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Enhancement of coffee quality through prevention of mould formation

Project progress report as at December 2004

Background

A copy of the latest progress report for the project "Enhancement of coffee quality through prevention of mould formation", is attached. The report covers the period January – December 2004.

Action

The Council is requested to note this report.

FAO Project Ref: GCP/INT/743/CFC
CFC Project Ref: CFC/ICO/06
Annual Project Progress Report Jan-Dec 2004

April 13th 2005

Enhancement of Coffee Quality through Prevention of Mould Formation

PROJECT PROGRESS REPORT

for

Enhancement of Coffee Quality through Prevention of Mould Formation

Report No. 8

I. Project Summary

1. Title: Enhancement of Coffee Quality through Prevention of Mould Formation
2. Number: GCP/INT/743/CFC and CFC/ICO/06
3. Project Executing Agency (PEA): Food and Agriculture Organization (FAO)
4. Location: Brazil, Colombia, Côte d'Ivoire, India, Indonesia, Kenya, Uganda, CIRAD (Montpellier), Ecuador (CFC/ICO/25FT)
5. Starting Date: 13th September 2000 (Disbursement of AA by CFC)
6. Completion Date: September 30th 2005 (CFC Funds)
   September 30th 2005 (Dutch Govt. Funds)
7. Financing:
   - Total Project Cost: USD 6,242,000
   - Of which:
     - CFC Financing (Grant): USD 2,526,000 (under CFC/ICO/02) and USD 60,000 (under CFC/ICO/25FT)
   - Co-financing:
     - European Coffee Industry USD 367,000
     - Dutch Government USD 1,500,000
   - Counterpart Contribution:
     - CIRAD USD 200,000
     - EMBRAPA (Brazil), CENICAFE (Colombia), CBI (India) USD 226,999 each
     - ICCRI (Indonesia), CNRA (Côte d'Ivoire), UCDA (Uganda), CRF (Kenya) USD 227,000 each

II. Period Covered by this Report

From: January 2004 To: December 2004

III. Status of Project Implementation

Administrative/Financial: Comprehensive country budgets, experimental protocols and work plans for January to December 2004 were finalised by the PEA in conjunction with the project Collaborating Institutions (CIs) at the end of 2003 and during the first weeks of 2004, a process that was repeated at the end of 2004 for the 2004/2005 season. These were approved by the Common Fund for Commodities (CFC), the Dutch Ministerie van Buitenlandse Zaken (MvBZ) and the International Coffee Organization (ICO), with an agreed 2004 budget of US$ 1.256 million. A minor increase of US$ 32,476 in the overall 2004 budget was subsequently requested in a budget revision submitted to the Fund on 15th April 2004.

Project stakeholders also met at the Fund on 8th December 2004, and discussed final project activities for 2004/2005. It was agreed that the Final Dissemination Workshop of the project would be held in Salvador, Brazil in September 2005 to coincide with the second World Coffee Conference. The project completion date was extended from June 30th 2005 to September 30th 2005 to accommodate this final meeting and workshop. A final budget revision was also discussed, and presented to the Fund on December 15th 2004, the revised 2004 budget of US$ 1.562 million being approved by the Fund on December 20th 2004.

A Project Team Meeting was held in Rome between April 28th and April 30th 2004 to discuss technical matters and examine the data generated in trials completed in 2003/2004 in order to guide future work. This was attended by officers from FAO, as well as the project mycologist and experts from CIRAD. A second meeting was held in early September 2004 to plan the final set of trials and investigations under the project, scheduled for the 2004/2005 season.

The final project Supervisory Mission by Mr Caleb Dengu of the CFC was completed in Indonesia in early December 2004.

In order to facilitate the technical guidance required by the collaborating centres in the seven participating countries, a new Letter of Agreement with CIRAD was concluded in January 2004, to cover activities during the rest of the year. CIRAD involvement in project implementation has focused on:

- Socio-economic analyses based on case studies in Indonesia and Uganda, working alongside national consultants and CIs;
- Statistical design of field trials and surveys, and statistical analysis of resulting data, by CIRAD bio-statistician;
- Technical supervision in the field and from home station, primarily of the three African project countries;
- OTA analysis for countries in Africa that do not have access to reliable analytical services;
- Participation on the elaboration of a CD-ROM based resource manual on the application of hygiene principles to the coffee chain.

In addition to the global coffee mould project, the Food and Agriculture Organization of the U.N. has approved the following four Technical Cooperation Projects (TCP) since 2002:

- Uganda (TCP/UGA/8923 and TCP/UGA/2801 – 'Enhancement of Coffee Quality through the Prevention of Mould Growth'), concluded 31st March 2003, total value US$ 422,000.
- Vietnam (TCP/VIE/2903 – 'Improvement of coffee quality and prevention of mould formation and ochratoxin A (OTA) contamination'), approved in September 2002, value US$ 372,000.
- Thailand (TCP/THA/3002 – 'Improvement of coffee quality and prevention of ochratoxin A on Robusta coffee'), approved March 2004, value US$ 368,000.
- Ecuador (TCP/ECU/3001 – 'Prevención de hongos productores de Ocratoxina A (OTA) en el café ecuatoriano'), approved July 2004, value US$215,000.

Field activities: The implementation and preparation of field activities has been ongoing in all project countries throughout 2004, and into 2005. Final investigations are focussed on field trials aimed at determining and seeking to finalise those critical control points in the coffee chain where the problem of

OTA contamination of coffee is most likely to be introduced, and in establishing best handling and processing practices to minimise such contamination.

The sections below provide more detail on individual activities under the project by each collaborating country. The matrix in the next section of this report summarises the situation by Activity. Work under Activity 1.1.1 on determining A_w windows for OTA producing *Aspergilli* has now been completed, which has informed the selection of critical control points to underpin an industry-wide Code of Practice. Similarly, the microbiological work forming part of Activities 1, 2 and 3 has largely been completed with all first and second phase sampling concluded, and contamination locales identified. However, in some areas, relatively high frequencies of *Aspergillus ochraceus* infection were found. As a result, additional survey work was undertaken in 2003/2004 to try to ascertain how the organism exists in the environment, and to gain some clearer ideas as to how coffee infection generally occurs.

Experimental protocols agreed for 2004 were, in most cases, put in place (please refer to individual country reports below for further details). These have included:

- Investigating the effects of hindered drying, delayed processing, and stirring frequency on drying time courses;
- Final drying surfaces comparison trials, including investigations into tree-drying;
- Analysing whether there is a link between bean defects and OTA production;
- Final trials on the storage of dry and fresh beans/cherries;
- Final composting investigations;
- Various market chain surveys and socio-economic studies.

The project is now in the final stages of trying to clarify a few important and practical points concerning practices along the coffee chain - previous field work has allowed the project to now focus on a fairly narrow set of issues including the risk of certain defects and the effect of drying on tarpaulin. This will ensure that any recommendations made by the project are based on sound statistical and scientific information that will stand up to close scrutiny, and allow the project to be confident about advice being developed.

The main outputs of these trials will be:

- Concrete recommendations on drying practices. Although the project can make general recommendations regarding drying practices, which have already been disseminated widely, the aim of the final set of field trials is to make these as conclusive as possible;
- Clarification of the impact of wet processing on the risk of OTA contamination;
- Recommendations on feasible methods of moisture management at all stages of the marketing chain;
- Advice regarding correlations (if any) between bean defects and OTA contamination;
- Analysis of feasibility of particular interventions in the coffee chain in selected countries.

Training activities: Sustainably reducing levels of OTA contamination of coffee in producing countries depends heavily on implementing effective programmes of training for everyone involved in the coffee sector.

As well as ongoing national training programmes derived from previous Training of Trainers' (ToT) events, planning of additional Training of Trainer's courses on "Application of food hygiene and HACCP principles to the coffee chain" has continued. A sub-regional ToT course was delivered to participants from 8 countries took place in Guatemala (11th-22nd October 2004). A final national 1-week ToT course was concluded in India just after the 2004 ASIC Conference. Unfortunately, deterioration in security in Côte d'Ivoire meant that the sub-regional ToT there scheduled for November 2004 had to be cancelled. This has now been rescheduled for May 23rd to June 3rd 2005 and will take place in Rwanda, with participants from the eight main Francophone African producer countries.

The CRF quality laboratory hosted an OTA analysis training course in April 2004 for participants from Côte d'Ivoire, Kenya and Uganda. In early 2005 three staff from CENICAFE attended a training course in HPLC analysis at the Universidad Nacional de Colombia, Bogotá. The CENICAFE laboratory has

been upgraded to full HPLC analysis specification during 2003, and this training is complementary to that effort.

