

**CROP PROTECTION PROGRAMME**

**Up-scaling sustainable 'clean' seed yam production systems for  
small-scale growers in Nigeria**

**R8416 (Za0648)**

**FINAL TECHNICAL REPORT**

***1 April 2005 - 31 January 2006***

Project Leader: Lawrence Kenyon

Natural Resources Institute

Date FTR completed \_\_\_\_\_

**"This publication is an output from a research project funded by the United Kingdom Department for International Development for the benefit of developing countries. The views expressed are not necessarily those of DFID." *R8416 Crop Protection Programme***



## Contents

<b>Executive Summary .....</b>	<b>4</b>
<b>Background .....</b>	<b>5</b>
<b>Project Purpose .....</b>	<b>6</b>
<b>Research Activities &amp; Outputs .....</b>	<b>6</b>
<i>Activity 1. Study commercial seed yam farmers' systems in Illushi and assess what lessons can be learnt for small-scale/home growers. ....</i>	<i>6</i>
<i>Activity 2. Undertake cost-benefit/livelihoods analysis of yam growers in Ekwuloko and Edeke .....</i>	<i>7</i>
<i>Activity 3. Compile records for and evaluate benefits from micro-credit schemes in Ekwuloko and Alla-Olukudu .....</i>	<i>8</i>
<i>Activity 4.1. Hold a project-R8278 review and project-R8416 start-up and stakeholder workshop.</i>	<i>9</i>
<i>Activity 4.2 Plant multiplication plots and use for training/ demonstration/promotion to identified partners .....</i>	<i>10</i>
<i>Activity 4.3 Hold end-of-project hand-over meeting. ....</i>	<i>12</i>
<i>Activity 5.1 Conduct participatory assessment of promotional material needs and production responsibilities, and Activity 5.2 Assess perceived need and options for internet dissemination of information on seed yam production .....</i>	<i>12</i>
<b>Contribution of Outputs to developmental impact.....</b>	<b>13</b>
<b>Conclusions &amp; Discussion .....</b>	<b>14</b>
<b>Project Reports and Publications .....</b>	<b>17</b>
<b>Annex 1. Revised version of the guide to seed yam production using the treated cut sett system. ....</b>	<b>19</b>

## Executive Summary

This project was set up to follow-on from previous projects in West Africa. The main aims were to gain a better understanding of the systems and economics of seed yam production and supply, and to further evaluate, demonstrate and promote the systems developed in the earlier projects for producing good quality seed yams.

A study of the commercial production systems in the Illushi area revealed that planting cut setts was generally more profitable than planting small whole tubers for producing seed yams. The Illushi growers had not received extension advice on improved methods of production and because they do not treat the planting material before planting, there are relatively high losses through setts not surviving in the field and through the harvested tubers rotting during storage. Seed yam production is not as profitable for these growers as it could be because of the poor access to the growing area and high costs of transporting the seed yam to market, and because of the requirement to sell the seed through the trading cartels who appear to take a large share of the profit.

A comparison of the livelihoods of small-scale yam growers in Ekwuloko and Edeke showed that although the Edeke households were more reliant on agriculture, particularly yam production for income and farm larger areas, they were not as well off as the Ekwuloko households who had more diverse income sources. The cost-benefit of growing their own seed yams is potentially greater for the Edeke households, though because they are less well off they are more reliant on having access to financial credit at key periods of the year. Setting up to produce their own seed yams was regarded as a high risk strategy by the Edeke households and by the recipients of credit in the Gorta-funded micro-credit (FEED) scheme. Most of the credit recipients spread their risk by using their credit to grow both seed yams and ware yams.

Demonstration and training plots of the seed yam production system optimized previously (consisting of planting cut setts of 80-120g treated with a fungicide+insecticide cocktail) compared with the farmers' usual practice of treating the setts with wood ash were planted in six states of Nigeria in 2005. From the harvest data so far available, the cocktail treated setts always produced more weight of seed yams than the ash treated sets with multiplication factors in the range of x1.8 to x 6.2; some of the ash-treated sett plots yielded less weight of tubers than was used to plant the plot in the first place.

There are three main systems of production within Nigeria where further interventions are likely to improve the general availability of good quality seed yams:

- The centralized, commercial seed yam producers in areas such as Illushi need to be informed about the improved systems for producing and storing seed yams so that they no longer have to suffer such huge losses in the field and during storage. Also, improving access to their production areas would reduce their transportation costs and perhaps reduce their reliance on the middle-man marketing cartels.
- The large commercial ware-yam growers should be shown the potential cost-benefits of producing their own seed yams using the improved systems (they have the financial buffer, degree of mechanization and economy of scale to be able to do this profitably as a component of their larger business).
- Only certain classes of small-scale farming households will be able to grow their own seed yams profitably. More efficient systems for identifying such households need to be developed as do methods for reducing the administration costs of the micro-credit schemes these farmers need to access to be able to produce seed and ware yam sustainably.

Ensuring the availability of genuine formulations of appropriate fungicide and insecticide mixtures in affordable pack sizes (which are easy and safe to use), and which are relatively short persistence so they do not carry over to the ware crop, is a key area for further development to enhance the potential for adoption of the promoted seed yam production system.

Although treating the planting material before planting will increase the quality and storability of the seed yams, further research is required to find methods to maintain or restore soil fertility while still using the short fallow system, perhaps by inter-planting with a nitrogen-fixing legume, or making appropriate formulations of organic or inorganic fertilizer available at an affordable cost. Other research priorities were also identified.

## Background

Previous CPP projects and others have shown that scarcity and expense of clean planting material (seed yams) is a/the major constraint to increasing yam production and productivity in West Africa. Traditional methods of seed yam production under low-input systems were found inadequate for supply of the large quantities required by farmers (Orkwor, 1995). The minisett technique was developed by NRCRI and IITA in the 1970s as a rapid means of multiplying yam germplasm, but Chikwendu *et al.* (1995) showed that while 78.8% of the farmers in the eastern forest zone of Nigeria were aware of the technique, only 48.8% actually practised it. More recent experience from CPP-funded projects (R8278, R7503) indicates that uptake is even lower than this. Age, household size cooperative membership, tenurial status and the intensity of extension contact were the significant determinants of the adoption of the technique, while the constraints to adoption were scarcity of complementary inputs, lack of funds and the tedious and technical nature of the procedures involved. Yam growers tend to supplement yam seed bought from the local market with home-saved seed, but the latter is generally of poor quality (Asiabaka *et al.*, 2001).

