SSP-WA Breeding and Germplasm Movement to Support the Region

Ted Carey

SSP-WA Support Platform
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SWEETPOTATO ACTION FOR SECURITY AND HEALTH IN AFRICA

Outline

- Breeding Objectives in SASHA
- Main Progress to date
- SSP-WA
  - Germplasm development and distribution
  - NIRS facility

Main Objective: Breed new populations with new methods and varietal development

SASHA
Sweetpotato Action for Security and Health in Africa

- Generate a radically expanded range of sweetpotato varieties that combine different quality traits with significant improvements in yielding ability
- Generate by population improvement new populations for major needs of users
  - SPVD resistance (East Africa)
  - Low sweetness (West Africa)
  - Drought tolerance (Southern Africa)
  - Incorporate important traits e.g.
    high beta-carotene content
    dual purpose for animal feed

Main Objective Continued

SASHA
Sweetpotato Action for Security and Health in Africa

- Redesign the sweetpotato breeding systems in the region to produce varieties in 3-4 years instead of the current 7-8 years: accelerated breeding
- Other new breeding methods to use:
  - heterosis into sweetpotato breeding
  - molecular markers for breeding for virus resistance

Major Progress to Date

We have demonstrated experimentally that heterosis can be applied in sweetpotato breeding to dramatically improve storage root yield

Sweetpotato Breeding Scheme

Local, Introduced &
Improved Germplasm & Breeding lines

Crossing Block (Polycross)

Seedling Nursery (Yr 1)
100,000 Seedlings

Clonal Evaluation (Yr 2)
2,000 Clones (No Reps)

Preliminary Yield Trial (Yr 3)
100 Clones (Replicated)

Intermediate
Yield Trial (Yr 4)
50 Clones (Replicated)

Advanced / Multi-Location
Trials (Yrs 5,6) 25 Clones
Replicated

On-farm Trials (Yr 7) 5
Clones (Replicated

Variety Release (Yr 8)

Accelerated breeding in Ghana

Year 1	Crossing block (50 parents)					
Year 2	Seedling nursery (~240 families, 5000 genotypes)					
	OT – AR (Kumasi)			OT – UE (Tono)		
	~250 clones selected with top selections for recombination in crossing block and for varietal selection					
Year 3	PYT - UE		PYT – CR		PYT – VR	PYT – AR
	~25 clones selected					
Year 4	AYT+OFT	AYT+OFT	AYT+OFT	AYT+OFT	AYT+OFT	AYT+OFT
Year 5	Multiplication and release of ~5 varieties					

OT = Observational Trial (unreplicated 3-plant plots)
PYT= Preliminary Yield Trial (2 replications, 2-row, 10-plant plots)
AYT = Advanced Yield Trial (2 replications, 5-row, 75-plant plots, additional regions)
OFT = On-Farm Trial (variable methodology)
UE = Upper East, CR = Central Region, VR = Volta Region, AR = Asante Region

Major Progress to Date

We have practically demonstrated accelerated breeding in Mozambique with release of 15 varieties after 4 years

