Giving seed-yams the credit they deserve

RIU

Validated RNRRS Output.

Ways of producing 'clean' healthy seed-yams, and an innovative micro-credit scheme, are helping to combat falling yam yields and declining yam quality in West Africa. Because farmers use pieces of tuber to plant their next yam crop, any pests and diseases in the soil get carried over into that crop. Breaking that cycle is easy, however, using the 'mini-sett' technique—which involves dipping small pieces of tuber in a mix of insect- and fungus-killing pesticides before planting. A micro-credit facility is also proving valuable to seed-yam producers in Kogi State, Nigeria. These advances can be used throughout West Africa and India, where yam is an important staple food. Posters and fact sheets on yam pests and diseases, and on the 'mini-sett' system, are also available.

Project Ref: **CPP25:**
Topic: **1. Improving Farmers Livelihoods: Better Crops, Systems & Pest Management**
Lead Organisation: **Natural Resources Institute (NRI), UK**
Source: **Crop Protection Programme**

Document Contents:

Description

CPP25

A. Description of the research output(s)

1. Working title of output or cluster of outputs.

Clean seed-yam production systems

Research into Use
NR International
Park House
Bradbourne Lane
Aylesford
Kent
ME20 6SN
UK

Geographical regions included:

Benin, Cote d'Ivoire, Ghana, India, Nigeria, Togo,

Target Audiences for this content:

Crop farmers,

In addition, you are free to suggest a shorter more imaginative working title/acronym of 20 words or less.

2. Name of relevant RNRRS Programme(s) commissioning supporting research and also indicate other funding sources, if applicable.

Crop Protection Programme
International Institute of Tropical Agriculture
Gorta Foundation (Ireland)

3. Provide relevant R numbers (and/or programme development/dissemination reference numbers covering supporting research) along with the institutional partners (with individual contact persons (if appropriate)) involved in the project activities. As with the question above, this is primarily to allow for the legacy of the RNRRS to be acknowledged during the RIUP activities.

Recent Projects
R8416 (2005-2006) Up-scaling sustainable clean seed yam production systems for small-scale growers in Nigeria (Za0648/A1159)
R8278 (2003-2005) Evaluation and promotion of crop protection practices for "clean" seed yam production systems in Central Nigeria (Za0556/A1096).

Earlier or linked Projects
R7504 (2005-2006) A synthesis/lesson-learning study of the research carried out on root and tuber crops commissioned through the DFID RNRRS research programmes between 1995 and 2005.
R7582 (2000-2003) Development of integrated protocols to safeguard the quality of fresh yams A0946
EU-INCO-Dev (1999-2003) Yam: Cultivar selection for disease resistance and commercial potential in Pacific Islands
R7504 (1999-2000) Study of Factors Affecting the Uptake of Crop protection Research on Yams in Ghana.
E0054 Studentship (1998-2002) The diversity and genetic variability of viruses infecting yams.
R6694 (1996-2000) Identification of resistance to major nematode pests of yams in West Africa (IIP component)
R6691 (1996-2000) Control of yam diseases in forest margin farming systems in Ghana.
R6505 (1996-2000) Post-harvest constraints and opportunities for marketing of yam
Gatsby-JIC (1994-1999) Identification of yam virus variability
R5735CB (1992-1996) Control of Yam Anthracnose and Other Yam Pests
R5897 (1993-1996) Development of rapid tests for identification and differentiation of yam virus variability A0346
R5688 (1993-1996) Strategies for the control of yam anthracnose
R5675 (1992-1996) Epidemiology and control of Anthracnose disease of yams in Nigeria

Lead **Natural Resources Institute**, University of Greenwich, Central Ave, Chatham, Kent. UK ME4 4TB.
Lead contact Dr. Lawrence Kenyon, e-mail: l.kenyon@gre.ac.uk

Partner **International Institute of Tropical Agriculture**, Oyo Road, Ibadan, Nigeria.
Contacts Dr. Danny Coyne, e-mail: d.coyne@cgiar.org
Dr. Biodun Claudius-Cole,
Dr. Robert Asiedu, e-mail: r.asiedu@cgiar.org

Partner **Diocesan Development Service** (DDS), Idah, Kogi state, Nigeria.
Contact Sr. Nora McNamara and Mr. Moses Acholo,
nmcnamara@solsticeconsult.com

Partner Department of Geography, **University of Reading**, Reading RG6 6AB UK
Contact: Dr. Steven Morse, e-mail: s.morse@reading.ac.uk

*4. Describe the RNRRS output or cluster of outputs being proposed and when was it produced? **(max. 400 words)**. This requires a clear and concise description of the output(s) and the problem the output(s) aimed to address. Please incorporate and highlight (in bold) key words that would/could be used to select your output when held in a database.*

Yams are an important **staple food** for many people in **West Africa**, **India** and the **Pacific Island Countries**. Their vegetative propagation by the planting of small yam tubers (**seed yams**) or pieces of tuber (**setts**) can result in the accumulation and perpetuation from season to season of pests and diseases. Because of the increasing human population in West Africa there is greater pressure on the land to produce food and farmers have to use **shorter fallow periods**. This is exacerbating the problem because there is insufficient time for populations of **soil-borne pests** and **diseases** to decrease and hence the disease-loading on harvested tubers is increasing. The outputs aimed to identify the causes of the apparent decline in yield and quality of yam production systems in West Africa and to develop **cost-effective/sustainable methods** or production systems to reverse the declining trend. The outputs comprise:

1. Knowledge of methods to identify the pests, diseases and **viruses** of yam, and the results of surveys/observation and field experiments in **Nigeria** and **Ghana** revealing that lack of availability of **healthy planting materia**l is one of the main biotic constraints to production in these areas.

