

# **Sweetpotato Value Chain Study**

**Exploring opportunities to promote greater exploitation of the benefits of Sweetpotato in Nigeria**



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**Sweetpotato Support Platform for West  
Africa (SSP-WA) Abuja  
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# Objective of study

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Gather and analyse evidence on the desirability and feasibility of investing in the development of sweetpotato value chains for fresh root marketing and processed products in major producing areas and markets



# Approach

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- Study of background information
- Field /market surveys –in Kwara, Nasarawa, FCT, Oyo, Lagos, and Osun States
- Identification of key players, markets, constraints, existing processed products and opportunities
- Case study value chains
- Suggestions for strategy



# Nigeria's agricultural economy

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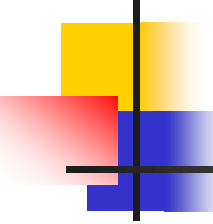
- Estimated population >150 million (2010)
- Huge domestic market which can drive growth in agricultural and industrial production, including agro-based value addition
- Diverse agro-ecological zones which are suitable for the production of cash crops – cocoa, oil palm, rubber and food crops such as maize, cassava, cocoyam and sweetpotato
- GDP growth rate of 6.7% between 2003 and 2009 driven largely by the petroleum and agricultural sectors. Manufacturing sector declined due to unreliable energy
- Average inflation in that period was 11.6%.

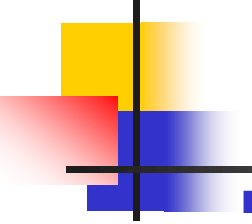
# Nigeria' s economy cont'd

## Diverse and relatively well developed financial sector:

- private sector share of total credit by formal sector dwarfs credit to public sector
  - 75% of credit is short-term maturity
  - Only 1.4% of private sector credit goes to agriculture
- Agriculture remains livelihood source, mostly in rural areas.
  - >41% of GDP,
  - employs  $\approx$  70% of labour force;
  - dwindling performance of sector due to
    - under-investment, poor pricing policies, inadequate access to modern inputs, low access to agricultural credit, land tenure insecurity, land degradation, inadequate and unpredictable investment in agricultural research, inefficiencies in agricultural marketing systems

## Challenges of agricultural sector ....

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- Domestic supply of food < demand
  - Dependency on food importation except for starchy roots, sugar crops and spices
  - Food importation has reached US\$2 billion/year despite the endowment of agro-climate
    - Wheat and rice – 30%
    - Value of rice importation is 35% of domestic production

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- Bulk of food consumed by average household are high carbohydrate sources deficient in protein and essential nutrients

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  - Recent explosion in instant noodles consumption in Nigeria.
    - >12 million Nigerians are consuming noodles made from **wheat** and many more are likely to join.
    - The estimated market size in 2007 was 250 million cartons (WINA) making Nigeria the 13<sup>th</sup> largest consumer of instant noodles in the world.
  - Vitamin A deficiency – leading cause of preventable visual impairment and blindness
    - average 29.5% incidence among children <5 years

# Sweetpotato production and marketing in Nigeria

- Nigeria is 3<sup>rd</sup> largest producer of Sp, but is a minor crop in the country based on volume produced (2.43 million tonnes – 2007) in relation to the size of population
- Share in total food consumption is only 0.03
- Production in all states due to ecological adaptability, low input requirements, shorter gestation period.
- Concentration shifted from sub-humid zones of Kwara, Plateau, Niger and Benue to semi-arid zones where Kaduna, Kano & Bauchi are leading producing states
- Dominated by smallholder farmers cultivating  $\leq 1$  ha
  - Most cultivate family or inherited land
  - Few rent or lease land –beginning to occur where commercial production is becoming significant





# Sweetpotato production

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- Commercial production appears concentrated in semi-arid northern states -Kano, Kaduna & Bauchi
  - Irrigation makes year round cultivation possible.
  - Less sweet & floury varieties for which there is rising demand in major urban markets.

