Status of Root and Tuber Crops in Africa

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Root and Tuber Crops

Cassava [*Manihot esculenta*]

Yams [*Dioscorea rotundata* + *D. alata* + *D. cayenensis*]

Sweetpotato [Ipomoea batatas]

Cocoyams [*Colocasia esculenta* taro + *Xanthosoma sagitifolium* tania]

Other minor root and tuber crops +++

In all

Cassava is the only R&T crop grown and processed on an industrially commercial scale.

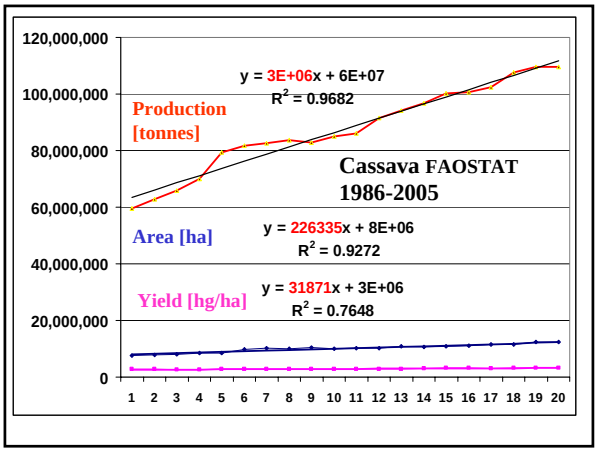
Dark soil floor at noon day

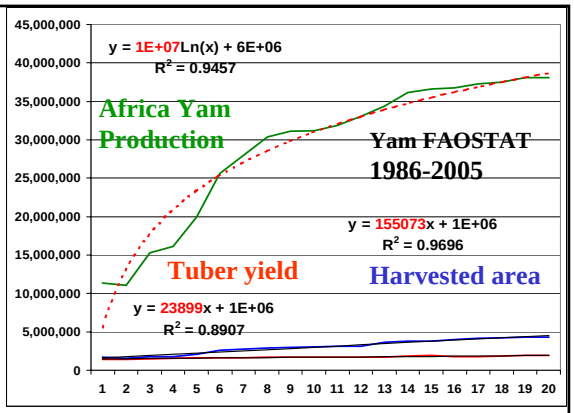
Cassava in the world **Top ten countries**

Year: 2004

Country	Area (ha)	Production (t)	Yield (t/ha)	% of total	Cum. total (%)
Nigeria	3,500,000	33,379,000	9.5	17.1	17.1
Brasil	1,780,870	24,230,332	13.6	12.4	29.5
Thailand	1,050,000	20,400,000	19.4	10.4	39.9
Indonesia	1,285,718	19,196,950	14.9	9.8	49.7
Rep. Dem. Congo	1,900,000	14,950,500	7.9	7.6	57.4
Ghana	819,000	9,828,000	12.0	5.0	62.4
India	270,000	7,100,000	26.3	3.6	66.0
Tanzania	660,000	6,890,000	10.4	3.5	69.5
Mozambique	1,045,625	6,149,897	5.9	3.1	72.7
Angola	640,000	5,600,000	8.8	2.9	75.5

Source: FAO (2005).