The yield advantage of using good seed yams over poor ones was consistently reported as being between 2 and 4 times greater, with 3 times being the most usual response among farmers questioned in Ekiti and Kogi during a survey carried out for R8278 in 2003. Unfortunately, seed yams of the most popular varieties appear the scarcest; this is perhaps because these varieties are “sweet” and more susceptible to nematodes and other diseases. The IITA breeding programme released 3 new varieties with improved yield and resistance in 2001, and other improved varieties were released by IITA and the RTIP-Ghana in 2003. However supply of planting material of these varieties cannot meet the demand. To overcome the problems around poor seed yams, Ikeorgu *et al.* (2002) proposed that seed companies and interested NGOs should handle the production of yam planting material (specifically minitubers) and sell to the farmers as is done by hybrid seed companies. However, the costs of production and transport probably mean that many yam growers will not be able to afford planting material produced this way.

In Ekwuloko (Kogi State) and near Ado-Ekiti (Ekiti State) project (R8278/Za0556) used an on-farm, livelihoods/cost-benefit analysis approach which is starting to show that it is possible for farmers to produce their own clean seed yams in an economically sustainable manner using adaptations of the systems identified in earlier projects. It is likely that these systems can be further improved and adapted to the needs of small-scale yam growers elsewhere in Nigeria using information gained from studying the methods of commercial seed yam growers – such as those identified in the current project on the banks of the river Niger around Illushi. Also, it may be beneficial to implement some form of credit scheme to overcome the constraint faced by many growers of insufficient available capital (for planting material, land preparation, seed treatment *etc.*) at critical points in the seed yam production cycle.

Aighewi, B.A., Akoroda, M.O. and Asiedu, R. (2003) Seed yam (*Dioscorea rotundata* Poir) production, storage and quality in selected yam zones of Nigeria. *African Journal of Root and Tuber Crops* 5, 20-23.

Asiabaka, C.C., Morse, S. and Kenyon, L. (2001) The development, dissemination and adoption of technologies directed at improving the availability of clean yam planting material in Nigeria and Ghana. DFID Crop Protection Programme (Za0478), Study Mission Report (11-22 June 2001), Natural Resources Institute (NRI) Chatham, Kent, UK. 54pp

Chikwendu, D. O., Chinaka, C. C., and Omotayo, A. M. (1995) Adoption of minisett technique of seed yams production by farmers in the eastern forest zone of Nigeria. *Discovery and Innovation* 7, 367-375.

Ikeorgu, J. E. G., Nwokocha, H. N., and Ikewelle, M. C. (2002) Seed yam production through the yam minisett technique; recent modifications to enhance farmers' adoption. 12th Symposium of the International Society for Tropical Root Crops: Potential of Root Crops for Food and Industrial Resources. September 10-16, 2000, pp. 372-375.

Orkwor, G. C. (1997) Seed yam production technology. The yam minisett technique. L'igname, plante seculaire et culture d'avenir. Actes du seminaire international CIRAD-INRA-ORSTOM-CORAF. 3-6 June 1997, pp. 87-92.

## Project Purpose

The purpose of the project and how it addressed the identified development opportunity or identified constraint to development.

Benefits for poor people generated by application of new knowledge on crop protection to annual and herbaceous crops in Forest Agriculture production systems.

*To evaluate crop protection practices (based on current practices, indigenous technical knowledge and the outputs from previous projects) for clean seed yam production for applicability and economic efficacy in Kogi and Ekiti states, and to identify how the outputs can be promoted more widely across the yam-growing belt of West Africa to increase the supply and availability of good quality seed yams.*

## Research Activities & Outputs

The activities conducted should be listed. Lessons learnt from them should be provided and the outputs that they have achieved. Were any intended outputs not achieved, were any additional outputs achieved? Please keep this as succinct as possible.

### **Activity 1. Study commercial seed yam farmers' systems in Illushi and assess what lessons can be learnt for small-scale/home growers.**

Local knowledge and previous studies had indicated that the area around Illushi on the Niger River is a major centre for the commercial production of seed yams. This activity was undertaken to identify and characterize the commercial seed yam production systems in this area, assess their profitability, as well as to identify the factors that promote or constrain the delivery of clean seed yams.

A questionnaire survey was used to collect information from seed yam producing migrant settlement camps in the lowland belt of the river Niger around Illushi, Edo State. The migrant farmers in these camps are the main producers of seed yam in the sub-humid tropics of the country. They each cultivate an average of 3.8 hectares, 72% of which are planted with yam, out of which 41% is for seed-yam production. The common varieties of yam cultivated are *Ekpe*, *Alumako* and *Obiotulogo*. Average yield of seed yams is 18,000 tubers per hectare (about 7.2Mt/ha). Farmers produce seed yams by planting either mini-seed yams or setts (120-150g) cut from small-sized yam tubers selected at harvest. Farmers in this area do not treat their yams before planting and are not aware of the minisett technique of seed yam production. Storage is poor and up to about half of the seed yam produced can be lost to diseases. Seed yam production in the area is profitable with an average net income ranging from 34,018Naira/ha for variety *Obiotulogo* to 61,374Naira/ha for *Ekpe*. The income productivity (income against production costs) per hectare is higher for *Ekpe* (48%) than those of *Alumako* (34.9%) and *Obiotulogo* (27.3%). The traditional sett technique is more profitable than the mini seed yam technique.

