Final Report
International Expert Meeting

Development of
Systematic Agro Biodiversity Monitoring Approaches

Santa Ana Experimental Station, Huancayo, Peru, November 4-7, 2013
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1 Background

The International Potato Institute, CIP, is currently implementing the planning grant “developing and implementing a shared methodological framework for in-situ conservation of RTB genetic diversity in hotspots”. The implementation of this planning grant will result in the development of the cross-cutting flagship proposal “Sustaining ecosystem services and benefits for custodian farmers through a well-coordinated, in-situ conservation network of RTB agro biodiversity” between each of five centres involved in the implementation of the CVIAR Research Program on Roots Tubers and Bananas (CRP-RTB): CIP, Biodiversity International, IITA, CIAT and CIRAD. Essential inputs for the development of the flagship proposal will come from two separate, yet complementary, meetings/workshops. First, the International Expert Meeting “Development of Systematic Agro biodiversity Monitoring Approaches” realized from 4 to 8 November 2013 in Huancayo, Peru, of which this is the final report.

2 Objective and expected outputs

2.1 Objective of the meeting:

To share state of the art methods and metrics for the systematic monitoring of in-situ conserved diversity of crops and crop wild relatives in centres of origin and diversity, and to define a minimal core set of standard procedures to be shared among different organizations and countries.

2.2 Expected outputs of the Expert Meeting:

- **Expected Output 1:** An overview / compendium of state of the art monitoring methods and metrics at the level of (i) molecular / genetic diversity, (ii) landrace / species diversity, (iii) landscape-level / agro ecological diversity, and (iv) collective knowledge systems; Furthermore, a pre-selection of “best practices” to be taken forward to the working groups on day 3 of the meeting.

- **Expected Output 2:** A sense of local stakeholder perspectives, ranging from farmers, women, and village authorities to youth perspectives, and factors that may stimulate or impede participation.

- **Expected Output 3:** A concerted minimal core set of standard procedures (method and indicators) to be recommended at the level of (i) molecular / genetic diversity, (ii) landrace / species diversity, (iii) landscape-level / agro ecological diversity, and (iv) collective knowledge systems.

- **Expected Output 4:** Specific recommendations for creating an enabling environment at the level of (i) data management, (ii) scaling-up & out, (iii) policy options, (iv) incentive systems. Furthermore, a general action-plan to implement the key recommendations from the meeting.

3 Participants

Among the participants were 35 scientists and practitioners from different countries (England, USA, Italy, Bolivia, Ecuador, Chile, Peru) and institutions (grassroot, NGO, governmental, international centres and universities). Please find the detailed lists in the annex.

4 Dates and Duration

The International Expert Meeting “Development of Systematic Agro biodiversity Monitoring Approaches” took place from 4 to 8 November 2013 in Huancayo, Peru.
## Program of the workshop

### Day 1: “Setting the Stage and sharing experiences” (Monday Nov. 4)

<table>
<thead>
<tr>
<th>Time</th>
<th>Theme</th>
<th>Presenters</th>
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<tbody>
<tr>
<td>8:30-8:45</td>
<td>Welcome</td>
<td>Cesar Dávila Veliz (INIA)</td>
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<tr>
<td>8:45-9:00</td>
<td>Background and objectives</td>
<td>Ehsan Dulloo (Bioversity)</td>
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<td></td>
<td>Introductions and team building exercise</td>
<td>Stef de Haan (CIP)</td>
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<tr>
<td>10:00-10:15</td>
<td>On-farm / in-situ ABD monitoring systems</td>
<td>Stefano Padulosi (Bioversity)</td>
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<tr>
<td>10:15-10:45</td>
<td>State of the art review and inventory among experts</td>
<td>Adam Drucker (Bioversity), Mary Thompson (Bioversity) and Severin Polreich (CIP)</td>
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<tr>
<td>11:15-12:15</td>
<td>ABD monitoring systems – international crop perspectives and experience:</td>
<td>Stefano Padulosi (Bioversity)</td>
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<tr>
<td></td>
<td>• NUS: Bioversity</td>
<td>Nigel Maxted</td>
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<td></td>
<td>• CWR: University of Birmingham</td>
<td>Stef de Haan</td>
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<tr>
<td></td>
<td>• Potato: CIP</td>
<td>Miguel Abberton</td>
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<td></td>
<td>• Yam: IITA</td>
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<tr>
<td></td>
<td>ABD monitoring systems - country perspectives and experience (part I):</td>
<td>Agripina Roldan, Tulio Medina</td>
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<td></td>
<td>• Peru: INIA and MINAM</td>
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<tr>
<td>12:15-12:45</td>
<td>Discussion</td>
<td>Facilitator</td>
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<tr>
<td>12:45-13:45</td>
<td>Lunch</td>
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<tr>
<td>13:45-14:45</td>
<td>ABD monitoring systems - country perspectives and experience (part II):</td>
<td>Alvaro Monteros</td>
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<tr>
<td></td>
<td>• Ecuador: INIAP</td>
<td>Manuel Muñoz, Bárbara Gómez</td>
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<td></td>
<td>• Chile: INIA and CET</td>
<td>Marília Lobo Burle</td>
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<td></td>
<td>• Brazil: EMBRAPA</td>
<td>María del Socorro Cerón</td>
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<td>• Colombia: Corpoica</td>
<td>Sergio Moreira, Wilfredo Rojas</td>
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<td>• Bolivia: INIAP and PROINPA</td>
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<tr>
<td>14:45-15:15</td>
<td>ABD monitoring systems – grassroots perspectives and experiences</td>
<td>Hugo Carrera</td>
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<tr>
<td></td>
<td>• Indigenous organizations: UNORCAC</td>
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<td></td>
<td>• NGO's USA: Native Seed Search</td>
<td>Chris Schmidt</td>
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<td></td>
<td>• NGO's Peru: Yanapai, CADEP</td>
<td>Maria Scurrah, Domingo Begazo</td>
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<tr>
<td>15:15-15:45</td>
<td>Discussion</td>
<td>Facilitator</td>
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<tr>
<td>15:45-16:15</td>
<td>Coffee break</td>
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<tr>
<td>16:15-18:15</td>
<td>Group work: identification of best practices, methods and/or tools for systematic monitoring</td>
<td>Facilitator</td>
</tr>
<tr>
<td>18:15-18:30</td>
<td>Logistics and travel details for next day's field visit</td>
<td>Viviana Infantas (CIP)</td>
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### Day 2: “Perspective from a community participating in ABD monitoring” (Tuesday Nov. 5)

<table>
<thead>
<tr>
<th>Time</th>
<th>Activity</th>
<th>Observations</th>
</tr>
</thead>
<tbody>
<tr>
<td>6:00-10:30</td>
<td>Travel to Huancavelica</td>
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<tr>
<td>7:30-8:15</td>
<td>Breakfast + background briefing on context</td>
<td>Stef de Haan</td>
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<tr>
<td>10:30-10:45</td>
<td>Arrival and welcome in the community</td>
<td>Local authorities</td>
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<tr>
<td>10:45-11:00</td>
<td>Background to the work of Grupo Yanapai</td>
<td>Raul Ccanto, Maria Scurrah</td>
</tr>
<tr>
<td>11:00-13:30</td>
<td>Interaction with different types of local actors:</td>
<td>Each group will have Quechua - Spanish - English translators</td>
</tr>
<tr>
<td></td>
<td>• Station 1: “Custodian farmers”</td>
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<td></td>
<td>• Station 2: “Women farmers”</td>
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<td></td>
<td>• Station 3: “Local authorities”</td>
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</tbody>
</table>
Day 3: “Consensus building for standard procedures, methods and metrics for systematic monitoring” (Wednesday Nov. 6)

<table>
<thead>
<tr>
<th>Time</th>
<th>Theme</th>
<th>Presenters</th>
</tr>
</thead>
<tbody>
<tr>
<td>8:30-9:00</td>
<td>Feedback from field visit</td>
<td>Facilitator</td>
</tr>
<tr>
<td>9:00-9:30</td>
<td>Outlining the methodology of dedicated work in sub-groups by scale for the morning session:</td>
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<tr>
<td></td>
<td>- Group 1: Genetic level</td>
<td>Facilitator</td>
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<tr>
<td></td>
<td>- Group 2: Varietal + species level</td>
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<td></td>
<td>- Group 3: Landscape level</td>
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<tr>
<td></td>
<td>- Group 4: Collective knowledge level</td>
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<tr>
<td>9:30-10:45</td>
<td>Group work: pre-selection of informative methods by scale</td>
<td>Facilitator, sub-group moderators and note takers</td>
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<tr>
<td>10:45-11:15</td>
<td>Coffee break</td>
<td></td>
</tr>
<tr>
<td>11:15-12:00</td>
<td>Continuation of group work: pre-selection of informative methods</td>
<td>Facilitator, sub-group moderators and note takers</td>
</tr>
<tr>
<td>12:00-12:15</td>
<td>Plenary: update of progress by group</td>
<td>Sub-group moderators</td>
</tr>
<tr>
<td>12:15-12:45</td>
<td>Outlining the methodology of dedicated work in sub-groups for the afternoon session (groups are maintained)</td>
<td>Facilitator</td>
</tr>
<tr>
<td>12:45-13:45</td>
<td>Lunch</td>
<td></td>
</tr>
<tr>
<td>13:45-16:00</td>
<td>Continuation of group work: pre-selection of robust metrics and indicators by method</td>
<td>Facilitator, sub-group moderators and note takers</td>
</tr>
<tr>
<td>16:00-16:30</td>
<td>Coffee break</td>
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<tr>
<td>16:30-18:30</td>
<td>Plenary: presentation of suggested and standard methods &amp; metrics by scale and discussion on linkages between scales</td>
<td>Facilitator, Sub-group moderators</td>
</tr>
</tbody>
</table>

