Crowdsourcing approach in East Africa: methods and lessons learned

Jeske van de Gevel, Associate Expert Genetic Diversity
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What is Seeds for Needs

- Researching **how** agricultural biodiversity can help to minimize the risks associated with climate change
- Giving farmers better information and access to a wide range of varieties
- Strengthen seed systems and seed-saving capacity to provide access to planting material that fits farmers’ changing needs

Seeds for Needs started in Ethiopia in 2009 and has spread to 11 countries:

- Cambodia: rice, sweet potato
- Colombia: beans
- **Ethiopia**: barley, wheat
- Honduras: beans
- India: rice, wheat
- **Kenya and Tanzania**: cowpea, pigeon pea, sorghum
- Laos: cucumber, long bean, rice, sweet corn, watermelon
- Papua New Guinea: sweet potato, taro
- **Rwanda and Uganda**: beans
Genetic erosion

Soil degradation

Loss of agricultural biodiversity
Why agricultural biodiversity matters

- Increased resilience to deal with climate risks
- Provides better nutrition
- Protection against biotic stress (pest & diseases)
- To safeguard resilient & adaptive planting material for the future
Genotypic characterisation

Phenotypic characterisation

Farmers knowledge

Genotypic characterisation
Research questions

+ What are the climate change adaptation and risk management strategies of smallholder farmers in different regions and different agroecological zones?
+ What is the current varietal diversity on farms in East Africa?
+ How can we strengthen farmers’ varietal portfolios? What are their preferences and needs?
+ Which favourable traits can be identified through morphological characterization?
+ How are crop varieties performing in different locations and under different management?
+ What is the adaptability potential of different varieties and crops looking at future projections and scenarios for climate change in Kenya and Tanzania?
+ What is a cost-effective way of providing farmers with better information and access to a wider range of varieties?
First step

1. A broad set of varieties is evaluated

1. Select material from the genebank and farmers fields
2. GIS-based selection of promising accessions
3. Multi-location research-led trials
4. Participatory variety selection
Performance of landraces versus the best improved varieties of wheat in Ethiopia

The table tells that:

- 21%, averaged over traits, of the landraces are superior to the best performer IM variety
- Many landraces mature earlier than the IM varieties
- A yield advantage of 61% obtained from the best landrace over the best IM variety (Robe)

<table>
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<th>Superior (IM)</th>
<th>Superior (LRs)</th>
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<th>%age</th>
<th>No Geregera</th>
<th>% Geregera</th>
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Ethiopian Unique Genetic Diversity
Development of a Structured Multiparental Population
Nested Association Mapping - NAM - Population

Principal Facts

➢ 52 RIL families

➢ 180 – 200 lines

➢ > 9,000 F6 lines in Dec. 2014

➢ wide phenotypic variation

Modified from Yu et al. 2008
Second step
## Survey

1. Focus group discussions
2. Individual interviews

<table>
<thead>
<tr>
<th>Topic</th>
<th>Data collected</th>
<th>Sample</th>
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<tbody>
<tr>
<td>ABD</td>
<td><strong>Crops</strong>: Major crops (long &amp; short rains). Unseasonal crops, major perennial crops, major vegetables, fruits. Crops in wild conditions, major cash crops. <strong>Varieties</strong> (target crops): seasonal calendar, management practices, trait preferences, varietal diversity, use <strong>Other</strong>: pest and diseases/calamities, weather, changes in cropping (loss of varieties).</td>
<td>4 FGDs (15-20 pp) in Western Kenya, Eastern Kenya and Central Tanzania</td>
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<tr>
<td>Seed System</td>
<td>For target crops (sorghum, pigeon pea and cowpea) &gt; trad varieties vs improved, seed custodians, abandoned varieties, seed sources, limitations in access to seeds, post-harvest storage.</td>
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<tr>
<td>ABD</td>
<td>Crops grown (incl. variety and area usage) Crops abandoned Intraspecific diversity of sorghum, pigeon pea and cowpea.</td>
<td>338 households in Western Kenya, Eastern Kenya and Central Tanzania</td>
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<td>Seed System</td>
<td>For target crops (sorghum, pigeon pea and cowpea) on varietal level: seed sources, change of seedlots, storage of seeds (practices, varieties), status (4-cell analysis), trait performance of each variety, constraints in accessing seeds, seed prices.</td>
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Participatory Evaluation

Ethiopia
- 30 farmers per location (15 male + 15 female)
- Individual score on 5 traits for 800 plots
- > 200 thousands data points

Kenya + Tanzania
- 20 sorghum and 15 cowpea varieties selected
- 60 farms in 3 sites
- Favourable traits determined by farmers

<table>
<thead>
<tr>
<th>Cowpea</th>
<th>Drought Resistance</th>
<th>Early Maturity</th>
<th>Grain size</th>
<th>Colour</th>
<th>Leaf amount</th>
<th>Leaf size</th>
<th>Creeping-Climbing variety</th>
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<td>Early Maturing</td>
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<td>Ability to market</td>
<td>Pest and Disease resistance</td>
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### Workaye Village Baby trial (November, 2013) Farmers evaluation data sheet (Mother trial)

**Group Number:** 1  
**Replication:** 1  
**Date of Evaluation:** 03/03/2006


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**Mother trial**

1. Aragaw Mebrate
2. Misganaw Mulugeta

**Researcher Data**

Farmers score Mother trial  
Farmers score Baby trial
Crop suitability mapping

Cowpea potential distribution 2000

Cowpea potential distribution 2050

Legend
- High
- Low

Legend
- High
- Low

Bioversity International
Crowdsourcing varieties
Collecting weather data using iButtons

Credit: Nuestro Diario (8 March 2015)
Outcomes
Empowerment of communities: more resilient to eco-socio-economic changes,

(1) Genetic diversity
(2) Selection & cultivation
(3) Harvest
(4) Value addition
(5) Marketing
(6) Final use

Outcome
Preservation of options for resilient systems

Outcome
Self-reliance of value chain actors on broader set of options, making them more resilient to market changes.

IMPACT
Improved nutrition, incomes and other livelihood benefits
And...

- Strengthen marketing channels
- Crop modelling and prediction mapping
- Participatory plant breeding
- Open Source climate smart seed systems
- Upscale of most promising technologies
- Global information platform on citizen science