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PigeonPea/Gungopea Cultural and Genetic History, and Prospects for Development

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Pigeonpea/gungopea cultural and genetic history, and prospects for development

Eric JB von Wettberg
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Presented at the SALISES 50:50 Conference in
New Kingston, Jamaica, Aug 23, 2012

Session: Diaspora and Linkages in the New
Global Architecture of Caribbean Development

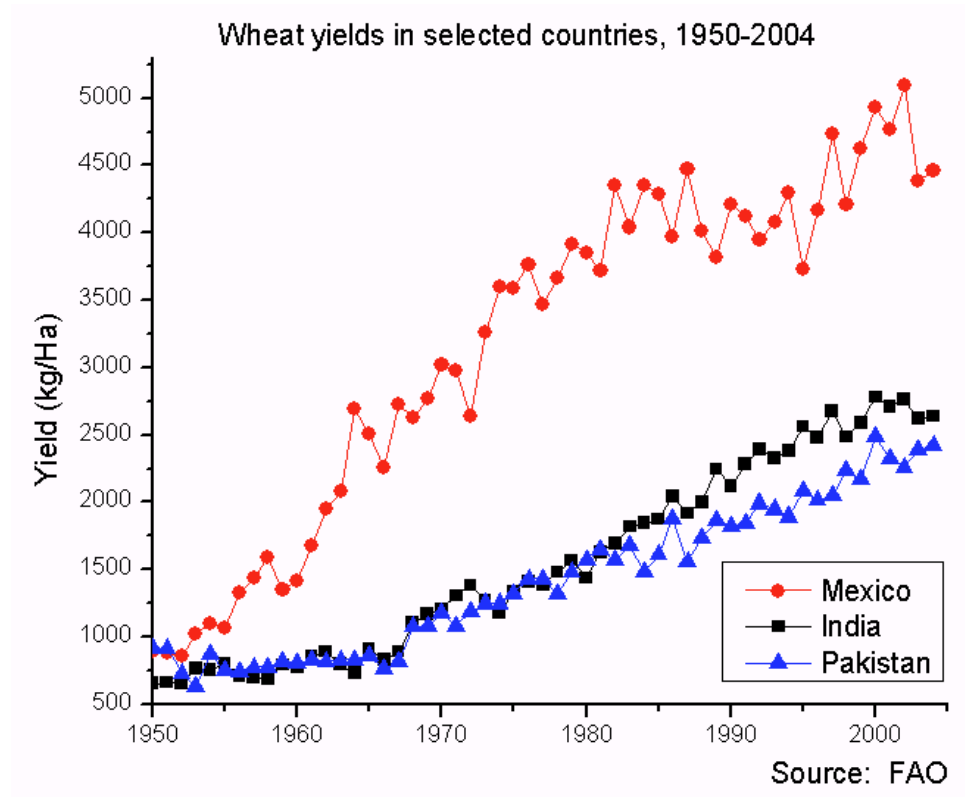
Thank you



- FIU African and African Diaspora Studies and College of Arts and Sciences
- Damian Nesbeth
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The green revolution

- Increased yields due to
 - Irrigation
 - Synthetic fertilizers
 - Pesticides
 - Mechanization
 - New varieties responsive to green-revolution technology



Breeding for the green revolution

- Yield response to water and fertilizer
- Dependence on pesticides
- Reduced height, competitiveness



