

**Cashew Study Tour in East Africa,
16th to 28th September, 1999**

**Dr Clive P. Topper
Professor Peter D. S. Caligari**

Report – October 1999

Financed by USAID Washington

Cashew Study Tour in East Africa - September 1999

Dr Clive Topper and Professor Peter Caligari

1. Background

Fruit and nut tree crop systems and cashew nut in particular, offer significant opportunities to generate income for small-holders in Africa. At present, tree crop products account for a large proportion of the foreign exchange derived from agricultural trade in Africa. Efforts to increase the productivity and efficiency of tree crop systems offer the opportunity to merge the interests of African small-holders, that dominate production, with medium and larger scale entrepreneurs involved in processing and exporting tree crop products to global markets. Tree crop systems also play a critical role in increasing and sustaining biodiversity and sound management of natural resources.

1.1 Sustainable Tree Crop Development

Given the actual and potential benefits derived from tree crop systems in Africa, there has been inadequate attention focused on their development. In the light of this, USAID/AFR/SD are examining needs and options for a sustainable tree crop development program. Strategies for developing, supporting and implementing such a program, involving both international and local African agribusiness firms and associations, as well as other US agencies, are currently being researched. Possible programme components that will be examined include: cross country cooperation in small-holder technology development and transfer; expanding the area of well performing clones; innovative efforts to increase the participation of private 'for profit' and 'not for profit' groups, in provision of support services for rural, and especially female, small holders; strengthening private sector tree crop associations; promoting linkages between US and African associations and firms; and promoting regional and national marketing and trade efforts that can increase the competitiveness of African Tree crops.

It was within this evolving tree crops framework and because of the importance of cashew in Eastern African tree crop systems, that the cashew study tour was developed.

2. Objectives and purpose of the study tour

The present study tour, concentrating on cashew, will particularly allow:

1. The major players from a number of Eastern African countries, involved in various aspects of cashew, to meet and visit a number of useful research, production and processing sites in Mozambique and Tanzania. The tour of these sites and facilities will allow the exchange of knowledge and ideas in a practical environment and thus help focus thoughts on areas of possible interaction. It will also highlight the potential benefits of interaction between the players in the Region. In addition, there will be direct benefits to the participants in learning, at first hand, techniques and approaches in the context of their practical application.
2. The participants will become familiar, at the practical level, with recent developments in the move towards establishing a regional tree crops programme/network. It will start to enable the potential partners in the Network to become cognisant of each other's facilities and expertise. Considering the importance of cashew to smallholders and the region of East Africa as a whole, cashew will almost certainly be one of the focal crops of the network. The study tour will facilitate, in a very practical way, the development of regional ideas, strategies, work plans to promote cashew from production to the finished processed product, thereby enhancing income generation for a broad spectrum of resource poor farmers, factory employees and also traders and processors.

