

# A worldwide view of maize diversity

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Alain Charcosset, Celine Mir, Marilyn Warburton, Luz George, Sukitoshi Taba, Susanne Dreisgacker, Claudia Bedoya, Jorge Franco, V. Mahalakshmi, Abebe Menkir, Sarah Hearne, Dominique Dumet, Maria Kolesnikova-Allen, Zachary Muthamia, S.H. Zhang, C. Xie, Sutrisno, Mohammed Yunus, Pichet Grudloyma, Chaba Jampatong, Phan Xuan Hao, B.M. Prasanna

# Project Rationale

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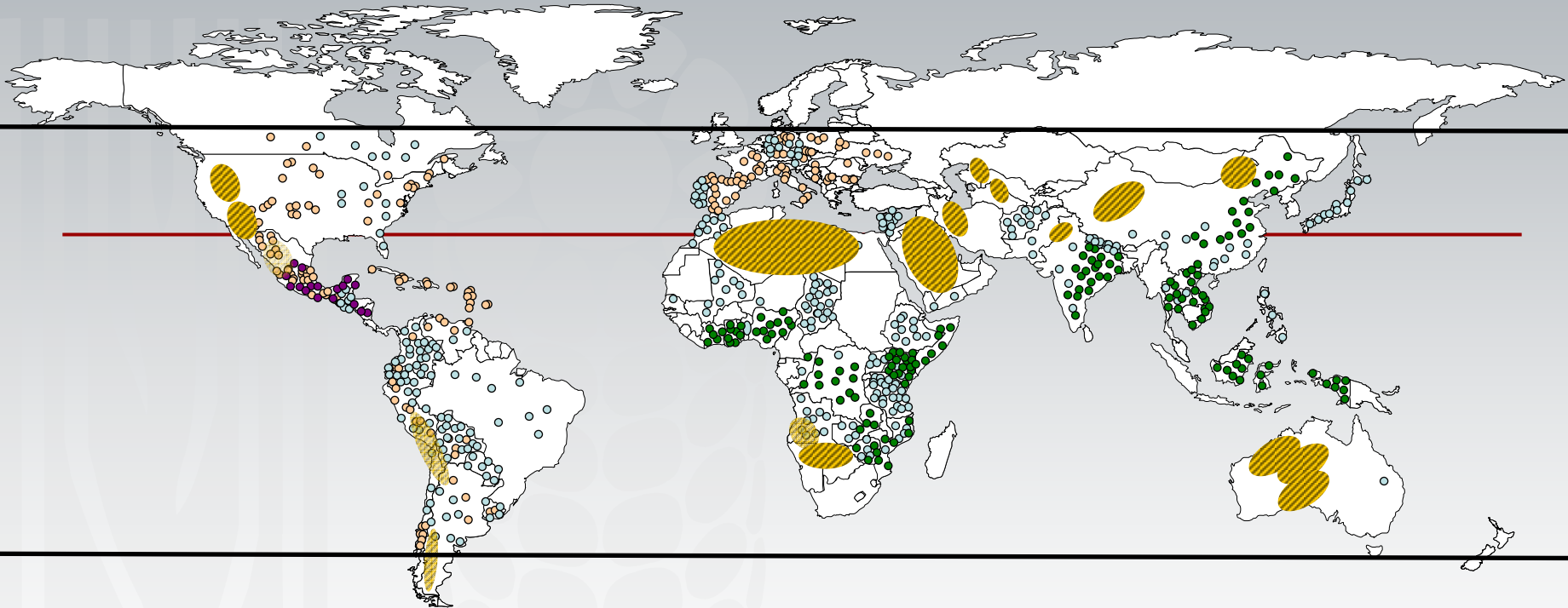
- ▶ Populations introduced into other countries from the center of origin following a complicated pattern of introductions have become adapted to new growing conditions and local stresses, including drought.
- ▶ Tapping this diversity requires an understanding of relationships between populations from different geographical areas and the diversity present in these populations for genes encoding traits of interest.