Day 4: “Creating and enabling environment and piloting of monitoring systems” (Thursday Nov. 7)

<table>
<thead>
<tr>
<th>Time</th>
<th>Theme</th>
<th>Presenters</th>
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<tbody>
<tr>
<td>8:00-8:15</td>
<td>Outlining the methodology of dedicated work in sub-groups for the morning session (new groups)</td>
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<tr>
<td></td>
<td>- Group 1: Data management</td>
<td>Facilitator</td>
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<td></td>
<td>- Group 2: Scaling-up &amp; out</td>
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<td></td>
<td>- Group 3: Policy options</td>
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<td></td>
<td>- Group 4: Incentive systems</td>
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<tr>
<td>8:15-9:45</td>
<td>Group work: defining key recommendations</td>
<td>Facilitator, sub-group moderators and note takers</td>
</tr>
<tr>
<td>9:45-10:15</td>
<td>Plenary: presentation of key recommendations</td>
<td>Sub-group moderators</td>
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<tr>
<td>10:15-10:45</td>
<td>Coffee break</td>
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</tr>
<tr>
<td>10:45-12:15</td>
<td>Action plan: where and how to start, existing and possible future initiatives, meeting proceedings</td>
<td>Facilitator</td>
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<tr>
<td>12:15-12:30</td>
<td>Closing of the meeting</td>
<td>Manuel Sigueñas (INIA)</td>
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<td>Tulio Medina (MINAM)</td>
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6 Development of the workshop

The program of the meeting has been developed mostly as it was planned, only some time adjustments have been made and on day 4 a fifth group on partnerships has been added. Here follows a description of how the expected results of the workshop have been addressed.
6.1 Expected Output 1:

An overview / compendium of state of the art monitoring methods and metrics at the level of (i) molecular / genetic diversity, (ii) landrace / species diversity, (iii) landscape-level / agro ecological diversity, and (iv) collective knowledge systems; Furthermore, a pre-selection of “best practices” to be taken forward to the working groups on day 3 of the meeting.

The inputs in order to generate the overview of the state of the art of monitoring methods and metrics at the different levels were presentations by participants about their experience in monitoring methods and metrics and the methods listed in the elaborated “Compendium of in-situ monitoring methods for Agrobiodiversity” (Compiled by Severin Polreich (CIP) and Mary Thompson (Bioversity International). There have been the following questions and answer and discussions:

After the first round of presentations on Development of Systematic Agro Biodiversity Monitoring Approaches:

Question: Are we talking about the conservation of certain phenotypic or characteristics rather than molecular?
Answer: It is not just about genetic diversity, it is about use and how people perceive the variety. Units of diversity depends on the unit that wants to be monitored (i.e. phenotype, landscape, etc. and, also, the farmer perceives phenotype differently). Units of Diversity need to look at:
- the varietal level
- different levels [from varietal level] would only differentiate spatially
- landrace because it embeds species and genetic diversity
- variety in terms of uses in “real life” because people use variety in “real life” (i.e. different tomatoes for different uses)
- Landraces could have same genetic composition despite if the farmer has characterized them as different varieties

Units of Diversity: CWR versus Cultivated
- Differences of CWR and cultivated
  - Species or population should be the unit for CWR
  - Crop variability only gives you numbers, while the population could give you different information about the diversity. In this way, CWR should be at population.
  - CWR is for a group of species that related rather than a number of species. So with genetic diversity you can play closer attention to the more related but also not ignoring the ones that are further related
  - Landraces are problematic at the genetic level and population should be the target.

CWR Monitoring
- Prioritizing CWRs is important and should be set up at a global level. However, the national level is important for sovereignty, so the international level does not dominate the farms.
- There is a lack of funding for CWR monitoring
- Priority is to conserve not manage
- [CWR monitoring] is not one or the other (management versus conservation) because it important to locate sites and not loose sites, since many sites are being lost
- Monitoring and conservation should be parallel to each other
- Endemism is important, but endemism in CWR monitoring has its restrictions geographically. For example, CWR are important regardless of endemism. Endemism should be found across grid plots not specific to countries. Endemism has to be present in genetic diversity.

Monitoring
- Tendency to depend on participatory monitoring should not move from that monitoring must be scientific. This is not to negate local validity and traditional knowledge. Also, participation of the local communities is not important.
- Collections should also involve molecular knowledge especially when the cost of molecular characterization is dropping.
- New technology should be explored (i.e. molecular)

Monitoring: use of vernacular name
- Monitoring needs to use the vernacular name
- Vernacular names allow way to see a loss of cultivars
- Genetic diversity analysis based on vernacular names to see where genetic diversity is embedded in local nomenclatures
- Vernacular names can cause a problem because they are inconsistent even within the same community. Something more consistent is needed.
- Vernacular names are not considered in a research project in Colombia on chemical-nutritional properties because the overlap of varieties with different names
- Vernacular names should be used because it encompasses farmer’s knowledge of the crop (i.e. colour, form, cosmovision)
- In terms of scale for landrace conservation, vernacular names are important
- Vernacular names should be used in combination with different characteristics (i.e. molecular and morphological)
- Landraces that have more vernacular names are the ones you conserve
- For ex situ, varieties should be identified molecularly
- Vernacular names have history
- Not using Vernacular names restricts you to the molecular level not at the farm
- Genotypes also means different phenotypes in different phenotypes
- Vernacular names are part of the conservation community since the farmer is who conserves in situ
- Vernacular names tell about the agronomic use of the farmer in different communities
- Vernacular names are created by the women
- Local vernacular names becomes indicators of spatial temporal distribution
- Vernacular names are time and space specific
- We need to consider the legal terms of collecting local knowledge
- Traits of cultivars should go beyond definitions of scientists because farmers have different ways to describe varieties because it is based on culture
- In situ conservation should complement ex situ conservation

Monitoring: socio-economic, agro ecological
- Intra specific diversity and ecology is important because they were generated as a survival strategy in communities
- Need to consider that areas with high biodiversity are correlated with high malnutrition when you think about who is doing the conservation

Comments on the four groups
- We shouldn’t split up because everything is interrelated, rather a matrix with different levels should be created

After the second round of presentations the next questions and discussions were held:

Presentation: CET/Chiloe
Question: What do you mean by intellectual property as a brand?
Answer: Intellectual property and traditions are used to brand products in areas where there is dynamic conservation. This happens in Chiloe where traditional practices are being conserved. Products are certified with origins to farming communities.

Presentation: UNORCAC
Question: Among indigenous people is there more of a desire to conserve rather than non-indigenous communities?
Answer: In communities with higher indigenous communities, there is more of an interest to conserve

Question: What about rights of the farmer, are you familiar?
Answer: We know about them, but we haven’t discussed them in depth.

Presentation: NGO Yanapai.
Question/Comment: A lot of knowledge is not collective knowledge, because it seems to be individualized knowledge in farming communities. Is individualized farmer knowledge in a community was individual knowledge or collective knowledge?
Answer: Families hold knowledge across generations. For example, certain potatoes are conserved solely because it was the grandfather’s favourite. In terms of red listing, you need to know your system and what the drivers that cause varieties to disappear are.
Answer: It is collective knowledge because in the community you have different knowledge of individuals
Answer: The farmers have their own views versus the community because there are farmers who don’t want to share.
Answer:
Answer: The term “collective knowledge” it doesn’t refer to space and time, but it also refers to intergenerational knowledge.
Answer: Important to recognize the process of sharing knowledge
Answer: Collective knowledge is dynamic

Fairs and systematic records
- UNORCAC registers the number of farmers and the variety they have
- Tendency for more farmers to participate each year
- Mean of variety and crops per agriculture also increases. This probably due to the incentives given to participating farmers

Use of molecular markers
- Chile uses the same molecular markers (kit) that CIP uses

Fairs: exchange of seeds and local diversity
- Fairs do not promote exchange
- They are not indicators of local variety because people go to other places to collect more seeds that are not their variety. Rather this is an indicator for the ability to collect seeds not the local variety. This is due to incentives.
- Farmers do not want to share because their possibilities of winning decrease
- Fairs do not contribute to diversity
- Indicator of regional diversity
- Romanticizing that farmers work together and contribute
- (Hugo) Fairs were first seen as a way to see diversity, later is was seen as a way to exchange. We want there to flow of diversity. Also the fairs are done once a year in September. Moreover, other species are also brought, like maize variety. It is not determine the amount of variety, rather to see the variety present. The public recognition of varieties is to increase self-esteem and for the communities to feel valued.
- The incentive should be more agriculturally related for long term use.
- We need to support them to improve the situation because in areas with more agro biodiversity is related to poverty.
- There is non-monetary value for their to be an exchange among communities
- The fairs are not for financial incentive rather the cultural incentive
- Revision of the replicability of monitoring should be revised. For example in Brazil, fairs are not popular and occur every two years with community separated by large geographic distances.
- Fairs do not allow random sampling, which is what should be used to estimate diversity
- Need to address bio piracy
- There needs to be an exchange of experiences and traditions
- To address bio piracy, the participants of fairs should be of the communities participating

The fairs should be during holidays and there should contests of varietal knowledge (such as knowledge of typical dishes versus modern dishes, names in all languages)

### 6.2 Expected Output 2:

| Generate a sense of local stakeholder perspectives, ranging from farmers, women, and village authorities to youth perspectives, and factors that may stimulate or impede participation. |

The field visit organized for this expected result was evaluated by participants as a very positive, rich experience. It generated a feeling of compromise, of willing to reattribute to the potato farmers visited.