# Major varieties produced in Nigeria

Sp varieties ranges from very sugary to bland

Varietal awareness is limited in Nigeria

- Commonly cultivated varieties are:
  - Red/purple skin – white fleshed sweet
  - Yellow/cream skin & light yellow flesh variety
  - Watery (low dry matter) to floury (high dry matter)
- Three improved varieties have been officially released by NRCRI
  - TIS 87/0087
  - TIS 8164
  - TIS 2532-OP-1-13




# Consumer preferences are

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- Influencing choice of varieties cultivated in communities where there is rising commercial production of Sp
- Yellow fleshed, less sweet variety with relatively high dry matter is very popular among consumers
  - Street food sellers of fried Sp chips; high dry matter reduces oil consumption; makes Sp more filling
  - Yellow colouration after frying is attractive to young consumers (including school children)
  - Adults also prefer less sweet varieties because of diabetic concerns

# Consumer preferences cont'd

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- Yellow fleshed less sweet varieties dominate supply in major markets of FCT & Lagos
    - Partly due to shift in supply base from southern Yoruba states to the north.
    - Preferred also in northern states where it is used as sweetener (*kunnun*)
  - Some communities in Kwara (around Offa) struggling to sustain production because they are producing sweeter white-fleshed varieties

**Table 1: Sweetpotato production cost (average figures)**

	<b>N</b>	<b>\$</b>
<b>Fixed costs</b>		
Land rent	8000	50.00
Depreciation of basic farm equipment	1280	8.00
Sub-total (fixed costs)	9280	58.00
<b>Variable costs</b>		
Land clearing	15000	93.75
Ploughing / ridging	7800	48.75
Vines	49200	307.50
Fertiliser	11000	68.75
Planting labour	5600	35.00
Weeding	9500	59.38
Harvesting	16500	103.12
Packaging	3700	23.13
Sub-total (variable costs)	118,300	738.38
<b>Total production cost</b>	<b>127,580</b>	<b>796.38</b>

Source: Rapid market survey & data from NRCRI Annual Report (2005) & Tewe *et al* (2003):  
average yield of 10 tonnes/ ha assumed

\$1.00 = N160;

- Cost of production / tonne of Sp = N12,758 (US\$79.64)
- Farm gate prices range from N2,100 to N2,500 (US\$13.12 - 15.63)/ bag of 125 kg

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- Price / tonne therefore ranges from N16,800 (US\$105) to N20,000 (US\$125)
- Gross margins of between N4,042 (US\$25.26) to N7242 (US\$45.26) / tonne
- Rate of return -31.7 % and 56.7%
- Farmer Households can earn gross margins of between N40,420 (US\$252.6) and N72,420 (US\$452.6) / ha /season
- Farmers rank Sp lower only to yam in terms of profitability
- Consumers rank Sp lower than yam and cassava but higher than Irish potato and cocoyam in terms of availability and affordability

# Utilization of Sweetpotato in Nigeria

- Awareness of health and nutrition related benefits growing in some communities
- Sp is consumed mainly in form of boiled or fried fresh or *roasted*
- Cooked together with cowpea and other root and tubers to make yam pottage..
- Preserved in Nassarawa by slicing, partial boiling and sun drying to produce *kimbar*
- Dried Sp chips are used to sweeten *kunnun*
- Sp leaves eaten in soups to control eye problems
- Roots boiled with yam and pounded (Kwara & Osun states)

# Marketing of sweetpotato in Nigeria



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- Bulk of marketed crop from the northern states is sold into FCT and in Lagos & Ibadan
- About 54,000 tonnes of fresh Sp roots from Northern states supplied to FCT / year?
  - Over 75% is delivered into wholesale market at Madala
  - Mararaba and Gosa markets receive supply from Madala





# Marketing in FCT

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- Traders who buy from Madala to sell in Mararaba and Gosa sell between 1-2.5 tonnes of fresh roots in markets
  - 40% to micro-retailers (2-4 of whom will jointly buy one bag and retail)
  - 20% to Sp fryers
  - 40% directly retailed



# Marketing in Lagos

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- Over 30,000 tonnes of fresh Sp supplied into Lagos annually from northern states (estimates appear understated - reluctance by traders to divulge information)
  - Bulk sold through Mile 12 with the rest distributed through markets in Agege, Ajegunle...



