Report of the Sweetpotato Support Platform – W.A.

Sweetpotato Breeders Meeting 2018, Nairobi, Kenya

Ted Carey et al, CIP

SWEETPOTATO ACTION FOR SECURITY AND HEALTH IN AFRICA

Sweetpotato Support Platform West Africa

SASHA
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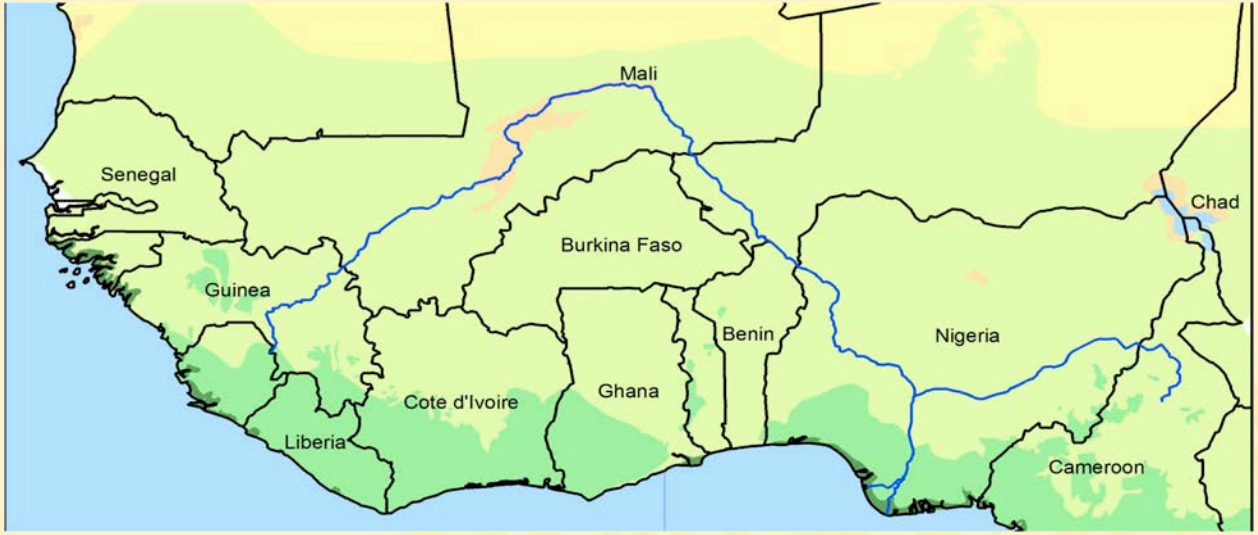
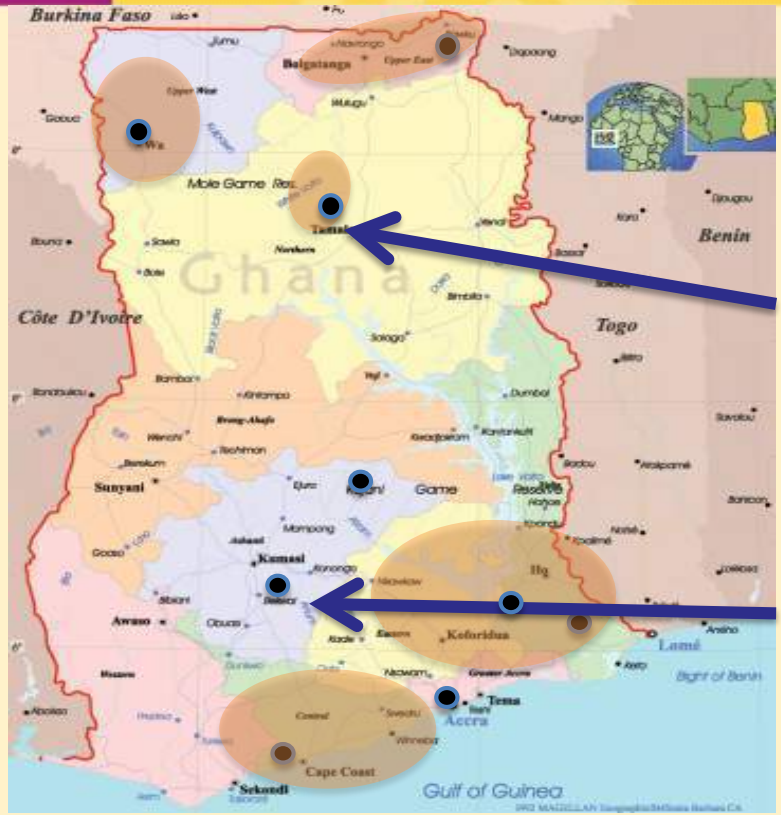
SASHA Breeding Approach