The aim has been to develop groups of trainers within each country who are then responsible for providing training to selected target groups as required. As noted in the previous progress report, it has become apparent that relevant institutions will benefit from a comprehensive training resource package to provide guidance in preparing their own training activities once the global project has concluded. Following a planning meeting in Brazil in February 2004 to outline the content of an interactive CD-ROM training resource on Good Hygiene Practices along the coffee chain, a lot of effort has been put into pulling together the material and designing the resource. A graphic designer has been engaged to develop this complex product, and a beta version will be circulated for peer review in April 2005. The project website (from which the GHP CD-ROM referred to above will be accessible) is being completed alongside the CD-ROM, and will be live in May 2005. Both products will be available in English, French and Spanish.

Finally, a one-day 'Sensitization of Stakeholders' seminar was held on 8th October 2004 in Guatemala, targeting senior decision- and policy-makers, and built on similar activities held in Kenya and Uganda during 2003. Arrangements for this event were made with the assistance of PROMECAFE.

Other capacity building: Procurement of equipment to assist the completion of the above activities, and to support national capacity building in project countries, has now finished. Purchase of items of HPLC equipment (manual injector, spectrofluorometric detector, data control system) for CNRA, Côte d'Ivoire, was completed in 2004. Purchase and installation of a Shimadzu modular HPLC system was completed for UCDA, Uganda in late 2004. Refurbishment and rehabilitation of existing Perkins Elmer HPLC equipment owned by CRF, Kenya was completed during the first half of 2004 as a low-cost option to upgrade Kenya's national capacity in OTA analysis.

Purchase of additional computer equipment for Côte d'Ivoire, as well as AV equipment for Côte d'Ivoire and India has been completed in this period (Activity 4.4.4), as has the purchase of laboratory ovens and other field / laboratory equipment and supplies for Brazil, Colombia, Côte d'Ivoire, India, Indonesia, Kenya and Uganda (Activity 2.1.1).

Planned Activities		***Target Set***	***Present Status***
Component I: Diagnosis in chosen participating countries			
Activity 1.1.1	Laboratory experiments at the CoE to determine A_w windows for different OTA producing fungi.	Identify OTA producing *Aspergilli* Identify exact window of action for OTA producing *Aspergilli*, and importance of competing yeasts.	**Completed.** **Completed.** OTA production window sufficiently defined. Report completed.
Activity 1.1.2	Validation of critical A_w windows through experiments in collaborating centres in project countries.	Establish operating (drying) conditions in each country and relate observed A_w with mould and OTA contamination.	**Near completion.** Core validation completed, and final related experimental trials in progress 2004/5 under Activity 2.1.2.
Activity 2.1.1	Selection and acquisition of optimal moisture measuring equipment for use by collaborating centres.	Methods of moisture analysis established for all participating centres and all necessary equipment acquired.	**Completed.** Equipment procured for Brazil, Colombia, Côte d'Ivoire, India, Indonesia, Kenya, and Uganda. Low-cost Chinese made moisture meters procured and evaluated. Additional equipment (thermo-hygrometers, A_w meters, solarimeters and anemometers) procured for drying trials (Activity 2.1.2).

Activity 2.1.2	Conducting drying experiments in collaborating centres.	Improved and appropriate drying procedures established in participating countries.	**Near completion.** Drying experiment protocols developed for all countries and final trials ongoing including investigations re: delayed drying, tree-drying, re-wetting, raking, drying layer thickness etc. See below for details.

Planned Activities		***Target Set***	***Present Status***
Component I: Diagnosis in chosen participating countries contd.			
Activity 3.1.1	Sound ecological understanding of fungal communities - design trials to investigate and evaluate conditions during processing, storage and transportation, allowing for comparative analysis of production practices.	Determine the relationship between the fungal communities, mould growth and conditions of processing & storage.	**Near completion.** First and second phase sampling concluded and contamination locales identified. Summary mycological studies report for each country completed. Final research trials on storage of dry and fresh beans/cherries and impact of processing regimes being completed 2004/5. Final international transportation trial (Uganda to Europe) completed early 2005. Survey of coffee chains to help evaluate CCPs being completed in 2004/5 in Côte d'Ivoire, India, Indonesia and Uganda. Interim findings from Uganda chain survey reported by CIRAD.
Activity 3.2.1	Systematic and objective evaluation of field trials, verification of risk of re-contamination via by-products and optimization of their disposal.	Determine risk of contamination from pulp and husk.	**Near completion.** Inconclusive evidence to date re: mulching and composting. Results from dust contamination and composting trials from India analysed, and additional composting trials in Colombia and India scheduled for completion early 2005.
Activity 3.3.1	Determination of valid critical control points for dissemination, based on field trial results.	Determine and disseminate code of good agricultural and manufacturing practice and HACCP-based tools for coffee chain.	**Near completion.** CCPs determined and working operational limits established and incorporated into ToT courses and training materials as well as ECF Code of Practice. See also Activity 5.1.1 for details.
Activity 3.4.1	Conduct feasibility studies on proposed recommendations of changes in practices and uptake of recommended technologies. Studies to cover socio-economic as well as non-economic feasibility aspects, and to look at investment project possibilities.	Feasibility studies completed with socio-economic analysis and recommendations/justifications for proposed practices/technologies.	**Ongoing.** Interim socio-economic studies on solar dryer technology completed in Uganda. Socio-economic studies being undertaken in Côte d'Ivoire and India in 2004/5. CIRAD overseeing socio-economic studies and surveys in Uganda and Indonesia during 2004/5, involving national consultants and local counterparts. Global economic-based study to determine the impact and costs of adopting recommended hygiene practices along the coffee chain commissioned from LMC International in April 2005.

Planned Activities		*Target Set*	*Present Status*
Component II: Dissemination of Good Practice / HACCP tools			
Activity 4.1.1	Establish links among all the collaborating institutions.	Creation of active OTA network in coffee-producing countries.	**Ongoing.** Regular communication maintained among officials of all collaborating institutions, PEA and Consultants. Regional OTA workshop held in October 2002, Indonesia. Full project meeting held in March 2003, Uganda. Project collaborator participation in ASIC 2004.
Activity 4.1.2	Develop a directory of expertise available in collaborating countries.	Directory of expertise in participating countries developed and disseminated.	**Ongoing.** Expertise being incorporated into *'Good Hygiene Practices along the coffee chain'* training resource.
Activity 4.2.1	Training of counterpart personnel in latest techniques for determination of OTA, A_w and moisture content in coffee, and in coffee related field and laboratory based microbiological techniques.	National personnel in all participating countries trained in relevant mycological and chemical analyses and laboratory procedures.	**Completed.** Field mycology workshops completed in Brazil (Brazil + Colombia) and Kenya (Kenya + Uganda + Côte d'Ivoire). Additional training provided by project mycologist during technical backstopping missions and for Côte d'Ivoire in May and December 2003, and in Brazil and Colombia in 2004. TLC OTA analysis training completed in Uganda, December 2002 and HPLC training completed for Côte d'Ivoire, Kenya and Uganda in April 2004. Study tours of Nestlé NQAC, Singapore completed by Coffee Board of India and ICCRI. Coffee Board of India study tour to Brazil completed in September 2003 re: OTA analytical techniques and regulatory systems. CENICAFE staff trained in HPLC analysis at Mictox in 2005. Good laboratory practices manual and training video on OTA analytical techniques produced by LACQSA, Brazil.
Activity 4.2.2	Procurement, installation and operation of lab equipment for mycological analysis, determination of OTA, A_w and moisture content.	Laboratory capacity strengthened in all participating countries.	**Completed.** Laboratory equipment and materials procured for all countries. Facilities upgraded in Kenya and HPLC equipment refurbished. HPLC equipment procured for Indonesia; HPLC and TLC equipment purchased for Uganda, and new laboratory constructed. TLC equipment procured in 2003 for Côte d'Ivoire and HPLC equipment procured in 2004. Analytical equipment procured for Colombia and India. Inter-laboratory proficiency ring test on OTA analysis commenced late 2004, run by LACQSA, Brazil, and scheduled to finish in September 2005.