The marketing margin increases as the product moves closer to the consumer. At the market, the farmers are not allowed to sell directly to anybody in the market except to the collector agents, who organize themselves into cooperatives or other marketing cartels. The collector agents aggregate seed yams from a number of small growers and store the yams until the traders come to collect them. Traders prefer seed yams that are free of pests,

diseases and physical injury; these are likely to have a longer shelf life. Peak sale period is December to February when sufficient quantities of seed yams are sold at competitive prices. Significant factors preventing farmers and traders from meeting the needs of their downstream customers include the inability of farmers and collector agents to supply seed yam of high shelf life that are substantially free from physical injury, disease infections, spots, and when required. Farmers do not trust their trading partners because the latter always act opportunistically; hence, farmers prefer those that visit their camps directly to buy seed yams. Major constraints to increased seed yam production reported by farmers in the area are, insufficient capital (76.3%), inability to buy disease-free seed yams (43.1%) and lack of knowledge of modern multiplication techniques (39.4%). The amount of land, labour, and capital used significantly affect seed yam production. However, the quantity of planting materials (seed yams) exert highest positive and significant influence on the output of seed yams particularly those under the mini seed yam production system. Extending production through increase in land area would only increase the output of seed yams under the mini seed method. In all cases, the output of seed yams among farmers would be significantly improved if land and labour were available for seed yam production. Thus, given the positive net income from seed yam production in the area and availability of farmland, the yield and subsequently income of rural seed yam farmers can be greatly enhanced if labour of the right quantity and quality is made available for seed yam production. These can be realized if seed yam farmers are adequately trained on the rapid seed yam multiplication technique, marketing strategies, pest and disease management, efficient storage technologies and improvement in transportation facilities. Full details of this study can be found in Ibane *et al.*, 2005.

### **Activity 2. Undertake cost-benefit/livelihoods analysis of yam growers in Ekwuloko and Edeke**

In Ekwuloko, the seed yams grown on the four collaborating farmers' sites in the 2004 season as part of the 2004 livelihoods study (see R8278 FTR, 2005) were planted on the same farms in the 2005 season and records were kept of the costs/profits of taking the seed yams on to ware yam production. In 2005, to provide a contrast to the Ekwuloko sites, four new households were identified in Edeke (riverine area) and provided with treated yam setts for seed yam production. Again the costs of growing the seed yams were monitored within the households' livelihoods context.

In order to obtain an accurate figure for the cost-benefit of the seed yam production, record keeping will have to be continued until the seed yams are sold and planted in the 2006 season (March/April). Thus, the results reported here are from an interim analysis and report on the study produced in December 2005 (Morse *et al.*, 2005). Although these are interim findings, with regards to livelihoods a number of points emerge that are relevant for the seed yam project. Edeke is close to the River Niger and was chosen as a contrasting site because it is a quite different agro-ecological and socio-economic environment compared to Ekwuloko. A better picture of how these differences impinge on the sustainability of small-scale seed yam production systems will be obtained when the results of the on-farm trials are available later in 2006 (April). However, with the results obtained so far it is clear that the two samples differ in a number of regards:

- *Edeke households appear not to be so well off as those in Ekwuloko (as evidenced by the asset ownership).*
- *Edeke households farm larger areas and spend proportionately more on farm labour than do the Ekwuloko households.*
- *Edeke households rely more heavily on agriculture for their income than those in Ekwuloko.*

- Sources of income for the Edeke sample are not as diverse as they were for the Ekwuloko sample.
- Yam production was far more important to household incomes in Edeke than it was in Ekwuloko.
- Edeke households have a greater degree of membership of agriculture-based social groups than do Ekwuloko households. Included here are specialist meetings of yam producers and even seed yam producers (Ujeju Onwa)

At one level all of these points should – in theory - predispose farmers in Edeke to be more interested in clean seed yam production and hence facilitate the adoption of the technology. After all, if they are more reliant upon yam and belong to a range of agriculture-based social groups then this should imply a tendency to be willing to try new ideas in yam production. However, it is also clear that while these farmers are more reliant on crops and especially yam for their income than Ekwuloko farmers, their room for manoeuvre is more limited – there is simply little alternative source of income to match that of yam. The more precarious household balances of Edeke suggest that credit is necessary on an annual basis to balance the books and indeed that is the case. But there are complex issues at play here. Women are one of the major sources of credit to the male yam producers and – of course – these women are also a part of households, but not necessarily the ones in Edeke. Some of these women (and men) money lenders will reside outside of Edeke and they do wield much power. In focus group discussions in December 2005 one of the four household heads said that he was wary of upsetting the money lenders by not borrowing from them in one year – after all what would happen the following year when he may need credit? Sustainability is very much about the future and as a famous saying in Nigeria goes, “who knows tomorrow?”

Credit is clearly a critical issue here and its not just about technical excellence. But breaking the household out of such a credit trap is not easy given that whatever is done has to ensure sustainability so that the farmers and their families do not fear having to go back to the money lenders almost on their knees. Confidence is a critical ingredient for sustainability.

### ***Activity 3. Compile records for and evaluate benefits from micro-credit schemes in Ekwuloko and Alla-Olukudu***

It was apparent from previous studies 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. In some areas the farmers are effectively tied in to a system of debt where they borrow from local money lenders, but because of the high interest rates charged (often as high as 100% in 6 months), any profit made from growing yams is immediately lost in paying the interest on the loan. To try to find a solution to this, the Diocesan Development Service (DDS) in Kogi state started The *Farmer's Economic Enterprise Development* (FEED) programme with funding from an Irish aid agency, Gorta, to attempt to establish a low cost micro-credit scheme in Kogi State. The 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. Only DDS Farmer Council members could participate, they could not have a previous loan outstanding and they had to engage in clean seed yam production. Here there had to be modifications for no one could perceive of the notion of producing seed yam only (however clean) unless there was some ware yam also. 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. The rationale is that the farmers pay back the loan with minor interest (2%) when they sell the harvested yams. The credit



scheme then keeps the funds 'safe' until the farmer requires another loan the next season. As the farms become more profitable through increases in efficiency, the farmers should become less reliant on receiving credit.