The visit was organized around four separate meetings which generated the following comments among participants:

**Male custodian farmers:**
- Broad knowledge of varieties and very focused on technical aspects of each variety
- This knowledge is a great opportunity to relate to climate change investigation
- They do conservation as a life principle, not as a service to humanity or somebody. Food security is the most important argument for conservation.
- It is interesting to take into account their knowledge of production related to the ecosystem (for example behaviour of a fox, rituals of calling the rain when the sky is clear)
- Take into account not all male or all women have the same knowledge
- The farming system is a strategy of the farmer in which he plants different varieties in different fields, this strategy is also important for monitoring

**Female custodian farmers:**
- Broad knowledge of varieties in relation to their use (food, sweet, bitter, semi-bitter)
- Many varieties are only for auto consumption
- Gender: women exclusively cook and store, other conservation tasks are shared
- There should be gender inclusive and gender sensitive indicators in the monitoring methods

**Authorities:**
- Very compromised
- Important to have authorities contributing
- Take into account election dates for compromises in monitoring

**Youth/Education**
- Much depends on one professor
- Very interesting model to mix ages

### 6.3 Expected Output 3:

A concerted minimal core set of standard procedures (method and indicators) to be recommended at the level of (i) molecular / genetic diversity, (ii) landrace / species diversity, (iii) landscape-level / agro ecological diversity, and (iv) collective knowledge systems.

### 6.3.1 Molecular / genetic diversity

**Group Members:** Michael Abberton (Chair), Sergio Moreira, Manuel Munoz, Ricardo Sevilla, Stef de Hann and Ehsan Dulloo (Rapporteur)

Discussion points:
There are 2 basic questions to be considered in monitoring of on farm genetic diversity:

- How many different landraces there are?
- How many diverse populations which include landraces?

For monitoring it was important to look at within and between the landrace diversity to detect changes in genetic diversity. The methodology would depend on objectives which could be different for clonally and sexually propagated crops. It was observed for example that although cassava is clonally propagated on farm, there are often gene flow between them and cassava plants arising in the field from botanical seeds.

**Sampling:**
In measuring genetic diversity, a key issue to consider is the sampling of the diversity. The key question is how do we sample to get a good measure of the diversity representative of the population? On what scale should sampling be undertaken? What should be the sampling size? I.e. How many individuals should be sampled?

**Methods for monitoring genetic diversity**
The group recognized that there are diverse molecular methods for measuring genetic diversity and that these methods are fast changing, as new technology develops. For monitoring purposes, this can be a challenge in establishing baselines with one given technique and subsequently over time other new molecular techniques are used for measuring genetic diversity, making comparison difficult.
The group agreed that what is important is for any methodology employed provides comparable results of genetic diversity. The group agreed that it will not further discuss and recommend which molecular technique to use, but rather to focus on the measures of genetic diversity for long term monitoring.
It was also mentioned that the sending materials abroad for genetic analysis was problematic due to policy restriction. However all countries have the capacity to extract DNA and apply microsatellites. Diversity kits such as CIP SSR data kits for potatoes can be used by countries, thus obviating the needs to send genetic materials abroad.
The group agreed that for monitoring in situ/on farm genetic diversity of cultivated plants and their wild relatives, population genetic parameters such as allele diversity and frequencies are the variables that need to be measured with the appropriate molecular techniques.
It was also important to understand what we are monitoring for and what is expected to change.
The group agreed that we need to monitor:
1. Population genetic parameters to measure allele and gene frequencies;
2. Genetic integrity of varieties/landraces through fingerprinting
3. Effective population size

It is expected that through time the population genetic parameters (frequency of genes and alleles) would change. The group also considered that it was also important to characterize the genetic makeup of local landraces to enable their identification and comparison of genetic diversity across different landraces.
Interventions are needed to conserve genetic diversity. The group considered two levels of intervention may be required depending on the situation:
- Restore in situ diversity when it is cost effective to do so
- Conserve genetic diversity in ex situ collections

It would be useful to develop guidelines for deciding on which interventions to use.

**Scale:**
The group discussed the scale at which genetic monitoring is needed. Genetic diversity can be endangered in a region, but can be common elsewhere. The scale at which genetic monitoring is required would depend on cost and logistics. For native potatoes in Peru, for example, 2-3 hotspots areas have been chosen by CIP for long term monitoring at an interval of 5 to 10 years. The
monitoring can be done primarily at an interval of 10 years, but secondary monitoring is undertaken as opportunity arises.

After the general discussion, the group formulated the aims of genetic monitoring and discussed who the actors are, frequency of monitoring the sampling strategy, metrics (variables and indicators) to be used for the monitoring of genetic diversity. Results of this discussion are presented in following table

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<th>AIM</th>
<th>Comments</th>
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<tbody>
<tr>
<td>Understanding changes in population genetics</td>
<td>Group clarified that a population mean the individuals in a specified geographic area within which there were gene flow or which were managed by farmers as a unit.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Who are the actors?</th>
<th>Comments</th>
</tr>
</thead>
<tbody>
<tr>
<td>Scientists, National programme institutions, International Organizations, Universities</td>
<td>Group discussed that the sustainability of the monitoring depend on the funding. The identification of the actors should take into account the target crops. Monitoring also requires that organizations have relevant scientific expertise in population genetics and taxonomy. Actors would form part of a consortium.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Frequency</th>
<th>Comments</th>
</tr>
</thead>
<tbody>
<tr>
<td>In-depth and periodic</td>
<td>Inherent to the scale and sampling, detailed monitoring should be done at regular time intervals which could vary between 5-10 years depending on the differences between cultivated plants and CWR. Light Monitoring should also be done after critical events have taken place such as a drought spell, disease outbreak, etc. which would affect allele frequencies. For e.g. in Ecuador allele frequencies in corn were affected following drought; Taro blight in pacific islands threatened genetic diversity across many island nations.</td>
</tr>
<tr>
<td>Light, opportunistic</td>
<td></td>
</tr>
<tr>
<td>Cultivated, CWR, Scale</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Sampling</th>
<th>Comments</th>
</tr>
</thead>
<tbody>
<tr>
<td>Stratified sampling</td>
<td>Group considered that criteria for monitoring sites should be defined in conjunctions with other groups. Criteria could include areas of high diversity (hotspots- definitions should be provided), types of</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Where</th>
<th>Comments</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hotspots</td>
<td></td>
</tr>
<tr>
<td>Partnerships</td>
<td></td>
</tr>
<tr>
<td>Logistics</td>
<td></td>
</tr>
<tr>
<td>Gradient</td>
<td></td>
</tr>
</tbody>
</table>
The group then discussed two case studies to illustrate the methodology.

**Case Study 1: Yams in Benin**

The populations of yams in Benin occur as cultivated plants in farmers’ field as well as wild species in adjoining forest areas. There is also frequent natural inter-specific hybridisation. Taxonomic expertise in recognising species and hybrid are important to be able to classify yams diversity. Ongoing differentiation in yams means that there is no clear differentiation between cultivated crops and wild relatives. Given the above, the group agreed that any monitoring of genetic diversity should be undertaken across the gene pool of yams from cultivated to wild species including hybrids. A stratified sampling method should be used to sample populations. The group also agreed that during sampling, information about threats to the population should also be collected so as to associate any observational changes in diversity to potential drivers. The selection of priority sites for monitoring would be made according to set criteria indicated in table above. Areas of high diversity (Hotspots) would be chosen, where populations within each hotspot area will be sampled across farmers field to adjoining forest areas. Prior to monitoring a study/survey should be carried to determine distribution of yam diversity in the country. When sites are chosen, it is important to establish a working relationship with local stakeholders and obtain permission and buy-in of these stakeholders.

**Case Study 2: Wild relatives of Coffee in Mauritius.**

This case was chosen to represent an extreme case where there are no connection between cultivated plants and their wild relatives. In Mauritius, there are 3 endemic species of wild Coffea species, *Coffea mauritiana*, *C. macrocarpa* and *C.myrtifolia* which are restricted to wild habitats and there no adjoining coffee cultivation in vicinity of the wild populations. The same criteria as discussed above would be adopted. The approach for genetic monitoring would include the mapping of wild coffee species distribution across the island, defining and prioritizing the populations of each of the species according to available resources and sampling of individuals within each population for genetic diversity assessment. A stratified sample would be taken. Population genetic parameters would be measured to determine the intra-specific genetic diversity of the 3 species. Targeted populations would be monitored at intervals of 10 years and light opportunities monitoring done when every 5 years or after an extreme event such as after passage of strong cyclone, which are common in Mauritius.