Wheat trials, Denmark – photo EvW

Green revolution varieties

These varieties require

- Water
- fertilizer
- pesticides
-



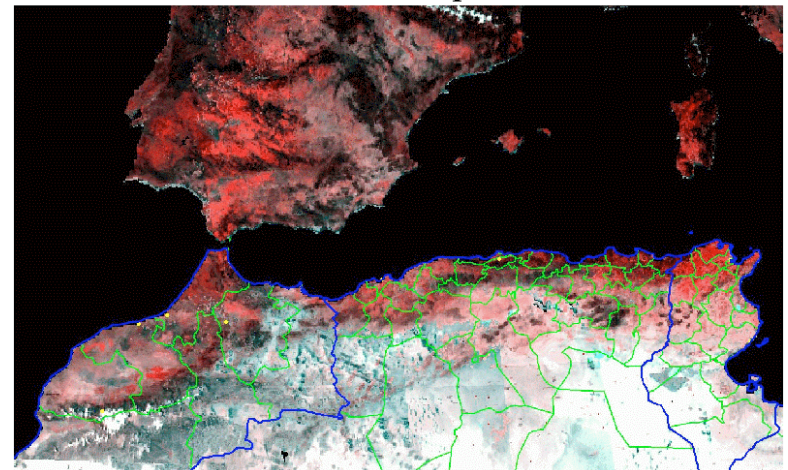
Wheat trials, Denmark – photo EvW

Is the green revolution sustainable?

- Water shortages
- Salinization of irrigated land
- Synthetic fertilizer from petroleum
- Expense of modifying marginal land
- Population growth
- Climate change



AVHRR Composite



Taken the first half of March 2000
Dark red = healthy vegetation

 Foreign Agricultural Service
Production Estimates and
Crop Assessment Division

Breeding for marginal lands

- Marginal lands will have to be used to feed a growing population, without green revolution inputs
- Breeding needs:
 - Understanding adaptation to marginal lands



Breeding for marginal lands

- Wild relatives of crops are ideal for understanding adaptation
 - Grow on marginal lands
 - Genetic resources
 - Germplasm collections

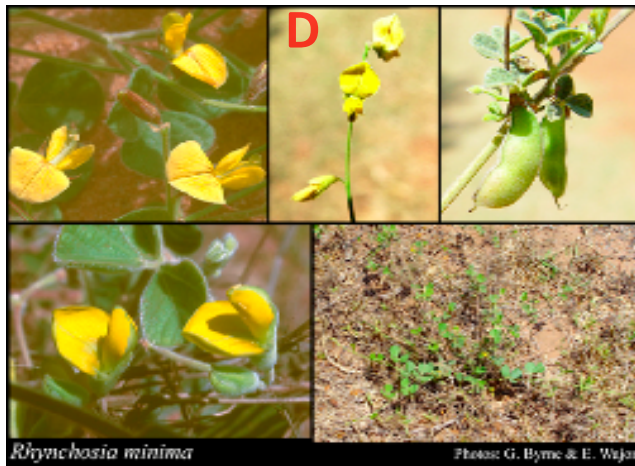
Breeding for marginal lands

- During domestication, wild relatives were adapted to cultivation
 - Understanding this process gives us insight into the important changes
 - Some consequences of domestication not intended by breeders

Breeding for marginal lands

- Following domestication, crops were moved to new areas with migrations, diasporas, and cultural exchange

Pigeonpea and Some wild relatives, A-Cajanus cajan, B-Dunbaria, C-Bolusafra, D-Rhynchosia and E-Eriosema



Gungopea agricultural uses

- Often a secondary crop
- Intercrop with grains
- Cover crop/green fertilizer
- Biofuel
- Starvation crop
- Seasonal vegetable



Known as pigeonpea, Congopea, Gungopea, and guandules in different parts of India, Africa, and the Caribbean

Domesticated Gungopeas

Less diverse than wild *C. cajanifolius*

African, Caribbean, and east Asian pigeonpeas are less diverse than domesticated Indian pigeonpeas