# Activities

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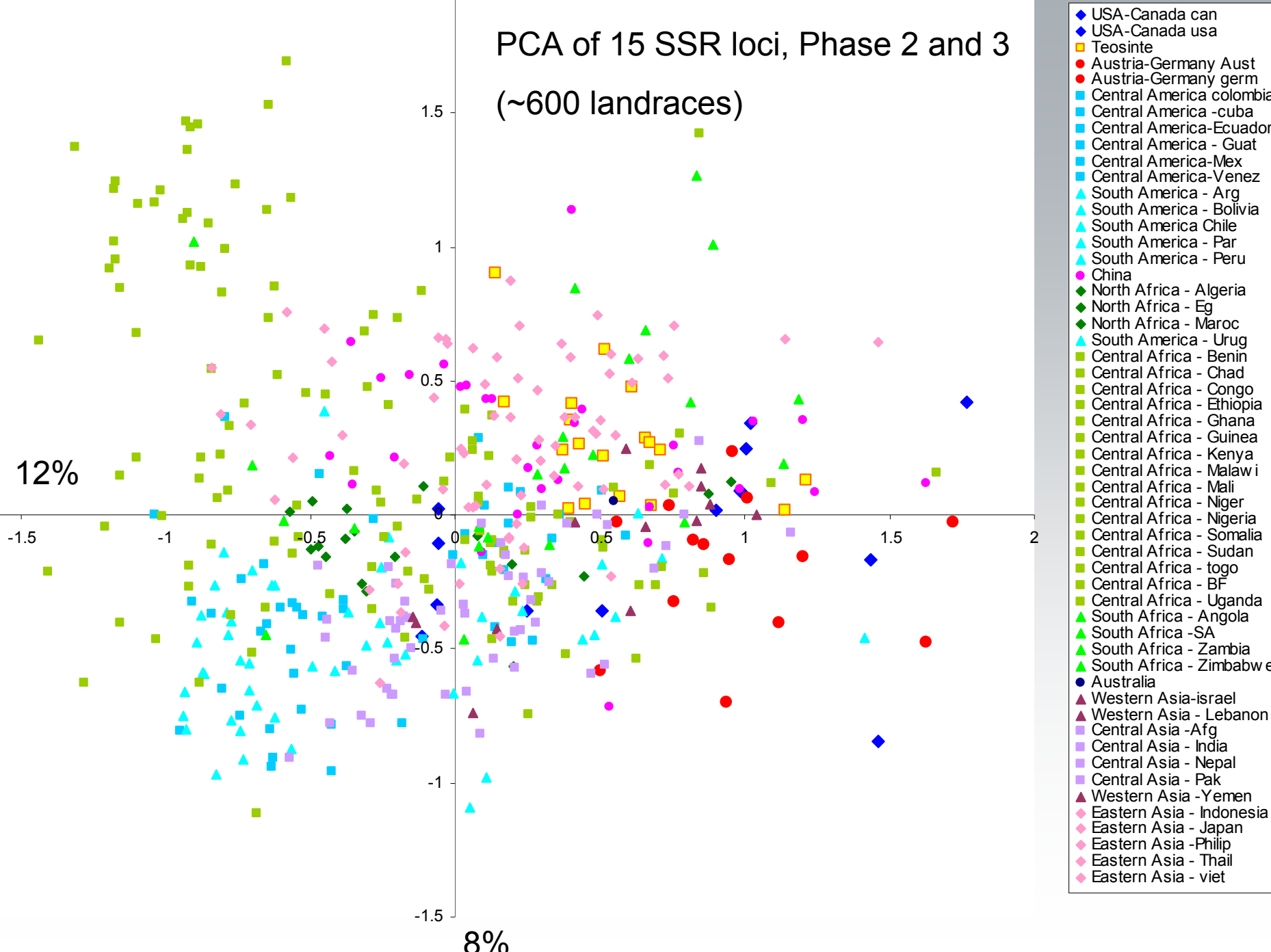
- ▶ **Germplasm selection:** 880 landrace populations of maize and teosinte characterized from around the world (including new collections directly from farmer's fields)
- ▶ **Structural characterization:** all populations characterized using SSR markers and the bulked fingerprinting technique (integration of data from 3 separate phases ongoing)
- ▶ **Capacity building:** Three workshops completed:
  - Nairobi, Kenya April 1 – 8, 2005; 24 scientists from 9 countries
  - Beijing, China, Dec. 5 – 9, 2005; 32 scientists from 9 countries
  - Delhi, India, April 1 – 6, 2007; 34 scientists from 18 countries

# LRs and OPVs Characterized: 3 Phases



880 Populations

# PCA of 15 SSR loci, Phase 2 and 3 (~600 landraces)



# Results of the Worldwide study to date:

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- ▶ To be completed by further statistical analyses (structure and related approaches) and by merging data from Phase 1 data (Europe and America) using protocols for combining data from different labs, platforms, and years
- ▶ Axis 1 confirms the major differentiation of “northern flints” derived material adapted to cool/temperate climatic conditions
- ▶ Axis 2 further suggests regional differentiation, specifically for African countries
- ▶ Groupings are not perfect based on geography, suggesting mixing due to migration

# Looking at regions: Asia

Country	Size	Allele No	Genotype No	Gene Diversity	Specific Allele No	Rare alleles (%)
China	300	6.3	14.1	0.569	9	25.9
India	360	9.0	24.6	0.673	31	39.9
Indonesia	315	8.2	20.9	0.644	22	35.2
Thailand	330	8.2	22.0	0.675	16	34.2
Vietnam	285	5.1	10.6	0.481	4	19.9



<b>Data Format (what analyzed by):</b>	<b>Release Date:</b>
Amplification protocols using the bulked method for ~50 SSR markers	September 2006
ID, pedigree, geographical origin, etc of 880 landrace populations used in the study, including where to request seed	September 2007
SSR data (raw = peak heights) for the 880 landraces	September 2007
SSR data (converted to frequencies by R program) for the 880 landraces, suitable for import into your favorite phylogeny analysis program	March 2008

Data Format (what analyzed by):	Release Date:
Limited phenotypic data: photos of cobs uploaded to web site	December 2007
Populations characterized for some adaptive gene polymorphisms such as <i>Dwarf8</i> and <i>Vgt1</i>	March 2008

# Links with other projects

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- ▶ Fingerprinting of additional populations within the Drought Tolerant Maize for Africa project (CIMMYT) for population structure and using genes linked to drought tolerance
- ▶ Ongoing association genetics project related to adaptation using allelic geographical clines (INRA)
- ▶ the Fingerprint Police (population identification) (CIMMYT)
- ▶ Individuals from national breeding programs and small companies have expressed interest to compare their germplasm to the world wide set and identify new germplasm suitable for breeding in their areas

# Product delivery/impacts on users

- ▶ Protocols for bulked DNA fingerprinting technique to characterize heterogeneous populations including reference data and new software -> basis for further regional studies linked to the entire set
- ▶ Reference information on maize population structure (highly complementary to inbred line genotyping) to better manage/interpret association genetics results
- ▶ Identification of diversity sources “forgotten” by inbred line development -> calls for a systematic program to develop new representative inbred lines