of crops including their wild relatives and other socio-economically valuable plant species conserved, while respecting, preserving and maintaining associated indigenous and local knowledge (Target 9).

- **Sustainable Development Goals (SDGs) (2015)**
  - Science-based solutions for development challenges
    - *End poverty in all its forms everywhere* (Goal 1)
    - *End hunger, achieve food security and improved nutrition and promote sustainable agriculture* (Goal 2)
    - *Ensure healthy lives and promote well-being for all at all ages* (Goal 3)
    - *Ensure access to affordable, reliable, sustainable and modern energy for all* (Goal 7)
    - *Take urgent action to combat climate change and its impacts* (Goal 13)
    - *Protect, restore and promote sustainable use of terrestrial ecosystems, sustainably manage forests, combat desertification, and halt and reverse land degradation and halt biodiversity loss* (Goal 15)