3. Participants

Country	Name and position	Organisation and address
Kenya	Mr F C Mng'ong'o	Coast Development Authority, PO Box 1322, Mombassa, Kenya. Email cda@africaonline.co.ke
	Ms Levina Lenjo District Cooperative Officer	Ministry of Cooperative Development, PO Box 25, Kwale, Kenya Tel – 254 – 0127 – 4175
Madagascar	Mr Dermot McHugh Regional Director	Landscape Development Interventions, 2, rue Barriquand, La Corniche, BP 62, Mahajanga, Madagascar. Email dmh@chemonics.mg
	Mr Xavier Metz Programme manager	Aqualma, BP 93, Quai Moriceau, Mahajanga, Madagascar. Tel (261) (20) 622 36 06
	Dr Rakotovao Zoeliarsoa Tree breeder	Departement de Recherche Forestiere et Piscicole (DRFP), FOFIFA. Email fofifa@bow.dts.mg
	Dr Solomon Ramahefarison Regional Director	FOFIFA North West Region. Tel 62 – 224 – 42 Email fofifano@dts.mg
Mozambique	Mr Rafael Uaiene Director	INIA (Instituto Nacional de Investigacao Agronomica), Av. Das F.P.L.M., nr 2698, Maputo, Mozambique. Email rafael@uaiene.uem.mz
	Mr Humberto Guibunda Programme manager	INCAJU (Instituto Para o Desenvolvimento do Caju, Rua da Resistencia, nr. 1746 – Bloco "B", Maputo, Mozambique. Email cwg@mail.tropical.co.mz
	Mr Carlos Costa Agri-business consultant	Technoserve, Av. 25 de September No 63 Nampula, Mozambique Email cmcosta@teledata.mz
Tanzania	Dr Shamti Shomari Director	Naliendele Agricultural Research Institute, PO Box 509, Mtwara, Tanzania. Email nari@raha.com
	Dr Peter Masawe Head of cashew research	Naliendele Agricultural Research Institute, PO Box 509, Mtwara, Tanzania. Email nari@raha.com
	Mr Lemenc Kikoka Agri-business consultant	Technoserve Tanzania, PO Box 2117, Arusha, Tanzania. Email tserve@vako.habari.co.tz
UK	Dr Clive Topper Tour Leader	Oakwood, Hawthorne Lane, Farnham Common, Bucks SL2 3SW United Kingdom. Email topper@agsystems.demon.co.uk Phone/fax: + 44 1753 646 289
	Professor Peter Caligari Tour Leader	Dept. of Ag. Botany, School of Plant Sciences, The University of Reading, Whiteknights, PO Box 221, Reading, Berks RG6 6AS, UK. Email P.D.S.Caligari@reading.ac.uk Tel +44 118 931 6684

4. Logistics

The logistics for the tour were undertaken by a number of organisations. In Tanzania all arrangements were made by Naliendele Agricultural Research Institute. In Mozambique, logistics in Maputo and Nampula were handled by INIA / INCAJU and World Vision respectively. The excellent job done by all of these parties is very much appreciated – see also Section 7, “Acknowledgements”.

External arrangements were handled by USAID/USDA in USA and by Prof. Caligari, Dr Topper and BioHybrids International Ltd in UK.

5. Brief overview of itinerary

Day	Date	Activity
1	Thursday – 16 th September	Participants arrive in Maputo, Mozambique
2	Friday - 17 th September	Tanzanians arrive via Pemba. Visit hand processing factory in Maputo.
3	Saturday - 18 th September	Fly to Nampula, depart at 0700hr and arrive 1000hr. Visit Cashew Rehabilitation Project nursery.
4	Sunday - 19 th September	Visit Entreposto, dwarf breeding programme, grafting (3 techniques), topworking, large-scale trial & factory.
5	Monday - 20 th September	Visit ADPP cashew selection programme and problems (<i>Anthracnose</i>), farmer training, fungicide trials.
6	Tuesday - 21 st September	Visit World Vision nursery at Muecate and fungicide/sanitation trial. Visit Nassuruma, cashew breeding programme (mother tree selection, dwarves)
7	Wednesday - 22nd September	Fly to Mtwara, Tanzania
8	Thursday - 23 rd September	Naliendele – Laboratories, breeding programme, nursery, trials Cashew Board of Tanzania
9	Friday - 24 th September	Integrated Cashew management programme. Cashew Development Centre Extension office in Masasi
10	Saturday - 25 th September	Naliendele – presentations and discussions
11	Sunday - 26th September	Fly to Dar es Salaam Discussion forum for sustainable tree crops programme and cashew in general
12	Monday - 27 th September	Visit Cashew Development Fund. Visit Mikochei Agricultural Research Institute - see Biotechnology labs
13	Tuesday - 28 th September	Depart for home; Mozambicans & Topper return to Mtwara
14	Wednesday - 29 th September	Charter Mtwara to Nampula for Mozambicans and Topper

6. Detailed itinerary, purpose of visits and issues raised.

In this section it is intended to give a brief description of the **main issues** related to each field visit, which in turn will make clear why the particular visit was included in the agenda. The issues related to each field visit then acted as a focal point for discussion.

