Agropolis: why getting involved in agrobiodiversity monitoring

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Biodiversity

Agrobiodiversity

- Mixed agro-ecosystems
- Crop species/varieties
- Livestock and fish species
- Plant/animal germplasm
- Soil organisms in cultivated areas
- Biocontrol agents for crop/livestock pests
- Wild species as landraces or with breeding
- Cultural & local knowledge of diversity
Long and short term trends

Ellis et al. 2010
History Database of the Global Environment - HYDE

B Gerard. Two same villages in Niger 1966-2004
(agro)biodiversity is at the same time:
  – a service of agro-ecosystems through its intrinsic value and its associated cultural services
  – the result of the management of other services (in particular production)
  – a component in the delivery of a large range of other services.

This makes the analysis of relationships between management, (agro)biodiversity and ecosystem services particularly complex.

Need to better understand dynamics associated with agrobiodiversity

Le Roux et al. 2008
GAP in knowledge where monitoring might be an asset
Testing the relation between farmers’ social organization and spatial patterns of crop diversity

Mont Kenya

V Labeyrie et al. PlosOne 2014
Thanks to V Labeyrie & C Leclerc for slides
Farmers’ social organization and crop diversity patterns

Uneven distribution of named sorghum varieties

Ethnolinguistic groups

V Labeyrie et al. PlosOne 2014
Thanks to V Labeyrie & C Leclerc for slides
Ethnolinguistic groups

Social partitioning of sorghum genetic diversity

Chuka
R.allèlique: 6.1<sup>a</sup>

Tharaka
R.allèlique: 5.9<sup>a</sup>

Mbeere
R.allèlique: 4.6<sup>b</sup>

V Labeyrie et al. PlosOne 2014
Thanks to V Labeyrie & C Leclerc for slides
Questions

Does it translate to differential capabilities of adaptation?

How social change impact such pattern and its evolution?
An example: The ennoblement practice in yam (West Africa)

The tuber of a spontaneous plant is harvested

Vegetative Multiplication (3-6 years)

Integration into the cultivated pool

Pre-ennobled yam
The resilience of this evolutionary dynamics will depend on:
- the resilience of the wild environnement (land use planning?)
- the resilience of the ennoblement practice (cultural tradition)

Scarcelli et al. Mol. Ecol 2006
Scarcelli et al. BMC Plant 2014
But lack of dynamics and monitoring…

• How such system evolved in a changing world
  – More land use for crop
  – Social modification
  – Relevance for long term adaptation?
In-situ assessment of wild diversity – pearl millet

Diversity of wild and cultivated pearl millet
Conclusion

Widespread and impact diversity assessment because it leads to local diversity hotspot.

Is it a problem? Dynamics?
Conclusion

Agrobiodiversity becomes a large fraction of worldwide biodiversity.

Understanding dynamics (via monitoring) is necessary to relate observation, process and interaction. It will allow better assessment of our resources *in situ* and favor the understanding of how such biodiversity is useful. It will allow consequently a better management of it.
Thanks
France and International Agricultural Research

• French support to the CGIAR reform
  – CRPs’ success is critical
  – Involvement in CRPs when relevant and possible
  – Consortium in Montpellier

• CRAI (French Commission on International Agricultural Research)
...by managing and enhancing the existing resources (incl. Agrobiodiversity) and processes in agroecosystems

Zhang et al 2007

Fig. 2—Ecosystem services and dis-services to and from agriculture. Solid arrows indicate services, whereas dashed arrows indicate dis-services.
after Le Roux et al. 2008 (after Zhang et al. 2007)
The earth has limited resources!

RIO+20

Europe

USA

So do we
Genetic Resources: a global issue

- Strong interest in genetic resources
- French research in genetic resources:
  - Very much on the « in situ » side of PGR
    - Ethnobotany (Haudricourt, Portères)
    - Population genetics and evolutionary biology
    - Even ex situ collections are seen as major assets for research (diversity, domestication history)
  - Decentralized ex situ PGR conservation system
• An open platform for genetic and genomic resource conservation, management and analysis

• A research programme addressing key challenges on Mediterranean and tropical crop diversity for agriculture and sustainable development

• A demand-oriented training platform for Southern scientific communities
International training course on Agrobiodiversity analysis

- 2-week course (in French)
  - Week 1: Population genetics
  - Week 2: Biology x Social Sciences

- 2010: Morocco
  - 23 trainees from 13 countries
  - 17 trainers (Arcad, IAV Hassan II, Bioversity, ...)

![Images of the course in Morocco]
Why contribute to a CGIAR initiative on the in situ management of agrobiodiversity?

• Insert our activities and expertise into a global effort
• Help mobilize of other local skills and teams
  – agrobiodiversity and ecological intensification
• Old and new partnerships
• Test and share methodologies
• Synergies between datasets, study sites
“I think you should be more explicit here in step two.”
Challenges

• Necessity of building partnerships between few organizations to move things forward at the conceptual and practical level

• Necessity of sharing existing research results about on-going or past projects

• Necessity of collecting critical mass of data and information to make meaningful assessment on larger scale
Three areas of cooperation

1. Help building international consensus on key GRFA policy issues: non-Annex 1, non-food/non-feed uses, non-plant GRFA, in situ...

2. Strengthen linkages between conservation and use: *how to increase benefits from conservation of GRFA to the widest range of stakeholders?*
   - Diversity characterization; GR diversity exploitation through pre-breeding strategies; information management and exchange; transfer of knowledge and research tools from major crops to minor crops

3. Increase on farm conservation relevance and policy support
A twofold role for researchers

1. Producers of knowledge and evidences to address these key research issues

   but also…

2. Users of genetic resources and key intermediaries between several actors who do not necessarily share the same objectives

   ➢ Ensure better institutional fit between existing practices and regulatory frameworks