- Population improvement program at a sub-regional level
- Link with participatory varietal selection at the national level
  - Theme attribute - Less sweet sweetpotato (unsweetpotato)
  - Reduced perishability



Sweetpotato Breeding Selection Sites and Target Zones in Ghana



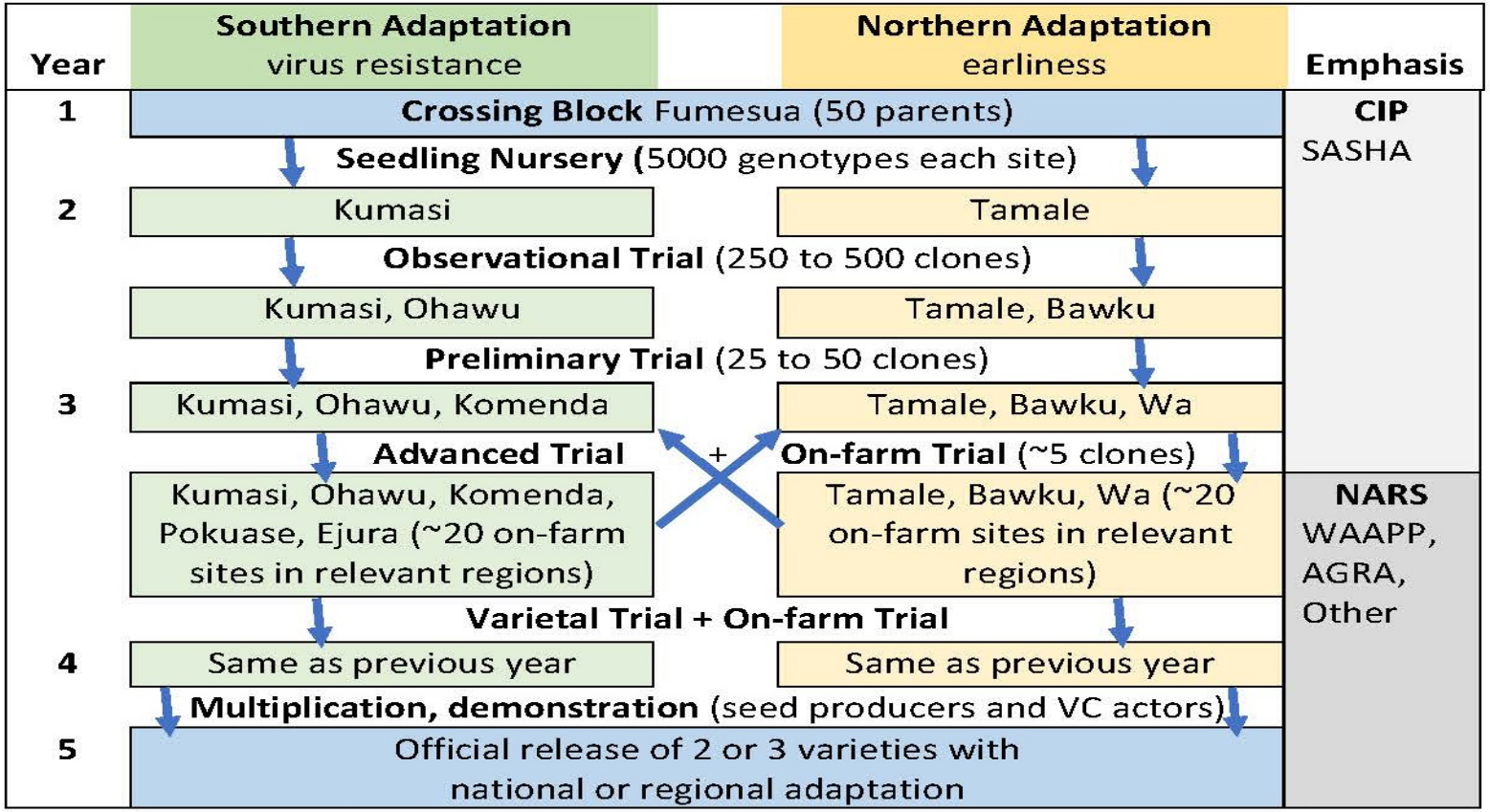
Target areas where sweetpotato Is currently important