2. A system based on adaptation of the **mini-sett technique** to local conditions which enables **small-scale yam growers** to produce **"clean" seed yams** (planting material) either for home use or for sale to other growers; validated through **demonstration** trials in farmers' fields and on community land.

3. **Extension materials** in the form of **posters** and **fact sheets** on yam pests and diseases and the system for producing clean seed yams.

4. **Lessons learnt**/knowledge of how to assess the **socio-economic/livelihoods** situation of resource-poor farmers in the **yam-belt** of West Africa and of how to use the information gathered to determine if seed yam production could be a viable option for them.

5. A method for implementing a **micro-credit scheme** for seed yam producers and knowledge of what conditions are required for the scheme to be self-sustaining. It became apparent that lack of finance at critical periods in the yam growing calendar is a major impediment to many farmers being able to obtain (or keep in store) as much **planting material**, or to grow as much yam as they would like to. The *Farmer's Economic Enterprise Development* programme in Kogi State (with Gorta Foundation (Ireland) funding) is a **low cost** and **business-plan** based micro-credit scheme linked specifically to a crop production enterprise such as clean seed yam.

5. What is the type of output(s) being described here?
Please tick one or more of the following options.

Product	*Technology*	*Service*	*Process or Methodology*	*Policy*	*Other Please specify*
	X		X		

6. What is the main commodity (ies) upon which the output(s) focussed? Could this output be applied to other commodities, if so, please comment

Yams (*Dioscorea* species) are the main commodity. The outputs could also be adapted in some locations to other vegetatively propagated crops such as cassava, sweet potato, cocoyam, taro and banana.

7. What production system(s) does/could the output(s) focus upon? Please tick one or more of the following options. Leave blank if not applicable

Semi-Arid	*High potential*	*Hillsides*	*Forest-Agriculture*	*Peri-urban*	*Land water*	*Tropical moist forest*	*Cross-cutting*
			X	X		X	

8. What farming system(s) does the output(s) focus upon?

Please tick one or more of the following options (see Annex B for definitions).
Leave blank if not applicable

Smallholder rainfed humid	***Irrigated***	***Wetland rice based***	***Smallholder rainfed highland***	***Smallholder rainfed dry/cold***	***Dualistic***	***Coastal artisanal fishing***
X						

*9. How could value be added to the output or additional constraints faced by poor people addressed by clustering this output with research outputs from other sources (RNRRS and non RNRRS)? (**max. 300 words**).*

Please specify what other outputs your output(s) could be clustered. At this point you should make reference to the circulated list of RNRRS outputs for which proformas are currently being prepared.

The projects listed above (3) operated as a loose cluster feeding into each other and sharing resources and experiences as appropriate.

The storability and resilience to transport damage of yams is highly dependent on the quality and disease loading of the yams at harvest (R6505), which is determined by the health of the planting material used and how clean the land planted was. How carefully seed yams/planting material are handled and stored after harvest will also influence how clean/healthy the material is when it is planted the following season.

Most smallholder (less commercial) yam growers in West Africa also grow cassava, sweet potato and banana, sometimes even intercropped with yam, so IPM interventions for these vegetatively propagated crops could be included in this cluster. E.g. sweet potato (R8243, R8040) cassava (R8227, R8456) banana (R8342, R7567)

Farmer participation was encouraged in demonstrating and testing the seed-yam production system and this could be expanded or incorporated into a farmer-field-school (FFS) type of approach (R8457).

Virus diseases are a major tuber-borne constraint in vegetatively propagated crops such as yam, cassava, banana and sweet potato. It is important to have reliable and robust diagnostic tools to be able to screen germplasm of these crops prior to multiplication either for research/breeding or commercial purposes. It may be appropriate to establish local laboratories with the basic facilities for performing disease diagnosis on all these crops (R6579, R7529, R6692).

Farmer-participatory breeding/selection as done for cassava (R8405) is a potentially useful approach for yam improvement and would be assisted by having a reliable method for propagation of the selected genotypes.

Lessons learnt through the root and tuber crop research projects have been compiled and synthesised in project R7504 (2005-2006) A synthesis/ lesson-learning study of the research carried out on root and tuber crops commissioned through the DFID RNRRS research programmes between 1995 and 2005 (see report at http://www.research4development.info/PDF/Outputs/root_tuber_research_synthesis_p1.pdf). Lessons learnt could also be valuably shared with other projects involved in the supply of clean planting material (seed) such as potato seed tubers (R8435) or other seeds (R8480).

Planting of a nitrogen-fixing woody legume either as a cover crop before yams or as an intercrop with yams could help restore soil fertility and reduce disease loading (including nematodes- R8296) in the soil, and provide cut sticks or live-staking for the yam plants.

