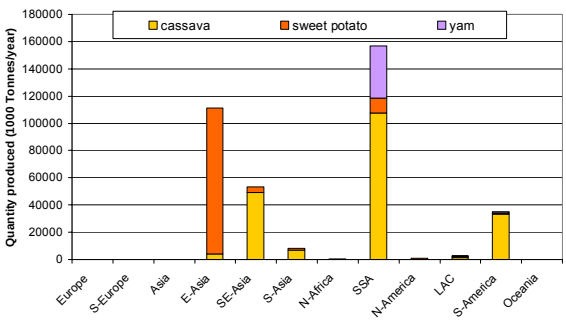
Lessons Learnt from Root and Tuber Crop Research in Sub-Saharan Africa

Lawrence Kenyon[1], Ponniah Anandajayasekeram[2] and Cosmas Ochieng[2]
[1]Natural Resources Institute, Central Avenue, Chatham, Kent ME4 4TB UK e-mail: L.Kenyon@gre.ac.uk
[2]IFPRI-ISNAR Division, c/o ILRI, PO Box 5689 Addis Ababa, Ethiopia.

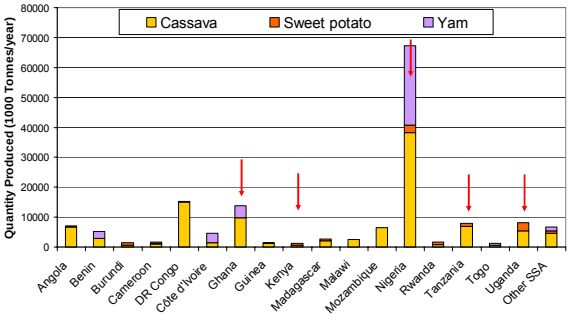
Objective

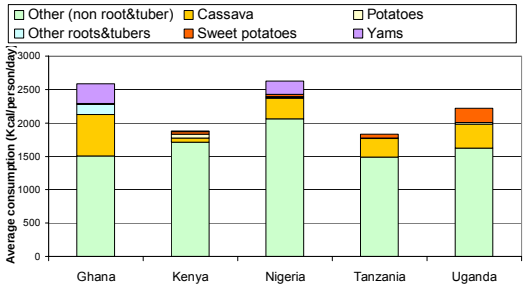
- study commissioned by UK Department for International Development (DFID) to assess the objectives and findings from the root and tuber research carried out in Ghana, Kenya, Nigeria, Tanzania and Uganda over the period 1995-2005 and to assess what were the main lessons to be learnt from the research with respect to planning, coordinating and conducting future research.

Tropical root & tuber crop production in 2004 (FAOSTAT2006)

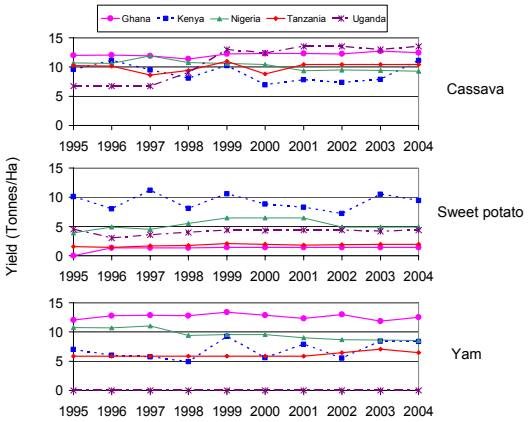


Root and Tuber production in Sub-Saharan Africa





Average (vegetable) calorie consumption per capita in 2004 (FAOSTAT 2006)



Root and Tuber crop projects for sub-Saharan Africa funded under the DFID-RNRRS (1995-2006)

Project Group (number of projects)	**Region**	**Cost**
1. Cassava Mosaic Disease (4)	EA	£1329K
2. Cassava Brown Streak Disease (6)	EA	£858K
3. Cassava Participatory Breeding (3)	WA	£437K
4. Cassava Post-Harvest Aspects (15)	SSA	£2558K
5. Sweet Potato Integrated Crop Management (7)	EA	£504K
6. Sweet Potato Virus Disease (5)	EA	£849K
7. Sweet Potato Post-Harvest Aspects (11)	EA	£1580K
8. Yam Crop Protection (7)	WA	£1036K
9. Yam Post Harvest Aspects (2)	WA	£534K

