Agricultural biodiversity and traditional foods

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Introduction: CGIAR and Bioversity
Agrobiodiversity: roles and benefits
Conservation: re-modulating approaches
The way forward: research and policy
Conclusions: food for thought
One of the 15 members of the CGIAR Consortium
CGIAR at RIO+20

Our campaign on the Road to Rio+20. Find out about our seven-point plan for a more sustainable, food secure future, as we call on all parties at Rio+20 to take action. Keep yourself up-to-date with our impact stories and key messages as we take our Rio+20 campaign on the road.

About CGIAR

Who We Are
Learn more about our global research partnership.

How We Do Research
How we work to reduce rural poverty, improve food security, nutrition and health and sustainably manage natural resources.

CGIAR Research Programs
Our collaborative research agenda.

Research Centers
Our 15 agricultural research centers innovating for poor people.

CGIAR Fund
Securing investments for a food secure future.

www.cgiar.org/
Bioversity International’s vision is of a world in which smallholder farming communities in developing countries are thriving and sustainable.
We investigate and promote the use and conservation of agricultural biodiversity in order to achieve better nutrition, improve smallholders’ livelihoods and enhance agricultural sustainability.
Where we work

A staff of around 360 operating from 16 locations around the world
1. Enable smallholder farmers to use biodiversity

Demonstrate how smallholder farming communities can significantly improve their livelihood and nutrition, and ensure more sustainable and resilient agricultural systems through the improved use of biodiversity, with the potential to benefit 320 million people.
2. Conserve plant diversity

Support development of an innovative operational global programme of *in situ conservation* of plant diversity

Significantly improve the availability of plant genetic resources
How we work

• No laboratories

• Research always with partners

• Partnerships to deliver direct impact

• A catalyst, facilitator, consensus broker, ‘thought leader’, enabler
http://www.bioversityinternational.org/
Agrobiodiversity

- **Managed for production**
  Crops, animals, trees

- **Not for production**
  Pollinators, soil microflora, Wind breaks, agents of biological control
Agrobiodiversity levels and roles

**Genetic level:** resilience of cultivations, resistance to pests and diseases, higher yields..

**Species level:** foods, wood for multiple uses, grasses, reeds, leaves for multiple uses, leaf litter for fertilizer, biochemicals, oils, resins, medicinal.. + other values (spiritual, recreational, cultural, aesthetic, etc)

**Ecosystem level:** interactions with other components, pollination, soil stability, climate regulation, flood regulation, detoxification, disease regulation, + others values (such as a sense of ‘place’, well being..)
Agricultural biodiversity is central to meeting today’s challenges

“Conventional view”:  
• A source of traits for crop and livestock improvement

“New paradigm” for sustainable agriculture:  
• A source of resilience and stability
• A source of increased income and improved livelihoods
• A source of better nutrition
• Central to sustaining cultural, ethnic traditions and identity
Today’s greatest paradox

- 300,000 Known plant species
- 100,000 Used by humankind
- 30,000 Edible
- 7,000 Used as food at local level
- 120 Important at national scale
- 30 Provide 90% of plant calories
- 3 Provide 60% (rice, wheat, maize)
Crop and livestock diversity in Ruhiira, Uganda

- Average number of edible crop species per farm: 21
- Average number of livestock species per farm: 2
- Number of edible crop species in the community: 72

Diversity of traditional crops important assets for the poor
Study conducted in 1983 by the Rural Advancement Foundation International gave a clue to the scope of the problem. It compared USDA listings of seed varieties sold by commercial U.S. seed houses in 1903 with those in the U.S. National Seed Storage Laboratory in 1983. The survey, which included 66 crops, found that about 93 percent of the varieties had gone extinct.
Loss of diversity: the Italian case

- **5599**: major plants species in Italy (Pignatti 1982)
- **815**: wild used for traditional foods (Bianco 2007)
- **Pistic**: sautée from Val Colvera (Friuli Region) prepared from 56 plants - a unique traditional dish about to disappear..

HOW MANY TRADITIONAL FOODS ARE SILENTLY DISAPPEARING AND WHAT WE DO TO SAFEGUARD SUCH A CULTURE AND ASSOCIATED PLANTS?
Genetic Erosion: other examples from Italy

- **2,000** vars of fruit trees of 8,000 vars recorded in late 1800s
- **1500** fruit vars under threats today (Osser. Agroambientale-Cesena)
- **116** indigenous breeds but over last 50 years lost 5 cow breeds, 3 goats, >10 chickens/ pigs, 7 horses, 4 donkeys (FAO 1992).
- XVIII sec- 42 vars of pears described from Parma (of these only 2 cultivated till 1937)
  - Cicoria di Barba di Cappuccino, Cavolo verza Padovano, cipolla di Chioggia, pomodoro Re Umberto no longer to be found..
- 47 vars of cauliflower, today only **31** registered in the national variety catalogue (gone are Toscano S. Giuseppe, Romanesco Gennarese).
- Var Rossello of durum wheat from Catania/Agrigento (resistant to drought) under threat of extinction.
The BIG issue of IK loss

2003 Ethnobotanic study on edible wild species in Lebanon covering 12 villages, 60 plant Families, 260 vernacular names with 1,400 use citations recorded: wisdom no longer passed to new generations

USES
Fresh  494
Cooked 478
Pickled 76
Spice  36
Agrobiodiversity nutrition and health