Hand processing factory (Madeira E Filhos, Lda.), Maputo – Friday, 17th September

Cashew processing is a very contentious and important issue for all Eastern African cashew producing countries. A major issue is the relative merits of hand processing (as used in India) compared with the large-scale mechanised factory approach. Hence visits to both types of processing unit (see later in the report for the large-scale factory visit) were very useful.

In Tanzania, cashew production has increased from around 16,000 tons in the late nineteen eighties to over 100,000 tons by the late nineteen nineties. One very important factor contributing to this impressive increase in production was the liberalisation of cashew marketing and the fact that the farmers were paid a good price for their produce. However, virtually all cashew is exported raw to India for processing. Twelve large-scale factories remain idle, indeed some have never processed a single cashew nut.

In the early 1970's, Mozambique was the world's major cashew producer; production now languishes around the 40 to 50,000 ton mark. Again, here there are many large-scale factories (15), nearly all of which have closed down. Companies and unions have lobbied the Government to ban the export of raw nuts, in order to allow the factories cheap access to nuts. The Government has not taken such drastic action but it has increased the export tax on raw nuts from 14% to around 20%. The overall result is that this tax is passed directly to the farmer, depressing farm gate prices and making increases in productivity and quality very difficult to achieve.

Processing is also an important issue for Kenya and Madagascar. In Kenya, one large-scale factory has closed but on the other hand, a new hand processing factory has recently started and there are some interesting processing initiatives from farmer associations. In Madagascar a large scale "Oltremare" factory has recently come on line.

Cashew Rehabilitation Project nursery – Saturday, 18th September

The Cashew Rehabilitation Project has been running for over 10 years. Its main objective has been to produce seedlings for distribution to farmers and to train farmers in the technique of grafting. Over 70% of the seedlings distributed are from "selected local mother trees". This approach relies on the visual identification of 'good' mother trees based on certain selection criteria. These trees are then cloned for distribution to farmers. At the INCAJU Strategy Workshop it was agreed that this approach has some serious drawbacks in that the mother tree's immediate environment is likely to be an important factor in the tree's performance rather than its genetic make-up. Hence when the mother tree is cloned and planted in a new location the performance of the original mother tree is unlikely to be repeated.

The remaining trees distributed to farmers have been of the Brazilian dwarf type, but again their performance has not been satisfactorily demonstrated so far – see next section.

Another important issue was the fact that the nursery operation was totally unsustainable. The price of seedlings to farmers was Mt 3,000 but the real production cost was Mt 12,000 (= \$1). In spite of the 75% subsidy, many seedlings were given away.

Entreposto dwarf breeding programme, large scale trial & factory – Sunday, 19th September

Entreposto is a large, diversified Portuguese company with interests in cashew processing and breeding. Three different grafting techniques were nicely demonstrated and also the end result of top-working.

Entreposto is probably running the biggest Brazilian dwarf selection/breeding programme out side of Brazil. Advantages and disadvantages associated with the Brazilian dwarf, as compared with other non-dwarf, selected trees were discussed at length. Brazilian dwarf advantages include:

- Large nut size
- Possibly lower powdery mildew levels due to its small size and canopy structure
- Easy to treat due to small size

Disadvantages:

- Possible increased susceptibility to *Anthracnose* and insect pests
- Susceptibility to fire
- Extended harvesting period

The fact that there is very little quantitative data available from Eastern Africa, to support or reject these claims makes it premature to recommend dwarfs to the farmers at this time (see also next section).

The Entreposto factory was visited to show participants an example of a large-scale, mechanical cashew processing facility to compare with the hand processing factory visited in Maputo. The break even point for this factory is estimated at around 6,000 tons of raw cashew nuts per annum, depending on the prevailing producer price.

ADPP cashew selection programme, farmer training & fungicide trials - Monday, 20th September

ADPP (a non-governmental organisation) is also carrying out a cashew selection programme with the objective of selling selected clones to farmers. However this programme recently experienced a major problem, in which one block in particular, of Brazilian dwarf progenies (ex Zambia) was devastated by *Anthracnose*, requiring applications of copper based fungicide, severe pruning and the elimination of some trees. The problem still remains. For the first 4 or 5 years after planting the problem was not noticeable. The experience is of particular relevance to all countries embarking on a cashew replanting programme with unproven material.