EA=East Africa, SSA=All sub-Saharan Africa, WA=West Africa

(there was some overlap of activities between project groups)

Cassava production constraints

- Shortage of (good quality) planting materials (larger sticks store and sprout better but are more difficult to transport (low multiplication ratio),
- Cassava Brown Streak Disease,
- Cassava Mosaic Disease
- Other pests and diseases,
- Lack of early-maturing or high-yielding varieties suitable for intercropping, adapted to local conditions and resistant to local diseases/pests

Cassava - constraints to increased production and utilization

- Perceived as a poor mans crop in some regions so often commands only a low price
- Post-harvest physiological deterioration (short fresh storage life),
- Low nutritional value (just carbohydrate, little protein/vitamins so need supplementing for a balanced diet)
- Lack of varieties adapted to local conditions and suitable for processing:- varieties unable to be pounded into "fufu"; high dry matter for processing into "GARI"; - high starch content for specific use (e.g. alcohol production); a range of preference by end users (easy peeling, attractive skin colour); costly processing methods (peeling and drying)
- Processing can be tedious/expensive/time consuming – particularly with hard/bitter/high-cyanide varieties, and there is a shortage of cheap and reliable processing equipment
- Information/guidelines on quality control, packaging, shelf-life, nutritional quality of processed products not widely available or enforceable
- Poor infrastructure to deliver to the market and market options often limited (Most traditional cassava markets are confined to a few products, can only absorb given quantities of roots, and have relatively low demand elasticities; poor quality and low processing efficiency restrain market expansion).

NB very context specific

Sweet potato – constraints to production

- Poor supply of planting material (Low multiplication rate, difficult to preserve over the dry period and perpetuation of pests and diseases)
- Shortage of varieties adapted to local conditions that are high yielding, early maturing, drought-tolerant and disease resistant,
- Pests (weevils & nematodes), diseases and viruses: Root quality, quantity and storability are affected.

Farmer field school, Uganda - Testing improved sweet potato varieties

Sweet Potato – constraints to adoption

- Stigma of being "poor people's food" in some areas (so does not command a sustainable price).
- Relatively short shelf life of tubers after harvest and susceptible to post-harvest losses due to pests/diseases and poor handling/ packaging/ transport.
- Poor knowledge in SSA of how to process (e.g. quality chip production) and add value (alternative recipes) and lack of affordable/reliable processing equipment (chipping machines)
- High per-unit cost as a raw material (especially low-dry matter varieties)
- Market for processed products not well developed so products don't always command a good price.

- Has tended to be regarded as the poor relation compared to cassava and yam in SSA, so until recently has attracted little interest from policymakers or national/international programmes
- In SSA, generally grown by resource-poor farmers who cannot articulate research/ development needs,

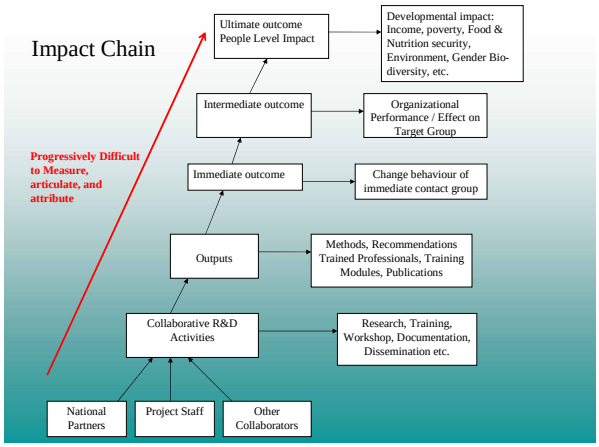
Yam – constraints to production

- Shortage of (good quality) planting materials, and methods for rapid multiplication of quality seed yams, (low multiplication rate and perpetuation of pests and diseases in the planting material which is bulky and difficult to store and transport – so is expensive)
- Pests and diseases
- Lack of locally adapted varieties – pest and disease resistant, early and late maturing varieties for different cropping systems or for export market (Scarcity of flowering, poor synchronization of male and female flowering phases, lack of efficient pollination mechanisms, and lack of knowledge of the genetics mean genetic improvement by breeding is very difficult and slow),
- Requires fertile soils for cost-effective production.
- Relatively expensive crop to produce – high labour requirement for land preparation, planting, weeding, staking and harvesting,
- Requires staking (costly) in many areas
- Easily damaged during harvesting and transport – leads to rotting

Yam – constraints to expansion

- Poor storability of the preferred varieties (e.g. Puna in Ghana), easily damaged during harvesting and transport – leads to rotting
- Lack of knowledge on affordable and reliable storage options (storage pests and diseases).
- Poor infrastructure and poor access to markets
- Ke, Tz & Ug – less familiar on market so does not command a reasonable price.
- "Generally neglected by policy makers".