Data collection for the credit scheme will continue until at least April 2006 so that a whole years worth of data can be assessed. So far the indications are that many of the loans will result in the farmers making modest improvements to their livelihoods; they will have either been able to start growing yams for the first time, or they will have been able to continue growing yams or grow more yams, but more profitably and sustainably. However, it is also apparent that the transactions costs of administering such a micro-credit scheme are very high because each application for a loan has to be scrutinized carefully and each loan granted has to be followed up with regular assessment to ensure that the funds are not being used for other purposes.

In order for a micro-credit scheme for (seed) yam production to be viable and sustainable in the long run, it will be necessary to find ways of reducing the transactions and administration costs. A cheaper and more efficient method of appraising whether farming households were suitable candidates (Rapid Rural Appraisal) for a loan will have to be developed, while an optimum interest rate for the loans will also have to be calculated. The interest rate will have to be lower than that offered by the money lenders and sufficiently low for the recipients still to be able to make a profit from growing yams, but high enough to cover the administration/transaction costs of the scheme.

**Activity 4.1. Hold a project-R8278 review and project-R8416 start-up and stakeholder workshop.**

A workshop with over 30 participants was held at IITA, Ibadan on 10-11 March 2005 (Kenyon 2005). The purpose was to review the activities and outputs of project R8278 and to dovetail those outputs into planning the work for this project (R8416). The main conclusions/recommendations of the workshop were:

1. Options should be explored for creating a lobby group for clean seed yam production (perhaps as a subgroup of participants at the workshop, and possibly coordinated with the IFAD project working group on clean seed yam production). The workshop participants should continue communicating with each other and should consider meeting again near the end of the project to report on progress.
2. The formation of farmers' groups or associations should be encouraged, but the modalities and incentives for establishing such groups require further investigation. Gender issues should be taken into account in this.
3. There is a need to promote/establish better linkages between stakeholders – eg IFAD – RTEP – NRCRI *etc.*, but again it was unclear what incentives there are for people to make this work. Linkages should extend to include trade/marketing organisations so as to improve market access/stability for seed yams.
4. More extension materials should be produced and distributed (this was included in activity 4.2 and 5.1 below).
5. More on-farm demonstrations plots should be planted covering a wider geographic spread of the country (this was already in progress with planting material being bought and suitable partners [several of whom were participants in this workshop] to host the plots being identified for activity 4.2)).
6. More information should be gathered on the cost-benefits of seed yam production. (Different aspects of this subsequently were pursued through the survey of the systems at Illushi (Activity 1), the continuation of the DDS livelihoods study (Activity 2), and the implementation of the micro-credit scheme at Ekwuloko (Activity 3).

Where possible, the socio-economic and cost-benefits related to the demonstration plots should also be considered (this was included under Activity 4.2).

7. Alternative and additional sources of funding for these activities should be sought. A message has already been sent from the Joseph Foundation (participant in this workshop) to "The Special Adviser to the President on Food Security" for support. Possible links to the FAO managed "Special Programme on Food Security" should be investigated (though this is primarily intended for South-South technical assistance; e.g. China-Nigeria in West Africa). IFAD and CORAF may be other international sources of support.

#### ***Activity 4.2 Plant multiplication plots and use for training/ demonstration/promotion to identified partners***

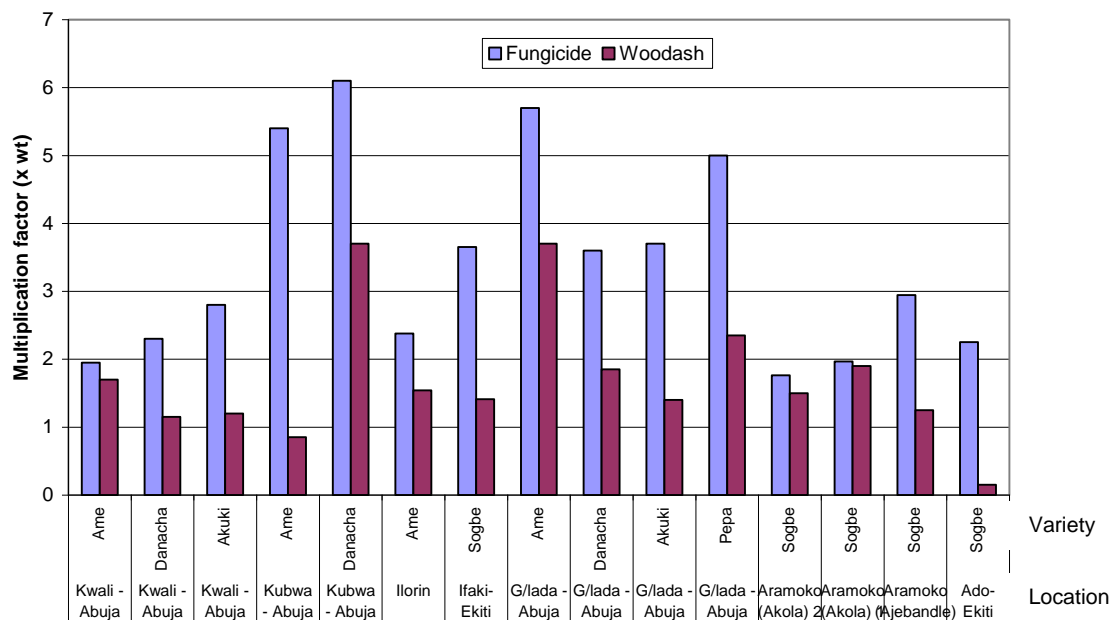
Seed yam multiplication/demonstration plots were planted in association with farmers groups, NGO's, Local Govt. Areas and commercial farms in Ekiti, Kogi, Oyo, Kwara, Rivers and Abuja in the 2005 season (see Table 1). Farmers and agricultural staff at each location were trained and demonstrations were given in using improved healthy seed yam production techniques. The demonstration plots were planted with sett (80-100g) treated with the pesticide mixture of Mancozeb and Basudin (Diazinon). For comparison, similar sized setts treated by the farmers' usual practice of dusting with wood ash were planted in adjacent plots. Plot sizes varied with location and the quantity of yams available. The project provided most of the planting material and inputs for each of the demonstration plots, with the farmers providing additional planting material, labour and land. The initial agreement between the project and each hosting organization was that when the plots were harvested the hosting organizations would each retain half of the seed yams produced in their demonstration plots and would return the other half to the project so that further demonstrations could be established with other partners the following season. Extension and awareness material/information was provided to project partners for further distribution to other farmers. Other interested parties, including other farmers and sometimes school children were invited to view the demonstration plots and take part in the activities/demonstrations carried out at each site.