The clean seed yam technology is being used to help conserve yam biodiversity in field gene-banks, and a similar approach could be used for conservation of other vegetatively propagated crops.

Validation

B. Validation of the research output(s)

*10. **How** were the output(s) validated and **who** validated them?*

*Please provide brief description of method(s) used and consider application, replication, adaptation and/or adoption in the context of any partner organisation and user groups involved. In addressing the "who" component detail which group(s) did the validation e.g. end users, intermediary organisation, government department, aid organisation, private company etc... This section should also be used to detail, if applicable, to which social group, gender, income category the validation was applied and any increases in productivity observed during validation **(max. 500 words)**.*

Output 1. The knowledge that the lack of clean/healthy yam planting material (because of shortening fallow periods) is a major constraint to increasing yam production was identified through the research activities of the project partners including surveys, focus groups, on-farm trials and working with farmers. Information derived through farmer discussions also suggests that perpetuation of seed-borne pests and disease was leading to loss of local cultivars/landraces, especially those most susceptible, which could be overcome or compensated for through development of healthy seed yam production systems.

Output 2. The development of an adaptation of the minisett technique to a viable system for producing clean seed yams and the validation of the system was undertaken initially through on-station trials before validating and introducing to farmers in a series of on-farm (farmers groups, local area councils) trials and demonstration plots where the adapted system was compared with the farmers' local practice. The objective was that each group or farm generated a 'rolling stock' of clean material for generation of new material with excess provided to participating farmers to generate their own individual stocks, or alternatively sold on. Indications were that many developed further along this line following project conclusion. Validation on-farm involved a number of groups to help with contact of farmers and farmer groups, including NGO's farmer led cooperative groups, individual farmers (small and large scale) and the national extension service. The on-station trials were research-partner led and cared for, while the on-farm plots were researcher led but to instil local ownership they were locally managed/cared for. A cost-benefit analysis of the clean seed yam production system was undertaken through detailed analysis of the livelihoods of farmers taking up the system in Kogi state, Nigeria.

Output 3. Posters and information sheets were pre-tested with project partners and collaborating farmers

Output 4. Lessons were learnt on how to assess the socio-economic/livelihoods status of farmers and assess if seed yam production is a viable option for them through farmer base-line surveys, the cost-benefit analyses mentioned above, and through the development of a micro-credit scheme (below).

Output 5. The DDS FEED programme was first implemented in 2004 as a pilot scheme and based on the lessons learned was more fully implemented with certain criteria pertaining in 2005.

*11. **Where and when** have the output(s) been validated?*
*Please indicate the places(s) and country(ies), any particular social group targeted and also indicate in which production system and farming system, using the options provided in questions 7 and 8 respectively, above **(max 300 words)**.*

Output 1 was verified in Nigeria (IITA-Ibadan, University of Agriculture -Makurdi, DDS-Kogi, Ekiti, Rivers, Oyo) and Ghana (CRI-Brong Ahafu, Ashani, MoFA -Northern and upper West Regions, University of Ghana, Accra) over several years starting from before the RNRRS.

Output 2. The clean seed yam production system was evaluated and demonstrated with seven groups in Ekiti, seven groups in Kogi, two growers in Oyo, six groups in Abuja, one group in Kwara and at six sites in Rivers state Nigeria in 2005 (See table in annex 1 for detail). Funds form the agro-input company (Dizzingoff) were also provided to further evaluate uptake of the system and provide support. The livelihoods/cost-benefit analysis was carried out with four farmers in Ekwuloko (Kogi) in 2004 and 2005, and to provide a comparison, with a further four farmers in the riverine area of Edeke (Kogi).

Output 3. Extension materials were initially evaluated in Nigeria and Ghana, but have subsequently been distributed more widely through International Society for Tropical Root Crops (ISTRC) meetings and requests for template files have been received from Cote d'Ivoire, Costa Rica and Vanuatu so that they can be adapted to local language/conditions.

Output 4. The farmer household baseline surveys on seed yam and ware yam production systems were undertaken in 2003 by DDS interviewing 98 farming households in Kogi State and IITA staff interviewing 122 households in Ekiti State.

Output 5. Only DDS Farmer Council members could participate in the micro-credit scheme; they could not have a previous loan outstanding and they had to engage in clean seed yam production. Over 400 smallholders across Kogi state (not just in Ekwuloko and Alla-Olukudu) were provided with credit based on a business plan proposal to enable them to buy and plant yam planting material in the 2005 season. All received guidance on how to treat the planting material and most grew some seed yams and some ware yams in order to spread their risks.

Current Situation

C. Current situation

*12. **How and by whom** are the outputs currently being used? Please give a brief description **(max. 250 words**).*

The extension materials (posters, calendars & fact sheets) are being used by project partners including Nigerian agric research and extension service and Plant Quarantine service, NGOs working with the project (e.g. Dizzengoff and Green Rivers project) for staff and farmer awareness and training. DDS currently has a membership of around 10,000 farmers and the information from the project has been widely disseminated to this group. The materials were also taken up and reproduced for use by the IFAD W Africa yam project and reproduced in French by Centre Suisse de Recherches Scientifiques en Côte d'Ivoire (CSRS). Electronic templates for the materials have been distributed to various researchers and agricultural staff in W Africa and in Costa Rica. These materials have also been disseminated internationally at International Society for Tropical Root Crops (ISTRC) meetings.