**Metrics:**

The group discussed the metrics in terms of variables and indicators and also identified tools that could be used to measure the population genetic parameters. The results are shown in table below:

<table>
<thead>
<tr>
<th>Variable</th>
<th>Indicators</th>
<th>Tools</th>
</tr>
</thead>
<tbody>
<tr>
<td>Population structure (within population)</td>
<td>Allele diversity</td>
<td>Change in allele diversity</td>
</tr>
<tr>
<td></td>
<td>Allele frequency</td>
<td>Change in relative allele frequency in population</td>
</tr>
<tr>
<td></td>
<td>Heterozygosis</td>
<td>Change in Nei index</td>
</tr>
<tr>
<td>Population comparison</td>
<td>Population differentiation</td>
<td>Fixation Index (Fst)</td>
</tr>
</tbody>
</table>
### 6.3.2 Landrace / species diversity

#### 6.3.2.1 Crop Wild Relatives

<table>
<thead>
<tr>
<th>Key Species for CWR conservation</th>
</tr>
</thead>
<tbody>
<tr>
<td>- Bananas- Papua and Indonesia</td>
</tr>
<tr>
<td>- Potato- Andes</td>
</tr>
<tr>
<td>- Cassava/Yuca- Brazil and Mexico</td>
</tr>
<tr>
<td>- Yam- Africa</td>
</tr>
<tr>
<td>- Sweet Potato- Coast y Jungle</td>
</tr>
<tr>
<td>- Taro- Andes and China</td>
</tr>
</tbody>
</table>

#### Summary

**Aim**
Maximize genetic conservation of CWR through management of diverse in situ populations

**Who**
Local Communities and national programs

**Frequency**
Depends on:
- Whether just set up
- Annual/perennial species
- Endangered/threatened
- Resources available

**Where**
- Centre of diversity
- Areas more or less impacted
- Pragmatic location
- Least expensive & most sustainable

**Scale**
- Monographic
- local, national, regional, global
- Geopolitical

#### Metrics

<table>
<thead>
<tr>
<th>Indicators</th>
<th>Variables</th>
</tr>
</thead>
<tbody>
<tr>
<td>- Demographic Change</td>
<td>- Size, diversity, frequency, cover</td>
</tr>
<tr>
<td>- Genetic Change</td>
<td>- Richness, frequency, abundance</td>
</tr>
<tr>
<td>- Management changes</td>
<td>- Practice</td>
</tr>
</tbody>
</table>

#### Preliminary Survey of Conservation Species and Sites

<table>
<thead>
<tr>
<th>Crop Wild Relative Prioritization</th>
<th>CWR Biodiversity Assessment</th>
</tr>
</thead>
<tbody>
<tr>
<td>A. Generic Level</td>
<td>A. Monographic (species by species)</td>
</tr>
<tr>
<td>B. Harlan and DeWitt (1a, 1b, 2, 3)</td>
<td>B. Geographic: geo/ecological distribution</td>
</tr>
<tr>
<td>C. Present IUCN listing</td>
<td>C. Political Prioritization</td>
</tr>
<tr>
<td>D. Associated value of crop</td>
<td></td>
</tr>
</tbody>
</table>

| Systematic Review                  | Geo-ecological Analysis | Gap Analysis to identify Conservation Priorities | Search for and identify CWR conservation |
|------------------------------------|-------------------------|-----------------------------------------------|
| Survey of Species and Distribution through: | Real &potential distribution |                                              |
| A. Literature                      |                          |                                              |
| B. Herbarium                       |                          |                                              |
| C. Gene Banks                      |                          |                                              |
| Systematic Revision                |                          |                                              |
Conservation

**In Situ**
- Reserves
- Non-reserve

**Ex Situ**
- Gene banks
- Seed banks
- in vitro
- Germplasm banks

**Identification and Implement of In situ Conservation Sites**
- established from GAP analysis

**CWR Reserves**
- how to
- where (surveys)
- Politics

**Initial Management Plan**
- history and background of site & species
- species and site interactions
- others

**Prescription of Management Plan**

---

Conservation Strategies and Techniques for Monitoring

<table>
<thead>
<tr>
<th>Monitoring CWR</th>
<th>Sampling</th>
<th>Variables</th>
<th>Data</th>
<th>Comparisons of Populations</th>
<th>Frequency of Monitoring</th>
</tr>
</thead>
<tbody>
<tr>
<td>plot or plot-less transects</td>
<td>vouchering</td>
<td>presence/absence</td>
<td>gathering and Analysis</td>
<td>Populations</td>
<td>Annual vs. perennials, Threatened</td>
</tr>
<tr>
<td>Farmers and indigenous peoples, MOMS, local community members</td>
<td>ex situ genetic baseline</td>
<td>frequency</td>
<td>Ecological variables</td>
<td>Changes Management efforts</td>
<td></td>
</tr>
<tr>
<td></td>
<td>stratified random</td>
<td>density</td>
<td>Management efforts</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>random</td>
<td>cover</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Intensive Monitoring of Threatened CWR**
- Population ecology and matrix modelling
- Mode of reproduction

**Alternative Uses of CWR by locals**

**Revision of Management Scheme**

**Revise IUCN Red Listing**

**Reintroduction of Species**

---

**Auxiliary variables to monitor**

**CWR and Cultivated Species interactions**

**Monitor obligate interactions**
- pollinators
- Dispersoirs
- Mycorrihizae
- Keystone species

**Monitor pests and diseases, plus invasive species**

**Economic value for Reserves and Cost effectiveness**

---

6.3.2.2  **Cultivated**

**Participants Group 2**: Adam Drucker, Severin Polreich, Agripina Roldan, Tulio Medina, Alvaro Moneros, Marilia Lobo, Domingo Begazo, Wilfredo Rojas, Maria Del Socorro Ceron

**Aim**
Determine baseline agro biodiversity conserved in situ in the study area, by participatory methods and conventional which permit continuous monitoring.

**Who?**
- The national genetic resources system
- Involved actors like: Farmers, communities, farmers associations, local governments, national and international institutes

**Where?**
- Global Community
- National Community
- Regional Community

**Aim:**
Monitoring (repetitive)
Monitor the patterns of behaviour of agro biodiversity in time and space

**Who?**
- The national genetic resources system
- Involved actors like: Farmers, communities, farmers associations, local governments, national and international institutes

**Where?**
- Global Community
- National Community
- Regional Community
- Local Community
- Custodian Families.

**Frequency**
Initially

**Methods**
- Register of varieties and crops (sample)
- 5 cell analysis
- Participatory characterization

**Variables**
1. Cultivated area /farmer/ variety.
2. Cultivated crops
3. Cultivated varieties
4. Conservationist families
5. Lost varieties or in risk of extinguishing.
6. Varietal uses.
7. Variety descriptions
8. Nomenclature
9. Evenness
10. Abundance

**Indicators**
1. No. Has/ farmer
3. No. Varieties/Farmer
4. No. Conservationist Families / community
5. No. Lost varieties or in risk of extinguishing
6. Uses/trait indicator
7. Nº morphologic descriptors/morphologic states; Nº Alleles (markers)
8. Nº inserted registers
9. Nº farmers /variety
10. Relation Area / variety
11. Area/quantity/ variety/farmer / total sample

**Tools**
- Surveys
- Focal groups
- Sampling of the plant and tuber at harvesting
  - Photograph archive of used descriptors.

**Final Result**
- List of registers /inventories
- Databases
- Redlisting
- Catalogues

**Frequency**
Depends on :
- Crop: campaign 1-4
- Method: 1 a 4 years
- Aim: More than 5 years.

**Methods**
- Register of varieties and crops (sample)
- 5 cell analysis
- Participatory characterization (defined descriptors)

**Variables**
1. 1. Cultivated area /farmer/ variety.
2. Cultivated crops
3. Cultivated varieties
4. Conservationist families
5. Lost varieties or in risk of extinguishing.
6. Varietal uses.
7. Variety descriptions
8. Nomenclature
9. Evenness
10. Abundance
11. Area/quantity/ variety/farmer.

**Indicators**
1. No. Has/ farmer
3. No. Varieties/Farmer
4. No. Conservationist Families / community
5. No. Lost varieties or in risk of extinguishing
6. Uses/trait indicator
7. Nº morphologic descriptors/morphologic states; Nº Alleles (markers)
8. Nº inserted registers
9. Nº farmers /variety
10. Relation Area / variety
11. Area/quantity/ variety/farmer / total sample

**Tools**
- Surveys
- Focal groups
- Sampling of the plant and tuber at harvesting
  - Photographs of representative parts used by custodians to distinguish varieties.

**Final Result**
- List of registers /inventories
- Databases
- Redlisting
- Catalogues

Discussion and questions
Barbara asked if the 5 cell methods and evenness / abundance are more expensive methods and replicable in different countries.
Severin responded that the 5 cell method isn’t costly.
Stefando asked if evenness / abundance or inventories are more laborious methods and that we should stress more in the collection realized by farmers. He mentioned that the 5 cell method isn’t so easy.

Stef mentions that the methods are complementary and not excluding. Also notes that varieties tested by different methods should be selected and compared the same (5 cell, participatory GIS)

Severin informs that the participatory component has been included in the methods presented by the group.

Adam manifests that it’s important to distinguish inventory and intervention. An important question is when to intervene, taking into account profitable products or loss of public goods.

Stefano states that it is very important the use of the varieties (characteristics), which is the use that guarantees agro biodiversity conservation.

Nigel states that there is differences between crops which multiply clonally and sexually.

Chris emphasizes the use and characteristics for the uses on the indicator lists on number 6, the trait indicator (which also can be agronomic characteristics)

Barbara states that she couldn’t see community participation in the selected methods.

Marilia responded that the three suggested methods do include community participation.

Nigel suggested that genetic analysis is a good tool to help identification in diverse places.

Michael states that he is worried about the focus on uses characteristics; to him molecular analysis is more important.

Eshan mentioned that all methodologies should be complementary.

6.3.3 Landscape-level / agro ecological diversity

Group members: Alejandra Arce, Henry Juarez, Chris Schmidt, Jose Louis Vasquez, Mary Thompson, Carolina Jiron, Barbara Gomez, Nigel Maxted.