At the time of writing this report not all the demonstration plots had been harvested so harvest data has only been compiled for some of the plots. These plots were set up to demonstrate the use of the simple fungicide+insecticide cocktail for treating yam sets prior to planting to produce seed yams and, since varieties, plot sizes and planting date varied from site to site, plots should not be regarded as replicates for statistical purposes. Thus, in Figure 1 the bars represent the multiplication factor achieved (the ratio of weight of material planted to weight of tubers harvested) for the setts treated with the fungicide cocktail and those treated with woodash alone, for each variety at each site for which the harvest data is available so far.

The targeted application of fungicide and insecticide to the planting material for seed yam production appears to be the most viable means of reducing the pest and disease loading of the crop since extending the fallow period between crops is no longer feasible in most areas. Targeting only the planting material for the seed crop is probably environmentally benign since only small quantities of pesticide are used and the likelihood of carry over so pesticide residues are detectable in the ware crop is small. However, to be confident of this, the necessary tests should be conducted; some fungicides or insecticides may be more persistent than others.

**Table 1. Direct project collaborators/partners and numbers of demonstration plots planted in 2005**

State	Partners	Demonstration plots/trials
Ekiti	<ul style="list-style-type: none"> <li>• ADP HQ Ekiti,</li> <li>• ADVL commercial farms (Ado Ekiti)</li> <li>• Ifaki farmers congress (group of 30)</li> <li>• Aramoko farmers group (group of 8)</li> <li>• 2 individual farmers (Aramoko)</li> <li>• farmers selected for on-farm trials (4)</li> </ul>	<ul style="list-style-type: none"> <li>• 1 demonstration plot in 2005</li> <li>• 1 demonstration plot in 2005</li> <li>• 1 demonstration plot in 2005</li> <li>• 2 demonstration plots in 2005</li> <li>• 4 demonstration trials in 2004 leading to 2 seed-to-ware trials in 2005</li> </ul>
Kogi	<ul style="list-style-type: none"> <li>• DDS</li> <li>• Idah local govt.</li> <li>• Igalamela Local govt</li> <li>• Oforachi farmers group (6)</li> <li>• Edeke women farmers (4)</li> <li>• Farmers selected for on-farm trials (4)</li> </ul>	<ul style="list-style-type: none"> <li>• 1 multiplication &amp; 1 demonstration in 2005</li> <li>• 1 demonstration plot in 2005</li> <li>• 1 demonstration plot in 2005</li> <li>• 1 demonstration plot in 2005</li> <li>• 1 demonstration plot in 2005</li> <li>• 4 demonstration trials in 2004 leading to 4 seed-to-ware trials in 2005</li> </ul>
Oyo	<ul style="list-style-type: none"> <li>• AlamAgro - Commercial farmer in Oyo</li> <li>• Mrs Otiti – Commercial farmer</li> </ul>	<ul style="list-style-type: none"> <li>• 1 multiplication &amp; 1 demonstration in 2005</li> <li>• 1 multiplication &amp; 1 demonstration in 2005</li> </ul>
Abuja	<ul style="list-style-type: none"> <li>• Gwagwalada area council</li> <li>• Kwali area council</li> <li>• 12 farmers in Kwali area council</li> <li>• 18 farmers in Gwagwalada area council</li> <li>• Peace farmers (group of &gt;20)</li> <li>• IITA field station</li> </ul>	<ul style="list-style-type: none"> <li>• 1 demo in 2005</li> <li>• 1 demo in 2005</li> <li>• 1 demo in 2005</li> <li>• 1 demo in 2005</li> <li>• 1 demo in 2005</li> <li>• 1 demo in 2005</li> </ul>
Kwara	<ul style="list-style-type: none"> <li>• Joseph Foundation (NGO) &amp; Ganmo Farmers association (&gt;10)</li> </ul>	<ul style="list-style-type: none"> <li>• 1 demonstration and 1 multiplication in 2005</li> </ul>
Rivers	<ul style="list-style-type: none"> <li>• Green River Project (AGIP petroleum) &amp;</li> <li>• Food for All International (FFAI)-NGO</li> </ul>	<ul style="list-style-type: none"> <li>• 5 demonstration plots in 2005</li> <li>• 1 demonstration &amp; 1 multiplication in 2005</li> </ul>



**Figure 1. Multiplication ratios in terms of weight of seed yams produced for different treatments and varieties at different demonstration sites.**

#### **Activity 4.3 Hold end-of-project hand-over meeting.**

An end-of-project meeting with the main project partners was held at IITA, Ibadan, on 19-20 December 2005. The main purpose was to review the findings of the project, collate the results for this report and to explore ideas for how the outputs might be taken forward after the end of the project. This final report is partly the output from that meeting.

#### **Activity 5.1 Conduct participatory assessment of promotional material needs and production responsibilities, and Activity 5.2 Assess perceived need and options for internet dissemination of information on seed yam production**

Dissemination materials - such as pest and disease identification sheets, seed yam production guides and calendars – some developed by earlier projects (See R8278 FTR 2005) and reprinted by this project were distributed to project collaborators and farmers attending the seed yam production demonstrations and field days. These gatherings, as well as project workshops (see activity 4.1 above) were also used as opportunities to gather the views of the project collaborators and farmers on the materials already produced and on what other materials might be developed.