Planned Activities		Target Set	Present Status
Component II: Dissemination of Good Practice / HACCP tools contd.			
Activity 4.3.1	Prepare, test and finalise training materials covering application of HACCP/GAP/GMP.	Training materials refined for GAP/GMP/HACCP. Training and education materials prepared for identified target groups throughout coffee chain.	**Near completion.** Basic ToT package developed. Seven ToT courses completed to date, covering 25+ producer countries. GAP/GMP '*Do's and Don'ts*' have been developed & circulated. Posters and farmer information leaflets produced. Further training materials and Level II courses at national level being developed and implemented (Indonesia, India, Kenya and Uganda). 'Wordless' booklet ('*COFFEA*') for training of farmers in good practices finalised and distributed globally by FAO in 2003.
Activity 4.4.1	Establish and maintain printed, video & computer based resources for training materials and technical information. Including CD-ROMs, video training aids, and Internet materials.	Training materials produced and available for circulation.	**Near completion.** Printed - smallholder farmer focussed posters and GMP/GAP *'Do's and Don'ts'* leaflets produced. Project mycological handbook completed. Training videos on HACCP/GMP/GAP and OTA analysis developed by LACQSA and MAPA, Brazil. Development of training resource *'Good Hygiene Practices along the coffee chain'* initiated and scheduled for completion and dissemination in 2005.
Activity 4.4.2	Disseminate training materials among coffee producing countries.	As above.	**Near completion.** Copies of *'COFFEA'* distributed to 45 coffee producing countries in 2003. Also refer to Activity 4.4.1.
Activity 4.4.3	Develop an Internet page, including bulletin board, and make available to all interested parties	Project website developed.	**Near completion.** As of April 2005, website being translated into French and Spanish. Scheduled to go live in May 2005.
Activity 4.4.4	Equip participating institutions with appropriate hardware, software and training in basic computer use and the Internet.	Procure computer equipment as required.	**Completed.** Computer and ICT equipment and / or Internet connectivity purchased for all project countries based upon identified needs.

Planned Activities		*Target Set*	*Present Status*
Component IIIa: Training & implementation of Good Practice / HACCP systems			
Activity 5.1.1	Organise training workshops, one for each sub-region, involving approximately 12 trainees per workshop.	Training workshops organised and completed.	**Completed.** Requirement exceeded. ToT courses completed in Ecuador (sub regional), Guatemala (sub-regional), India x2 (national), Indonesia (one national and one sub-regional), Kenya (sub-regional), and Uganda (national) involving 25+ trainees on each occasion. Under the Vietnamese FAO TCP a national ToT course was completed in late 2003. Under the Thai FAO TCP a national ToT course was completed in early 2005. A final sub-regional course for Francophone producer countries in Africa is scheduled for May 23rd to June 3rd 2005 in Rwanda, to replace course cancelled in Côte d'Ivoire in November 2004.
5.2.1	One training course in each producing country involving collaborating centres and trained trainers, to benefit 12-15 extension workers per course.	National training events organised and completed.	**Ongoing.** Stage 2 ToT courses in India implemented. Information sessions undertaken in Uganda, and Sensitization of Stakeholder's workshop completed in Guatemala, Kenya, and Uganda. Development of follow-up training materials underway with local farmers' school, and comprehensive Stage 2 training completed in 2003 /2004 in Indonesia. Extensive training in Colombia reaching thousands of farmers completed. Farmer training materials produced in Uganda.
Component IIIb: Monitoring and feedback - guidelines disseminated and compliance reviewed			
Activity 6.1.1	Prepare, test and finalise guidelines for GAP and GMP covering whole coffee industry based on the experiences gained and distribute to appropriate institutions and organizations.	Guidelines produced suitable for distribution to global coffee industry.	**Ongoing.** Guidelines circulated via ICO as ED 1763/00 Rev 1 in May 2001 based on the conclusions of the ASIC workshops in 1997 and 1999, and the findings of the Pilot Project. Subsequently replaced by draft Code of Practice (ICO document PSCB No. 36/02), finalised in June 2002, updated with work from the global coffee mould project.
Activity 6.2.1	Review application of GAP, GMP and HACCP control techniques at end of project in context of OTA contamination levels and compliance with suggested practices.	Review undertaken and reported on.	**Scheduled.** A comprehensive study to define and recommend changes in the national regulatory systems of all seven project countries that would be required to ensure the best take-up of project outputs scheduled for 2005.

Activity 6.2.2	Provide assistance on monitoring and control programmes to collaborating countries if required.	Assistance provided as requested by project technical officers.	**Scheduled.** Activity scheduled for end of project.

IV.1 Resource Utilisation to 30th December 2004 – CFC Funds

Budget Item	Budget Categories	CFC CFC/ICO/06 USD	CFC Fast Track ICO/25FT USD	2000 Exp	2001 Exp	2002 Exp	2003 Exp	2004 Exp
Personnel & Consultancy								
International Experts								
Coffee Specialist /Project Mgr	**V (5650)**							
Food Microbiologist/ Coffee Specialist	**V (5650)**	$4,000.00			$650.00			
Senior Mycologist	**V (5650)**	$106,444.25			$68,826.30	$12,617.95		$18,240.36
Project Administrator	**V (5300)**	$135,000.00					$57,126.92	$63,593.81
Sub-total		$245,444.25	$0.00	$0.00	$69,476.30	$20,617.95	$57,126.92	$81,834.17
National Experts								
Coffee Scientists, Field workers, Lab Analysts	**IV (5660)**	$208,000.00	$16,169.00			$16,000.00	$50,440.58	$53,163.62
Sub-total		$208,000.00	$16,169.00	$0.00	$0.00	$8,000.00	$50,440.58	$53,163.62
International Consultants								
Trainers	**V (5650)**	$50,000.00						$2,080.00
Socioeconomists	**V (5650)**	$17,284.39						$10,691.59
Training Material Specialist	**V (5650)**	$50,000.00						
Data Handling Specialist	**V (5650)**	$3,000.00						
Investment Project Specialist	**V (5650)**							
Sub-total		$120,284.39	$0.00	$0.00	$0.00	$0.00	$0.00	$12,771.59

Budget Item	Budget Categories	CFC CFC/ICO/06 USD	CFC Fast Track ICO/25FT USD	2000 Exp	2001 Exp	2002 Exp	2003 Exp	2004 Exp
National Consultants								
Agronomists	**V (5570)**	$10,000.00			$10,000.00			
Field workers	**V (5570)**							
Sub-total		$10,000.00	$0.00	$0.00	$10,000.00	$0.00	$0.00	$0.00
Official Travel								
Project Meetings	**VI (5900)**	$65,000.00		$121.89	$3,072.63		$7,881.60	
Field visits, ToT courses, Meetings, Other travel (local)	**VI (5900)**	$212,000.00			$3,345.08	$42,179.30	$64,913.16 $49,120.53	$96,028.57
Other travel (local etc)	**VI (5900)** **VI (5900)**	$140,143.00	$8,000.00		$13,000.02	$29,752.00	$54,141,96	
Sub-total		$417,143.00	$8,000.00	$121.89	$19,417.73	$71,931.30	$176,057.25	$96,028.57
Contracts								
Centre of Microbiological Expertise	**V (5650)**	$200.36		$200.36			-$9,216.34	
Other Institutions	**V (5650)**	$271.00			$271.00			$2,826.26
Sub-total		$471.36	$0.00	$200.36	$271.00	$0.00	-$9,216.34	$2,826.26

Budget Item	Budget Categories	CFC CFC/ICO/06 USD	CFC Fast Track ICO/25FT USD	2000 Exp	2001 Exp	2002 Exp	2003 Exp	2004 Exp
Equipment								
Laboratory Equipment	**I (6100)**	$201,084.00	$6,500.00		$19,750.08		$126,545.85	$61,296.78
Non-expendable Equipment	**I (6100)**	$85,500.00					$53,547.33	$22,701.82
Supplies and Material	**III (6000)**	$165,000.00	$10,787.00		$98,000.04	$2,500.00	$32,511.21	-$195.67
Infrastructure	**I (6100)**	$70,000.00					$2,306.32	$59,058.30
Sub-total		$521,584.00	$17,287.00	$0.00	$117,750.12	$2,500.00	$214,910.71	$142,861.23
Training and Dissemination								
Training of trainers	**VII (5920)**	$268,720.00	$11,280.00		$5,000.00	$6,965.97	$73,895.71	
Training of extension workers	**VII (5920)**	$241,280.00				$29,640.00	$60,805.25	$140,005.86
Study Tours and Farmer Training	**VII (5920)**	$160,000.00				$8,314.00	$92,242.61	
Sub-total		$670,000.00	$11,280.00	$0.00	$5,000.00	$44,919.97	$226,943.57	$140,005.86