Breeding selection sites

CSIR - Savanna Agricultural Research Inst.
Kwabena Acheremu, Joseph Adjebeng-Danquah - NARS
CIP office – Erna Abidin, Daniel Akansake, Isaac Dorgbetor

CSIR – Crops Research Inst.
Kwadwo Adofo, Ernest Baafi - NARS
CIP office – John Saaka, Asimah Razak, Eric Dery, Tommy Tufour, Simon Imoro, Jolien Swanckaert

Accelerated Breeding Scheme Ghana



Unsweetpotato, consumer acceptance and breeding for quality attributes

- Despite this being our signature trait, we are still not totally clear about the target
  - Sugars in raw sweetpotato not really a good predictor of sweetness in cooked sweetpotato
  - Sugars in cooked sweetpotato not really a good predictor of sweetness since other factors contribute (aromatic)
  - While we can precisely measure cooked sugars (NIRS), we cannot accurately and routinely describe taste
  - We needed a trained panel to precisely define sensory attributes in selected contrasting genotypes (low and high sugar; low and high sweet)

Low sugar/non-sweet

Panelists evaluating samples in standard cubicles (Eric Dery)

Panelists recruited:

- 27 panelists
- 14 good at identifying flavors and intensity

Lexicon development
(yam comparison, boiled)

- Appearance (5)
- Texture – by hand (2)
- Texture – by mouth (4)
- Flavor (10)
- Mouthfeel (3)
- Basic taste (5)
- Sweetness (3)

Low sugar/non-sweet

- Lexicon developed for fried sweetpotato
- Low sweet, medium sweet and high sweet genotypes identified in comparison with yam [Combinations of low and high sugars and sweetness.] Low sweet – Bohye, CRI-Gavana; High sweet – Nan, Sauti; Med sweet - Ogyefo
- Consumer evaluation [400 consumers] in 4 communities – liking and naming. Focus group discussions and consumer sensory [Design in development – starts in July]

Postharvest Perishability/Storage

Wholesale sweetpotato market, Bobo Dioulasso

Jebbeh Samba, sweetpotato breeder from Sierra Leone and doctoral student with WACCI breeding for improved shelf-life

Postharvest Perishability/Storage

- Screened roots from ~26 parent genotypes from 3 separate trials
  - Weight loss, rots, weevil

Good	Bad
Ligri (Cemsa 74-228)	Sauti (Tanzania)
Okumkom	Mother's Delight
CRI-Gavana (AP3A)	King J
Bohye (CIP 199062.1)	Apomuden
SARI-Diedi	Otoo (Mogamba)

  - Cortex thickness
  - Wound healing assessment (lignification)
  - Isolation, inoculation with Java Black Rot (*Lasiodiplodia theobromae)*

Postharvest perishability

- Searching for rapid assay for evaluation of many genotypes
- Use current breeding population (parents and offspring)
- May use BxT or other population for marker identification