On-farm trials for the control of powdery mildew, the most important biotic constraint, were also seen. The differences between the potential yield of the fungicide treated trees

compared with the untreated trees, was visually very significant. Until recently, the estimated 26 million older trees growing in Mozambique had been assumed to have virtually no potential at all. These trials and many others elsewhere, have demonstrated that:

- fungicides can effectively control powdery mildew and
- many of the existing stock of older trees have a good yield potential

A creative example of how to get extension messages across to farmers was given by ADPP actors and actresses in the form of a play (usually performed in villages) about the problems of powdery mildew and how to control it.

World Vision nursery at Muecate and fungicide/sanitation trial –Tuesday, 21st September

Like other projects, one of the major objectives of the World Vision (WV) programme is to assist in the planting of new cashew. Initially WV was supplying cloned "mother trees" to farmers as described above. However in the light of the INCAJU strategy workshop where the "mother tree" approach was questioned, WV changed its strategy to focus on the introduction and evaluation of cashew material from Tanzania. This new approach was discussed at length both at this site and also at subsequent sites.

A trial, testing the feasibility of controlling powdery mildew by cultural means (sanitation) was visited. It has been demonstrated in Tanzania that sanitation can push back the start of the powdery mildew disease epidemic and hence reduce the number of fungicide applications, but so far no actual benefit in yield has been shown through sanitation alone. The issue of fungicide cost is always an important one for resource poor farmers, therefore sanitation can have a valuable role to play in an integrated approach to cashew management.

Another on-farm fungicide trial was visited and again the benefits of fungicide application could clearly be seen.

CRP cashew breeding programme at Nassuruma –Tuesday, 21st September

As was noted under the entry for 18th September the Cashew Rehabilitation Project has been running for over 10 years, with the objectives as previously noted.

A range of germplasm was present at the site including local material, including some transferred from Ricatla, as well as some Brazilian dwarf trees and their derivatives. A range of trials had been set up but mostly without any formal statistical design. Thus the assessment of the material was mostly carried out on the basis of breeders' observations. The site has been developed over the period of the project but has the drawback of being in a relatively isolated site and without standard mains supplies (eg electricity). A number of techniques for grafting had been very successfully developed to allow propagation of cashew to be carried out and training in these techniques had been given to villages. Little specific breeding, in terms of making specified crosses had been carried out.

There were small-scale ("look see") ad hoc applications of pesticides to the collection to gain an impression of the impact that these might have on particular groups of genotypes. In addition, fungicide trials were being carried out on older trees.

From the Centre the activities related to Mother Tree selection had been carried – the shortcomings of which have already been highlighted.

Naliendele Research Station – Thursday 23rd September

Naliendele Agricultural Research Institute (NARI) is the main agricultural research institute in Southern Tanzania responsible for research into cashew, and other crops that are important to the local economy such as root and tuber crops and oilseeds. Two complete days were spent at NARI, visiting the laboratories, field trials and nursery; participating in presentations and discussions of both current and past research work. The two days were very productive and made visitors aware of the large amount of research that has been conducted in Tanzania on cashew and the good level of expertise available locally in East Africa.

The other important issue that emerged was the sustainable nature of cashew research at Naliendele. Towards the end of the Cashew Research Project, (CRP - funded by the Department for International Development (UK), the Government of Tanzania and World Bank), mechanisms were established to collect a levy on cashew exports to fund research and development. The CRP finished in 1996 and since then cashew research has been funded from the levy and the Institute has continued to carry out good quality research and function in an exemplary manner. This is an excellent example of sustainable development, for which the Naliendele scientists are to be congratulated.

NB. The CRP was a component within the larger Cashew Improvement Programme, CIP.