Budget Item	Budget Categories	CFC CFC/ICO/06 USD	CFC Fast Track ICO/25FT USD	2000 Exp	2001 Exp	2002 Exp	2003 Exp	2004 Exp
General Operating Expenses & Supervision								
CFC supervision	***IX***	*$35,000.00*						
Evaluations	***IX***	*$16,185.00*						
General Operating Expenses	**VIII (6130 / 6300)**	$281,888.00	$7,264.00		$28,920.80		$89,448.05	
Subtotal		$333,073.00	$7,264.00	$0.00	$28,920.80	$0.00	$89,448.05	$0.00
GRAND TOTAL		**$2,526,000.00**	**$60,000.00**	**$322.25**	**$250,835.95**	**$147,969.22**	**$805,710.74**	**$529,491.30**

IV.2 Resource Utilization to 30th December 2004 – Dutch Govt. Funds

Budget Item	Budget Categories	Dutch Govt. WW053803 US$	2001 Exp	2002 Exp	2003 Exp	2004 Exp
Personnel & Consultancy						
International Experts						
Coffee Industry Specialist (Gerrit van der Stegen) & mid term evaluation costs	**V (5570)**	$60,000.00			$11,308.20	$37,040.48
Food Microbiologist / Coffee Specialist	**V (5570)**	$91,221.46	$41,221.46	$50,000.00		
Senior Mycologist	**V (5570)**	$74,000.00	$2,338.54	$24,666.00	$34,712.89	$12,282.57
Project Administrator	**V (5300)**	$117,000.00		$53,227.78	$29,200.00	$34,572.22
Sub-total		$342,221.46	$43,560.00	$127,893.78	$75,221.09	$83,895.27
National experts						
National experts and staff locally recruited	**IV (5660)**	$108,000.00			$54,291.50	$53,708.50
Consultants (National and International)						
Coffee Socioeconomists, Trainers	**V (5570)**	$52,000.00		$9,500.00	$16,421.84	$26,078.16
Investment/Feasibility Project Specialist	**V (5570)**	$50,000.00				$8,107.99
Sub-total		$210,000.00	$0.00	$9,500.00	$70,446.34	$87,894.65

Budget Item	Budget Categories	Dutch Govt. WW053803 US$	2001 Exp	2002 Exp	2003 Exp	2004 Exp
Contracts						
Centre of Microbiological Expertise	**V (5650)**	$188,778.54	$29,729.00	$46,666.00	$70,439.66	$41,943.88
Other Institutions	**V (5650)**	$71,000.00	$29,729.00	$20,334.00		$20,937.00
Sub-total		$259,778.54	$59,458.00	$67,000.00	$70,439.66	$62,880.88
Equipment						
Laboratory Equipment	**I (6100)**	$229,000.00	$24,500.00	$88,502.49	$18,269.74	$97,727.77
Pilot Plant/Coffee Dryers	**I (6100)**					
Supplies and Material	**III (6000)**	$121,000.00		$9,942.40	$38,181,60	$66,017.46
Infrastructure	**I (6100)**	$70,000.00	$14,750.00	$4,000.00		$51,250.00
Sub-total		$420,000.00	$39,250.00	$102,444.89	$56,451.34	$214,995.23
General Operating Expenses & Supervision						
Evaluations	***IX***	*$8,000.00*				
General Operating Expenses	**VIII (6130 / 6300)**	$260,000.00	$17,295.00	$44,961.88	$77,255.47	$115,108.67
Sub-total		$268,000.00	$17,295.00	$44,961.88	$77,255.47	$115,108.67
GRAND TOTAL		**$1,500,000.00**	**$159,563.00**	**$351,800.55**	**$350,080.90**	**$564,774.70***

*NB – A further $20,233.85 was posted between Jan-Mar 2005 relating to 2004 expenditure, leaving a balance of $45,547.00 for the study discussed in December 2004.

IV.3 Resource Utilization to 30th December 2004 – Summary Totals

CFC Category	Summary Totals by Expenditure Category to 30th December 2004
I	$644,206.48
III	$246,957.04
IV	$227,604.20
V	$888,364.88
VI	$363,556.74
VII	$416,869.40
VIII	$372,989.87
Total Expenditure	**$3,160,548.61**

V. PEA's Assessment of Project Progress and Prospects

V.1 – Assessment of Technical Progress

There has, generally, been increased improvement in technical progress under the project, which has been assisted both by the provision of standardised work plans containing experimental protocols for each country, and extensive travel by the project team during 2003 and 2004. Detailed analysis and interpretation of microbiological and mycological data collected in 2002/2003 has been prepared separately by the project mycologist, Dr Mick Frank. As noted above, the project needs to clarify a few important and practical points concerning practices along the coffee chain, and previous field work has allowed the project to focus on a fairly narrow set of issues. These, and some additional trials, will ensure that any recommendations made by the project are based on sound statistical and scientific information that will stand up to close scrutiny, and allow the project to be confident about the advice being developed. The information presented below outlines activities completed/scheduled by project country:

1. Brazil:

The project in Brazil has benefited from linkage with the national Brazilian OTA Project and Food Safety Programme, involving some 6 institutions and universities across the country. The survey programme (involving extensive sampling) has been completed in seven selected regions:

- Minas Gerais - South
- Minas Gerais - Zona da Mata (forest)
- Minas Gerais - Cerrado (west)
- Espírito Santo - Central West (arabica region)
- São Paulo
- Rondonia
- Goiás - Cerrado

Preliminary drying studies have also been completed. In the main piece of work relating to drying thus far, asphalt as a drying surface produced the lowest moisture content in sixteen days followed by cement, brick and clay. However, the surfaces were indistinguishable over the first eight to nine days. A new drying methodology called the hybrid terrace, which comprises perforated ducting laid on a patio and over which the coffee is heaped, was tested. Cherry coffee can be dried in 75 hours and parchment in 45 hours, with an operating temperature of 60°C. Cupping showed the quality to be good, and better than sun-dried comparators. Although the evaluation procedure was not described, data has been presented that shows the best combination drying method (i.e. a system which combines 'pre-drying' in the sun to 30 to 40% m.c. with a final mechanical drying step), in energy efficiency terms, to be drying on a clay terrace followed by concurrent 'flows type' mechanical drying.

Fieldwork scheduled for the 2004/5 season was designed to obtain a fuller picture of drying dynamics and their effect on critical fungi under various Brazilian conditions. The following key areas were being addressed by the Brazilian team, and at the time of writing data from these trials were being analysed:

- The recent increase of mechanical harvesting in some regions means that coffee harvested from ground has become quantitatively more important and needs investigation. Fruits also drop to the ground during the process of maturation due to both biotic and abiotic factors, and remain in contact with the soil for indeterminate periods of time before being harvested (varrição). Preliminary results of earlier trials indicate a higher incidence of OTA producing fungi in coffee harvested from the ground, and findings elsewhere indicate that varrição presents a serious risk of OTA contamination.[1] A protocol to further investigate this important project objective (i.e. to answer the question of what duration of contact of fresh cherry with the ground produces a significant impact on OTA occurrence) was implemented in July 2004 by the University of Lavras. However, due to atypical climatic conditions fruits did not fall on the soil and the protocol was adapted so that samples were harvested and then deposited on the ground. This data was only received at the start of 2005 and is currently being analysed.
- At the University of Vicosa, the team investigated the effect of cherry contact with the soil on the risk of OTA contamination. This data (currently being evaluated) will help establish a basis for estimating any additional risk of OTA accumulation that may be implied by a period of contact of coffee cherries with the soil before processing commences.
- In some of the most important coffee-producing regions, coffee that is substantially dried on the tree (boia) comprises over 60% of the harvest - evaluation of this practice is being carried out at the University of Lavras (using a revised protocol incorporating comparison with other drying methods), and experiments on microbial population dynamics with regard to 'tree drying' were initiated in June 2004, with sampling at the end of June, July and August. Data on this is currently being analysed. Unfortunately, an earlier experiment investigating tree dried fruits in 2002/2003 was lost due to the accidental harvesting of the area.
- Comparative trials of drying technologies will be concluded by the team at the University of Vicosa, and will be combined with the cereja, cereja descascado, and boia trial (see below). The aim is to examine the relationship between OTA contamination of coffee and drying rates as they occur using specified drying technologies. Because of the prevalence of mixed sun and mechanical drying in Brazil, this is also to be tested, as will additional artificial drying systems developed by Prof. Juarez's group.
- The newly important coffee class, cereja descascado, and boia processing and their influence on OTA production are also being investigated. The objectives of this experiment by the University of Vicosa are to compare the risks of OTA contamination of boia and cereja descascado compared with a sun-dried cherry (cereja) control, and to measure their respective drying time courses. The experiment was run consecutively as many times as drying rates and harvest period permit, at the following sites in Cerrado (representing a dry climate) and in Zona da Mata (representing a humid climate):