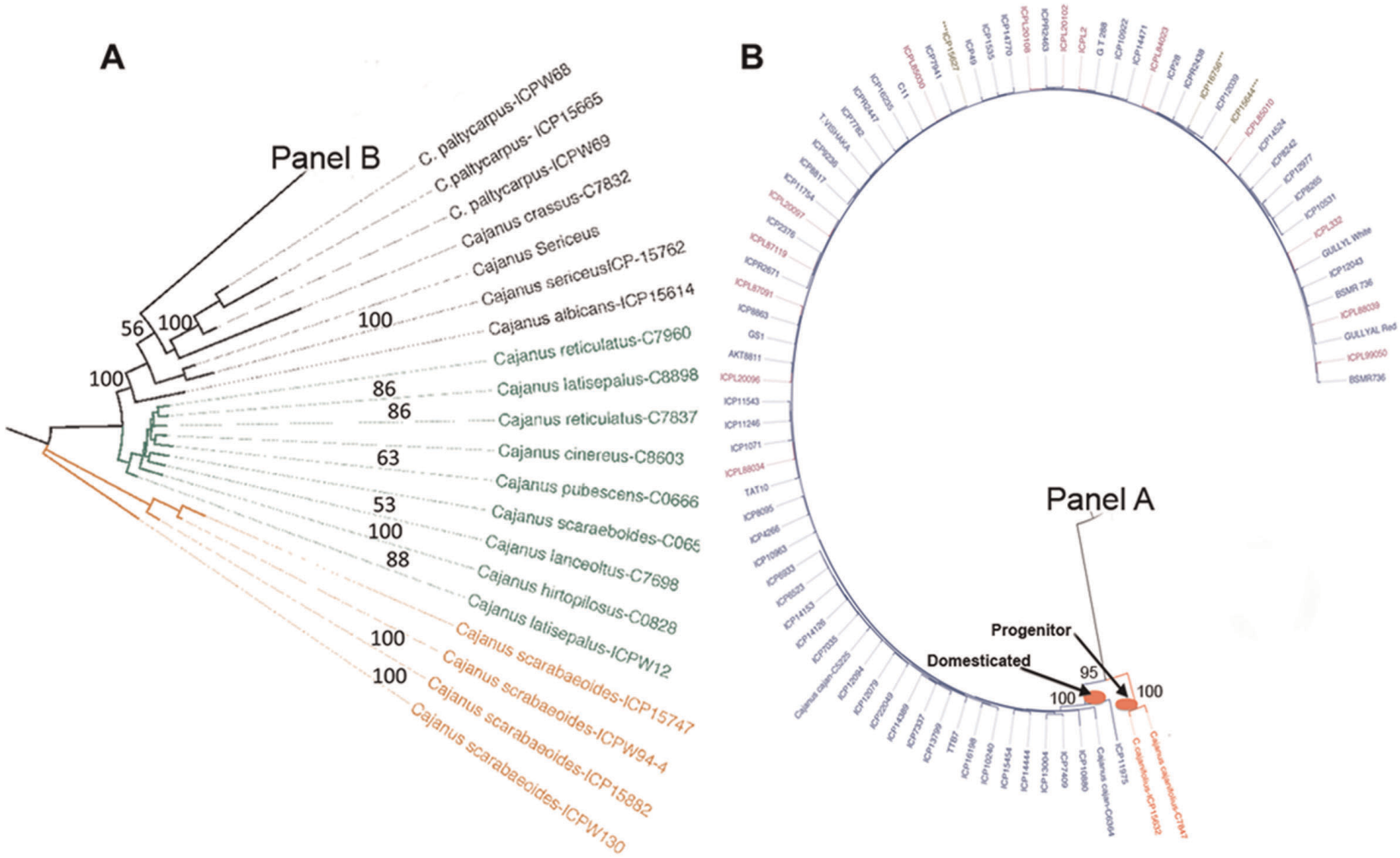
Pigeonpea genome-wide variation

Less diverse than wild *C. cajanifolius*

African, Caribbean, and east Asian pigeonpea less diverse than domesticated Indian