## Mile 12

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- Informal structure managed by *Dilali* who control trade
- *Dilali* maintain contacts with suppliers in the north and control supplies into Lagos
- *Dilali* maintain system of registration of traders which limits number of wholesale traders & access to market by non-registered sellers
- Supplies from south west begin in August /September  $\approx 5,000$  tonnes

# In and around Port Harcourt



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- Supplies from Benue and Taraba states to Rivers, Cross Rivers and Bayelsa States
- Bulk of Nassarawa Sp sold into Rivers and Cross Rivers State even though Nassarawa is closer to FCT
  - Farm gate prices are similar to those offered farmers in the north



## Marketing costs and margins of sweetpotato in Nigeria

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- Farm gate prices represent 55% of retail prices in major markets in and around Lagos and FCT
- Transport and handling costs account for 22%
- Levies (by states of origin and transiting states) – 16%
- Traders' margin -7% of prices paid by consumers at retail markets
  - Wholesaler margin of 2.2%
  - Retailer margin of 4.2%


# implications



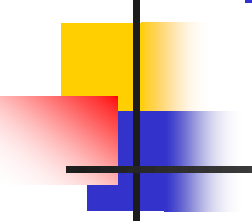
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- Tight wholesaler margin imply that they have to maximize volumes traded to optimize their earnings
- Traders sell between 100 and 150 bags (12.5 - 18.75 tonnes) of sp/week
- Gross earnings of N10,000 – N15,000/week
- Educated young men are being attracted into the Sp wholesale trade (minimum wage at time of study was N7,500)

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- Larger end of retail trade in Sp is dominated by men
  - They sell 10 bags (1.25 tonnes) of Sp/day
  - Bulk (60%) of this is sold in bags to street fryers
  - Gross earnings /week  $\approx$  N9,300
  - Small scale retailers (dominated by women) sell up to 2 bags (0.25 tonnes)/day with a gross weekly income of  $\approx$  N2000
  - Transport costs on main highways (Zaria – Lagos)  $\approx$  N7.10 (US\$0.05)per tonne/km (as at time of study)

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- Storage is lacking in farming communities;  
Sp is stored in bags in cool open spaces
  - Some store unharvested roots in the soil (risky because of weevils); hilling up is done to prevent weevils
  - No storage facilities in the markets leading to significant losses due to rot.
  - Sorting and bagging roots by size is not common; **trade by description is difficult**



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- Very few farmers had access to credit, although it didn't seem to be a barrier to entry
  - New entrants start by retailing small volumes and gradually build up capital and scaling up
  - Others begin as agents on behalf of larger traders based in the northern states

# Opportunities – Household Consumption

## ■ Close to 75% of fresh Sp is directly for home consumption

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- Volumes influenced by health, urbanization, convenience and availability of competing crops such as yam
- Perceptions linking sweet foods to diabetes appear to militate against consumption; growing awareness of health and nutritional benefits driving up demand

## ■ Demand from middle to high income households might increase with creation of awareness about +ve nutrition and health benefits especially if linked to OFSP

- Ready to eat forms of Sp growing in popularity because of urbanization and increasing demand for convenience products

- Vendors (mostly women) consider fried Sp as highly profitable
- Gross margins of N2025 (US\$12.56) / bag of fresh roots (return of 23.9% on working capital)
- Entry barriers are low as start-up capital requirements are minimal
- Need research to minimize oil absorption during frying as cooking oil and fuel wood are the main high cost consumables

# Opportunities – Sweetpotato crisps

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- Production and marketing of Sp crisps taking off
  - Companies identified in Lagos and other parts of the country
  - Mainly micro to small scale enterprises employing 2-3 people, but few have over 10 employees
  - One of the largest companies got into Sp crisps as diversification strategy since raw material for original product – plantain chips is seasonal
  - Steady growth in production; marketed in Lagos, Abeokuta, Ibadan, Abuja and Kano