On-farm Monitoring at the Landscape Level

I. The group began by discussing what we meant by “landscape” and what attributes were associated with that level of analysis. Four different broad categories were developed to encompass the points generated by the group on this topic. The results of this part of the conversation are as follows:

- Definitions of Landscape
  - Context in which diversity exists. (Latitude, longitude, altitude, climate, soils, culture, political, economic)
  - Collection of ecosystem types/production systems that have differing levels of diversity and different attributes favourable for or detrimental to diversity.
  - Networks of production systems? Aggregated systems and their collective diversity
  - Diversity of flora y fauna. (agriculture, forestry, context cultural/identity, water resources, altitude, geographical architecture, the condition and interaction of systems)
  - Defined on a project or program basis (no concrete boundaries other than those defined by particular programs)
  - Production lines
  - Dynamic Conservation

- Ecological and biophysical attributes as well as attributes of climate and soils
  - Latitude, longitude
  - Zones of species by altitude
  - Diversity by field across space
  - Diversity by altitude
  - Distribution especial de crops/varieties
  - Occupied area for a variety across the community
  - Red list
- Varieties at family and community level
  - Understanding Distributions
    - Total area; min/max of area of plots, average area of plots
    - Centre plus distribution away from the centre
  - Ecological Community (w/wild relatives)
  - Diversity by niche
  - Areas with special climatic attributes
  - Climate tolerances/climate envelopes (present and future)
  - Pollinator Distributions
  - Soil type and slope
  - Management at plot/community level
- Cultural and human related attributes
  - General cultural practices and traditions that contribute to protecting or managing diversity
  - Socio economic activities that influence agro biodiversity in regions
  - Economic dynamics
  - Public investment policy
  - Territorial use
  - Industrialization
  - Degree of connectivity (cultural/communities)
- Emergent properties across landscapes.
  - Resilience
  - Redundancy
  - Connectivity (Including gene flows)
  - Productivity
  - Ecosystem services
  - Livelihood benefits

II. Next the group had a discussion of what the aim was of this monitoring at the landscape level. To begin with the aim was listed as:
   a. “To monitor the geographical distribution of diversity”
   b. As the discussion progressed throughout the day that aim was critically examined and it was judged by the group that it did not sufficiently encompass the breadth that the landscape level entails and so it was changed and finally arrived at: “To monitor the geographical distribution of diversity and the dynamic socio-ecological context within which it exists to maximize benefits for farmers and understandings for scientists”

III. Much discussion was given to what the appropriate unit of measurement is for monitoring at the landscape level. It was put forth by Alejandra that the community is an appropriate unit of measurement because that level of analysis can cover many of the attributes that we had listed at the beginning of the discussion. It was suggested by some group members that perhaps there should be some mention of the need to aggregate data from multiple communities in order to arrive at a landscape level of analysis or monitoring. It was also noted that monitoring interventions or practices need to be inclusive of varied levels of diversity and knowledge etc. that can be found within communities as well. At the end of the discussion it remained that the community is the most appropriate unit of scale and scale out.

IV. Going on the compendium that was compiled of methods related to agro biodiversity (ABD) monitoring and provided to workshop participants, different methods were
considered that have been discussed as associated with the landscape level. The group focused most heavily on the “Participatory Mapping” method. This method is outlined here:

a. Process
   i. Select target communities (by centres of crop diversity, hot spots, agro bio diverse zones)
   ii. Talk with community leaders to inform them and get their approval for participation and method implementation.
   iii. Select local farmers to do monitoring work
   iv. Teach methodology (technical) to local farmers (GPS use, survey taking, varietal content)
   v. Select random sample of farmers in the community
   vi. Map each field at the beginning of the implementation, and its varietal content at harvest.
   vii. Workshop to define synonyms (local names)

b. Who
   i. Local farmers
   ii. Local NGOs
   iii. Government
   iv. Scientists

c. Frequency
   i. Five to Ten years (depending on the crop annual/perennial)

d. Metrics
   i. Number of landraces/altitudinal belt
   ii. Altitudinal range/ landrace (max/min)
   iii. Number of landraces/field
   iv. Number of landraces/household

e. Indicators
   i. OCF (Overall cultivar frequency)- evenness
   ii. RCF (Relative cultivar frequency)- abundance
   iii. At a larger scale
      1. Alpha, beta, gamma diversity
      2. Number of landraces/region, community (etc. same as above)
      3. Long/Lat/Altitude range (min/max)

V. Chris mentioned that it is important to remember the constraints of using hot-spots as priority monitoring sites. He explained that if the goal is food security in farming systems, then using hot-spots that have the highest diversity might lead to those areas and those people not growing as many varieties to be overlooked. Only looking at hot-spots might also produce misleading trends in ABD when aggregated at broader scales.

VI. The group also discussed the need to encompass certain relevant socio-economic attributes with appropriate indicators. This is based on the view that ABD has an active human component and that the dynamism of that human component needs to be captured with appropriate indicators. Such measures can help answer the question of what do farmers get out of this monitoring, as well as highlighting potential correlations between certain socio-economic conditions and trends in ABD. These indicators need to be focused on monitoring how social and economic changes in involved communities over time influence ABD and vice versa, how ABD brings value to communities and households through income and food security.
a. Chris’s Phylogenetic Entropy example outlined in the compendium brings us closer to capturing these components through the use of indicators of functional value.

b. Adam Drucker mentioned in the plenary that he has a set of indicators available that would likely contribute to this functional value indicator or measure. These relate to/include:
   i. Number of dissimilar farming communities
   ii. Diffusion of knowledge and seed exchange

c. Other helpful indicators might include
   i. Number of food insecure days for a community
   ii. Nutritional measurements within the community
   iii. An indicator which captured the economic value of preserving ABD to household incomes within a given community would also be helpful

VII. Other key points/aspects that are important to remember when discussing landscape level monitoring of ABD include

a. The need to consider flexible definitions of “community”. Need to reiterate that communities can be highly variable across regions and the world and that many different types of actors might be included in that general category

b. The need for standardized data across scales so that it can be utilized by many different institutions and actors at many different levels

c. Technological considerations for more breadth in monitoring (ex. Remote sensing technologies, and land-use/land-cover data)

d. Would be helpful to geo-reference much of the biophysical and socio-economic data and aggregate that data within a GIS

e. Need for including climate data in monitoring activities including precipitation, temperature, and soil moisture.

- During the group discussion more discussion was given to the relevance of including information about seed distribution, exchange, and seed flows in monitoring efforts.

CWR- Nigel Maxted

I. In the afternoon, Nigel Maxted joined the group to discuss gap analysis for CWR at the landscape level. The methodological process for this is as follows:

a. First certain CWR should be prioritized in some way. One common way to prioritize is to focus on those CWR that are most closely related to important cultivated crops

b. Next The gap analysis itself should be undertaken using the following steps:
   i. Sort out diversity that exists in nature. This includes:
      1. Taxonomy
      2. Genetic diversity
      3. How important the CWR is to food systems
   ii. Gathering ecoregographic data
      1. Where the species has been collected in the past
      2. Utilize the CIAT database of CWR occurrence records that will very soon be available (~5 million records on CWR)
   iii. Review of current in-situ and ex-situ conservation programs
      1. Find out if the CWR is already being conserved in situ or ex situ and take into consideration the quality of those existing programs

iv. Do the analysis utilizing GIS
   1. Layers the data and compares and prioritizes certain geographic areas

v. Review the GIS results
   1. After receiving the output of the GIS one must take into consideration budgetary constraints. With this in mind further prioritization must take place.
      a. Difficulties involved with monitoring a certain CWR population
      b. Climate change impacts (can be desirable to find areas highly impacted or hardly impacted depending on the goal)
      c. Level of genetic diversity
      d. Multiple CWR existing in one place
      e. Local community interest and/or capacity for monitoring
      f. Location with regard to other CWR populations or reserves

vi. Implement and establish genetic reserves
   1. Either inside or outside protected areas depending on context/condition

vii. Do the monitoring

II. Who: scientists, local farmers for input, government ministries because they have access to data, relevant NGOs and research institutions

III. Frequency: Once initially and then review of in situ and ex situ status periodically (5-10 years in annual crops)

IV. Metrics
   a. Variables and Indicators
      i. Population size (census) + diversity (minimum number that maintains relative health for 100 populations [Utilizes the VORTEX program for this measurement] = effective population size
      ii. Genetic diversity as measured with the f statistic
      iii. Eco geographic diversity = different habitats

Specific monitoring aspects of this can be gleaned from group two’s morning discussion.

6.3.4 Collective knowledge systems

Participants: Roger Becerra, Stefano Padulosi, Rosa Urrunaga, Merelyn Valdivia, Aide Guzman, René Gomez.

Aim: Strengthen the community knowledge to efficient management of agro biodiversity.

Who: Local association to ABD (woman, man, and authorities)

<table>
<thead>
<tr>
<th>Area</th>
<th>Frequency</th>
<th>Methods</th>
<th>Where</th>
</tr>
</thead>
<tbody>
<tr>
<td>Recollecting</td>
<td></td>
<td>Knowledge: Visits, maps, discussion groups, videos and surveys.</td>
<td>Areas with different context. (Micro centre, market, isolation with local institutions)</td>
</tr>
<tr>
<td>- Knowledge</td>
<td>Permanent</td>
<td>Documentation: Descriptions to used local descriptors, technology per use, passport and resistant.</td>
<td></td>
</tr>
<tr>
<td>- Documentation</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Community demonstrative</td>
<td>Per year.</td>
<td>Pre-established. In these parcels the variety is showed according</td>
<td>Municipalities and</td>
</tr>
</tbody>
</table>
plots. resource loss with focus on distribution and recuperation. to this value (can be evaluated closest to houses) projects

5 cell analysis for the knowledge of varieties and practices. Once per five year. Application of five cell measuring by age (Older age: less knowledge, mayor knowledge, minor age: less knowledge, mayor knowledge), and one cell for lost knowledge. All selected areas

Share the knowledge - WawaYachachi (The children are masters of diversity) - Fairs associated to festivities with focus on local knowledge. Once a year or more. Through interviews in communities, exchange visits, seed exchange fairs between small and big conservationists, having as key objective in the fairs the meeting between conservationists. Revive the concept of “the route of the seeds” for knowledge.