Storage barn in Kumasi


BLOOMSDAY
2005 FINISHER

Crossing 2017 – 25,000 Seed

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		Apomuden	Patron	Naruhgum	PGA 11140-6	Santomoma	CIP-442380	Tu-Purple	PGA 12164-26	PGA 13867-7	CIP-442162	Otoo	PGA 11119-21	Light	Pure	Bohye	PGA 12164-25	Sauti	BF 59 x CIP.4	PGA 12210-15	Mother's Delight	PGA 14008-9	PGA 14011-43	PGA 14372-3	PGA 14351-4	PGA 14008-15	PGA 14008-22	PGA 14351-36	PGA 14229-2	PGA 14011-13	PGA 14171--1	PGA 12151-13	PGA 12136-2	PGA 12086-18	PGA 12166-30	TIEBELE 2	OKUMKOM	KING J	OGYEFO	AP 3/A	JITIHADA	BF 92 x TIB 2	DADANYUIE	HI-STRACH	NKO 31A	OBARE	TU-ORANGE	BLUE BLUE	KUFFOUR	
1	APOMUDEN	6	29	2			44	24			1	65		5	39	33		10							3																						17	10		0	257
2	PATRON	111		35			63	14		55	1	1		38	16	51		38			43	41	7		45	5																					5	52		0	753
3	NARUHGUM	32	21				16	21		15	4	12		12	16	21		4	10		5		1		7	12																					10	22	4	0	294
4	PGA 11040-6																																																0	0
5	SANTOMPONA	38	23	6				14		11		35	1	6	36	23		1	1			1								1																24	6		0	215
6	CIP 440290	36	29	5				21	16		14	25		2	20	54		54	13	1		13				21																				14	2		0	265
7	TU-PURPLE	63	53	1			24	4	3	54	59	27	4		43	45		26	32	38	5	21			73																					12	10	5	0	425
8	PGA 12164-26						5			4	1	1		7	1				7		2				15																								0	181
9	PGA 13867-7		3	1			3					5				1									4																							4	0	64
10	CIP 442162	5						11	12					1	17						1	2			6																					1			0	68
11	OTOO	174	1	31			101	141	7	74		4		33	335	199		196	1		19				11	6																				22	34		0	1431
12	PGA 11113-11																																																0	0
13	LIGHT	13	20				10	15	3	1		21			6	16		4																																0	114
14	PAARA	154	295	36			202	17		6	24	295		60	35	281		3	102	1	6	5			74																					43	34	4	0	1105
15	BOHYE	60	101	26			52	44	19	41	5	93		24	114	3		65			1																									22	22	2	0	725
16	PGA 12164-21		5				6			21	20		1						7			3			5																							4	0	115
17	SAUTI	126	107	31			122	161	5	1		176		74	4	115		2	14	14					39																					13	31		0	1044
18	BF 59 x CIP.4	4	17	3			6	41	16	29	5				10		4	4			2																									3			0	262
19	PGA 12010-15																																																0	0
20	Mother's Delight	7	10					4	4		2	2		1	12	13																																	0	73
21	PGA14008-9		8					2			12	2	3													2																									68
22	PGA14011-43																																																	0
23	PGA14372-3																																																	0
24	PGA14351-4																									2																							2		7
25	PGA14008-15	4	5	5			6		3	2							6																																	33
26	PGA14008-22																																																	0
27	PGA14351-36																																																	0
28	PGA14229-2																																																	0
29	PGA14011-13		3				3	12	2		3														2	6																									31
30	PGA14171--1																																																	0
31	PGA12151-13																								2																									2
32	PGA12136-2																																																	0
33	PGA12086-18	18					3															5				8																									34
34	PGA12166-30																																																	0
35	TIEBELE 2																																																0	0
36	OKUMKOM																																																0	0
37	KING J																																																0	0
38	OGYEFO																																																0	0
39	AP 3/A																																																0	0
40	JITIHADA		10	5				15									4		12			2			5																								0	53
41	BF 92 x TIB 2																																																0	0
42	DADANYUIE																																																0	0
43	HI-STRACH																																																	0
44	NKO 31A																																																	0
45	OBARE	44	25	9			38	55	1	5	17	9		38	51	62		1	5		26	7			6																					1	3	5	0	477
46	TU-ORANGE	1	5				4	15		3					1			3			1																									1			0	34
47	BLUE BLUE	8							4										3							5																							0	21
48	KUFFOUR																																																0	0
		900	739	183	0	0	715	638	182	322	175	790	5	293	853	957	14	483	214	60	118	100	1	0	295	62	0	41	0	0	0	135	0	383	0	0	0	0	0	0	59	0	0	16	0	155	232	38	0	5951