The clean seed yam production system is being used by some of the project partners and those who received extension materials and/or participated in demonstration days.

A version of the seed yam production system is being used to produce small ware yams (= breakfast yams) suitable for export by commercial growers and outgrowers in Ghana and Jamaica (though this is not directly attributed to this project)

The micro-credit scheme is being used by the DDS-FEED programme to promote and facilitate seed yams production by small-holder growers in Kogi State Nigeria..

*13. **Where** are the outputs currently being used? As with Question 11 please indicate place(s) and countries where the outputs are being used **(max. 250 words).***

The extension materials were initially distributed in Nigeria mainly to project partners and associated organizations and farmers. Subsequently they were distributed more widely in Nigeria and through the IFAD and CSRS activities in other countries of West Africa, particularly Ghana, Benin, Togo and Cote d' Ivoire.

The system of producing seed yams by treating sett pieces of ca 100g with insecticide+fungicide prior to planting has been used in the Caribbean (e.g. Jamaica) and South Pacific island countries for many years. In an adapted form it is being used to produce small, uniformly sized and shaped ware yams for export from Ghana and Jamaica.

NGOs, farmers and groups involved in the project are understood to be continuing the clean seed generation, while some larger scale farmers have continued to increase their acreage under the system.

The system is being demonstrated on President Obosanjo's personal farm at the President's request. Requests for greater promotion of the system by yam and seed producers in Nigeria not initially involved have been received by IITA. Farmers involved in the local area council in Abuja, were used in promoting the technology via television, which is expanding the number of farmers participating. The system has benefited by continued support and supply of inputs from Dizzengoff. The system is now being used by the Green Rivers Project to produce their seed yam prior to delivery to farmers.

The DDS-FEED programme is continuing to operate the micro-credit scheme for clean seed yam production in Kogi State.

14. What is the scale of current use? Indicating how quickly use was established and whether usage is still spreading ***(max 250 words).***

Yam virus diagnostics are only currently applicable to the research situation – they (or slight adaptations) are being used by IITA (Nigeria) and CIRAD (France, Guadeloupe and Vanuatu) and Secretariat of the Pacific Community (SPC, South Pacific Island countries) to screen germplasm prior to international exchange, in vitro conservation and for crop improvement by breeding.

It is difficult to estimate what the scale of use/uptake of the clean seed yam production system is currently or the scale in the increase of expansion of farmer participation since the detailed monitoring/surveillance was not included in the original projects. IITA continues to receive feedback, interest and requests for advice and help however, from previous participating groups and more. Dizzengoff also provides support to further assess agrochemical products that are already pre-mixed, which improves ease of application and reduces potential farmer contamination.

The FEED programme has provided credit to 120 Kogi State households in 2005 & 06 o enable them to grow seed yams. The credit was allowed to roll over for 2 years to ensure there was adequate funds to ensure the clean seed yams were not sold but available for the second year.

15. In your experience what programmes, platforms, policy, institutional structures exist that have assisted with the promotion and/or adoption of the output(s) proposed here and in terms of capacity strengthening what do you see as the key facts of success? ***(max 350 words).***

IITA, CIRAD and SPC have contributed to promoting some of the diagnostic tools for yam viruses

Dizzengoff (Agro-input supplies) have made significant contributions to the promotion of thclean seed production system by providing inputs of the fungicide and insecticide, which was otherwise the farmer's greatest concern with this technology: supply and access to the products.

The organizations originally involved in the demonstration and promotion of the technology have also continued to generate healthy yam from yam originally provided by the project and promote the technology of producing healthy seed.

The Diocesan Development Services has been the main player in the promotion of the FEED programme micro-credit scheme. They have a network of several thousand farmers (may growing yams) in their mandate area of the Catholic Diocese of Idah (Kogi State). They are also highly active in helping farmers from outside of that area with training.

The International Institute of Tropical Agriculture have the CGIAR research mandate for yams and has links to or leads all the yam research and extension in West Africa including:

- IFAD/WECARD/IITA/CSIR-CRI Yam Project (Ghana)
- Roots and Tubers Expansion Programme (RTEP-Nigeria, IFAD)
- The IFAD-supported Programme for Improving Livelihoods in Rural West and Central Africa through Productive and Competitive Yam Systems, administered by IITA, promotes the development and dissemination of improved varieties and addresses soil productivity constraints.

- West African Seed and Planting Material Network (WASNET) – yam is one of the networks 11 priority crops currently.

Environmental Impact

H. Environmental impact

24. What are the direct and indirect environmental benefits related to the output(s) and their outcome(s)? ***(max 300 words)***

This could include direct benefits from the application of the technology or policy action with local governments or multinational agencies to create environmentally sound policies or programmes. Any supporting and appropriate evidence can be provided in the form of an annex.