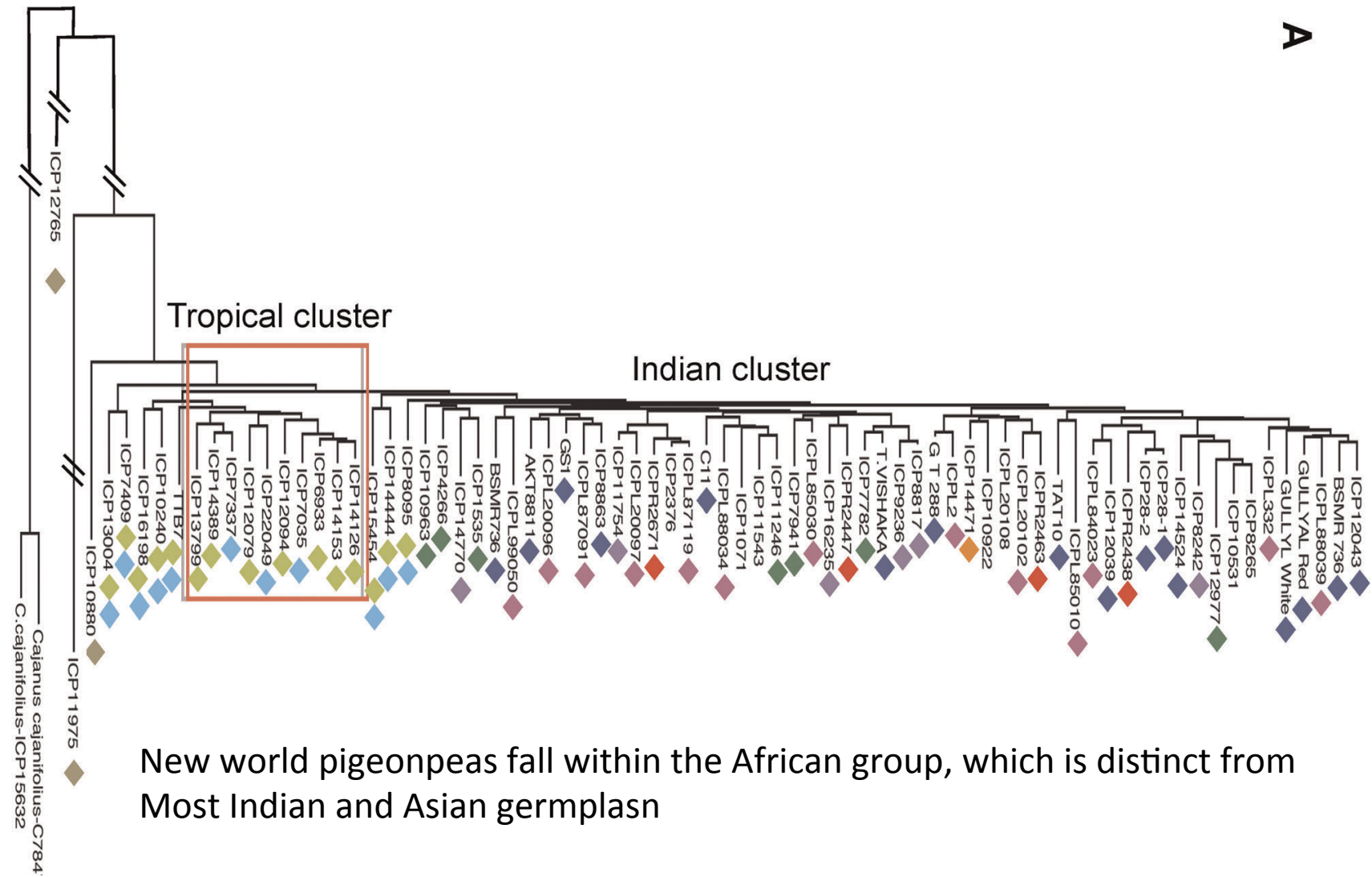
752 and 1616 locations across the pigeonpea genome in 184 cultivated and wild accessions





Blue and red- crop
Orange, green black- wild

A



New world pigeonpeas fall within the African group, which is distinct from Most Indian and Asian germplasm

From Kassa et al 2012, *Public Library of Science ONE*

Table 2. Percentage of Polymorphic loci in wild and domesticated groups.

Sub-groups	Number of accessions	Genetic Status	Polymorphic loci (%)
Wild <i>scarabaeoides</i>	4	Wild	36.7%
Wild Australian	9	Wild	11.84%
Wild Indian	9	Wild	37.37%
Domesticated Indian	58	Domesticated	8.64%
Domesticated Tropical	12	Domesticated	5.45%
Philippines	3	Domesticated	23.94%
Mean			20.66%
SE			5.78%



Development perspectives

- Where does gungopea fit into Jamaican agriculture?

Development perspectives

- Breeding for year round production
- Breeding for mechanical harvesting (determinate flowering)
- Non-food uses such as biofuels
- Stressful soils and degraded land

- Value of wild relatives of crops
- Microbial mediation of traits