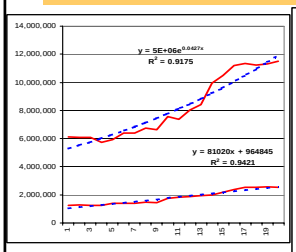


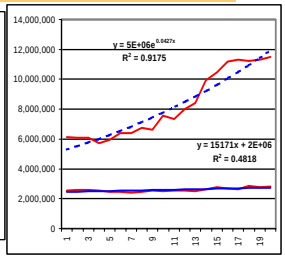


Sweetpotato is fit for any food revolution in any tropical country

SWEETPOTATO TOTAL PRODUCTION, AREA, AND YIELD

1986 TO 2005 = 20 YEARS; 39 countries of Africa





AREA HARVESTED

Reg Coef = 81,020 Hectares

FRESH ROOT YIELD

Reg Coef =15171 hg

Sweetpotato harvested area in Africa 2005 [ha] FAO

143,805	Angola
11,171	Benin
5,908	Burkina Faso
125,000	Burundi
45,000	Cameroon
720	Cape Verde
25,000	Chad
2,350	Comoros
45,851	Congo, Dem Republic of
850	Congo, Republic of
20,000	Côte d'Ivoire
10,000	Egypt
14,000	Equatorial Guinea
36,000	Ethiopia
	Ethiopia PDR
1,600	Gabon
65,000	Ghana
10,000	Guinea
61,000	Kenya
1,900	Liberia
105,735	Madagascar
3,000	Mali
2,000	Mauritania
55	Mauritius
750	Morocco
9,000	Mozambique
2,100	Niger
516,000	Nigeria
148,526	Rwanda
1,112	Senegal
10,500	Sierra Leone
750	Somalia
16,130	South Africa
650	Sudan
1,300	Swaziland
500,000	Tanzania, United Rep of
3,000	Togo
602,000	Uganda
3,600	Zambia
800	Zimbabwe

REGIONAL SWEETPOTATO STATISTICS

SWEET POTATO PRODUCTION (1000 TONNES)

	2000	2001	2002	2003	2004
Kenya	527.95	552.26	434.77	615.46	571.29
Uganda	2,398.00	2,515.00	2,592.00	2,558.00	2,650.00
Tanzania	798.00	950.10	950.00	970.00	970.00
Rwanda	1,032.92	1,156.36	1,292.36	868.20	908.31
Ethiopia	300.00	300.00	339.15	360.00	360.00
Sudan	8.50	8.60	8.70	8.70	8.70

SWEET POTATO AREA HARVESTED

	2000	2001	2002	2003	2004
Kenya	59.74	66.52	60.41	58.77	60.70
Uganda	555.00	572.00	589.00	609.00	602.00
Tanzania	416.60	522.30	500.00	500.00	500.00
Rwanda	174.66	192.73	195.37	147.13	163.07
Ethiopia	30.00	32.00	34.03	36.00	36.00
Sudan	0.64	0.64	0.65	0.65	0.65

Sweetpotato production in Africa 2005 [tonnes] FAO

	production in tonne
	2005
659,451	Angola
50,018	Benin
40,864	Burkina Faso
835,000	Burundi
190,000	Cameroon
4,000	Cape Verde
64,000	Chad
5,500	Comoros
229,760	Congo, Dem Republic of
6,000	Congo, Republic of
43,000	Côte d'Ivoire
300,000	Egypt
36,000	Equatorial Guinea
360,000	Ethiopia
	Ethiopia PDR
2,800	Gabon
90,000	Ghana
60,000	Guinea
50,000	Mali
2,000	Mauritania
500	Mauritius
11,800	Morocco
66,000	Mozambique
30,000	Niger
2,516,000	Nigeria
885,648	Rwanda
27,809	Senegal
26,000	Sierra Leone
7,000	Somalia
64,529	South Africa
8,700	Sudan
2,300	Swaziland
970,000	Tanzania, United Rep of
3,500	Togo
2,650,000	Uganda
53,000	Zambia
1,700	Zimbabwe

Major cocoyam producing nations of Africa in 1984 and 2004

Country/ Region	Production (`000 tonnes/ha)		Harvested Area (`000 ha)		Fresh Yield (tonnes/ha)	
	1984	2004	1984	2004	1984	2004
World	4516	10615	1071	1844	4.2	5.7
Africa	2169	8225	839	1656	2.6	5.0
Cameroon	350	1128	90	204	3.9	5.5
Cote d`Ivoire	260	370	190	265	1.4	1.4
Egypt	103	117	3	4	35.0	33.7
Ghana	800	1800	396	270	2.0	6.7
Madagascar	93	200	14	30	6.5	6.7
Nigeria	207	4027	68	735	3.0	5.5
Rwanda	35	136	7	27	5.1	5.0

Asymptotic/Optimal Yield = $ / ha / month

If and only if:

benefit [$] : cost > 1 . *X*

Where *X* [in decimal] is interest on all capital used

Nutrients in 100 g of fresh materials of root and tuber crops

Nutrient	Sweet potato	Potato	Yam ++	Cassava	Taro	Tania
Energy [KJ]	500	335	460	630	480	570
Water [g]	72	80	72	62	72	65
Crude protein [g]	1.5	1.8	2.0	1.0	1.7	2.1
Starch+Sugar [g]	25	17	24	35	25	32
Crude fat [g]	0.2	0.1	0.2	0.2	0.2	0.3
Crude fibre [g]	0.8	0.5	1.0	1.3	0.8	1.0
Ca [mg]	30	10	22	30	23	13
P [mg]	42	51	88	40	-	-
Fe [mg]	1.0	1.0	1.0	0.8	1.1	1.1
Vita. A [I.U.]	25-2500+	40	0	0	0	0
Thiamine [mg]	0.1	0.1	0.1	0.06	0.15	0.09
Riboflavin [mg]	0.05	0.04	0.03	0.02	0.03	0.03
Niacin [mg]	0.6	1.4	0.4	0.6	0.9	0.6
Vitamin C [mg]	20	20	5	30	5	10