Helps restore productivity on traditional yam lands so less need to extend yam cultivation into more marginal lands (which would result in rapid degradation of these more fragile lands) or forest reserve areas (as seen in the Ekwuloko study). Might also stop growers shifting from yam to cassava cultivation – cassava is generally regarded as causing more rapid soil degradation than yam, especially *on more marginal soils.*

Greater germination/sprouting of less pest/disease-prone material would lead to less 'sterile' heaps that farmers prepare, but are unable to plant through deterioration of planting material. Greater sprouting through more viable planting material would also lead to fewer 'missing' hills planted, but not sprouted. This in turn leads to less land 'waste' in terms of being prepared and open to erosion, but not used to its potential. Greater productivity in general of the planted material creates better returns and consequently more efficient use of land, which should lead to less land needs if more productive.

Adoption of the outputs should help to maintain genetic diversity of yams; Varieties/land races are currently being lost due to pests and diseases and to inability to thrive on more marginal lands.

25. Are there any adverse environmental impacts related to the output(s) and their outcome(s)? ***(max 100 words)***

Not significant: The small quantities of pesticide used to dress setts is targeted at the seed crop so two seasons away from harvest of food crop, so there should be no detectable residues in the food crop, and it means you are focusing resources efficiently.

26. Do the outputs increase the capacity of poor people to cope with the effects of climate change, reduce the risks of natural disasters and increase their resilience? ***(max 200 words)***

YES: Healthy yams have a relatively long dormancy period and can be stored for 3-4 months, so can provide food when other food crops are scarce. Also, they are relatively less susceptible to drought/late arrival of rains after planting than are most other crops.

Annex

Annex 1. Locations and partners where the clean seed yam production system was trialed/demonstrated (validated) in 2005.

State	Partners	Demonstration plots/trials

Ekiti	• ADP HQ Ekiti, • ADVL commercial farms (Ado Ekiti) • Ifaki farmers congress (group of 30) • Aramoko farmers group (group of 8) • 2 individual farmers (Aramoko) • farmers selected for on-farm trials (4)	• 1 demonstration plot • 1 demonstration plot • 1 demonstration plot • 2 demonstration plots • 4 demonstration trials in 2004 leading to 2 seed-to-ware trials in 2005
Kogi	• DDS • Idah local govt. • Igalamela Local govt • Oforachi farmers group (6) • Edeke women farmers (4) • Farmers selected for on-farm trials (4)	• 1 multiplication & 1 demonstration • 1 demonstration plot • 1 demonstration plot • 1 demonstration plot • 1 demonstration plot • 4 demonstration trials in 2004 leading to 4 seed-to-ware trials in 2005
Oyo	• AlamAgro - Commercial farmer in Oyo • Mrs Otiti – Commercial farmer	• 1 multiplication & 1 demonstration • 1 multiplication & 1 demonstration
Abuja	• Gwagwalada area council • Kwali area council • 12 farmers in Kwali area council • 18 farmers in Gwagwalada area council • Peace farmers (group of >20) • IITA field station	• 1 demo • 1 demo • 1 demo • 1 demo • 1 demo • 1 demo
Kwara	• Joseph Foundation (NGO) & Ganmo Farmers association (>10)	• 1 demonstration and 1 multiplication
Rivers	• Green River Project (AGIP petroleum) & • Food for All International (FFAI)-NGO	• 5 demonstration plots • 1 demonstration & 1 multiplication

Gyansa-Ameyaw, C.E., Hahn, S.K., Alvarez, N.M. and Doku, E.V. 1994. DETERMINATION OF OPTIMUM SETT SIZE FOR WHITE GUINEA YAM (*DIOSCOREA ROTUNDATA* POIR.) SEED YAM PRODUCTION: TRENDS IN SPROUTING IN THE PRESPROUT NURSERY AND FIELD PERFORMANCE. Acta Hort. (ISHS) 380:335-341
http://www.actahort.org/books/380/380_52.htm

Table 1. Importance of yam in DFID-PSA countries

Country	Population, Number of Persons (millions)	Prevalence of under-nourishment in total population (%)	Minimum Dietary Energy Requirement (kcal/ person/day)	Quantity yam produced (1000 tonnes)	Calories/day/ capita (kcal) provided by yam	Percentage of calorie requirement provided by yam (%)
Asia						
Bangladesh	146.7	30	1780	0	0	0.0
Cambodia	14.1	33	1770	0	0	0.0
China	1311.6	12	1940	0	0	0.0
India	1065.4	20	1820	0	0	0.0
Indonesia	219.9	6	1840	0	0	0.0
Nepal	25.2	17	1810	0	0	0.0
Pakistan	153.6	24	1770	0	0	0.0
Viet Nam	81.4	16	1840	0	0	0.0
East Africa						
Ethiopia	70.7	46	1720	310	10	0.5
Kenya	32	31	1840	7.7	1	0.1

Rwanda	8.4	33	1750	4	1	0.1
Sudan	33.6	26	1840	137	10	0.5
Tanzania, Utd Rep	37	44	1810	11	1	0.1
Uganda	25.8	19	1770	0	0	0.0
Southern Africa						
Lesotho	1.8	13	1850	0	0	0.0
Malawi	12.1	35	1790	0	0	0.0
Mozambique	18.9	44	1890	0	0	0.0
South Africa	45	4	1960	0	0	0.0
Zambia	10.8	46	1820	0	0	0.0
Zimbabwe	12.9	47	1840	0	0	0.0
West Africa						
DR Congo	52.8	74	1830	12	8	0.4
Ghana	20.9	11	1860	3892	301	15.1
Nigeria	124	9	1830	26587	197	10.8
Sierra Leone	5	51	1820	0	0	0.0