The general consensus was that the materials already produced were satisfactory as they were and did not require significant changes. Soft copy versions of these were provided to NRCRI and CNRA (Cote d'Ivoire) so that they could adapt and print them for their own use. There were only a few definite suggestions for other publications. One of these was the production of a more comprehensive pocket guide for the cultivation of yams. This would include the selection and production of good quality seed yams as well as all aspects of growing a ware crop and storing planting material in the dry season.

As a means of disseminating information about the project and about the systems for improving the supply and availability of good quality seed yams more widely, it was also suggested that the project partners seek to publish more popular articles akin to that printed in "*African Farming and Food Processing*" (Ward, 2005) in publications such as "*Spore*" and "*Leisa*".

Although originally rejected as an idea, because of the rapidly expanding access to the internet in Africa, it was later agreed that an internet site (www) dedicated to yam production, pathology and processing could be extremely useful, especially if it could be a repository for much of the 'grey literature' on yam that is not widely available. This could also act as a gateway to a network of yam researchers and producers. The questions of where such a site should be hosted and how it should be administered and maintained were not resolved.

## **Contribution of Outputs to developmental impact**

This project represents the latest stage and culmination of a series of projects in West Africa. The primary aims of these projects were to develop and evaluate systems/technologies to overcome the constraints to yam production of pests and diseases. As such, the outputs of the earlier projects were mainly knowledge, recommendations and technologies. These outputs had had relatively little direct impact on the poor (yam farmers and consumers), but paved the way for this project to explore which of the outputs should be disseminated more widely, how they should be disseminated and, to begin the dissemination process.

One of the activities of the previous project (R8278) was to establish evaluation-demonstration plots of the 'treated, cut sett system' for producing good quality seed yams in both Ekiti State and Kogi State. In this project (R8416) the number and distribution of such demonstration plots was increased so there were seven in Ekiti state, nine in Kogi, two in Oyo, six in Abuja, one in Kwara and six in Rivers State (Table 1). Since for the majority of these, the project provided most of the planting material, the fungicide and insecticide for treating the cut setts and a pre-emergence herbicide, as well as guidance and training in treating the cut setts and setting-up the plots, all the partner organisations or groups hosting the plots will have benefited directly from the project; they were able to keep all the seed yams produced in their demonstration and multiplication plots and use these to both grow a crop of ware yams and to multiply for more seed yams the following season.

Formal field days were held at the demonstrations plots (mainly at planting and harvesting time) where local farmers and other interested parties were able to learn about the seed yam production system being promoted. Many of these observers will also have received copies of the extension materials produced by the project, and it is likely that a proportion of the attendees will have tried the system (or their own adaptation of the system) on their own farms. Unfortunately, it was not in the scope of the project to follow up on the attendees and assess how many did try the system and whether they did it successfully or not.

In Kogi state, the system for producing good quality seed yams through treating cut setts was also promoted through the activities of the DDS Farmer Council members, who included the participants in the household livelihoods studies in Edeke and Ekwuloko, and the participants in the DDS-Gorta FEED programme. Almost 400 farmers benefited from credit in the FEED programme in 2005, and these with another group of about 400 will benefit again in 2006. The main consideration is to build agricultural finance so the beneficiaries can become independent of credit. It also is estimated that information about the clean seed yam system has reached approximately 250,000 people via the Farmer Council programme. It is unclear what proportion of these will have benefited directly or indirectly from the project. Only a small percentage of these will be eligible to participate in the FEED programme over the next 10 years as they have to be members of the FC programme. However, there were farmers in the riverine areas who indicated that they are likely to adapt 'clean seed yam production' on their own without formal assistance.

The knowledge from this project has helped, and will continue to help, inform the DDS 'rights based' business plan approach (FEED) on the provision of agricultural credit. Much has been learnt about the role of seed yams in household livelihood strategies, and in particular the limitations that can exist in the provision of clean planting material. The FEED programme is being implemented with resource-poor farmers in Igalaland and hence is directly benefiting the poor. In addition, the encouragement of yam production in the area will improve nutrition as well as be of economic benefit.

## Conclusions & Discussion

Yam remains the preferred starchy staple for many people in the yam belt of West Africa. However, it is the most expensive of the root crops to produce because of the high labour demands for land preparation, planting, staking, weeding, harvesting and transport to market. Also, planting material (seed yam) is expensive and in short supply because of the low multiplication rate of yams. There is a scarcity of reliable data on the area, production and yield of yam, but from the FAO-Stat (2005) figures, in Nigeria the average yield of yam appears to have been steadily declining over the last 8-10 years (Figure 2).

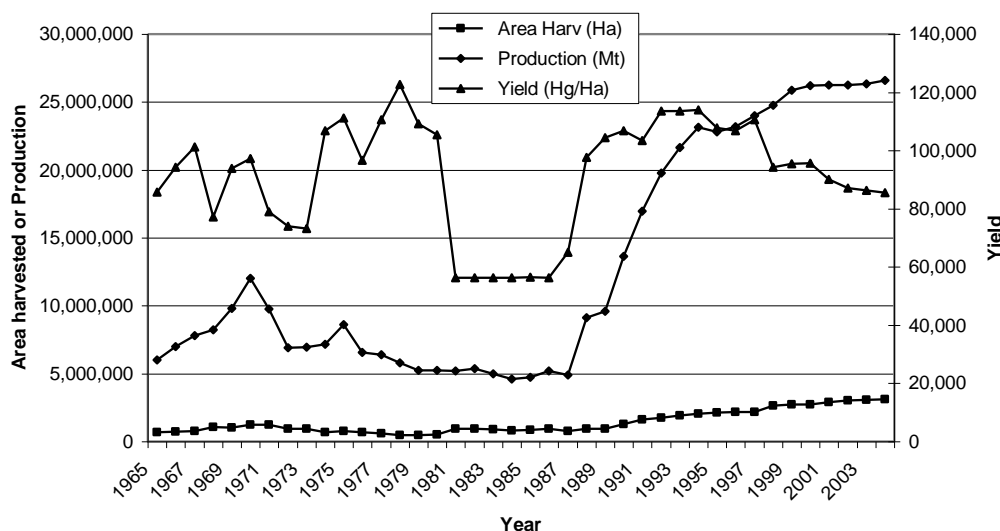


Figure 2. Production, area and yield of yam in Nigeria (Data from FAO-Stat 2005)

The cause of this decline is often cited as being the declining soil fertility due to employing shorter fallow periods and the use of more marginal lands for yam production because of the increasing demand on agriculture to feed the increasing human population. The result of the reducing yields is that total production is staying relatively static (not keeping up with demand) despite the land area used for yam being increased. Shorter fallows and use of more marginal lands are also likely to cause increased pest and disease problems through build up of populations in the soil, which will carry over to the harvested tubers. Increasing demand for tubers for food combined with increased loading of the tubers with pathogens and pests means that good quality (low disease) tubers for use as planting material are becoming evermore scarce and expensive.