Integration of knowledge in the curricula. Permanent In different educational levels: primary, secondary and superior. At national level in different educational institutes.

The products will be: recipe books, catalogues, samples and descriptors. Metrics:

<table>
<thead>
<tr>
<th>Themes</th>
<th>Thematic</th>
<th>Variables</th>
<th>Indicators</th>
</tr>
</thead>
<tbody>
<tr>
<td>Recollection of knowledge and documentation.</td>
<td><strong>Knowledge of the plants and Cosmo vision (wild or cultivated)</strong> <strong>Knowledge of practices and uses</strong> (Bio indicators, harvest, agricultural practices, processing, foods, etc.) <strong>Conservation of germoplasm on farm.</strong></td>
<td>The variables will be defined based on existing biography. Take into account the communal biodiversity registers (CBR). Priorisation based on culturally relevant characteristics.</td>
<td>a) Nº of diversity free lists. b) Nº of uses registered c) Nº of recipes d) Nº of cultivation practices. e) Nº of institutions related to conservation of traditional knowledge.</td>
</tr>
<tr>
<td>Share knowledge</td>
<td>Effectiveness of sharing knowledge at fairs.</td>
<td></td>
<td>f) Nº of fairs for local knowledge sharing. g) First recipe book of crops. h) Nº of recipes in time.</td>
</tr>
<tr>
<td>Integration of knowledge</td>
<td>Integration of agro biodiversity in the educational system.</td>
<td></td>
<td>h) Presence / Absence of agro bio diversity issues in curricula. ( Nº of themes). i) Nº of professors implementing agro biodiversity in the curricula.</td>
</tr>
</tbody>
</table>
Take into account: The knowledge can be captured by interviews about recipes, also its possible to share recipes between communities and use it to share knowledge between those. The change variables are socioeconomic, cultural, politic, etc.

6.4 Expected Output 4:

<table>
<thead>
<tr>
<th>Specific recommendations for creating an enabling environment at the level of (i) data management, (ii) scaling-up &amp; out, (iii) policy options, (iv) incentive systems. Furthermore, a general action-plan to implement the key recommendations from the meeting.</th>
</tr>
</thead>
</table>

6.4.1 Data management

**Recommendation from Data Management Group**

**Recommendation 1:** In situ/on farm information system should provide information at genetic, varietal/landrace, species, crop wild relatives, indigenous knowledge as well as economic and social data and provide baseline information at priority sites for long term monitoring.

**Recommendation 2:** Information tools such as GPS, camera, ICT (Mobile phones), descriptors etc., should be made available for various actors to gather data on different components of agro biodiversity.

**Recommendation 3:** A data management system should be flexible to allow interoperability of data at local, regional, national and global levels. The system needs to robust, of high quality, sustainable and allows contributions from various through web portals.

**Recommendation 4:** Information should be demand driver, freely available in different recognised languages with prior informed consent. Information should be provided back to farmers as well as contribute global initiatives (FAO Commission on Genetic resources for food and agriculture, CBD secretariat, UNFCC and desertification conventions) as well as provide information to decision makers for formulations of conservation policies for agro biodiversity.

**Recommendation 5:** An efficient and effective data management system requires that competences in the gathering, management, data analysis, communications, data sharing are strengthened at different levels including farmers, NGOs, local, regional and national governments.

6.4.2 Scaling-up & out

**Starting principles**

- needs to be general and broad
- data standardization
- flexibility of terms (i.e. communities, population)
- Applicable on many levels
- Indicators should have flexibility to incorporate the methods across space and time
- Technicality of the science methods is not accessible; the result of this work should be presented accessible and culturally-comprehensive
- Culturally-appropriate

**Scaling up**

- document, centralize documentation locally
  - horizontal linkages (community)
    - ferias
    - participatory investigation
    - local authorities and community members are needed
• vertical linkages (international organization)
  - all the information
  - map to ex situ and in situ
  - Who will be in charge?
    - Information system is needed; web-based system; basis for a big in situ information
- Mechanisms to establish across scales
- Carefully designed to protect the rights of communities if they want to share or not
- Access to information
  - Restrict access
  - Simplify data
  - Some data can be shared nationally only and then only in the community
- There needs to articulation of the information across; convergence of shared interests
  - this important to address shared interests; not a matter of designing a scheme
    - Facilitating and developing agreements between institutions
    - Honest broker
- Quality of data
  - Peer-reviewed versus
  - The data should be able to use
  - Complexity and scales of the data; qualitative and quantitative data
- Citizen Science
  - Information of tech and of anything
  - Building networks of info exchange with small farmers

Scaling down
  - the information should be cyclical
Public policy that supports through public incentives for in situ conservation; not just management and imposing policy.

6.4.3 Policy options
Participants: Roger Becerra, Rosa Urrunaga, Merelyn Valdivia

About international politics:
- Legal protection for CWR and LR for conservation on global to national level
- Establish an integral network of CWR and LR on local, regional, national and global level
- Development of tools for sustainable CWR and LR resource use
- Funding mechanisms for limited resource countries as a national conservation fund for CWR and LR where necessary
- Every country should develop and implement a basic conservation strategy for CWR and LR

About national politics:
Implementation of agro biodiversity zones.
- Actualize the national strategy on genetic resources
- Responsible biotechnology use
- Development of market niches for LR which benefit local communities.
- Development of national strategy for CWR and LR
- Implementation of the Nagoya protocol

About local policies:
- Preservation of local knowledge (crops, uses, etc) for example the experience in Queros, Cuzco.
- Promote continuation of LR crops. For example the Sacred Inka Valley, with the white maize crop from Urubamba.
- Work with local communities to locate and conserve diversity of CWR. For example potatoes park
- Local communities work with scientists on the monitoring. For example: Zimbabwe with elephants or Costa Rica for exploration

6.4.4 Incentive systems

Brainstorming
(1) How to assure sustainable participation permanently?
(2) Not only custodians, also other actors
(3) How to establish a sustainable mechanism
   a. The benefit for the person
   b. Focalize the benefit (for example nutritional problems)
   c. Objectives of monitoring explained to the community
   d. Explain the monitoring in the communal context (including documentation)
      i. Explain monitoring makes effect of climate changes clearer
      ii. Biodiversity for nutrition
      iii. Document characteristics of crops
(4) After the crop interesting products of monitoring are
   a. Recipes
   b. Catalogues
   Will be useful products for self esteem.
(5) Resources like how to prepare culinary food
(6) Non-monetary incentives
   a. Resources to improve crops
   b. Resources for women to improve culinary practice

Basis
- Need to identify communities needs (the various actors, political, families).
- The methodology needs to be culturally-appropriate.
- Culturally competency training for scientist working with communities

Discourse
The discourse must involve parts of the communities that are most vulnerable
- Complementary engagement - Tools that need to exist so that there is relationship between groups (i.e. farmers, authorizes, youth, older community members)
- Youth engagement
- Groups can be categorized throughout age, class, and gender

Appropriate Deliverables/Incentives
What are the concrete products?
- Not only focus on farmers issues, also support artisans
  - Examples include recipe books, Access maps of seeds and catalogues
  - Invite farmers to events and provide certificates; this would be a non-monetary
  - It is important to do exchange visits; promote exchange of information (recognition)
  - Diffusion of quality, communities appreciate products
  - For in situ conservation the deliverables should not solely be considered a reward for conserving
  - Youth-specific
    o training people how to use cameras or other art mediums
    o participation at schools; curriculum in schools
  - Farmers
    o they should get tools that they need

Sustainability and no dependency
Focus on Socio-economic development

Examples:
Generate communal biodiversity management - Revolving Fund in Nepal
- produces money for different activities
- produces exclusive products from that community which prohibit funding (auto regeneration)
- the credit produced

Important considerations
Identification of key products in specific areas should be permanent.
Donor support will be important.

Incentive Systems
(1) Understanding socio-economic context and cultural content, and political
(2) Appropriate discourse (for each context)
(3) Appropriate deliverables (catalogues, recipes books, seed access maps)
(4) Sustainable and non-dependency via socio-economic development

6.4.5 Partnerships
How to assure that different institutions (local-regional-national-international and public-private)
complement roles towards a common objective?
Participants: Sergio Moreira (INIAF), Rene Gomez (CIP), Michael Abberton (IITA), Alejandra Arce (CIP), Maria Scurrah (Grupo Yanapai)

General Notes:
- Firstly we should identify all institutions –and not just those working in our specific area of interest- and their activities in the locality, region or territory of desired research-for-development intervention.
- Clarity and commitment should be established early on in the process.
- Expectations should be realistic.
- When approaching local communities interaction will initially take place with local authorities (local president, etc.). Nonetheless, in a more advanced stage of the dialogue with them, it is advised that the community form a committee to articulate specifically with the monitoring initiative/effort.
- Establishment of democratic structures to allow for horizontal decision-making process from the beginning of the inter-institutional process.
- Potato Park in Cusco was presented as an example of multi-stakeholder initiative (Association Andes, farmers, CIP) toward the conservation of genetic resources. Its success thus is primarily attributed to three main factors, in tune with the Convention of Biological Diversity: conservation, sustainable use of resources, and benefits to communities.
- Capacity-building at the local level with farmers and local institutions would be a tangible benefit to communities (training of farmers, technicians in monitoring methods, etc.).
- Creation of common platform should facilitate delivery of strategic goals and execution of common objectives, excluding funding which should remain each institution’s responsibility and commitment. Having a common “piggybank” was perceived as a potentially complicating factor.
- If one partner independently looks for funding to support monitoring effort, consultation should be made with partners beforehand (example of the way Fontagro proceeds with its partner institutions).