Table 2. Non DFID-PSA countries where yam production and consumption occurs

Country	Population, Number of Persons (millions)	Prevalence of under-nourishment in total population (%)	Minimum Dietary Energy Requirement (kcal/person/day)	Quantity yam produced (1000 tonnes)	Calories/day/ capita (kcal) provided by yam	Percentage of calorie requirement provided by yam (%)
Côte d'Ivoire	16.6	13	1850	3050.00	320	17.5
Benin	6.7	12	1800	2257.25	373	20.7
Togo	4.9	24	1830	570.00	221	12.1
Central African Republic	3.9	44	1800	350.00	189	10.6
Colombia	44.2	13	1830	310.20	15	0.8
Cameroon	16	26	1860	286.49	29	1.6
Chad	8.6	35	1810	230.00	53	2.8
Brazil	178.5	7	1900	230.00	2	0.1
Haiti	8.3	46	1940	197.00	53	2.9
Japan	127.6	-2.5	1920	170.00	3	0.2
Cuba	11.3	-2.5	1940	167.02	12	0.6
Gabon	1.3	5	1850	155.00	168	8.7
Jamaica	2.7	9	1930	148.00	117	6.1
Burkina Faso	13	15	1800	89.69	16	0.9
Congo, Republic of	3.7	33	1830	84.86	4	0.2
Venezuela,Bolivar Rep of	25.7	18	1850	69.88	6	0.3
Guinea	8.5	24	1830	40.00	11	0.6
Solomon Islands	0.5	21	1780	29.00	167	9.4
Philippines	80	18	1810	28.53	1	0.1
Panama	3.1	23	1830	26.50	19	1.0
Liberia	3.4	50	1820	20.00	14	0.7
Dominican Republic	8.7	29	1920	16.35	5	0.3
Mali	13	29	1800	12.43	3	0.2
New Caledonia	0.2	10	1920	11.00	60	3.1
Burundi	6.8	66	1800	9.91	4	0.2

Dominica	0.1	8	1930	8.00	103	5.4
Fiji Islands	0.8	5	1920	5.20	16	0.9
Guyana	0.8	8	1880	4.20	13	0.7
Comoros	0.8	60	1830	4.00	14	0.8
Samoa	0.2	4	1870	2.60	36	1.9
Mauritania	2.9	10	1840	2.50	2	0.1
Saint Vincent/ Grenadines	0.1	10	1900	2.20	20	1.1
Portugal	10.1	-2.5	1970	2.10	1	0.1
Sao Tome and Principe	0.2	10	1770	1.50	23	1.3
Barbados	0.3	-2.5	1980	0.60	7	0.4
Grenada	0.1	7	1910	0.40	11	0.6
Saint Lucia	0.1	5	1900	0.11	2	0.1
Belize	0.3	4	1810	0.03	1	0.1

Table 3. DFID-RNRRS projects concerning yam

R-Number	**Title**	Lead Organization	Start	End	Cost
R8416	**Up-scaling sustainable clean seed yam production systems for small-scale growers in Nigeria**	Natural Resources Institute	01/04/2005	30/01/2006	£71,569
R8278	**Evaluation and promotion of crop protection practices for "clean" seed yam production systems in Central Nigeria**	Natural Resources Institute	01/01/2003	30/03/2005	£196,509
R7254(C)	**Overcoming major constraints to yam breeding**	International Institute of Tropical Agriculture, Nigeria	01/04/1999	30/03/2002	£236,831
R6691	**Control of yam diseases in forest margin farming systems in Ghana**	Department of Agriculture. University of Reading	01/07/1996	30/06/2000	£323,208
R6505	**Relieving post-harvest constraints and identifying opportunities for improving the marketing of fresh yam in Ghana.**	Natural Resources Institute	01/01/1996	30/03/2000	£217,710
R5983	**Factors influencing the occurrence of yam tuber rots in West Africa**	Overseas Development Group, School of Development Studies, University of East Anglia	01/10/1993	30/03/1996	£75,700
R5897	**Development of rapid tests for identification and differentiation of yam virus variability**	Natural Resources Institute	01/10/1993	31/03/1996	£106,280
R5738	**Epidemiology and controlof anthracnose disease of yam in Nigeria**	University of Reading	01/10/1992	30/03/1996	£70,060
R5688	**Strategies for the control of yam anthracnose**	Department of Agriculture. University of Reading	01/04/1993	30/03/1996	£231,990
R5346	**Biology of yam anthracnose (Colletotrichum)**	Natural Resources Institute	01/04/1992	31/03/1995	£21,885
R5345	**Epidemiology and control of yam anthracnose**	University of Reading	01/05/1990	30/03/1993	£120,070

R5259	**An examination of Dioscorea spp (yam) for nematode resistance and its incorporation into improved cultivars**	Natural Resources Institute	01/04/1992	31/03/1996	£127,900