Previous projects had identified the shortage of good quality and affordable planting material as one of the main constraints to increased yam production. They had also explored systems based on the treatment of cut sets with a fungicide + insecticide mixture for the more reliable and efficient production of good quality 'clean' seed yams. The broad aim of this project was to identify what technologies or system changes should be promoted, and to which sectors, to increase the supply and availability of good quality seed yam in Nigeria. Part of the aim was also to identify how to go about the promotion, and to start to implement the most likely successful strategy.

From the results obtained it is apparent that there are three broad systems of seed yam production where further focussed interventions are likely to have greatest impact in increasing production and availability:

- The centralized, large-scale, commercial seed yam producers in areas such as Illushi need to be informed about the improved systems (e.g. the treated, cut sett method) for producing and storing seed yams so that the farmers can avoid the huge losses due to setts rotting in the field or seed yam rotting during storage. Also, improving (infrastructure) access to their production areas would reduce their transportation costs and perhaps reduce their reliance on the middle-man cartels.
- The large commercial ware-yam growers should be shown the potential cost-benefits of producing their own seed yams using the improved systems (they have the financial buffer, degree of mechanization and economy of scale to be able to do this profitably as a component of their larger business).
- Only certain classes of small-scale farming households will be able to grow their own seed yams profitably and sustainably. More efficient systems for identifying such households need to be developed as do methods for reducing the administration costs and interest rates of the (micro-) credit schemes that these farmers need to access to be able to produce seed and ware yam sustainably.

Reducing the disease and pest loading on the harvested tubers is implicit in producing good quality seed yams or planting material. Since increasing fallow periods so that soil populations of pathogens and pests are able to decline naturally is no longer an option, it is necessary to use other approaches. The system of producing seed yams evaluated in this project uses a targeted application of a mixture of a fungicide and an insecticide to cut tuber pieces (80-120g) which are then planted at relatively high density (40,000/ha) to produce a crop of small tubers (seed yams) ideal for planting whole the following season to produce a ware crop. The cost of the fungicide and insecticide for treating the cut setts was negligible compared to the other costs involved in producing the seed yams in the livelihoods study households and in the demonstration plots. However, the main concern here is in ensuring a reliable supply of a genuine formulation of an appropriate fungicide and insecticide mixture in an affordable size of packaging that is easy and safe to handle and apply.

The Illushi area of Edo State is one of the major seed yam growing areas of Nigeria. Its farmers have received almost no support from Federal or State government agencies in Nigeria. There is much potential in a link-up between the Illushi farmers and farmers who have participated in the seed yam demonstration trials and the FEED micro-credit scheme to share experiences and learn from each other. However, there may be tensions here since the commercial growers might not want to lose their market by encouraging small-scale growers to grow their own seed yam.

The livelihood study and on-farm trials have shown that clean seed yam production by resource-poor farmers in at least two villages in Igalaland can make a viable contribution to household livelihood. However, it is also clear much depends upon the context of the household – for some it would be a far more attractive option than for others. In Edeke, the farmers are specialist yam producers and clean seed yam production is viable. In Ekwuloko the farmers have a range of livelihood options and clean seed yam is but one of these. With the right support they will engage in clean seed yam production, but they will constantly evaluate the other options and in some cases would prefer to invest in those instead. Here, the lesson learned is that micro-credit schemes need to be flexible and allow choice.

Access to credit at an affordable interest rate appears essential for most small-scale growers to start, or to expand, growing yams. Results obtained from evaluation of the FEED programme indicate that such a programme could be successful in sustainably increasing the profitability of yam production to farmers or small-scale growers. However, for such a scheme to be sustainable, the transaction and administration cost of the scheme have to be reduced, while a study will have to be made to find the optimal interest rate to charge on the loans so that they still meet the farmers' needs, but also provide sufficient income for the scheme to be self-sustaining.

To continue increasing (or restoring) the efficiency and diversity of yam production in West Africa, further research and development is required in a number of areas:

- Further identification, development and evaluation of appropriate and sustainable methods to reduce the pre- and post-harvest losses due to pest, diseases and viruses.
- Identification, characterization and conservation of a greater diversity of yam germplasm including accessions with desirable traits such as greater pest and disease resistance or tolerance, more amenable to the rapid multiplication methods, different starch and taste qualities, early or late maturing, different growth habit (e.g. dwarf/short stature so staking is not so critical).
- Alternative agricultural practices such as use of selective herbicides to reduce the labour demand for weeding, alternative plant spacing (increased plant density) and alternative staking methods (e.g. wires along the rows) for rapid establishment of a dense canopy to shade out weed competition and to produce a crop of smaller ware yams (breakfast yams) which are easier to harvest and transport with less damage.
- Environmentally and economically sustainable methods of maintaining or improving soil fertility while still keeping the shorter fallow periods now necessary; these could be by the use of appropriate formulations of organic or inorganic fertilizers if these can be made available at the appropriate price, or by use of nitrogen-fixing leguminous cover crops or intercrops (perhaps pigeon pea, flaminigia or *Gliricidia sepium*).
- Methods to identify the appropriate classes of grower to whom the developed, improved production methods should be promoted because they are most likely to make them work and benefit from them, and what are the most appropriate and efficient methods of promoting these methods to the appropriate class of grower.
- What are the appropriate characteristics for a micro-credit scheme (interest rate, what complexity of business plan is required of each recipient, how much contact with or supervision should be given to each client, etc.) to meet the needs and be beneficial to the growers while still being self-sustaining and viable?
- What needs to be done to make the outputs more widely relevant and what should be done to disseminate them more widely in West Africa?