Potato production in Africa 2005 [ha] FAO

90,000	Algeria	49,965	Madagascar
123,958	Angola	150,000	Malawi
5	Benin	430	Mauritania
250	Burkina Faso	420	Mauritius
10,000	Burundi	65,000	Morocco
45,000	Cameroon	6,200	Mozambique
210	Cape Verde	420	Niger
390	Central African Republic	177,000	Nigeria
5,000	Chad	135,622	Rwanda
35	Comoros	384	Senegal
20,013	Congo, Dem Republic of	0	Seychelles
510	Congo, Republic of	53,000	South Africa
0	Côte d'Ivoire	2,200	Sudan
100,000	Egypt	3,000	Swaziland
2,205	Eritrea	38,000	Tanzania, United Rep of
38,000	Ethiopia	25,000	Tunisia
	Ethiopia PDR	83,000	Uganda
130,000	Kenya	1,200	Zambia
5,400	Lesotho	2,200	Zimbabwe
10,000.00	Libyan Arab Jamahiriya		

Empowerment of farmers on improving quality of self-supply seed through disease identification and positive selection in Kenya, 2005

Sources of 98-99% of potato planting materials in SSA

- **Farmers' previous degenerated table potato crop (self-supply seed)**
- **Farmers' neighbours**
- **Local markets**
- **Friends**

•About 1-2% use improved seed in SSA from:

- **National Potato Programs**
- **Seed multipliers**
- **Importation from outside the country**

Linking stakeholders to promote potato utilization

Commercialisation of sweetpotato: A show of evidence

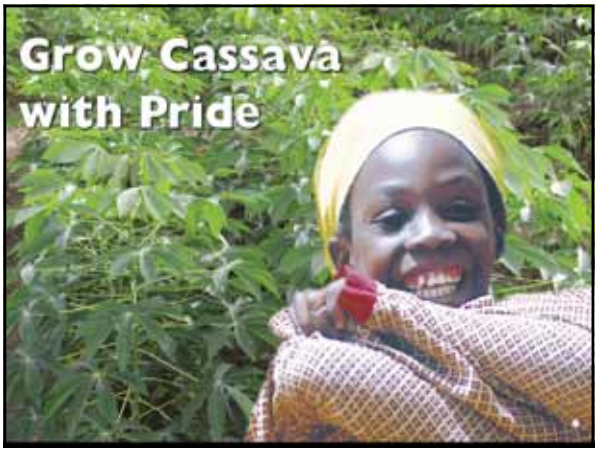
Comparison with Cassava and evidence of similar or superior bio-material supply under small farmer production systems

Socio-economics of sweetpotato cultivation in major sweetpotato agro-ecological zones

Vitamin A deficiency in Nigeria
(Page 8, THISDAY Volume 11 No 4141. Wednesday 23 August 2006)
.
President Olusegun Obasanjo has described the high rate of infant and maternal mortality in the country as unacceptable, saying that **over 88,000 infant deaths recorded in the country as a result of vitamin A deficiency**. Obasanjo who stated this yesterday [22 August 2006] during the flag off of the National Sensitization Workshop on Appropriate Distribution and Use of **Vitamin A capsules**, said it is unfortunate that despite series of interventions by NAFDAC, UNICEF and other partners, Nigeria continues to suffer high mortality rate due to vitamin A deficiency.

Collecting sweetpotato accessions in Bayelsa State

Retailing sweetpotato $1/kg on E-W road Yenagoa



Challenges to enhancing sweetpotato

- **Putting all desirable traits in few clones**
- **Funding for the required work**
- **Policy issues with conflicting interests**
- **Acceptability among varied tasters**
- **Slow seed systems to meet demand**
- **Drought tolerance in dry areas**
- **High moisture tolerance in wet areas**

Challenges to Commercialisation

Unfermented cassava flour: i) substitutes for imported alternatives as paperboard and plywood glue extenders; (ii) wheat substitution in bakery products.

Organise small farmers in order to bulk their produce and organise a primary processing.