Specific Key Recommendations:
1. Identify institutional actors and their activities in the zone or region of desired incidence.
   i.) International institutions should make a greater effort in interacting with institutions at the other scales.
2. Each partner should have established clear objectives.
3. Find common objectives among partners.
i.) Common objective should contemplate conservation, sustainable use and benefits (the latter is not necessarily monetary and can be in terms of capacity-building, etc.)
ii.) Clear benefits for all stakeholders.

4. Create an “umbrella” multi-stakeholder agreement that secures the commitment of all institutions involved.
   i.) Common budget will not be included in this agreement.

6.4.6 **Action-plan to implement the key recommendations from the meeting**
   - High level meeting Friday 9 nov Lima 10 am
   - In-depth planning meeting 12-14 nov in Lima
   - Review paper on monitoring methods
   - Review paper on optimal populations for conservation
   - Drop box on website to be announced

7 **Conclusions**

The objective of the meeting was: “To share state of the art methods and metrics for the systematic monitoring of *in-situ* conserved diversity of crops and crop wild relatives in centres of origin and diversity, and to define a minimal core set of standard procedures to be shared among different organizations and countries”.

The first part of the objective “...share state of the art methods and metrics for the systematic monitoring of *in-situ* conserved diversity of crops and crop wild relatives in centres of origin and diversity...” can be considered accomplished. Regarding the other element “...to define a minimal core set of standard procedures to be shared among different organizations and countries...” serious advances have been obtained, though the results need to be purified to really count with the “minimal core set”.

The meeting has been evaluated as successful as objectives and expected results are obtained.

8 **Annexes: List of participants**
<table>
<thead>
<tr>
<th>Nº</th>
<th>Participant</th>
<th>Position</th>
<th>Institution</th>
<th>Abbreviation</th>
<th>Email</th>
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<tbody>
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Annexes: Presentation high level meeting 8 nov 2013

Encuentro Internacional de Expertos
Procedimientos sistemáticos de monitoreo de la agrobiodiversidad: resultados y recomendaciones

Contenido

- Principios claves
- Monitoreo: métodos y medición
  - A nivel genético
  - A nivel varietal
  - A nivel de paisaje
  - A nivel de conocimientos colectivos
- Entorno de suporte
- Conclusiones

Principios Claves

- Replicabilidad
- Representatividad
- Efectividad (costos)
- Sostenibilidad
- Escala (local a regional)
- De aplicación practicó
- Métodos “rápidos y aplicadas”
- Métodos “profundos y cuantitativos”
### 1. Genético (general)

**Propósito:** Monitorear / entender cambios en la genética de poblaciones

**¿Dónde?** (i) microcentros (cultivadores), (ii) comunidades genéticas (ejemplo)

<table>
<thead>
<tr>
<th>Variable</th>
<th>Indicadores</th>
<th>Herramientas</th>
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<tbody>
<tr>
<td>Estructura de población (en poblaciones)</td>
<td>Diversidad o riqueza genética</td>
<td>Cambios en diversidad / riqueza</td>
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<tr>
<td></td>
<td>Frecuencia eléctrica</td>
<td>Cambios en frecuencias relativas</td>
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<td>Heterogeneidad</td>
<td>Cambios en índice de Nei</td>
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<tr>
<td>Comparación de poblaciones (entre poblaciones)</td>
<td>Diversidad genética</td>
<td>Fixation Index (Fst)</td>
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### 2. Especies / Cultivares (variedades)

**Propósito:** (i) Establecer la línea de base a nivel de variedades, (ii) Monitorear los patrones de cambio en presencia de variedades en el tiempo y el espacio

**¿Dónde?** (i) microcentros, compuesto de: (ii) comunidad, (iii) familias custodios

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<th>Métodos</th>
<th>Variables</th>
<th>Indicadores</th>
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<td>- registro de especies y variedades (muestro)</td>
<td>- Área de cultivo, variedad</td>
<td>- Ha / cultivo, ha / variedad (*)</td>
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<tr>
<td>- caracterización participativa</td>
<td>- Especies, cultivos</td>
<td>- No. especies, cultivos (*)</td>
</tr>
<tr>
<td>- abundancia relativa de variedades (5 células / año)</td>
<td>- Variedades</td>
<td>- No. Variedades (*)</td>
</tr>
<tr>
<td></td>
<td>- Familias custodios</td>
<td>- No. Familias (*)</td>
</tr>
<tr>
<td></td>
<td>- Variedades en riesgo, perdidas</td>
<td>- No. variedades</td>
</tr>
<tr>
<td></td>
<td>- Uso de variedades</td>
<td>- No. usos, índice de caracteres</td>
</tr>
<tr>
<td></td>
<td>- Descripción de variedades</td>
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<td>- Nomenclatura vernacular</td>
<td>- No. registros</td>
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<td>- Eveness</td>
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<td></td>
<td>- Abundancia</td>
<td>- Relación área / variedad (OCR)</td>
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(*) = escala familia / comunidad / microcentro

### 2. Especies / Cultivares (CWR)

**Propósito:** Maximizar / monitorear la conservación genética de los parentes silvestres mediante el manejo de poblaciones diversas in-situ

**¿Dónde?** (i) centros de diversidad, (ii) áreas más o menos impactadas, (iii) localidades agrícolas

<table>
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<th>Nivel genérico</th>
<th>Variable</th>
<th>Indicador</th>
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<tr>
<td></td>
<td>Cambio demográfico</td>
<td>Tamaño, diversidad, frecuencia, cobertura</td>
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<tr>
<td></td>
<td>Cambio genético</td>
<td>Riqueza, frecuencia, abundancia</td>
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<td></td>
<td>Cambio en manejo</td>
<td>Prácticas</td>
</tr>
</tbody>
</table>

**Muestreo parentes silvestres**
- parcela o sin parcela
- transecto
- exciso
- línea de base genética
- agricultores, miembros de la comunidad

**Muestreo**
- randomizado
- sistemático
- estratificado

**Indicadores**
- presencia/ausencia
- frecuencia
- densidad
- cobertura
- específico de especies
- Forma de reproducción
3. Paisaje (diversidad cultivada)

| Propósito: Determinar / monitorear cambios en la distribución genoespacial de las variedades |
| ¿Dónde?: (i) microcentros, compuesto de: (ii) comunidad, (iii) familias, (iv) parcelas |
| Métodos (p615) |
| - Selección de microcentros |
| - Informar a autoridades y solicitar CPI |
| - Capacitación jóvenes locales |
| - Muestreo ambiental de familias |
| - Mapeo de parcelas / muestra de variedades a la cosecha |
| - Talleres (nomenclatura / resultados) |

<table>
<thead>
<tr>
<th>Variables</th>
<th>Indicadores</th>
</tr>
</thead>
<tbody>
<tr>
<td>Agrofaza</td>
<td>No. variedades / parcela, familia</td>
</tr>
<tr>
<td>Distribución</td>
<td>No. variedades / piso</td>
</tr>
<tr>
<td>Plasticidad</td>
<td>Rango / variedad</td>
</tr>
<tr>
<td>Área</td>
<td>Ha. / variedad</td>
</tr>
<tr>
<td>Mosaicos</td>
<td>No. parcelas / piso, área</td>
</tr>
<tr>
<td>Comunidades</td>
<td>No. agricultores / variedad (OCF)</td>
</tr>
<tr>
<td>Abundancia</td>
<td>Relación área / variedad (RCF)</td>
</tr>
</tbody>
</table>

4. Conocimientos Colectivos

| Propósito: Monitorear el conocimiento asociado al manejo y uso de la agrobiodiversidad |
| ¿Dónde?: (i) microcentros, compuesto de (ii) comunidades, (iii) familias |

<table>
<thead>
<tr>
<th>Temas</th>
<th>Frecuencia</th>
<th>Métodos</th>
</tr>
</thead>
<tbody>
<tr>
<td>Reconstitución / documentación de conocimiento</td>
<td>Permanente</td>
<td>Visitas, mapas parlantes, grupos de discusión, videos y entrevistas</td>
</tr>
<tr>
<td>Análisis de las cinco celdas para el conocimiento por las usanzadas o prácticas</td>
<td>Cada cinco años</td>
<td>Aplicación de las cinco celdas mediante el conocimiento por edad</td>
</tr>
<tr>
<td>Integración del conocimiento en la currícula</td>
<td>Permanente</td>
<td>En los diferentes niveles educativos</td>
</tr>
<tr>
<td>Parcelas comunales demostrativas para valorización</td>
<td>Cada año</td>
<td>En estas parcelas se demuestra la variedad de acuerdo a su valor</td>
</tr>
<tr>
<td>Compartir el conocimiento</td>
<td></td>
<td></td>
</tr>
<tr>
<td>- Waow Yakahil</td>
<td></td>
<td></td>
</tr>
<tr>
<td>- Ferias asociadas a festividades con enfoque en el conocimiento local</td>
<td>Cada año o más.</td>
<td>En arquitectura de comunidades, pasantías, ferias de intercambio</td>
</tr>
</tbody>
</table>

1. Bases de datos

- Sistemas que logran integrar distintos tipos de información (genética a CC).
- Vincular los sistemas de información a herramientas como GIS, teléfonos, etc.
- El sistema tiene que integrar escalas (local a internacional), ser sólido y a la vez flexible
- Información de libre acceso y con resúmenes / análisis para tomadores de decisiones
- Capacitación a diferentes niveles es esencial
3. Alianzas
- Objetivos claros y comparativos entre los diferentes aliados
- Complementariedad en cuanto a capacidades y competencias
- Comunidades y autoridades locales son parte desde el inicio
- Alianzas en base a principios / agendas mutuos sin dependencia de fondos
- Transparencia, horizontalidad, confianza

4. Escalamiento
- Generación de capacidades con los actores de monitoreo
- Estandarización de datos / indicadores para que sean aplicables a diferentes escalas
- Generación de redes: redes de reservas de parientes silvestres, redes para cultivos
- Comunicación, facilitación y liderazgo
- Proceso cíclico: información / beneficios

5. Políticas
Políticas regionales / internacionales:
- Establecer una red integral de parientes silvestres y variedades nativas en niveles locales, nacionales, regionales y globales.
- Mecanismos de fondos para países de recursos limitados como fonde de conservación para parientes silvestres y variedades nativas.