- Sp crisps lucrative as demand > supply

- Gross margins of 65% are achievable

### Rapid expansion constrained by

- Lack of capital for acquiring requisite fixed assets and meeting working capital requirements
- Difficulty in complying with regulatory requirements – NAFDAC; **Technology Incubation Centres can be adopted to address this problem**
- Quality variability is common, attributable to types of packaging materials and poor product storage by retailers; **Training in product quality assurance important**

## Prospects –intermediate dried sweetpotato

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- In many rural areas of production, and traditional street eateries (*bukas*), Sp is mixed in flour form with yam flour to prepare *amala* in up to 30:70 ratio
  - Sp is added into *kunnun* (traditional non-alcoholic drink) as a thickner and sweetner.
    - *Kunnun* has short shelf life which may be prolonged through pasteurisation

# Opportunities - Street fried Sweetpotato



Sector appears to be growing rapidly in urban areas ( $\approx 20\%$  of fresh Sp sold)

- More filling and relatively cheaper than yam and Irish potato chips
- Main consumers are school children as midday snack & low income workers
- Increased awareness of nutrition and health may strengthen growth
  - School children as good communication agents will share information with parents

# Prospects – inclusion of Sweetpotato in bread and Confectionary products


- Technically feasible to substitute wheat flour with flour from sweetpotato; bakers seem to be willing
- In China (world largest producer of Sp), instant noodles are based on Sp.
- Rapid growth in the instant noodle industry in Nigeria.
- Substitution with Sp up to 20% will imply large demand for Sp roots
  - Main challenge is cost of including Sp as a flour product




Table 2: Estimated cost of producing sweetpotato flour and puree in Nigeria


<b>Costs in Naira (except where indicated)</b>	<b>Sun-dried sweetpotato flour</b>	<b>Mechanically-dried sweetpotato flour</b>	<b>Sweet Potato Puree</b>
Cost of fresh roots per tonne	20,000.00	20,000.00	20,000.00
Transport cost to processing unit	1625.00	1625.00	3200.00*1
Peeling/grating/de-watering	1050.00	1050.00	600.00*2
Boiling and mashing	0.00	0.00	1200.00
Drying	300.00	2370.00	0.00
Milling and sieving	500.00	500.00	0.00
Packaging	300.00	300.00	50.00
Fixed and other costs	600.00	600.00	600.00
Sub-total	24375.00	26445.00	24075.00
Conversion rate	20%	20%	75%
<b>Breakeven price per tonne</b>	<b>121875.00</b>	<b>132225.00</b>	<b>32100.00</b>
Wholesale price per tonne of wheat flour (Keffi)	112000.00	112000.00	112000.00
Savings on inclusion of Sweet Potato	(9875.00)	(20225.00)	79900.00

- Table 2 shows that option of including sweetpotato in the form of flour is not financially feasible.
- The cost of sweetpotato flour produced by means of mechanical drying is far higher than the sun-dried flour.
- Mechanical drying preferred by end-users because of the assurance of delivery of food-grade flour on a consistent basis.
- The flour can compete on cost basis only if fresh roots used in producing food-grade sun-dried flour is reduced by 9.9 percent of the average harvest season farmgate price.
- For mechanically-dried sweetpotato flour to compete at the same price as wheat flour, the price of the fresh roots has to fall by over 20 percent of the average harvest season farmgate price.
- We do not anticipate this occurring unless there is substantial over-production of the crop.

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- Table 2 further shows that the option of using mashed sweetpotato (puree) can lead to substantial cost savings as it costs less than 30 % of the cost of the wheat flour it can replace.
  - Option discussed with some bakers
    - Indications are that it may be attractive to small to medium-scale bakers if they can obtain regular supplies of puree from reputable processors who can guarantee consistent compliance with food quality standards.
    - Willing to produce the puree on-site if supply of roots is regular.
    - It may be possible to pilot this in the Keffi area where an identified trader can supply fresh roots obtained from the northern states to about five medium-scale bakers in the community

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- The larger-scale bakers and biscuits manufacturers unwilling to substitute sweetpotato in the form of the puree, arguing that it will entail additional logistics management.
  - The flour is preferred but cannot be justified on the grounds of cost.
  - Similar considerations will appear to limit the scope for partial substitution of wheat flour in producing noodles.
    - utilising the mashed puree in producing noodles could create demand for fresh sweetpotato roots
  - However, the logistic challenges for the industry in using the puree need to be addressed and awareness about the opportunities created in the industry if uptake is to be encouraged.