Challenges to Commercialisation

In Ghana, native starch production has reached about 3,000 tonnes in 2004 (but this is just 15% of installed factory capacity due to several reasons especially raw root supply difficulties related to low price).

Challenges to Commercialisation

Malawi: starch factory established at Nkhotakota [25 tonnes starch per month].

Malawi: After a visit to the Nkhotakota, one investor built a 5 tonne/hour starch factory

Tanzania: starch factory at Tanga

Challenges to Commercialisation

Little research by government or private agencies for the value of research is not clear to most of them

Ghana

Very little research on cocoyam exists in Ghana or even in West Africa. RTIP-I mainly focused on production of corms (roots), although the leaves are also an important (more important than corms?)

Understanding must preceed application

Max Planck, 1919

Models or Recipes

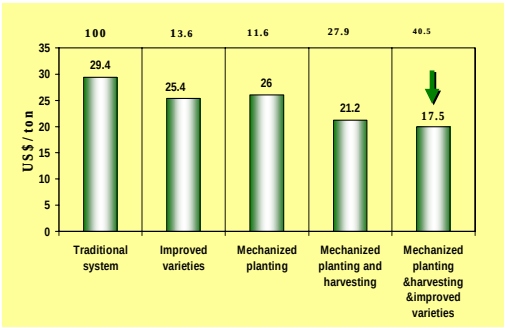
Each farm site has to get its own model or prescription of a set of recommendations to be optimal and economically viable.

One recipe for all farms will spell failure for most and success for a few.

Regional nutrient removed by cassava crop systems (kg/ha) FAOSTAT 10.11.2006

sn	Country	N	P2O5	K2O	MgO	S	All nutrients
1	Brazil	28	6	33	9	1	77
2	Cambodia	16	11	29	3	2	61
3	Indonesia	20	13	36	4	2	75
4	Laos	23	15	41	4	3	86
5	Malaysia	17	11	30	3	2	63
6	Myanmar	19	13	34	3	2	71
7	Phillipines	14	9	25	3	2	53
8	Thailand	28	18	49	5	3	103
9	Vietnam	15	10	26	6	1	58
10	Colombia	15	9	28	3	2	57
11	Costa rica	23	13	43	5	2	86
12	Cuba	5	3	9	1	1	19
13	Dominica	12	7	22	2	1	44
14	Ecuador	14	8	25	3	1	51
15	Jamaica	34	19	62	7	4	126
16	Panama	24	13	43	5	2	87
17	Peru	20	11	37	4	2	74
18	Venezuela	23	13	41	5	2	84
	mean	19.44	11.22	34.06	4.17	1.94	70.83
	Std dev	3.536	4.950	5.657	2.828	0.707	4.950
	CV (%)	18.18	44.11	16.61	67.88	36.37	6.99

Cost Reduction Effects



Fertiliser Issue & High Yields

NEPAD summit again,
85% of Nigerian soils are of low nutrient fertility. So most would need some organic and inorganic fertiliser application at economic costs.
But, price of fertiliser [60.00/kg in 2005] exceeds by 3-5 times the price of cassava roots [13.12/kg in 2005].

Needed: Fertiliser subsidy at Summit

Challenges to Commercialisation

At the moment, export of cassava pellets for the European feed sector is <u>not a viable option</u>.

<u>Why?</u>

The <u>huge</u> <u>gap</u> between current international prices for cassava pellets and the f.o.b. price for cassava chips in West Africa

Challenges to Commercialisation

Donor-driven interventions which have not survived commercial realities

Raw root requirements exceed existing raw root supply lines.

Local markets are too small and dominated by competitive imports

Nutrient in 100 g dry matter of starchy plants

Starchy plant	Crude protein (g)	Starch + sugar (g)	Crude fat (g)
Rice (polished)	8.1	91	0.6
Maize	11.3	80	5.1
Wheat	13.8	80	2.3
Potato	9.0	85	0.4
Sweetpotato	5.4	89	0.7
Yam (*D. alata*)	7.2	86	0.7
Cassava	2.6	92	0.5
Taro	6.1	89	0.7
Plantain	3.8	90	1.6

Cassava processed products in Ghana

gari,

fufu,

Dry chips, chunks, flour **[agbelima, and kokonte]**

Gari **is most important for trade.**

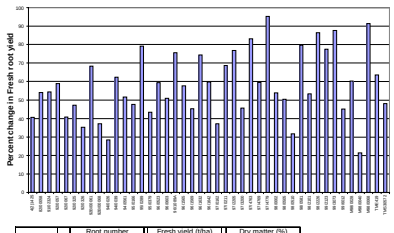
Ghana:

Total fresh yam tuber production of 3.8 million tonnes.