Seed yam production system trial – Kogi Nigeria



Most projects were set up as "Research" to produce direct outputs (Knowledge, Methods, Recommendations Trained Professionals, Training Modules, Publications *etc.*).

→ Most addressed real needs

→ Most achieved their original objectives

Only some of the later (follow-on) projects were expected to deliver "people-level developmental impact"

→ BUT Not enough time, insufficient base-line-data and collaboration with other programmes/projects means that achieving, assessing and attributing impact are very difficult.

Poor quality seed yam in Eastern Nigeria

Project Outputs – 7 broad types

- Knowledge/Technologies/Methods/Procedures
  (new varieties, crop protection practices, processing methods *etc.*)
- Training/extension materials
  (posters, manuals, guidebooks, radio programmes *etc.*)
- Publications
  (journals, books, grey-literature)
- Capacity building (human + institutional) within project
  (staff/students trained [MSc, PhD], equipment/techniques installed)
- Technology transfer/training/extension (downstream)
  (workshops, seminars, farmer-field schools, field days)
- Establish linkages/networks/partnerships
  (promoting/assisting linkages between NGOs, regional organizations etc.)
- Policy advocacy/dialogue
  (promoting/lobbying governments/donors)

Priority Actions	Cassava	Sweet potato	Yam
Breed/select/identify varieties adapted to local conditions (resistant to pests & diseases) and with traits desired by local markets	***	***	**
Develop/promote systems to improve supply of affordable, good quality (disease/pest-free) planting material of appropriate/desired varieties	***	***	***
Develop/promote systems to improve efficiency of production (crop protection & systems to maintain/improve soil fertility)	**	**	*** (staking)
Develop/promote systems to increase fresh shelf life	*** PPD, handling	***	** (storage)
Improve drying/processing technologies, value-addition and alternative uses	***	***	*
Improving access to and demand from local markets (promoting varieties with traits the markets want)	**	***	* (Gh, Ng) *** (Ke, Tz, Ug)
Improving methods for disseminating and promoting technologies/varieties/procedures	***	***	***
How to provide a conducive/enabling environment (socio/cultural/financial) for resource-poor farmers to grow the crops sustainably/profitably – incentives /credit facilities	**	**	**

Recommendations to enhance, and be better able to assess, the developmental impacts of project activities.

Projects:

- Integrate monitoring, evaluation and impact assessment against baseline data to quantify the farm level benefits of project outputs.
- Incorporate explicit strategies for knowledge management, utilization, and dissemination (Adopting the innovation systems perspective, value chain concept and impact orientation could facilitate this process).
- Ensure multidisciplinary and multi-stakeholder participation in the design and implementation of projects.
- Ensure collaboration/interaction with other projects in the field to avoid duplication of effort
- Consider the sustainability and continuity beyond the project period.

Programmes

- Revisit the three year project cycle and review process (DFID programmes). A longer term perspective, and working on a few selected key problem areas could lead to efficient utilization of resource and enhanced socio-economic impact of the investment.
- Reviews should go beyond looking at the quality of research and direct outputs. A mechanism should be put in place to measure the efficiency and development impacts of the projects and programmes.
  (NB DFID now stipulate that 1/3 of the Research in to Use Programme [RiUP] budget be for M&E and impact assessment)

Thanks to all those who contributed to the study including the research programme managers, project leaders, project collaborators and all those people consulted or who filled in the survey questionnaires.


Cassava brown streak disease

More details about and report from many of the projects mentioned in this study can be found at:

http://www.research4development.info/projectsAndProgrammes.asp

Or

http://www.fao.org/sd/teca/search/default_en.asp

The study report that this talk is based on is available online at:

http://www.research4development.info/PDF/Outputs/root_tuber_research_synthesis_p1.pdf