Table 4. Sub-Saharan African country NARS

Angola	Instituto de l'Investigacão Agronómica Program de Raizes e Tuberculos
Benin	Centre Béninois de la Recherche Scientifique et Technique
Benin	Institut National des Recherches Agricoles du Bénin (INRAB)
Botswana	Department of Agriculture Research
Burkina Faso	Centre National de la Recherche Scientifique et Technique (CNRST)
Burkina Faso	Institut de l'Environnement et de Recherches Agricoles (INERA)
Burkina Faso	Centre de Recherches des Trypanosomoses Animales (CRTA)
Burundi	Institut des Sciences Agronomiques du Burundi (ISABU)
Burundi	Institut de Recherche Agronomique et Zootechnique de la P.O.L. Burundi
Cameroon	Ministère de Recherche Scientifique et Technique
Cameroon	Direction de la Recherche et de la Planification
Cameroon	Institut de Recherche Agricole pour le Développement (IRAD)
Cape Verde	Institut National d'Investigations Agraires (INIA)
Cape Verde	National Institute for Agrarian Research Development (INDIA)
Central African Republic	Institut Centrafricain de Recherche Agronomique (ICRA)
Central African Republic	Chargé de Mission Agriculture
Congo	Ministère de l'Education Nationale, de Recherche Scientifique et Technique
Congo	Direction Général de la Recherche Scientifique et Technique
Congo	Centre de Recherche et d'Initiation des Projets de Technologie (CRIPT)
Congo(Democratic Republic)	Institut National pour l'Etude et la Recherche Agronomique (INERA)
Cote d'ivoire	Ministère de l'Enseignment Supérieur de la Recherche Scientifique
Cote d'ivoire	Institut des Savanes (IDESSA)
Cote d'ivoire	Institut des Forêts (IDEFOR)
Cote d'ivoire	Centre Ivoirien de Recherches Economiques et Sociales (CIRES)
Eritrea	Agricultural Research and Extension Department
Ethiopia	Institute of Agricultural Research (IAR)
Gabon	Ministère de l'Agriculture, de l'Elevage et du Développement Rural
Gabon	Institut de la Recherche Agronomique et Forestière (IRAF)
Gabon	Centre d'Introduction et d'Adaptation du Matériel, Végétal Vivrier, Fruitier et Maraicher (CIAM)
Gabon	Centre National de la Recherche Scientifique et Technique (CENAREST)
Gambia	National Agricultural Research Institute (NARI)
Ghana	Ministry of Food and Agriculture (MoFA)
Ghana	Department of Crop Services
Ghana	Ministry of Food and Agriculture
Ghana	Council for Scientific and Industrial Research (CSIR)
Ghana	Crops Research Institute
Ghana	Savanna Agricultural Research Institute (SARI)
Guinée bissau	M. le Ministre du Développment Rural
Guinée bissau	Instituto Nacional da Pesquisa Agraria (INPA)
Guinée conakry	Ministère de l'Agriculture, des eaux et forêts (MAEF)
Guinée conakry	Institut de la Recherche Agronomique de Guinée (IRAG)

Guinée equatoriale	Ministry of Agriculture and Fishery
Guinée equatoriale	Council for Scientific and Technical Research (CICTE)
Kenya	Kenyan Agricultural Research Institute (KARI)
Lesotho	Department of Agricultural Research
Madagascar	Centre National de la Recherche Appliqué au Développement Rural
Malawi	Chief Agricultural Research Officer
Malawi	Ministry of Agriculture
Malawi	Agricultural Research and Extension Trust (ARET)
Mali	Institut d'Economie Rurale
Mali	Comité National de la Recherche Agronomique
Mali	Ministère du Développement Rural et l'Environnement
Mauritania	Centre Regional de Recherche Agronomique du Développement Agricole (CNRADA)
Mauritius	Agricultural and Extension Unit
Mauritius	Food and Agricultural Research Council
Mozambique	Instituto Nacional Investigacao Agronomica (INIA)
Namibia	Ministry of Agric., Water and Rural Development
Namibia	Department of Agriculture and Rural Development
Niger	Institut National de Recherches Agronomiques du Niger (INRAN)
Nigeria	Institute of Agricultural Research & Training (IAR&T)
Nigeria	Institute of Agricultural Research (IAR)
Nigeria	National Root Crops Research Institute (NRCRI)
Nigeria	National Cereal Research Inst. (NCRI)
Nigeria	National Horticultural Research Institute (NIHORT)
Nigeria	National Seed Services
Nigeria	Forestry Research Institute
Nigeria	Federal Agricultural Coordination Unit (FACU)
Nigeria	National Agricultural Extension & Liaison Services (NAERLS)
Nigeria	Lake Chad Research Institute
Nigeria	Institute for Agricultural Research
Nigeria	Department of Agric. Sciences, Ministry of Agriculture
Rwanda	Institut des Sciences Agronomiques du Rwanda (ISAR)
Sao tome et principe	Centre de Culturas Alimentaires de Mesquita (CCAM)
Senegal	Institut Sénégalais de Recherches Agricoles (ISRA)
Sierra leone	National Agricultural Research Coordinating Council (NARCC)
Sierra leone	Institute of Agricultural Research (IAR)
Sierra leone	Rice Research Station (RRS)
South Africa	Agricultural Research Council
Swaziland	Ministry of Agriculture and Cooperatives
Swaziland	Malkerns Research Station
Tanzania	Research & Training
Tanzania	A.R.I.
Tanzania	Department of Research and Training, Ministry of Agriculture
Tchad	Ministère du Développement Rural
Tchad	Direction de la Recherche et de la Technologie Agricole
Togo	Institut National des Cultures Vivirières (INCV)
Togo	Institut Togolais de Recherche Agricole (ITRA)
Uganda	National Agricultural Research Organization (NARO)
Zambia	SADC Plant Genetic Resources Center (SPGRC)