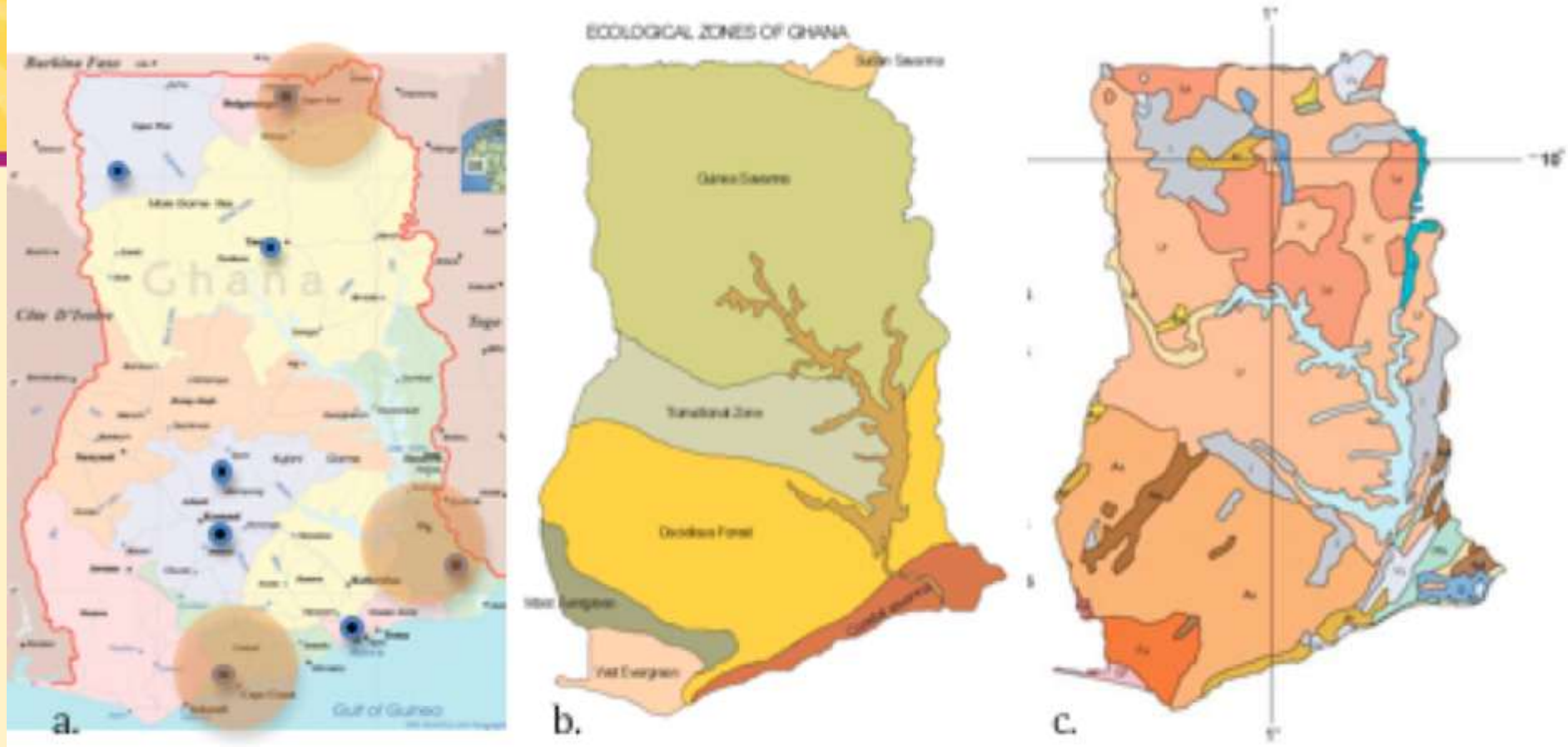


Figure 1. Map of Ghana showing a) sweetpotato production zones (large, light brown circles) and selection sites used by the breeding program (black dots), b) agroecological zones, and c) edaphic zones.

