Research Program
Dryland Cereals

Vincent Vadez on behalf of Stefania Grando and the Research Program

CCER meeting,
ICRISAT, Patancheru
11 November 2013
Outline

• Overview of the program
• Anchor to the CRP-Dryland Cereals
• HQ linkage to SSA programs
Our Crops

- Essential staple for poor smallholder farmers
- Sorghum - 33 million ha in sub-Saharan Africa (76%) and Asia (24%)
- Millets – >30 million ha – 60% in Africa
- Grain – food (55%), feed (33%), industrial uses
- Stover – dry season fodder for livestock
- Nutritious grains
- Market opportunities
- Sweet sorghum
Trends in demand

- Population growth
- Health food
- Livestock feed and fodder
- Industrial uses
Main Directions

• Multi-purpose crops
  – Food and Nutritional security
  – Biofortification
  – Feed and fodder quality
  – Sweet sorghum

• Resilient crops

• Seed systems

• Strategic partnership

• Enhance genetic gains
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Our Research Agenda

• ICRISAT’s Strategic Plan to 2020
• CGIAR Research Program on Dryland Cereals.
• Six of the seven Product Lines of the CRP-Dryland Cereals
• Biofortification component of the CGIAR Research Program on Agriculture for Nutrition and Health (A4NH)
• CCAFS and Dryland Systems
• Strategic Partnership
Pearl millet for Africa and Asia

• PL2. Improving food security for subsistence smallholder farmers in East and West Africa with productive and nutritious pearl millet food and fodder production technologies

• PL4. Improving nutritional security with productive and nutritious finger millet production technologies for East and Southern Africa

• PL6. Improving food security and income with productive, nutritious multi-purpose pearl millet hybrid production technologies for East Africa and South Asia
Sorghum for Africa and Asia

• PL1. Supporting farmers’ transition from subsistence to market orientation with productive, nutritious, photoperiod-sensitive sorghum production packages for multiple uses in West Africa

• PL3. Drought tolerant, highly productive, multi-use sorghum varieties for food and processing uses in the dry lowlands of East Africa

• PL7. Multi-purpose post-rainy season sorghum hybrid production technologies for improving food and fodder availability in the driest region of South Asia
## Focus countries

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<th>SA</th>
<th>WCA</th>
<th>ESA</th>
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<tbody>
<tr>
<td>Millet</td>
<td>India (11.3 m ha)</td>
<td>Niger (6.9) Nigeria (4.1) Mali (1.5) Burkina Faso (1.4) Senegal (1.0)</td>
<td>Sudan (2.2) Uganda (0.5)</td>
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<tr>
<td>Sorghum</td>
<td>India (7.7)</td>
<td>Nigeria (5.7) Burkina Faso (1.8) Mali (1.1)</td>
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Dryland Cereal research at HQ for SSA

• Genomics
• Phenomics for trait donors (biotic / abiotic constraints)
  • Biofortification
• Modern breeding approaches
  • Crop simulation modeling
Genomics

- Pearl Millet Genome Sequencing
- 500-600 lines re-sequenced (Asia, ESA and WCA)
- Pre-sequencing of finger millet
- Genotyping – by – sequencing
- Genome Wide Association Studies
Biofortification

• Pearl millet ICTP 8203Fe first biofortified crop variety officially released in India
• Large variability for grain Fe and Zn in sorghum landraces, hybrid parents, and commercial cultivars
• Database in public domain (http://hdl.handle.net/11038/10081)
• Rapid phenotyping (XRF method)
• WCA and ESA
Objective: Assess water use under drought
Select donors for breeding

Objective: Characterize contrasting pearl millet varieties under low-P and water stress
Isxxx – accessions with high water extraction capacity
Isxxx – accessions with high TE
CSM63E and Lata3 – BCNAM pop recurrent parents
Characterization of stress scenarios
Simulation of stress effects on yield

Stress scenarios

Effects on yields

Which traits confer advantage in the most frequent environment?
Tools to enhance breeding efficiency

- Genomic tools (QTL, genome sequencing, MABC, GS, MAS)
- Harnessing genetic resources
- Phenotyping platforms
- Breeding data management and analysis platforms

- Trait based hybrid parents (>800 A-/B- pairs and more than 1000 R-lines)
- Pearl Millet Hybrids based on IC-Patancheru bred hybrid parents, at Miwaleni, Tanzania, 2012 (30-65% yield gain)
- Hybrid Parent Research Consortium for Africa
Training of technicians and scientists

- **Strengthening Management of Pearl Millet Downy Mildew In Sub-Saharan Africa - A Training Course**
- **Training course on pearl millet hybrid parent improvement and seed production (36% from Africa)**
- **Training course on sorghum hybrid parent improvement and seed production (38% from Africa)**
- **Training course on genomics and molecular breeding (71% from Africa)**
  - ...
Thank you!

ICRISAT is a member of the CGIAR Consortium

International Crops Research Institute for the Semi-Arid Tropics