  - Araponga; Fazenda Itatiaia
  - Ervalia; Fazenda Morro dos Padeiros
  - Ibituruna; Fazenda Kabizuca
  - Espiritos Santo; Fazenda Roncador
  - Patrocinio; EPIMIG
  - Viçosa; UFV

- Based on precedent from other mycotoxin-commodity systems, it is possible that infection of the coffee seed occurs through the flower. Preliminary results obtained from the 2003 season showed high levels of infection of the cherries when the flowers were inoculated. However, interestingly, even the control treatments showed high levels of infection. Unfortunately, there is some confusion about exactly how the controls were set up – from the same tree, from neighbouring trees, from

[1] De Moraes, M.H.P., Luchese, R.H., (2003) "Ochratoxin A on Green Coffee: Influence of Harvest and Drying Processing Procedures", Journal of Agricultural and Food Chemistry, published on Internet.

trees at a given distance – and the answer is destined to remain unclear, because in setting up the repeat experiment during the last coffee flowering season, it appears that the inoculated branches were not covered, and that high levels of peripheral contamination could be expected. A repeat experiment was initiated in June 2004 at UFLA. Control samples were taken from non-inoculated branches of the same tree, and also from more distant trees. Other coffee plant tissues of inoculated and non-inoculated trees were subjected to mycological examination. All data received is currently being analysed.

- In the previous mould survey a relatively high frequency of *Aspergillus ochraceus* infection was found in coffee in Sul da Minas. In this area, additional surveys were undertaken in 2004 to try to ascertain how the organism exists in the environment and gain clearer ideas as to how coffee infection generally occurs.

Laboratory improvement is complete at UFLA, EMBRAPA-CTAA and MAPA. At IAL further items of non-expendable equipment have been acquired. Clean and naturally contaminated green coffee samples for the preparation of homogenous reference materials for interlaboratory control were identified, and interlaboratorial OTA analyses between MAPA and EMBRAPA-CTAA were completed. An ampoule sealer was purchased for use by LACQSA to prepare samples for the ongoing inter-laboratory proficiency being run for the project by Dr Vargas.

As previously reported, EMBRAPA finalised their GAP/HACCP training video - "Segurança Alimentar e Qualidade na Produção de Café" - and an OTA analytical techniques video and good laboratory practices manual for detection of OTA have been developed. This was improved for the OTA analysis training course held in Kenya in April 2004, and delivered by officers from LACQSA. The Brazilian team hosted the development and planning meeting for the Good Hygiene Practices (GHP) CD-ROM training resource in February 2004.

EMBRAPA-CTAA also started a ToT programme under the national Food Safety Programme (PAS) in Minas Gerais in December 2003, in conjunction with SENAI (an industry funded body), covering quality issues, GAP, GHP, and HACCP principles.

2. Colombia:

Previous trials of sun drying of coffee cherries and coffee beans (processed both by natural fermentation of mucilage and by mechanical removal of mucilage (using Becolsub machines)) have been completed, with m.c., water activity and the presence and number of fungi present during drying being measured.

Trials involved parabolic dryers, tables, cement elbas and tarpaulin, with varying drying loading thicknesses, were undertaken. Depending on prevailing weather conditions, drying wet parchment coffee to a moisture content (m.c.) of 12% was found to take between 6 and 10 days in a solar parabolico dryer loaded at 13 kg/m^2 (approx. 2 cm deep). In general, the time taken to dry parchment coffee and coffee cherries increases as the loading per m^2, and hence thickness of layer, increases. However, other variables such as raking frequency and local climatic conditions (e.g. radiation and humidity) obviously have a major impact. From the drying trials only three samples (1 sample of cherries dried on parabolico and 2 samples of parchment coffee dried on tables) showed traces of OTA contamination, at a maximum of 0.2 ppb. In 2004/5, the following key areas have been investigated. Trials, as of April 2005, are either in the process of concluding, or data is in the process of being analysed:

- Coffee bean defects – if certain defects are ascertained as characteristic of fungi that also produce OTA, a method for identifying a greater probability of OTA contamination might be possible. The main defects in the Caldas region of Colombia are black beans; molida a concha; vinagre; and brocada. Storage trials of the defects are also being completed.
- Coffee fermentation and its impact on the risk of OTA contamination - the aim being to test the protective effect of wet processing, which has been shown to produce a reduction in filamentous moulds infecting beans.
- Storage of parchment coffee – to assess the stability during storage of parchment coffee that has been produced by both good and poor practices in order to evaluate the limits of dry storage in preserving stability, using the output from the fermentation investigation above. Initial results show that the high temperatures observed in Côte d'Ivoire sacks of coffee delayed before processing were again evident.

The second run of the fermentation trial wasn't completed as scheduled in June 2004, owing to the difficulty of acquiring suitable coffee, and had to be delayed until the next main harvest season – it recommenced on 6th September 2004. The associated storage protocol was adapted to reflect this new timeframe.

Fig. 1 - Storage of results of defect protocol.

Fig. 2 - Liquid leaking from the sacks of delayed processed coffee after approx. 36 hours

Laboratory facilities are satisfactory at CENICAFE and have required little upgrading, but the purchase of some small laboratory items in early 2004 (laboratory balance, A_w probes and a stomacher) has complemented other equipment purchases made in 2003.

National training activities continued in 2004, building on previous courses delivered to coffee farmers, extension services, students and authorities of the Colombian Coffee Federation. Training in OTA analytical techniques by HPLC for three CENICAFE staff at Mictox took place in early 2005. In October 2004 Dr Puerta of CENICAFE assisted in the delivery of a regional Training of Trainers' course in Guatemala ("Application of food hygiene and HACCP principles to the coffee chain").

3. Côte d'Ivoire:

Activities in Côte d'Ivoire were hampered due to the poor security situation since September 2002, which initially hindered missions by the central project team to areas outside Abidjan. Although some useful experiments have been conducted in Côte d'Ivoire, shortcomings of recording and reporting crucial information has, however, limited the usefulness of some of the work. However, a full project team mission was completed in November / December 2003 (involving Drs Clarke and Frank, and Mr Jackson), coinciding with the harvest season, with the aim of setting up associated field activities and trials. A follow-up mission was completed by a coffee processing expert from CIRAD in January 2004 to further assist with the ongoing implementation of field trials.

The early arrival of the 2003/2004 harvest season in November 2003 meant that initial preparations for the trials were more rushed than anticipated. Since OTA-producers appear to be common, Côte d'Ivoire is an excellent location to examine the effect of delaying certain portions of the drying time-course on OTA production, and for conducting further mycological surveys to better understand how the mould interacts with the environment and how this influences risk of OTA-contamination of coffee.

The following activities were focussed on in the 2003/2004 season, and all data was received by mid-2004:

- Drying time-course investigations for cherry drying on bare earth, bamboo tables, cement and plastic tarpaulins were conducted at CNRA, Bingerville;
- A protocol designed to assess the impact of a delay in processing after harvest applied to both wet and dry processing was set up in Divo;
- Sampling designed to examine the distribution of fungi, especially OTA-producers, within a small production unit (i.e. farm) was conducted at two locales on Divo station and one at Bingerville;
- Storage trials were established using the material generated from the trials described above;

- Defect analysis investigations to ascertain whether there is any correlation between OTA producer development and particular defect classes;

On the basis of results from the above trials, for the 2004/2005 season it was decided to further investigate the impact of delayed processing on mould and OTA contamination of cherries sun-dried on different surfaces, and to examine the possibility that tarpaulin drying can have an adverse effect on OTA contamination. Results from these trials are now awaited.

A request for proposals for a socio-economic study was initiated locally in December 2003, and, under pressure from the PEA, finalisation was only made in late October 2004, just in time for the 2004/2005 coffee season. A final report is expected in April 2005, the study focussing on:

- The marketing and processing chain to identify areas for improved efficiency, with reference to coffee quality and how the market functions (e.g. influence of handling practices, investigating provision of incentives etc.);
- The economic viability and socio-economic implications of any proposed recommendations in changes in practices or uptake of new technologies by the project from the perspective of smallholder producers.

As well as the provision of computing, laboratory and field equipment, the project has also completed procurement of Thin Layer Chromatography and equipment and supplies for CNRA to enhance their national analytical capacity. This is being complemented by the purchase of some HPLC equipment, which will be installed by early 2005. Training in OTA analysis by HPLC and good laboratory management, benefiting five national staff, was completed at CRF, Kenya in April 2004.