# Prospects – glucose syrup production

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- Demand for glucose syrup is estimated at >120,000 tonnes per month
  - Domestic production is marginal (less than 5%)
  - Cassava is currently the main raw material
  - Sp cannot be used because of extremely low starch content




## Prospects –promoting sweetpotato through fast food outlets

- the potential for inclusion of sweetpotato French fries on the menus of the fast growing fast-food outlets in Nigeria was explored because of rapid growth in street frying of sweetpotato.
- Currently, there are over 250 of such outlets run by the big four chains: Chicken Republic, Sweet Sensation, Mr Biggs and Tantalisers.
- Together these chains consume between 15,000 and 20,000 tonnes of imported frozen Irish potato chips per annum.


- Some Industry players expressed interest in marketing sweetpotato fries in Nigeria.
- Its introduction has already taken off in the United States and the fast food outlets have demonstrated capability in successfully introducing traditional Nigerian dishes onto the menus.
- They also have the infrastructure for testing and marketing new products, including test kitchens and use of designated outlets to market-test consumer acceptance.
- However, it was stressed that collaboration with research institutions involved in development of sweetpotato products can potentially lower the cost and speed up the process of product development.

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- Major challenge which need to be addressed in promoting this new product includes attracting investors who will be in a position to distribute sweetpotato chips which are cut to standards determined by the industry on a regular basis.
  - It is conceivable that such investment can be linked into the existing sweetpotato supply chain from the northern states into the major urban markets around Abuja and Lagos.
  - The producer regions have demonstrated ability to adopt improved varieties with high demand in the target markets and should be able to adapt if specific varieties with shape and size suited to chipping are required. **This potential needs to be further explored**



## Strengths, weaknesses and constraints faced by key players – fried/ boiled sweet potato

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- Growth in market for street fried Sp will have +ve impact on reducing poverty (especially among women in rural & urban areas)
  - Consumer perceptions about health risks must be reversed –
    - School Feeding Programme? (OFSP)
    - Public awareness campaigns, Sp festivals / fairs
  - Successful inclusion in School feeding Programme will facilitate similar inclusion in boarding school & tertiary institution menus


## Strengths, weaknesses.... – sweet potato crisps

- Ability to identify the emerging opportunity & being able to switch to other products
- Limited capacity of Sp crisp companies to comply with NAFDAC requirements

### Inappropriate premises

- ~~Lack of suitable equipment for scaling up~~
- Non adoption of GMP
  - Lack of awareness
  - Limited resources to invest
- Inability to access credit
- Quality variation high
  - Cheap inappropriate packaging / poor storage
  - Technology Incubation centre have roles to play

## Strengths, weaknesses ..... – frozen chips

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- Introduction of Nigerian dishes on menus of fast food outlets
  - Potential to freeze chips exists
  - Technology for chipping Sp exists elsewhere and fabrication can take place in Nigeria
    - Need to collaborate with Sp breeders for shape and size

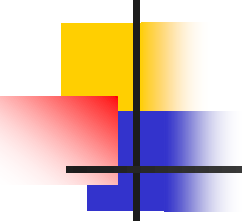
# Boosting farmer's output & productivity

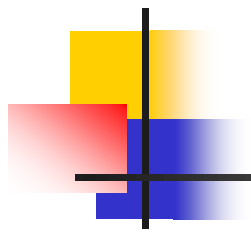


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- Improved access to high yielding varieties / practices
  - Involvement of NGOs in promoting uptake of technologies
  - Need for strong farmer organizations
- Removal of access to land constraint
- Improved access to credit
- Labour availability

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Thank you!