## **Project Reports and Publications**

- Ibana, S., Coyne, D., Claudius-Cole, A. and Kenyon, L. (2005). Economics of Seed Yam Supply Chain Management in the Lowland Belt of the River Niger, Nigeria Study report for *Up-scaling sustainable clean seed yam production systems for small-scale growers in Nigeria* Project (R8416). International Institute for Tropical Agriculture, Ibadan, Nigeria.
- Kenyon, L. (2005). Project Review Workshop Report: Evaluation and Promotion of Crop Protection Practices for "Clean" Seed Yam Production Systems in Central Nigeria (Project R8278 & R8416). International Institute for Tropical Agriculture, Ibadan, Nigeria. 10-11 March, 2005
- Morse, S., McNamara, N. and Acholo, M. (2005). Edeke on-farm trials and livelihood study. Interim Report for CPP Project R8416 (Za0648) DDS, Idah, Nigeria, December 2005, 41pp.
- Ward, A., (2005). Yum, Yum, more Yam. *African Farming and Food Processing* September/October 2005 (Alain Charles Publishing Ltd. London UK.) p 23.

## **Biometricians Signature**

*The projects named biometrician must sign off the Final Technical Report before it is submitted to CPP. This can either be done by the projects named biometrician signing in the space provided below, or by a letter or email from the named biometrician accompanying the Final Technical Report submitted to CPP. (Please note that NR International reserves the right to retain the final quarter's payment pending NR International's receipt and approval of the Final Technical Report, duly signed by the project's biometrician)*

I confirm that the biometric issues have been adequately addressed in the Final Technical Report:

Signature:

Name (typed):

Position:

Date:

Note: This was a relatively short project primarily aimed at identifying and promoting systems to improve the production and availability of good quality seed yams in Nigeria. At the time of writing this report there was little quantitative data to report on and it was considered unnecessary to obtain a biometricians approval at this stage.

## Annex 1. Revised version of the guide to seed yam production using the treated cut sett system.



### How to Produce Healthy Seed Yams !

Accessing healthy seed yams for planting is the most important challenge for yam growers in Nigeria. Seed yams account for about 50% of the cost of production of ware yams. Seed yams that are available are often of poor quality and diseased resulting in the production of poor quality and small ware yams.

**An easy technique using a pesticide dip can help produce good quality seed yams in large quantities.**



- Step 1: Select good quality seed yams tubers
- Step 2: Cut tubers into pieces of 100 -150g (milk tin size)
- Step 3: Place the setts into a nylon or plastic net sack

- Step 4: Prepare pesticide dip using 100g (milk tin) Mancozeb + 70mls Diazonon in a bucket with 10 litres of water.
- Step 5: Dip the setts in the mixture for 5 - 10 min.
- Step 6: Leave pieces to drain and dry for a few hours or overnight.
- Step 7: Plant setts 30 - 50cm (about hand to elbow length) apart along ridges.



Treated setts will produce good sized healthy seed yams

Results from on-farm trials show that this method increases the percentage sprouting, number, quality and size of tubers compared to the usual traditional methods.

#### **SAFETY**

*Use gloves, eye protection and protective clothing, read labels and dispose of excess chemical safely.*

Contact your local **ADP** and



Patrick Ohoji  
Tel: 01 4600100

for more information



Annex 2. Seed yam production calendar for 2006 (small version)



# 2006



**Method of production**



1 Cut tubers into 100 - 150 g (rubber size)



2 Dip in fungicide mix of Dithane (fungicide) and insecticide (knapsack)



3 Harvest high quality seed yams



4 Towards good quality ware yam production...

January		February		March		April																
S	M	T	W	T	F	S	S	M	T	W	T	F	S	S	M	T	W	T	F	S		
1	2	3	4	5	6	7	5	6	7	8	9	10	11	2	3	4	5	6	7	8		
8	9	10	11	12	13	14	12	13	14	15	16	17	18	9	10	11	12	13	14	15		
15	16	17	18	19	20	21	19	20	21	22	23	24	25	16	17	18	19	20	21	22		
22	23	24	25	26	27	28	26	27	28	26	27	28	29	30	31	23	24	25	26	27	28	29
29	30	31																				

May		June		July		August																	
S	M	T	W	T	F	S	S	M	T	W	T	F	S	S	M	T	W	T	F	S			
1	2	3	4	5	6	4	5	6	7	8	9	10	6	7	8	9	10	11	12				
7	8	9	10	11	12	13	11	12	13	14	15	16	17	13	14	15	16	17	18	19			
14	15	16	17	18	19	20	18	19	20	21	22	23	24	20	21	22	23	24	25	26			
21	22	23	24	25	26	27	25	26	27	28	29	30	27	28	29	30	31						
28	29	30	31																				

September		October		November		December															
S	M	T	W	T	F	S	S	M	T	W	T	F	S	S	M	T	W	T	F	S	
3	4	5	6	7	8	9	1	2	3	4	5	6	7	3	4	5	6	7	8	9	
10	11	12	13	14	15	16	8	9	10	11	12	13	14	10	11	12	13	14	15	16	
17	18	19	20	21	22	23	15	16	17	18	19	20	21	17	18	19	20	21	22	23	
24	25	26	27	28	29	30	22	23	24	25	26	27	28	24	25	26	27	28	29	30	
							29	30	31	26	27	28	29	30							

## Healthy Seed Yams !

Results from on-farm trials show that this method increases the percentage sprouting, number, quality and size of tubers compared to the usual traditional methods.

Contact your local **ADP** and **Dizengoff**

Patrick Obwe  
Tel: 01 4600100 for more information