A planned sub-regional Training of Trainer's course in Côte d'Ivoire had to be cancelled due to renewed socio-political unrest in November 2004. The course will now be held in Rwanda in May/June 2005, with trainers from Côte d'Ivoire and CIRAD.

4. Ecuador:

The CFC funded Fast Track project has now concluded, as reported in previous updates to the Fund. However, Anecafé's involvement has continued with national extension staff, and participants from Costa Rica (representing PROMECAFE), Panama and Peru, benefiting from a regional ToT course held in Manta, Ecuador in April/May 2003 and run by FAO project consultants. A Technical Cooperation Project proposal for FAO funding was recently approved (as noted above). The proposal focuses on implementing an extended national training programme on OTA prevention along the coffee chain, and commenced in late 2004.

5. India:

The Indian team have been active in investigating many areas. However, reporting of some results from 2001/2002 meant interpretation was uncertain, and in some cases trials were revisited in 2003/2004 to clarify data. During 2003 activities by the Indian Coffee Board focussed on estate surveys (surveys on 22 estates comprising both arabica and robusta processed either by wet method (parchment) or dry method (cherry) have now been completed); field experiments on wet processing; pre-drying practices (stage of ripening, washing to separate floats); and drying (drying surfaces; drying thickness; frequency of stirring; rewetting; mixed drying; hindered drying).

Drying surface was shown again to influence drying rate, but in these tests this had little bearing on the mycological outcome of the process. Hard and non-porous surfaces showed higher water loss rates but the difference was more marked in cherry drying than parchment and other drying parameters were more important. In trials, an additional cherry layer thickness of 2.5cm for cherry and 2cm for parchment adds a day to the drying time over 10 days and 4 days respectively. Anti-fungal treatments showed some effects but they were generally inconsistent and this approach to control is considered neither practical nor efficacious, and will not be pursued further under this project.

Combination ('mixed') drying trials have indicated that initial sun drying followed by mechanical drying (using a 'Pinhalense' rotary drum mechanical dryer) greatly reduces the drying time. Arabica parchment took 3.5 days and robusta cherry 6.5 days to reach the desired moisture level. On the other hand sun drying of the same took 7 and 12 days respectively for arabica parchment and robusta cherry. However,

the economics of drying and quality of coffee mechanically dried need to be studied further, and this is being addressed in the socio-economic study being completed in 2004/2005.

Field trials scheduled for 2003/4 season were initiated in the first part of 2004. These included drying trials to further examine the relationship between OTA contamination of coffee and drying rates as they occur using specified drying technologies, carried out at CCRI and Chettalli:

- Cherries dried at a given load density in two side-by-side replicates of the following treatments:
  i) Drying on tarpaulins
  ii) Drying on compacted soil
  iii) Drying on cow dung
- Parchment dried at a given load density in two side-by-side replicates of the following treatments:
  i) Drying on tarpaulins
  ii) Drying on cement
  iii) Drying in *parabolicos*

Additionally, the impact of processing delay and processing method on fungal development has been instigated to test two basic hypotheses:

- That delays between harvesting the coffee cherries and onset of processing increase the risk of OTA contamination in green coffee.
- That the wet processing of coffee using a fermentation step may inhibit growth of OTA-producing mould.

Both replications of the drying technology trials were completed as of March 2004. However, due to the erratic ripening of fruits last season leading to an inadequate quantity of cherries available for pulping, the repetition of the delayed processing trial was postponed until the next harvest season at the end of 2004.

There is some indication from previous trials that cherry drying on tarpaulin can have an adverse effect regarding OTA contamination and quality. This is an important issue made more so by a widespread impetus to replace the most common low-cost surface used for cherry drying, compacted soil, with plastic tarpaulin. Therefore, an experiment comparing tarpaulin with other surfaces at different control parameter levels was implemented in India, and also set up in Côte d'Ivoire, Kenya and Uganda for the 2004/2005 season.

Additionally the hypothesis that fungal communities and average levels of OTA contamination are different amongst defect classes, as compared with sound beans, has been investigated. The Coffee Board had some problems in buying coffees from private sources for the defect investigations, so 10 different arabica and robusta coffees from Coffee Board research stations and demonstration farms were selected for this investigation. Data from these trials is currently being analysed.

Final investigations have also been completed to assess whether coffee pulp and cherry husk based composts pose any real threat to the threat of spread of OTA moulds in coffee plantations, and to assess the risk of dust cross-contamination in coffee production works. Hygiene is an important aspect of plant maintenance, and data relating to this readily disseminated potential source of fungal contamination is required to codify cleaning routines.

Some final items of laboratory equipment have been procured to ensure that OTA analytical capability and infrastructure is in place, and a LCD projector was delivered to the Coffee Board to assist with the delivery of training programmes. A short 1-week Training of Trainers' refresher course took place between 18th and 22nd October, immediately after ASIC 2004, and coincided with a technical backstopping mission by Drs Frank and Clarke.

6. Indonesia:

The project's farm survey protocol was apparently not applied uniformly in all of the three study sites: Lampung (Southern Sumatra), Java Timur and Bali. The differences between the regions in climatic, ecological and processing terms make for a particularly interesting comparison. Interest on the part of the collaborating team shifted, with good reason, to changes occurring in the chain. The data indicates that ochre group *Aspergilli* are not as common in samples from farms as they appear to be in several of the other collaborating nations. No horticultural or processing practices have emerged as predictive of the

occurrence of these organisms, neither has a coherent geographical pattern of distribution emerged. The survey, including samples taken from the marketing chain, showed an expected tendency for coffee of higher moisture contents to be of poorer quality as measured by total defects, black beans and ochre group *Aspergilli*, but it was not a statistically significant tendency.

There is a demonstrable increase in frequency of occurrence of these fungi during the passage of coffee through the often long and obscure trading chain in Indonesia. The trading chains in the study regions are rather individual and also unstable. There were indications that practices are in a state of flux as the market adjusts to fluctuations in currency rates, new quality norms and, of course, ongoing coffee price changes.

The approach whereby the coffee chain is traced from exporter to producer through the stakeholders that are encountered during visits and interviews and sampled at points of sale, showed that even a complex chain can be meaningfully sampled. In light of work completed to date, the following recommendations were made by the PEA:

- Due to previously poor repeatability, it is imperative that drying time-courses be measured over as many replications as possible in coffee-growing regions with comparisons between soil, cement and whole and split cherries to be made. Solar-convective dryers should also be assessed. The impact of the 'split cherry' technique on contamination with OTA-producing mould and OTA must be investigated;
- Drying trials testing the interaction between stage of harvest and tarpaulin drying are required to assess this surface and investigate any possible consistent bias imposed as the season progresses;
- Since the Indonesian harvest is generally by strip-picking, investigation of the impact of maturity at the time of processing should be undertaken;
- It is essential that a thorough investigation of coffee resident in the trading chain be made. In Indonesia, though not necessarily the case generally, results so far strongly point to this area as of principle concern.

Unfortunately, it became apparent during the second half of 2003 that the four protocols/trials included at the start of 2003 in ICCRI's work plan concerning: i) evaluation of drying technologies (including an evaluation of split cherries), ii) stage of harvest, iii) maturity of cherries, and iv) survey along the chain had either not been undertaken comprehensively, or had not even been started. This situation was confirmed during a backstopping mission by the Project Administrator in December 2003.

The project still needs to draw some critical conclusions about the risk of OTA contamination and links to selected practices in Indonesia. In order to ensure that this is addressed during the final seasons in Indonesia before the close of the project, the PEA decided to engage the services of a international coffee processing specialist, Mr Anthony Marsh, for three 2-week missions during 2004 (in March, May and December) overseeing the planning, preparation and implementation of field trials. These missions have been completed and there is already a marked improvement in the implementation of activities and delivery of results by ICCRI. Field trials were focussed on drying and storage (including solar dryer trials, treatment of robusta before drying and storage of dry coffee), the mycology of robusta bean defects, and the storage of wet arabica parchment prior to wet hulling in North Sumatra. Data are currently being evaluated by the project mycologist.

Additionally, CIRAD, under their 2004 Letter of Agreement, assisted in the design and implementation of a socio-economic/market chain analysis of the coffee sector. This was carried out in conjunction with a national consultant, and with a CIRAD student based in Indonesia. The analysis considered all major actors within the coffee chain, the impact of their actions on coffee quality and safety, the system of pricing/penalties, and how this influences the functioning of the chain.

