BREEDING SWEETPOTATO FOR HIGH BETA-CAROTENE, DRY MATTER CONTENT AND YIELDS IN BURKINA FASO

Somé Koussao , Ouedraogo Jeremy, Belem Jerôme, Asante Isaac, Vernon Gracen and Danquah Eric

APA 2013 - 9th triennal conference - Naivasha-Kenya

30/06 -04/07/2013

Sweetpotato production in Burkina Faso

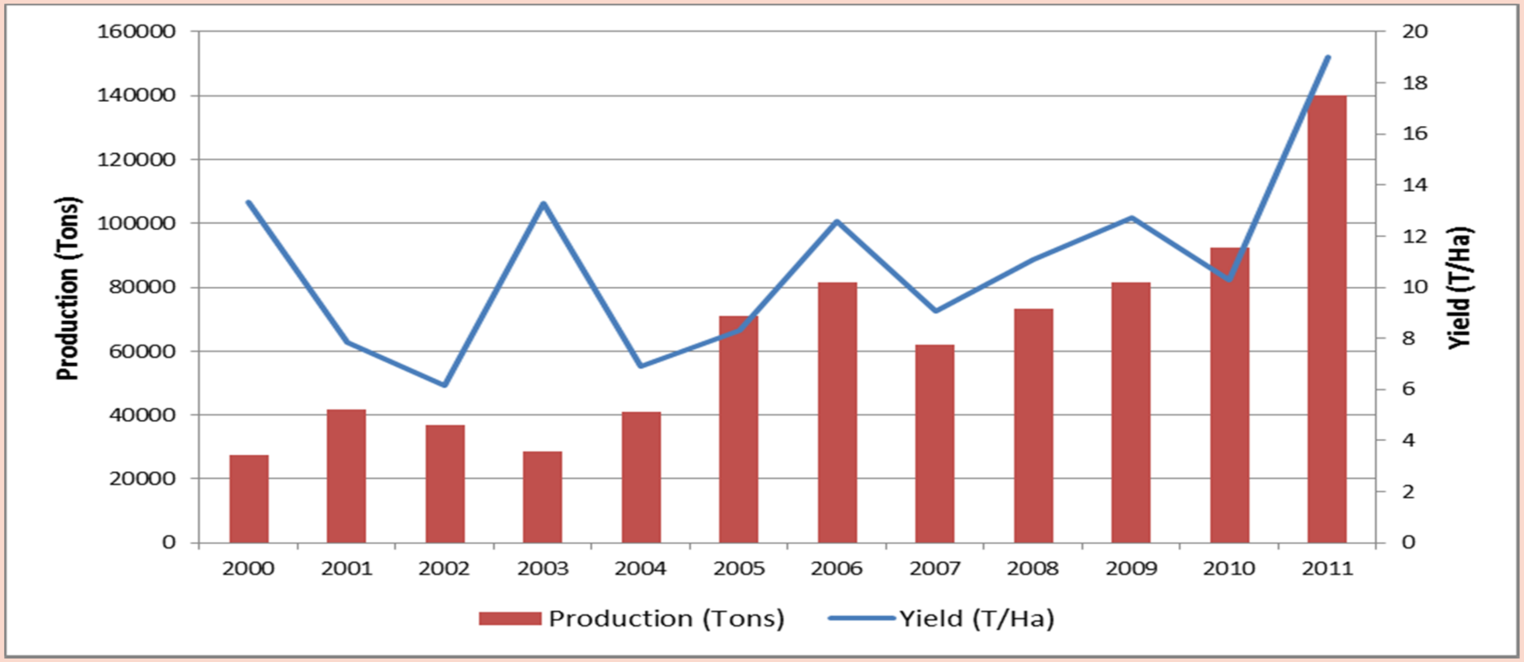
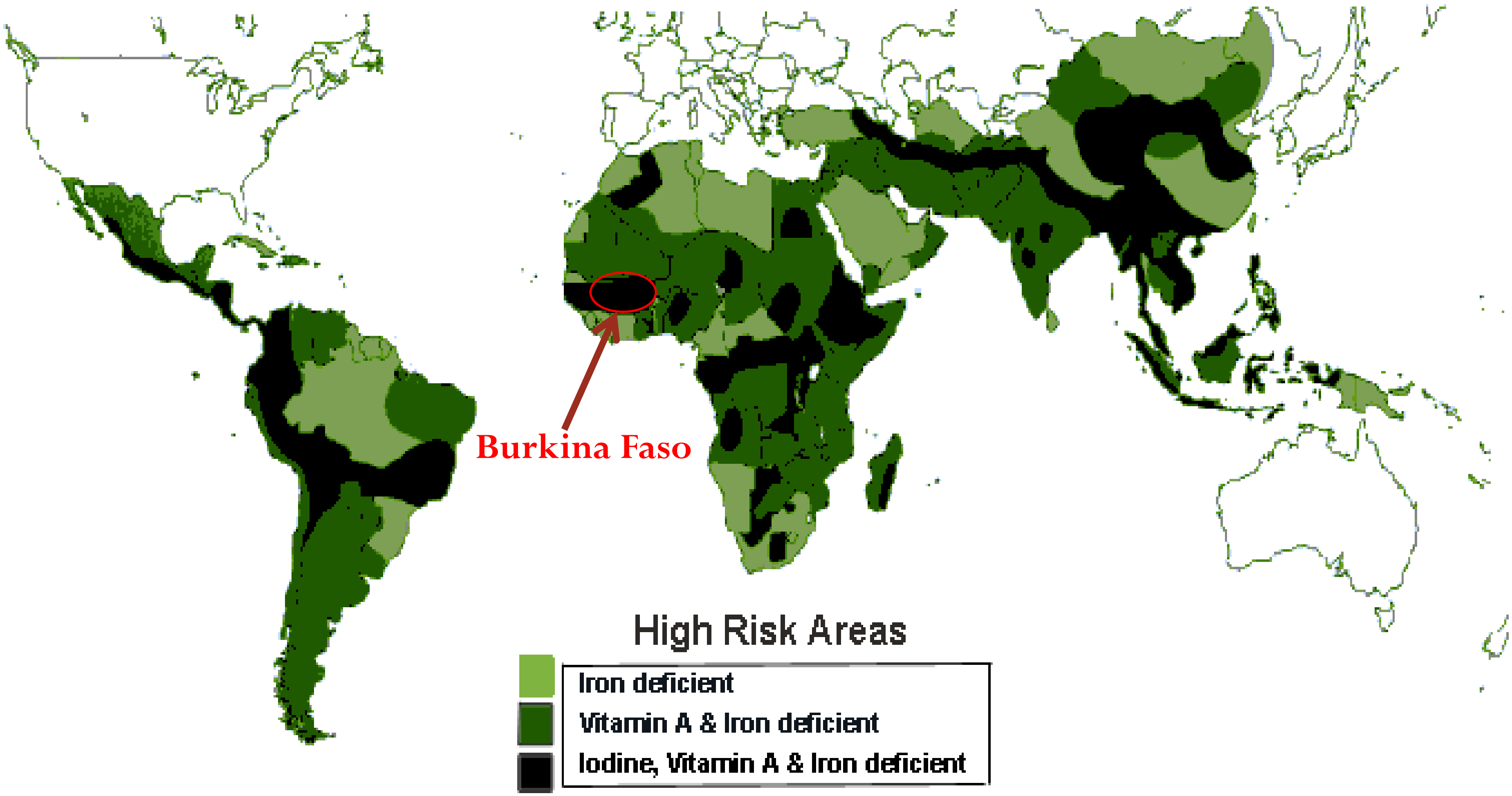