Agrobiodiversity & Wild biodiversity

Dietary diversity

Functional diversity

Health
Diet diversity improves nutrient intake.
Complexity of human nutrition calls for diet diversity and a food systems approach. Traditional crops are highly strategic to meet both needs through a variety of culturally adequate food choices.
African leafy vegetables

<table>
<thead>
<tr>
<th>Per 100 gm</th>
<th>Amaranth (leaf)</th>
<th>Cleome</th>
<th>Nightshade</th>
<th>Cabbage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Iron mg</td>
<td>8.9</td>
<td>6.0</td>
<td>1.0</td>
<td>0.7</td>
</tr>
<tr>
<td>Calcium mg</td>
<td>410</td>
<td>288</td>
<td>442</td>
<td>47</td>
</tr>
<tr>
<td>ß carotene µg</td>
<td>5716</td>
<td>10452</td>
<td>3660</td>
<td>100</td>
</tr>
</tbody>
</table>

[Credit: KENRIK poster for Maundu at Kenya National Museums]
Corchorus olitorius (juta) - Giza market (Cairo, Egitto)

Molokheya (ملوخية):
Egyptian National Dish

Juta used as fiber
Agricultural biodiversity is part of the solution and must be conserved.
Conservation: a range of approaches

- **In situ**
  - nature reserves
  - managed areas
  - introduction to reserves
  - on-farm management (farmer exchanges; new introductions)
  - on-farm conservation (community genebanks)
  - field genebanks
  - seed genebanks (short-term; long-term)
  - *in vitro* genebanks (slow growth; cryopreservation)
  - pollen banks
  - DNA libraries

- **Ex situ**
Ex situ conservation of ABD today

- 1740 gene banks conserving 7.4 mil samples
- Traditional crops largely under-represented
FIGURE 3.1
Geographic distribution of genebanks with holdings of >10,000 accessions (national and regional genebanks (blue); CGIAR Centres genebanks (beige); SGSV⁴ (dark green)⁵
Movement of crop diversity enhanced tremendously use of agrobiodiversity: cultures play unique role in crop selection and support development of new traditional dishes. Example of tomato in Italy, home of one of largest and most popular varietal diversity of this crop.
FIGURE 3.5
Contribution of major crop groups in total *ex situ* collections

- Cereals, 45%
- Food legumes, 15%
- Forages, 9%
- Nuts, Fruits, Berries, 6%
- Vegetables, 7%
- Roots and Tubers, 3%
- Oil Crops, 3%
- Fibre crops, 2%
- Sugar crops, 1%
- Others, 8%
More emphasis needed for *in situ/on farm* conservation!

1. Problem of non orthodox seeds
2. *Ex situ* unable to conserve all agrobiodiversity
3. *Ex situ* unsuitable to maintain IK/culture
4. *In situ* allows evolution, adaptation
5. *In situ* supports local development leveraging indigenous resources and traditions..
Aging custodian farmers: no longer replaced by young people...
On farm left to individuals and/or local associations whose work is scarcely supported...

Isabella dalla Ragione searches for forgotten local fruit tree varieties and species to rescue them from extinction, using local knowledge and memories of lost flavors and tastes. Isabella and her father Livio started the association Archeologia Arborea 25 years ago with the goal of rescuing these forgotten trees. They visited abandoned properties, parish gardens and the orchards of monasteries. They looked at ancient agricultural manuscripts and artworks for clues. The result is a rich collection maintained on the dalla Ragione farm near San Lorenzo di Lerchi.

http://www.archeologiaarborea.org/inglese.html
Biodiversity fairs: celebration of conservation and use
Documenting and monitoring agrobiodiversity on farm: enhance management of local resources, protect rights of indigenous people over their assets and raise self esteem..

- Community Biodiversity Registers
- Red Lists for cultivated species
**Red Lists**: under testing in S.Asia and S.America

**STAGE 1**
General assessment and inventorying

- Status and Trends
- Selection of focus species

**STAGE 2**
Five Cell Analysis

- CELL A: Large Area, Many HH
- CELL B: Small Area, Many HH
- CELL C: Large Area, Few HH
- CELL D: Small Area, Few HH
- CELL E: Lost varieties

**STAGE 3**
First validation of Red List (fairs, extension work, schools etc)

**STAGE 4**
Second validation of Red List (use of descriptors, molecular tools)

- Red List
- National PGR Conservation Strategy
- National Documentation
- Regional Consolidation
- Community Documentation & Monitoring (CBR, DB, others)

- Vulnerability List

Padulosi et al. Eds. 2011
The way forward: research and policy actions

1. Mapping distribution of diversity on farm
2. Study diversity to identify material with important adaptive traits
3. Study nutritional and health contribution
4. Develop cultivation practices and technologies to enhance competitive
5. Document scientific and IK to increase value
6. Characterize seed supply and exchange systems to improve
7. Strengthening capacities of value chain actors and community-based institutions in promoting

1. Support small-scale farming and creating incentives to support diversification
2. Make germplasm available for research and use in farming systems, through access and benefit sharing schemes
3. Promote seed fairs and community seed banks
4. Establish measures to protect traditional crops and their resources from biopiracy
5. Integrate traditional crops in policies dealing with climate change adaptation and environmental and public health to encourage their cultivation and
Conclusions

➢ Urgent need to assess distribution and use of agrobiodiversity and its deployment in traditional foods;

➢ Strengthen the on farm conservation / management of agrobiodiversity and its complementary role to ex situ;

➢ Develop policy and legal frameworks to support custodian farmers and their invaluable contribution;

➢ Establish a global collaborative platform for on-farm conservation involving formal and informal actors
Thank you!