Sweetpotato Population Improvement

Population B

Population C

Phenotypic selection
Crossing selected plants with population C

Phenotypic selection
Crossing selected plants with population B

Pair crossing
B_1xC_1
B_2xC_2
B_3xc_3

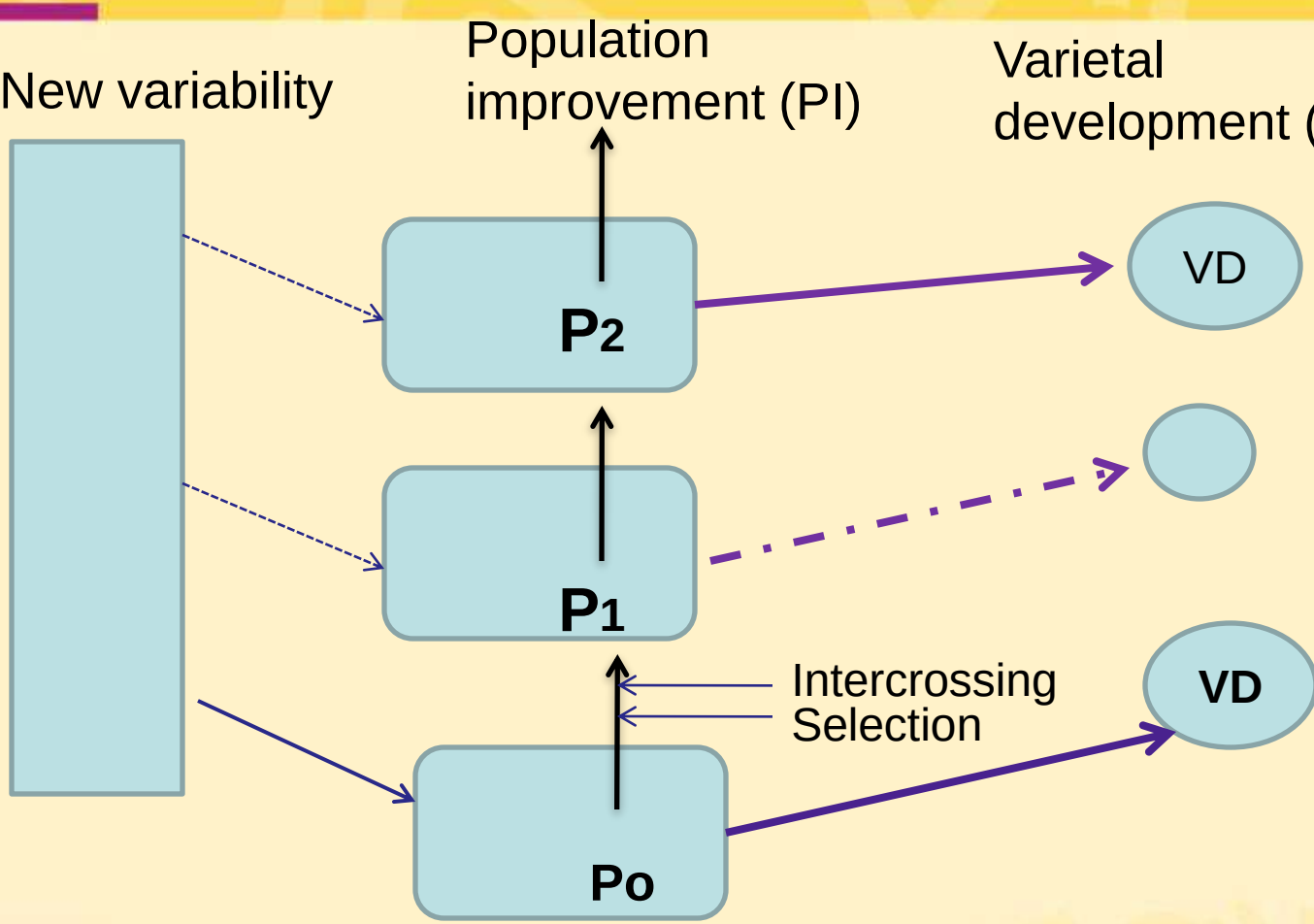
Evaluation of full-sib progenies
Selection of best progenies B_1xC_1

Intercrossing mother plants B_1 of the selected progenies B_1xC_1

Intercrossing mother plants C_1 of selected progenies B_1xC_1

Have initiated population improvement at the Sweetpotato Support Platforms: Drought tolerance, SPVD resistance, low sugar

Sweetpotato Support Platform (SSP) Breeding Activities



- **PI** by SSP – long term by SASHA : use distinct populations to exploit heterosis to improve e.g. yield, disease resistance
- **VD** by sweetpotato National programs – short term (AGRA or other support)

Progress: a) Molecular characterization of parents

b) Use of NIRS equipment

- **Parents (142) in crossing blocks at Namulonge have been characterized using 10 SSR markers**
- **Near Infra-Red Spectrometer (NIRS)** at Namulonge**, calibrated** (Total P, carotenoids, beta-carotene, Fe, Zn, Ca, Mg, starch, glucose, fructose, maltose)

Progress at SSP-EA

SASHA
Sweetpotato Action for Security and Health in Africa

- **Breeding for Sweetpotato virus disease (SPVD) resistance**

Received (Nov 12, 2010) a real-time polymerase chain reaction (RT-PCR) machine at Namulonge – Used it successfully to quantify SPCSV and SPFMV in April 20111

Status of AGRA Proposal Development

AGRA countries[1]		Non-AGRA
Supported	Submitted	
Malawi	Ghana	Angola
Rwanda	Uganda	Burkina Faso[3]
Tanzania	Kenya	Burundi
Kenya (Rift Valley)[2]	Ethiopia[4]	Madagascar
Nigeria	Mozambique	S. Africa
Zambia	(2nd phase)	

[1]Criteria for AGRA support: Active sweetpotato breeding program (full time breeder, on-going breeding activities, including crossing
[2]Funded before start of SASHA project, now 2nd phase
[3]One PhD supported by AGRA at W. African Center for Crop Improvement (WACCI), Ghana, [4]and at Kwazul-Natal University, S. Africa

Progress: CloneSelector

- Easy-to-use
- Excel-based program
- Developed for routine breeding tasks e.g. planting trials, and analyzing data
- These tools will greatly increase the power and efficiency of sweetpotato breeders in Africa

Regional germplasm

- Diverse sources – seed, varieties, clones
- What's available?
- How available? – Import permit, phyto, SMT
- Clean seed
  - For international distribution
  - For seed systems.

END

Three breeders discuss the challenge of screening for drought tolerance

Thank you