The study will included an investigation into the feasibility of a) techniques/technologies investigated under the project, and b) specific policy interventions either already under consideration, or that might be proposed. In 2004 the following investigations were agreed, and the main survey work was completed by the end of 2004. The final report has been received and is currently being reviewed:

- Targeted investigation of robusta coffee processing and marketing chain in Lampung;
- Investigation of the feasibility of wet processed robusta by small holder farmers in Bali and East Java;
- Targeted study of the arabica coffee production chain in North Sumatra Arabica ('Mandheling Coffee')

The PEA notes that extensive Level-2 national Training of Trainers' courses were completed by ICCRI staff in 2003/2004 in Jember (covering Central Java, East Java, Bali and East Nusa Tenggara), Liwa (covering Lampung, South Sumatra and Bengkulu), and Enrekang (covering Central and South Sulawesi), benefiting some 76 extensionists. Farmer schools activities have also been initiated. These are important steps in ensuring that a sustained impact on coffee quality enhancement in Indonesia is achieved, and further local ToT courses were completed in Northern Sumatra in late 2004.

7. Kenya:

The Kenyan team are undertaking their prescribed activities well. They completed initial mould surveys in Kirinyaga and Trans Nozia, and embarked on more intensive surveying in areas shown to be contaminated during the initial sampling. As the initial extensive sampling did not lead to the isolation of ochre group *Aspergilli* from beans of cherries collected at the farm and dried as cherry coffee, the intensive sampling was guided by contamination detected in soil and air.

The programme in Kenya requires the comparison of two sites. The site East of the Rift Valley (Trans Nozia) is wetter during the harvest season than the site West of the Rift Valley (Kirinyaga). An internal comparison in Kirinyaga has been proposed between a new kind of producer, the small estate farmer who processes his own coffee, and the traditional farmer, whose coffee is processed at a cooperative facility.

Conventional and meshed drying tables, the ITIPAT design dryer, a UCDA design dryer and conventional solar dryer were all tested in Kirinyaga on wet processed coffee during 2003/2004. The parabolicos design was tested in the 2003/2004 season in both Kirinyanga and Trans Nozia against well maintained mesh tables (both protected from sun and unprotected), and tables with sagging mesh. Unexpectedly, results indicate that the drying tables performed better than the parabolico drier, with wire mesh tables completing a drying time course in 7-8 days, compared to 13-15 days for the parabolico drier.

A constraint reported by CRF facing the implementation of this protocol was the inadequate availability of coffee on any one day to start all the trials at the same time, as production was low and the harvest was tailing off. This has made it more difficult to draw conclusions from the trials.

For 2004, the focus was on three areas of investigation: a) the impact of stirring frequency on the rate of parchment drying on mesh tables under sub-optimal drying conditions, b) defects investigations, which was delayed until May/June 2004 due to problems obtaining defect beans, and c) the impact of delays before processing, and the processing method, on fungal development (completed May-July 2004).

Investigation of the uniquely Kenyan practice of conditioning, as a complementary activity in the drying process, was not completed in early 2004 as hoped – as in 2003 it could not be carried out due to a lack of coffee being treated in this way.

The trials above indicated that a further conditioning investigation and defects investigation were warranted for the 2004/2005 season. As noted above, an experiment comparing tarpaulin with other surfaces at different control parameter levels was implemented in Kenya, in parallel with those set up in Côte d'Ivoire, India and Uganda. Data from these trials is currently being analysed.

In order to ensure better communication with the project team, the project agreed to fund the cost of improved internet connection at CRF, and provide associated computer equipment and training in MS Office applications. Although the computer equipment and software training were delivered as scheduled, the selected Internet provider failed to install the new Internet connection. This was due to the regular theft of fixed line telephone cables in the Ruiru area, making the installation impossible. CRF has secured a full refund of the costs paid in advance, and the installation of wireless Internet was completed in mid-2004.

In order to ensure national OTA analytical capability the refurbishment of existing HPLC equipment has been completed, and the provision of extensive laboratory supplies and equipment to furnish the CRF quality laboratory was completed in April 2004 in time for an OTA analysis training course delivered by Dr Eugenia Vargas and Dr Eliene Santos of LACQSA, Brazil.

8. Uganda:

The quality of the work undertaken by the UCDA team has improved over the duration of the project. Mycological work progressed well in Masaka district but data received from the second study region, Mukono, was, unfortunately, incomplete. Three sets of more focussed drying trials were completed by the end of 2003. These trials compared the performance of a locally designed cabinet solar dryer; a green-house effect solar dryer; the CENICAFE designed parabolicos solar dryer, the ITIPAT solar dryer, tarpaulin and bare ground. The following field trials were started in mid-2004, and results were received for the first runs in July 2004:

- Experiment to test the hypothesis that fungal communities and average levels of OTA contamination are different in some defect classes as compared with sound beans;
- To investigate whether delays between harvesting coffee cherries and the onset of drying increases the risk of OTA contamination in green coffee;
- To finalise investigations into the effect of retarded drying on fungal development;
- Storage trials on dry cherries are ongoing, and will be completed in 2004/2005.

CIRAD assisted in the design and implementation of a socio-economic/market chain analysis of the coffee sector. This was carried out in conjunction with a national consultant, and with a CIRAD student based in Uganda. The analysis considered all major actors within the coffee chain, the impact of their actions on coffee quality and safety, the system of pricing/penalties, and how this influenced the functioning of the chain. Some socio-economic research has been completed which has allowed an abbreviated survey of the chain to be designed. The most important survey findings are outlined below, and these have informed the design of the 2004 study, the report of which is expected in April 2005:

- Upwards of 80% of Ugandan growers harvest unselectively, delay drying for four days from harvest before spreading the cherry coffee on bare ground to dry.
- A significant proportion of FAQ coffee (uncleaned bulk green coffee) arrives at the exporter above recommended moisture levels.
- The time allowed to dry coffee varies between farmers from 7 to more than 21 days.
- Correlation of occurrence of ochre group *Aspergilli* between niches is generally poor but intra-farm sampling suggests a correlation between occurrence in the soil and in the fresh fruit. However, this will need to be examined more closely before any conclusions are drawn.
- Careful analysis indicates that about ¾ of bean infection by the niger group *Aspergilli* originates in the fruit tissue.
- Solar-convective dryers showed a more favourable drying time-course than traditional sun drying methods, with respect to the period drying coffee remained in the OTA production window. There is an indication that some of methods tested may adversely affect the rate of moisture loss at the later stages of drying.
- *De novo* infection of beans during drying falls away as the cherry dries below about 35% m.c. (w.b.).

The following investigations under the study have been agreed, and the main survey work took place in the second half of 2004:

- Impact of EU OTA standards on the coffee marketing chain/ marketing chain structure;
- Feasibility of technologies under the project – traditional drying, wet processing and improved drying methods;
- Prices and OTA in the marketing chain – commodity chain analysis.

Regarding the development of HPLC OTA analytical laboratory capacity at UCDA, civil works to covert existing UCDA office space into a laboratory were completed in mid-2004, funded by UCDA. The project has procured complementary HPLC analytical equipment (under Activity 4.2.2), which was installed in September 2004. The project has thus enabled a permanent solution for a facility controlled by UCDA with both good infrastructure, and support for maintenance beyond the life of the project.

Training in OTA analysis by HPLC, and good laboratory management, for five national staff took place in Kenya in April 2004.

9. International transportation trials:

Further investigation into international transportation was recommended in the 2003 Mid-Term Evaluation and discussion concerning international trials (both in bulk and in bags) was initiated with the OTA-Taskforce of the European coffee sector, through Dr Gerrit van der Stegen. Agreement has been reached with the OTA-Taskforce that the results of trials to date will be shared with the CFC/ICO/06 as a counterpart contribution to the global project, *viz*:

- Container with coffee in bags at dockside in Rotterdam during winter (17/2/1999 to 18/3/1999)
- Container with coffee in bags from Kampala to Bremen (4/12/1999 to 23/1/2000)
- Container with coffee in bulk from Kampala to Utrecht (28/5/2000 to 20/7/2000)
- Coffee in bags and in bulk from Santos to Rotterdam (21/11/2000 to 7/1/2001)
- Several containers with coffee in bulk from Vietnam to UK (28/1/2002 to 26/3/20002)
- The recent repetition of trial #1 with containers in Antwerp failed because of a technical error in programming the monitors. This trial will be repeated with corrected settings.