Fig1. Evolution of sweetpotato production and yield from 2000 to 2011. (DGSPA, 2012)

- **412%** increased of production from 27366 t in 2000 to 140,061t in 2011 **mainly due to increase of production area**
- However, yield over time has been unstable.
- Cultivars used are mainly white flesh = low nutritional potential

Nutritional status in the world



USAID, 2003

81% of children an 64% of their mother suffered from VAD in rural BF

The objectives of this study were:

1) To develop high yield and beta-carotene rich sweetpotato locally adapted and that meet farmers' and consumers' expectations

2) to estimate narrow sense heritability for economically and nutritionally important traits

3) to estimate the genetic gain from selection of the breeding product

MATERIALS AND METHODS

- Population development using 2 sets:
  - ✓ **Local cultivars** of white to yellow flesh: used as female parents: **BF24, BF59, BF77, BF82 and BF92**
  - ✓ **Introduced OFSP** (beta-carotene source) considered as male: **CIP199062.1, Resisto, Tainung**.

- Controlled crosses done at the INERA station of Kamboinsé from November 2009 to February 2010

- Standard crossing procedures for sweetpotato were applied

Field evaluation

- Established in three different agro-ecological zones
- 130 F1 progenies and their 8 parents involved (Total = 138)
- In an Alpha Lattice design, The experiment was done from July to November 2010 and replicated in 2011

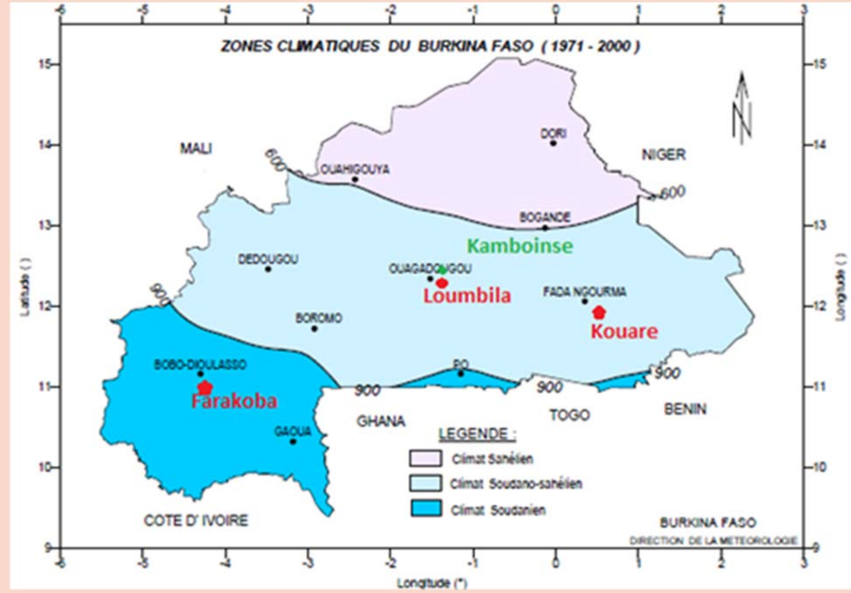


Fig 2 and 3. Evaluation sites and field

DATA COLLECTION:

- **growth parameters**:
  - ✓ vine length,
  - ✓ above ground fresh weight,

- **and storage root parameters**:
  - ✓ Yield components (number/plant, individual fresh weight and dry weight, weight per plant)
  - ✓ Dry matter content
  - ✓ Beta-carotene content

DATA ANALYSES:

- ✓ Narrow sense heritability (h^2), was estimated from parent-offspring using the method described by Holland *et al.* (2003).

- ✓ The genetic advance was calculated according to Falconer and Mackay (1996)

Fig 4. Data collection in the field

Table 1. F1 family average performance for storage root yield, DM and β-carotene

Family	RtYield	DM	BetaCar
BF24xCIP	10.65±8.27	**33.16±11.68**	0.048±0.043
BF24xResisto	11.38±7.76	27.90±6.51	0.024±0.029
BF24xTainung	10.73±6.68	28.25±7.25	0.036±0.136
BF59xCIP	13.19±6.79	27.59±9.22	**4.625±4.125**
BF59xResisto	14.71±9.35	25.68±5.02	0.042±0.054
BF59xTainung	12.36±8.68	25.21±5.26	0.067±0.060
BF77xCIP	**17.08±11.18**	21.62±3.22	0.082±0.057
BF77xResisto	13.28±8.58	27.48±5.91	0.018±0.024
BF77xTainung	**17.14±7.75**	26.29±6.42	0.028±0.039
BF82xCIP	12.29±8.70	26.06±6.61	**3.156±3.730**
BF82xResisto	6.97±6.76	27.30±6.88	0.082±0.250
BF82xTainung	13.79±9.35	23.31±6.60	0.717±1.978
BF92xCIP	14.53±13.41	26.84±5.96	**2.273±3.440**
BF92xResisto	12.70±8.29	24.73±6.21	0.945±2.849
BF92xTainung	11.06±6.91	28.20±3.57	0.0467.060