Cashew Board of Tanzania (CBT) – Thursday, 23rd September

The CBT was once the powerful cashew marketing board of Tanzania (TCMB) but now its main functions are to collect the export levy, issue licences to cashew traders and maintain the 12 unused processing factories owned by CBT. For this it receives one third of the levy money. Very soon it will hand over the factories to the Government. The main point of discussion was CBT's desire to introduce some form of export ban on raw nuts or a high tax, to allow the factories to buy raw nuts cheaply in order to start processing again. One of the key factors in the remarkable increase in cashew production in Tanzania, was the improved farm gate price paid to farmers as a result of liberalisation. CBT wants to significantly reduce the price paid to farmers (some of the poorest smallholders in Africa) to allow its factories to compete with Indian processors. In effect, CBT's strategy would penalise large numbers of poor farm families in order to subsidise an uneconomic processing industry. Fortunately this is unlikely to happen in Tanzania. What is really required is more imaginative thinking and investment to tackle the processing problems (particularly at the technical level) facing East African countries.

Integrated Cashew Management Programme – Friday, 24th September

This was an intensive and long field trip to Newala and Masasi to see the Integrated Cashew Management programme. The ICM programme is the culmination of much of the research that has been conducted in Tanzania. A range of technologies or "basket of options" is being tested on-farm by farmers themselves. A very important aspect of the ICM programme is the process of two-way transfer of knowledge from research to the farmer and from the farmer to research, to allow farmers to adapt these technologies to suit their own socio-economic and ecological circumstances. This aspect of adaptation is crucial because of the tremendous variability that exists within cashew, from tree to tree, from farm to farm, village to village and from year to year. It has been found that the simple extension messages, which characterise

the typical Training and Visit (T & V) extension system, are not appropriate in such a variable agro-ecosystem.

District Extension office, Masasi – Friday, 24th September

A call was made to the District extension office in Masasi to meet the DALDO (District Agricultural and Livestock Development Officer) and discuss extension matters. The second phase of the World Bank extension programme has recently started. The first phase promoted the typical, rigid T & V system at an unsustainable cost of \$25 million; the second phase hopes to inject a more participatory approach into the T & V system, at a cost of another \$25 million. It will be a difficult transition process. Other local sources of funding are being explored in an attempt to make the extension service eventually sustainable, but the most obvious source will be an even higher tax on cashew.

Naliendele – presentations and discussions – Saturday, 25th September

See "Naliendele Research Station – Thursday, 23rd September".

Tree Crops Network meeting, New Africa Hotel, Dar es Salaam – Sunday 26th September

All of the participants on the Cashew Study Tour were present.

The scene was set with the presentation of the rationale for a Tree Crops Network and the suggested activities such a network might undertake; this was taken from a report entitled:-
"Assessment of Options and Opportunities for Tree Crop Development in East and West/Central Africa" by Dr Clive P Topper and Professor Peter Caligari.

The above report was a synthesis of two reports, one specifically for East Africa and another for West/Central Africa.

There was unanimous agreement on the need and the potential value of a tree crops network along the lines proposed. The forum then discussed what modifications and additions were necessary.

The following additions were proposed as being needed or requiring additional emphasis.:

Processing

- increase efficiency of processing - both small and large scale
- developing appropriate technology
- information on different techniques
- information on packaging and building brand image

Database

- information on expertise
- sources of information
- publications
- institutions

Regional Research

- Regional Trials – co-ordinated multi-locational trials

Proposed Structure

Need an Executive Secretary and a SMALL administration at a specific location as a focal point for the Network.

Need a Steering Committee of modest size but the representation needs careful consideration - simple official country representation will probably not work. The Chairman and members need a fixed term for their appointment and the Chairman needs to rotate between disciplines / countries.

The whole structure needs to be transparent, light and flexible.

Examples of possible models included SACCAR and ASERECA.

Other countries might be considered as members.

NB. Name of Network might need consideration as Mozambique is not traditionally included in "East" - possibly could be Eastern Africa Tree Crops Network.

Research Priorities

- Germplasm
- Crop Protection
- Market Development
- Processing Technology
- Biotechnology
- Socio-economics - including business development, technology impact and constraints
- Effects of chemicals
- Climate effects and crop modeling
- Soils and management
- Fire management
- Technology transfer
- Use of "by-products" including apples and CNSL
- Cause of low yielding trees
- Diseases + pests - effects on nut quality
- Propagation

All the above points and issues were thoroughly discussed.