Commerce mainly on two varieties *Pona* and *Laribako*

A strong position in the European market.

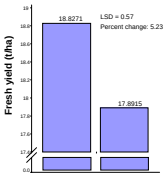
Fertilizer evaluation



200 kg/ha in 2 reps of each of 3 sets

14 locations:

Abeokuta	Abuja	Akure
Ekiti	Ibadan	Ikenne
Irrua	Ishiagu	Mokwa
Otobi	UNN	Ubiaja
Umudike	Warri	



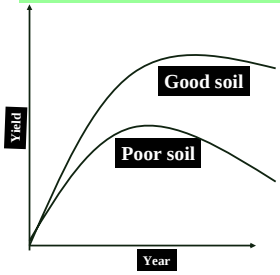
		Root number		Fresh yield (t/ha)		Dry matter (%)	
Source	df	SS	P>F	SS	P>F	SS	P>F
Loc	13	971721	<0.0001	35920	<0.0001	5871	<0.0001
Fert	1	1448	0.0963	359	0.0001	0.7	0.8178
Loc*Fert	13	21722	<0.0001	1740	<0.0001	112	0.0226
Clone	42	199688	<0.0001	6107	<0.0001	3576	<0.0001
Fert*Clone	42	11123	0.9964	674	0.9537	870	0.0027
R-square		0.6886		0.6378		0.6838	
CV		31.83		26.84		10.29	

Land and soil issues in root and tuber crop cultivation

Buying Land - key issues

- Involves large sums of money
- What land are you buying
- What type of soil - Dead or alive
- Why selling that land and not the other
- What present/past crop enterprises
- Neighbourhoods
- Location
- Past/current yield/productivity

Effect of soil fertility, depth, texture on fresh root yield of root crops



The cyclical component of cassava prices is extremely strong.

Many farmers expand the acreage attributed to cassava when the prices are high, but reduce acreage significantly when prices are low.

Agro-phobia

Drudgery of manual work for longer hours than any office period

What does it add up to? Profit = returns on capital

Past image of agriculture

Current emphasis give by government = downtrodden = profession of empty promises and a lot of speech making with little to show for it

Agro-phobia

Commercial Farms
3ha at least backed by science and business

Small gardens manually-operated backed by traditional know-how

Weak Commitments and Weak Results towards MDG in Africa

Lower level of investments by national governments and foreign donors to root crops since independence [circa 1960] to 2005 compared to maize, rice and wheat crops in Africa over the same 25-year period

Arable crop systems in Africa now enjoy 8 kg/ha but NEPAD Africa Fertiliser Summit in August 2006 recommended the level be raised to 50kg/ha.

Even at that, the added amount, on average, will still be less than what cassava removes from the soil.

Conflicting signals:

Higher use of fertilisers advised

Or

A campaign for organic agriculture

What to do?

Examine both claims and do what is appropriate for each country

Challenges to Commercialisation

Mixed flour from all root crops for reconstitution with hot water into a dough to swallow with sauce

Needed are ways to increase yield per unit area per unit time

Land area increase is extensive production which is not sustainable or competitively profitable

Modelling of field cultivation costs

1. **Understanding of price of inputs is poor**
2. **Process study and documentation is poor**
3. **Business skills are low: short trainings needed**
4. **Use of machines is low but rising**
5. **Many are illiterate functionally [even if literate, but not numerate]**

Full cover of cassava against weed growth and reduce cost of weed control and erosion as foliage break the force of falling rain drops

Major Gaps in Africa's Cassava Economy

1. **Proven sustainable crop and soil management technologies**
2. **Seed systems that are not monetized**
3. **Appropriate varieties for each end-use**
4. **Postharvest development is traditional**

What to worry about now

1. **Demonstrate best practices technically and economically**
2. **Best-bet practices on mean field area of cultivators' farms**
3. **Show supply system for all input**
4. **Where are the daily operators?**
5. **Know more about yams/cassava/ sweetpotato/cocoyams**

Please assist me with information.

Send emails to
m_akoroda@yahoo.com

On any root and tuber crops matter or information of note in your area of work

m_akoroda@yahoo.com

Thank you for listening

Obrigado

Merci beaucoup

Do-o