Hybridization further updates

- More focused cross combinations among new parents in 2018
- Grafting of non-flowering genotypes to prolific sweetpotato types, establish in the field – take to screenhouse for crosses [Induction of flowering not working as well as we'd like – SD following grafting; try LED lighting?]
- Polycrosses in the field to ramp up seed production (50,000 year 5…) – bringing from field -
- MS student, Yaya Drabo – flower induction (2,4-D; grafting); incompatibility (salt solution)

Exploitation of heterosis

2017: Heterosis trial using cuttings from seedlings

- 149 families with 20 progenies (= 2980 genotypes)
- 22 parents
- 5 plant-plots (each plot is 5 different genotypes from the same family)
- 4 plots per family
- Data collection per plot (= family mean of 5 different genotypes)

2018: Heterosis trial after multiplication

- 80 families with 10 progenies (=approximately 800 genotypes)
- 17 parents
- 3 plant-plots (each plot is 1 genotype; OT-like design)
- 10 plots per family
- Data collection per plot (= data for each genotype)

Exploitation of heterosis

2017: Heterosis trial using seedling cuttings

Advantages:

- Possible for large number of genotypes
- Fast, no need to multiply first
- The good and the bad are included

Disadvantages:

- No information on each genotype

2018: Heterosis trial after multiplication

Advantages:

- Data is more precise
- Statistically proven method

Disadvantages:

- Only a small number of genotypes/families
- A lot of genotypes disappeared during multiplication

Heterosis trial: first results

Heterosis increment = $\frac{average\ yield\ progenies}{(average\ parent1 + average\ parent2)/2}$

Diversity assessment with SSR markers will (hopefully) confirm the heterotic groups

High:
parents belong to a different population

Low:
parents belong to the same population

TRAIT	Heterosis increment (%)		
	Mean	Min	Max
Number of commercial roots per plant	7.1	-84	293
Commercial root yield (t/ha)	98.2	-87	641
Total root yield (t/ha)	83.6	-79	641
Foliage yield (t/ha)	80.2	-78	558

Heterosis trial: first results

Reciprocal effects are significant

Based on 41 families (82 cross combinations)

Apomuden as male	Heterosis increment (%)	Apomuden as female	Heterosis increment (%)
CIP440390 x Apomuden	141	Apomuden x CIP440390	105
Faara x Apomuden	121	Apomuden x Faara	57
Jitihada x Apomuden	63	Apomuden x Jitihada	29
Otoo x Apomuden	125	Apomuden x Otoo	29
PGA13067-7 x Apomuden	53	Apomuden x PGA13067-7	4
Sauti x Apomuden	231	Apomuden x Sauti	81

How do we move forward?

Stop making the same cross combinations each year

Apomuden x CIP442162	CIP442162 x Apomuden
PGA14021	PGA14019
PGA14195	PGA16044
PGA16029	PGA17229
PGA18006	PGA18128

Include advanced clones as parents:

- Population improvement
- Variety development

How do we move forward?

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Population A

Apomuden
Jitihada
PGA13067-7
Bohye
Santompona

PGA16070-1
PGA16028-1
PG17001
PG17009
PG17105
PG17205
PG17212
PG17344
PG17507

Population B

Ligri
CIP440390
Faara
Tu-purple
Hi-starch
BF59 x Cip4

Most parents are not yet characterized as part of a population

PG17129
PG17136
PG17140
PG17146
PG17171
PG17305
PG17333
PG17340
PG17532
PG17536

Population improvement

Cleanup for distribution and seed system

- Released or advanced selections
  - Clean: Ghana (14), Nigeria (2), BF (4)
  - Being cleaned: Ghana (20), Nigeria (1) BF (15)
- Distribution mostly from Nairobi, but we need to increase routine distribution from SSP-WA
- Will routinely introduce and evaluate clones from elsewhere – 100 best bet clones

Clean seed is Integral to success of the breeding effort

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Thank you

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Our vision is roots and tubers improving the lives of the poor

CGIAR RESEARCH PROGRAM ON Roots, Tubers and Bananas

CIP INTERNATIONAL POTATO CENTER
A CGIAR RESEARCH CENTER

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...today's research is tomorrow's wealth