Zambia	Crops and Soils Research
Zanzibar	Ministry of Agriculture, Livestock and Natural Resources
Zimbabwe	Department of Research and Specialist Services
Zimbabwe	Ministry of Agric. Lands & Rural Resettlement

Nigeria	Roots and Tubers Expansion Programme Population pressure on the land has significantly reduced soil fertility in many parts of the country. For poor farmers coping with declining soil fertility and crop yields, fertilizers are expensive and frequently unavailable, and shifting to cassava production is often the best option. Cassava grows better than yam in low fertility conditions. In the poorest communities roots and tubers make up a high proportion of the family diet. The long-term objective of the programme is to commercialize root and tuber production in order to improve the living conditions, income, food security and nutritional health of the poorest smallholder households in the programme area. It particularly targets small-scale farmers with less than 2 ha of land per household. The programme uses the existing extension service system to introduce improved varieties of roots and tubers as well as better cultivation techniques. Since women play a major role in cassava and other food crop production, processing and marketing, the programme encourages them to participate in research trials and demonstrations. Specific programme objectives include: § developing improved root and tuber production technologies to improve productivity § multiplying improved planting material § developing processing techniques and marketing activities § collaborating with NGOs for farmers' training The programme has improved availability and access to new varieties of planting materials, and has also enhanced the processing and marketing of products. The programme introduces trade policies to expand the breadth of demand for root and tuber products, and cassava in particular. It will also help targeted communities purchase equipment for processing.	**Contact information** **Mr. Ade Adeniji** Programme Coordinator RTEP 68 Ajalorun Street 2130 Ijebu-Ife Ode Federal Department of Agricultaure Nigeria Tel: +234 8055178766/8034730231; 37-432933 cassava@skannet.com **Facts and figures** Total cost: **US$36.0 million** IFAD loan: **US$23.0 million** Duration: **2001-2010** Geographical area: **25 states, mostly in the southern and middle-belt states** Directly benefiting: **560,000 households** Status: **ongoing** **Partners** § Federal Ministry of Agriculture and Rural Development § Food and Agriculture Organization (FAO) § International Development Association

Ghana	Root and Tuber Improvement and Marketing Programme The programme's development goal is to enhance the food security and incomes of poor rural households in Ghana, with special emphasis on women and other vulnerable groups. Its specific objective is to build up competitive, market-based and inclusive commodity chains for roots and tubers, supported by relevant, effective and sustainable services that are accessible to the rural poor. It will support the emergence both of an inclusive private sector that is deeply anchored in the realities of Ghana and of a stronger public sector capable of improving the policy and regulatory environment and delivering the required public goods.	**Contact information** **Mr Mohamed Manssouri** Country programme manager IFAD Via del Serafico, 107 00142 Rome, Italy Tel: +39 0654592330 Fax: +39 0654593330 m.manssouri@ifad.org **Facts and figures** Total cost: **US$27.6 million** IFAD loan: **US$18.7 million** Duration: **8 years** Geographical area: **nationwide** Directly benefiting: **180,000 households** Status: **About to start??**
Ghana	Root and Tuber Improvement Programme Roots and tubers are extremely important crops in rural Ghana. They are a source of both food and income. In the northern regions, the **yam** harvest marks the end of the lean period while families wait for their main staples, sorghum and millet, to ripen. Cassava is a staple in central Ghana and is a major element of food security since it can be stored in the ground and harvested when needed. Sweet potato and cocoyam (taro) are important in the more humid zones in the south. All three categories of roots and tubers are the staple foods of urban dwellers, especially the urban poor. The goal of this IFAD project is to enhance food security and improve the income of resource-poor farmers by facilitating access to new but proven technologies to boost production of root and tuber crops. The project's objectives are to: § develop a sustainable system for multiplication and distribution of improved planting materials for roots and tubers § develop an integrated pest management system, including biological control, to reduce the incidence of disease and pests § strengthen on-farm adaptive research and increase the availability of new cropping, storage and processing techniques § empower resource-poor farmers, particularly women, to ensure that they have unimpeded access to improved technologies	**Contact information** **Mr Akwasi Adjei Adjekum** National Programme Coordinator Root and Tuber Improvement Programme (RTIP) B.P. Box 7728 Kumasi, Ghana Tel: +233 5133159/25835 Mobile: +277568287 Fax: +233 5125835 aaadjekum@hotmail.com rtip@africaonline.com.gh **Facts and figures** Total cost: **US$10.1 million** IFAD loan: **US$9.2 million** Duration: **1999-2005** Geographical area: **nationwide** Directly benefiting: **750,000 households** Status: **closed**