Políticas nacionales:
- Hacer operativos estrategias nacionales de conservación in-situ para variedades nativas and parientes silvestres.
- Implementación de zonas de agrobiodiversidad.
- Aplicaciones prácticas para “benefit sharing” (mercados nichos, RSC...)

Políticas locales:
- Innovar como comunidades locales trabajan juntas con los científicos en el monitoreo. Por ejemplo: Zimbabwe con los elefantes o en Costa Rica por explotación.
Conclusiones

- Los métodos, variables e indicadores sugeridos por los expertos se publicarán en procedimientos.
- Se requiere soporte estratégico para hacer la implementación una realidad: político, institucional y de la cooperación internacional.
- Dentro el grupo de expertos se han identificado rutas concretas hacia la implementación a nivel piloto.
Importancia y Relevancia del Monitoreo Sistémático de la Agrobiodiversidad

Encuentro Internacional de Expertos:

Desarrollo de Procedimientos Sistémáticos de Monitoreo de la Agrobiodiversidad

Objetivo principal:

Compartir métodos y indicadores de punta para el monitoreo sistemático de la diversidad de cultivos y parientes silvestres en centros de origen; también, definir procedimientos estandarizados para ser compartidos entre organizaciones y países.
Antecedentes

- Oportunidad única sin precedentes para compartir métodos y conocimientos entre instituciones y expertos.

- Participación de alrededor de 40 científicos provenientes de más de 15 países y 25 instituciones.

- 4 diferentes niveles de monitoreo:
  - diversidad genética
  - diversidad de especies y variedades
  - diversidad de paisajes agrícolas o agroecosistemas
  - conocimientos colectivos asociados a la biodiversidad.

- Evento se llevó a cabo en el INIA Santa Ana, Huancayo (4 al 7 de Noviembre)
Los Participantes

- INIA y MINAM, Peru
- INIAP, Ecuador
- CORPOICA, Colombia
- INIAM, Bolivia
- Embrapa, Brazil
- INIA, Chile
- Centros Internacionales: IITA Nigeria, Bioversity Italia, CIAT Colombia, CIP Peru
- ONGS: UNORCAC, Ecuador; PROINPA, Peru; CET, Chile; Grupo Yanapai, Peru; CADEP, Peru; Seed Savers Network, Estados Unidos
- Universidad: Universidad Agraria La Molina y Universidad San Antonio Abad, Peru; Universidad de Birmingham, Reino Unido

¿Qué es la Diversidad Agrícola/Agrobiodiversidad?

- Se refiere a toda la diversidad que existe dentro y entre las especies halladas en sistemas domesticados, incluyendo parientes silvestres, y especies que interactúan con polinizadores, plagas, parásitos y otros organismos.

- La biodiversidad domesticada (cultivos, árboles, piscicultura, ganadería) es una consecuencia de la intervención deliberada del ser humano, que sirve tanto como un componente de la producción como fuente para el mejoramiento genético.

Fuentes: Wood and Lenné, 1999; Qualset et al., 1995; Cassman et al., 2004.

Por qué nos debe importar la diversidad agrícola?

- Controlar las Plagas y Enfermedades
- Contribuye al nutrición y salud
- Adaptación al cambio climático
- Contribuye a los ecosistemas y bosques
Por qué es necesaria la diversidad agrícola?

Es muy riesgoso depender de un grupo muy pequeño de cultivos, ya que la hambruna y la malnutrición son dos consecuencias graves.

¿Porqué Conservar?

- Los Reportes de la FAO del Estado Mundial de los Recursos Genéticos reflejan una pérdida sin precedentes de la ABU y el conocimiento tradicional asociado en todo el planeta.
- “Estamos perdiendo las opciones biolóxicas que necesitamos para fortalecer la seguridad alimentaria y para sobrevivir el cambio climático global. Las consecuencias son serias, irreversibles y golpeadas” [FAO State of Plant Genetic Resources, 2017]
- “La pérdida de biodiversidad es el único cambio global ambiental que es verdaderamente irreversible que el planeta Tierra enfrenta hoy en día” [Ernie and Raven, Environment and Resources, 2013]
- La agrobiodiversidad: Si desaparece, nosotros también!
Preocupación global respecto a la Conservación de la Agrobiodiversidad

- **Tratado Internacional Sobre Los Recursos Fitogenéticos Para La Alimentación Y La Agricultura**
  - "Preocupado sobre la erosión actual de tales recursos"
- **Plan de Acción Mundial para los Recursos Fitogenéticos para la Alimentación y la Agricultura**
  - "La erosión genética ha sido reportada en muchos países del mundo y ha crecido la vulnerabilidad genética de muchos cultivos".
- **Plan Estratégico para la Biodiversidad 2011-2020**
  - Alcalá Meta 18: "Para 2020, se habrá mantenido la diversidad genética de las especies vegetales cultivadas y de los animales de ganado doméstico y de las especies silvestres en el país, incluyendo otras especies de valor económicamente y cultural, y se habrán desarrollado y puesto en práctica estrategias para reducir al mínimo la erosión genética y para salvaguardar su diversidad genética."

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**Conservación In-Situ: un marco conceptual general**

Orientada a Investigación
- Proyectos (IARC, Universidades, etc.)
- Para entender conservación FD & DO
- Caracterización de diversidad & IK
- Identificación de genotipos / alelos raros
- Análisis comparativo
- Estudios de impacto
- Estudios nutricionales
- Dinámica temporal & espacial
- Etc.

Orientada a Desarrollo
- Proyectos (NGO, ONG, etc.)
- Vista foralcoor cons. por agnc.
- Componentes de desarrollo:
  - Sistemas de cultivos
  - Programas de nutrición
  - Marketing
  - Sistemas de innovación
  - Programas educativos
  - MF & MIC
  - Reafirmación cultural
  - Etc.

Por Agricultores
- Lo que hacen agricultores
- Fenómeno histórico
- Estrategias de vida
- Rol:
  - Seguridad alimentaria
  - Productos & valor social
  - Generación de Ingreso
  - Satisfacción
  - Uso, etc.

Sistemas de Conservación Ex-situ

= interfaz de comunicación

También se trata de:
- Múltiples actores
- Más que conservación por se
- Estrategias de vida
- Aprendizaje organizacional
- Sistemas sostenibles
¿Porque monitorear?

- “No puedes manejar lo que no mides”
  (Peter Drucker)

¿Porque monitorear?

- “Muchas economías continúan ciegos al enorme valor de la diversidad de animales, plantas y otras formas de vida y su papel en la salud y funcionamiento de los ecosistemas”
  (Achim Steiner, Director del PNUMA, Nagoya 2010)

¿Porque monitorear?

- No podemos conformarnos con solamente denunciar que estamos perdiendo diversidad agrícola.
- Es urgente identificar cuanta diversidad existe, donde se encuentra, a que amenazas esta sujeta y que medidas podemos tomar para detener esta perdida.
- Pero teniendo en cuenta que los cultivos en las charcas de agricultores son estáticos, al contrario están constantemente siendo seleccionados por la mano humana y por el ambiente.
Necesidad para (Mejores) Sistemas de Monitoreo de la Agrobiodiversidad

- Información limitado disponible respecto al estatus actual de riesgo de la agrobiodiversidad
- Aún no contamos con sistemas funcionales de monitoreo de la agrobiodiversidad in-situ y mucho menos con indicadores que permiten hacer comparaciones a través del tiempo.
- Diferentes organizaciones y proyectos adoptan medidas diversas y falta algunos dimensiones importantes, como con el respecto a la diversidad genética.
- No hay un sistema (procedimientos, indicadores y métricos) estandarizado de observación para entregar información sobre cambios en la agrobiodiversidad de una forma regular y puntual
- Muchos esfuerzos convencionales de monitoreo son científicamente débiles y no han involucrado productores y sus comunidades

Desafíos

- Necesidad de un compromiso al largo plazo. Enfoques relacionados a proyectos de corto plazo han resultado en una falta de información básica y crítica. No se permite, necesariamente, comparaciones espaciales, entre especies y a través del tiempo.
- Hay una necesidad de priorizar lugares para el monitoreo. No se puede hacerlo en todos los lugares o comunidades. Se necesita identificar sitios representativos donde se puede comprometerse a monitorear al largo plazo
- Para la representatividad, se necesita encontrar un equilibrio entre las actividades de monitoreo y intervenciones para reducir pérdidas (priorizar lugares con evidencia de pérdidas pero se puede monitorear en otros lugares también)
- Evitar trabajo no coordinado – las actividades de diferentes instituciones nacionales pueden ser complementarios, así fortaleciendo la conservación.
Las Buenas y Las Malas

- “La buena noticia es que cuando realizamos que la conservación funciona; sabemos más y más lo que se puede hacer, y cuando lo hacemos funciona muy muy bien” (UICN, 2010)

- Pero el monitoreo sostenible de la agrobiodiversidad a largo plazo, que todavía falta, es un componente fundamental para la realización de tales actividades de conservación

Gracias por su atención

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