A letter from Jeff Hill was distributed and finally the participants were requested to send their comments regarding:-

- The usefulness of the cashew study tour and
- The potential of a tree crops network

to Jeff Hill, USAID Washington. Many participants sent their comments to Washington DC and these are being assessed and views taken into account for the future development of the programme.

Cashew Development Fund (CIDEF) – Monday, 27th September

Sustainability of cashew research and development is dependent not only on having a suitable level of expertise available but also on adequate funding. With the cessation of funding from the World Bank and from the Department of International Development (UK) (through the Cashew Improvement Programme), obtaining adequate funding in a timely

manner from the cashew export levy was and remains critical for sustainability. The levy is collected by the Cashew Board of Tanzania and then two thirds of it is handed over to CIDEF. The Executive Secretary explained the structure of CIDEF and how it works. It is managed by a 7 person board of trustees and a small management team.

Unfortunately it appears that the board is being disbanded by the Government as a result, it is alleged, of non-compliance with having its accounts audited.

Mikocheni Agricultural Research Institute biotechnology labs – Monday, 27th September

The work on developing tissue culture techniques and the application of molecular markers were presented and the facilities available were demonstrated.

Cashew has proved to be a recalcitrant species as far as tissue culture techniques have been concerned although progress was demonstrated on tissues and explants from juvenile material – investigations were continuing on extending this to explants from mature trees. The possibility of being able to store and multiply disease-free material was clearly a justification for continuing investigations in this area.

The PCR technique of Random Amplified Polymorphic DNA (RAPD) had been applied to a range of cashew germplasm and showed the potential that such techniques had to aid identification and exploitation of cashew germplasm.

The added advantage of being able to exploit molecular markers include: the potential to quantify the out-crossing rate in cashew; to uniquely identify cashew clones; to assess levels of biodiversity and its relation to origin, as well as opening the longer term possibility of tagging important agronomic traits with molecular markers (QTLs).

7. Acknowledgements

A large number of people from a number of institutions were responsible for making the study tour a success. The authors would like to thank all of those persons involved, particularly the following.

Mr Alvaro Martins of the Madeira E. Filhos cashew processing factory in Maputo.

Mr Rafael Uaiene from INIA and Ms Clementina Machungu of INCAJU

Mr Paulo de Carvalho and his technicians from Entrepasto.

Ms Else Marie and her group of technicians, actors and actresses at ADPP.

At World Vision, Mr Renato Gordon, Mr Gary Bayer, Mr Joao Bobotela, Dr Chris Aszansi, Mr Eliezer Camargo and technicians.

Mr Americo Langa, Mr Moises Basilio and Mr Alfredo Nampuo of the Cashew rehabilitation Project

At Naliendele Agricultural Research Institute, Dr Shamti Shomari, Dr Peter Masawe, Mr Louis Kasuga, Dr Emmarold Mneney and many others

Dr Alois Kullaya at Mikocheni Agricultural Research Institute.

We would also like to thank all USAID personnel in the different countries for facilitating the attendance of the participants and in particular Mr Bob Wilson from USAID Mozambique for organising the flights from Mozambique to Tanzania. Special thanks should go to Mr Jeff Hill and Ms Cathy Watkins of USAID / USDA Washington for making it all possible financially and logistically.

Finally we would like to extend our thanks and appreciation to all the tour participants for being such an enthusiastic and amiable group.

Dr Clive Topper
Oakwood
Hawthorne Lane
Farnham Common
Bucks SL2 3SW, UK
(email: topper@agsystems.demon.co.uk)

Professor Peter Caligari
BioHybrids International Ltd
P O Box 2411
Reading RG6 5FY, UK
(email: petercaligari@biohybrids.ac.uk)

and
Department of Agricultural Botany
School of Plant Sciences
The University of Reading
PO Box 221
Whiteknights
Reading RG6 6AS, UK
(email: p.d.s.caligari@reading.ac.uk)