Table 2. Comparison of parents and offspring mean performance and their significance

Generation	Rtyield (T/ha)	BetaCar (mg/100g of fresh root)	DM (%)	Biomass (kg/per plot)	Rootnum (Number /plant)	IRtwgt (g/plant)	VL (m)
Offspring	12.83	0.89	26.22	15.05	2.96	134.23	1.70
P_{female}	8.26	0.28	29.61	7.15	2.58	97.15	1.43
F_{male}	11.45	3.27	27.93	7.47	2.95	130.62	1.01
Mid-Parent	9.86	1.77	28.77	7.31	2.77	113.87	1.22
% increase/MP	**30.12**	**-49.72**	**-8.86**	**105.88**	**6.86**	**17.88**	**39.34**
%increase/P_f	**55.33**	**216.73**	**-11.45**	**110.49**	**14.73**	**38.17**	**18.88**
All entries	***	ns	***	***	***	*	***
Offspring	***	***	***	***	***	***	***
Offsp.vs(Pf+Pm)	**	ns	***	***	ns	ns	***

*, **, *** Significance of F at the 5%, 1% and 0.1% levels, respectively.

Table 3. Narrow sense heritability (h^2) estimate per location and genetic advance from improvement

	Heritability estimate				
	Farakoba	Kouare	Loumbila	**Combined**	**Genetic advance (%)**
Storage root yield	0.20±0.25	0.58±0.25	0.58±0.32	**0.21±0.16**	**5.85**
Dry Matter	0.75±0.06	0.93±0.03	0.75±0.14	**0.76±0.003**	**22.60**
Beta-Carotene	0.43±0.63	0.49±0.44	0.97±0.02	**0.90±0.039**	**3.37**
Biomass yield	0.58±0.18	0	0.05±0.42	**0.04±0.07**	**7.81**
Root number per plot	0.62±0.44	0.52±0.38	0.57±0.27	**0.41±0.21**	**8.03**
Individual Root weight	0.69±0.14	0	0.55±0.34	**0.27±0.12**	**6.35**
Vine Length	0.33±0.42	0.57±0.28	0.16±0.07	**0.48±0.28**	**0.26**

The Best OFSP F_1 genotypes that had significantly higher yield than the best check (Caromex with 11.50 t/ha)

Genotypes	Root yield (t/ha)	Upgr BiomYield (t/ha)	B-carotene (mg/100g of fresh weight)	Virus2	DM%	Irwgt
BF82xTainung-8	20.33	16.33	0.48	2.33	23.2	179.15
BF82xTainung-20	19.67	17.23	0.78	3.33	21.82	242.68
BF82xCIP-17	18.56	14.78	3.92	1.17	28.45	118.18
BF80xTainung-2	18.11	11.89	2	2.33	19.27	203.89
BF82xTainung-24	17.83	25.89	8.29	1	21.79	136.43
BF92xCIP-6	17.11	17.83	6.44	1.83	26.61	175.9
BF59xCIP-4	16.78	21.56	8.32	1.83	24.81	116.15
BF24xTIB-3	16.17	17.28	7.66	2.67	27.33	116.72
BF59xTIB-6	15.22	11.39	4.36	2.33	21.48	275.94
BF82xCIP-18	15.22	30.11	2.32	1.5	22.81	186.07
BF59xCIP-1	13.56	18.33	8.32	1.17	27.09	110.82
BF82xTIB-4	13.5	10.33	1.03	2.17	30.06	145.36

OFSP BF82xTainung.8 (20.33 t/ha)

OFSP BF92xCIP.6 (17.11 t/ha)

WFSP BF59xTainung.5 (54.67 t/ha)


THANK YOU