The OTA-Taskforce indicated its willingness to assist in organising further international transportation trials under the project. Transportation is when the risk of condensation and mould growth is highest, when relatively warm green coffee travels to much colder countries. A trial on international shipment of coffee from India to Europe was completed toward the end of 2004, and a final one between Kampala and Rotterdam concluded in March 2005. Initial sampling showed no significant OTA contamination, and other data is now being evaluated.

V.2 - Assessment of Resource Utilisation

Resource utilisation and disbursement of funds have continued at consistently higher levels when compared to the slow disbursement rates of 2001 and 2002. Indeed total expenditure under the project in 2003 was over 2.5 times greater than in 2002, and in 2004 expenditure totalled over US$ 1.1 million (including some US$ 110k of journaled expenditure against the 2003 budget). This pattern is consistent with the expected roll-out of activities and purchase of non-expendable equipment under the project.

The preparation and payment of replenishment funds requests has been fully regularised. It was noted in previous Progress Reports that delays of up to 8 weeks from the request of funds by the PEA to receipt of payment by the CFC had occasionally resulted in PEA project account deficits. By the latter part of 2003 and in early 2004, this occasional cash flow problem had been ameliorated.

The PEA is certain that the available budget for the remainder of the project is sufficient for all remaining planned activities, up to the revised project completion date of 30th September 2005. However, some virements from categories to cover duty travel and equipment and supplies in 2004 are necessary, and these requirements were discussed with the Fund at a meeting in November 2003 when the 2004 draft budgets were discussed and agreed. It is also expected that virements between categories will be required during 2005 to better reflect the final expenditure necessary under the project. An internal FAO audit of the project for the period January 1st to December 31st 2003 was completed at the start of 2005, and a final letter regarding this will be issued to the Fund shortly.

In light of one of the recommendations of the Mid-term Evaluation, all non-expendable equipment over the value of US$ 500 has been procured centrally through FAO-HQ by the project coordinator/administrator and delivered through national FAO-Representations. This helps ensure that goods are delivered both duty- and tax-free. Savings have already been made using this procedure as the project avoids paying premiums often associated with locally procured equipment.

Procurement of laboratory and field equipment for national collaborators has been a major activity under the project, but is now near conclusion. Items purchased in 2004/5 include:

- Procurement of LCD projectors for training activities in India and Côte d'Ivoire;
- Purchase of Shimadzu modular HPLC equipment for analysis of OTA in coffee for CNRA, Côte d'Ivoire. CNRA had already received the core of a new HPLC system as a result of cooperation between Côte d'Ivoire and Spain. However, this equipment came without an

injector, data processing system or fluorescence detector. These are being purchased to provide full HPLC OTA analysis capacity;
- Purchase of ampoule sealer to support an inter-laboratory proficiency round being run by LACQSA, Brazil;
- Balances, stomacher and homogenising equipment to further equip national quality and analytical laboratories;
- Romer RAS sample mills for Indonesia, Kenya and Côte d'Ivoire;
- Provision of an additional desktop computer for Côte d'Ivoire.

V.3 – Assessment of Project Co-ordination and Management

Overall, project co-ordination and management continues to be satisfactory. It should be noted that late submission of results from some counterparts has meant delays in analysis by the central project team, and in ensuring that follow-on activities are planned sufficiently in advance. Indeed, the coordination of a seven country, three continent project continues to be challenging, but the provision of standardised country budgets and work plans, and frequent technical backstopping missions, has helped to ensure that country activities are more focussed and comparative.

Communication with national counterparts is, on the whole, both more reliable and regular, significantly improving project co-ordination and activity implementation. Using project funds, Côte d'Ivoire, Kenya and Uganda have all installed upgraded Internet connections (in some cases using wireless technology) to improve project communication and interaction.

Previous concern that the co-ordination and exchange of data and experiences between the counterparts in Brazil has been addressed – missions by Mr Jackson in 2003, and Dr Clarke and Dr Frank in early 2004 attempted to resolve this issue. Unfortunately, communication from certain collaborators in Brazil remains inconsistent and patchy, despite the best efforts of the project team. The net result is that, at times, progress of activities in Brazil is hard to monitor and track, and this situation has continued into 2005.

It has become apparent that some drying trials in India (measuring the impact of delays before processing and the processing method (wet vs. dry) on fungal development) were not put in place as expected in the 2003/2004 season. It is unclear as to why this was the case, and delaying the trials to 2004/2005 has been, unfortunately, the only solution.

A second mission to Côte d'Ivoire was completed by CIRAD staff in January 2004; at the time it appeared that concerns over the inability of the PEA to undertake missions due to the security situation were no longer valid. However, the situation in the country deteriorated in October/November 2004 and the sub-regional ToT course scheduled for November 15th to 26th in Abidjan had to be cancelled due to concerns over safety. This has been rescheduled and relocated and will now take place in Rwanda in May 2005.

Further to some minor events in 2003 that conspired to hamper project activities (please refer to the previous Progress Report), there have been some additional unforeseeable problems to contend with during 2004. Poor weather in Kenya meant a late harvest which disrupted drying trials; climatic change and heavy rain also entailed a late harvest in Indonesia, with an impact on the trial schedule; heavy rain was also a feature in Brazil - atypical wet weather in June around Vicosa made it hard for national collaborators to follow established protocols correctly, though it is hoped that some trials were salvaged.

In April 2004 a project team meeting involving FAO, the project mycologist and officers from CIRAD was held at FAO, Rome to discuss trial data and plan for the rest of the year, with a follow-up team meeting taking place in September 2004.

V.4 – Social, Environmental Effects of Project Implementation

Negative social effects related to project implementation *per se* are not evident. The wider context of the global coffee crisis has, however, been of great concern. The ICO composite indicator price fell from 133.91 dents/lb in 1997 to 51.91 cents/lb in 2003. However, there are indications since the end of 2004 that the price situation is improving, with prices having risen sharply, piercing the 100 cent barrier for the first time in years. The big question now is whether this upward swing is sustainable, or simply a reflection of the period of low prices having had an impact on production in a classic supply and demand equation.

The fall in prices since the late 1990s was dramatic. A poor price situation in countries where coffee represents a cash crop element in a subsistence farm means substantially less money is available for expenditure on medicine, communications and education. This is, unfortunately, was the case in many African countries.

In countries where farmers depend largely on coffee for income, including food purchase, and where indebtedness has been incurred, farmers are now either more heavily in debt or have been forced to abandon their farms or switch to alternative crops. Options for the latter may be reduced and may include proscribed drugs like coca. In Guatemala, for the 2001/02 crop, the harvest labour force was reduced from 500,000 to 250,000. In Colombia, coca plantations can now be found in coffee areas, and indebted coffee growers have committed suicide in India. In general the situation stimulates emigration to both cities and to industrialised countries.

There is little doubt that the exodus from rural areas and increased poverty in coffee producing areas caused by the current price crisis poses a very real and wide-ranging threat to sustainable development. It is against this backdrop and concern in consumer countries over ochratoxin A (OTA), which the global project "Enhancement of Coffee Quality through the Prevention of Mould Formation" has been operating.

The consequences of the current situation vary but in many cases prices still do not even cover the costs of production, and large numbers of coffee farmers have been near threshold poverty for years. They face critical decisions on whether continuing to commit scarce resources to coffee is viable, or justifiable, when returns are negligible. Coffee was increasingly neglected in the field, sometimes in favour of other activities. Persistent low prices forced changes in practice; agronomic inputs, good husbandry and processing techniques are being withdrawn or suspended where there is insufficient capital.

The project obviously is as cognisant as possible of these changes in terms of the implications they have for mould formation/OTA production. This requires a clear understanding of OTA production, and necessarily means close interaction with farmers. It is also incumbent on this project to ensure that any recommendations to improve coffee quality through the prevention of mould formation are accessible, achievable and sustainable for small-holder farmers, processors and national programmes alike. Only in this way can the project hope to achieve a positive social impact by improving the quality of coffee available to market, hopefully with minimal economic costs associated with the adoption of recommendations. However, it is inevitable that lower prices will have a significant impact on the ability of farmers, especially, to implement any recommendations from the project, no matter how low cost they might be, and both the Fund and Supervisory Body should continue to be aware of this.

In terms of social capital, the project approach continues to emphasise capacity-building at national level within the coffee industry and responsible government agencies, and supports national quality control programmes for prevention and control of OTA-contamination of coffee through provision of analytical capability. Such programmes are central to any effective risk management policy aiming at protecting public health from risks linked to OTA exposure.

Through the application of, and training in, internationally-agreed principles of food hygiene and a HACCP-based approach to food safety throughout the coffee production and processing chain, and by developing good practice guidelines, the project hopes to demonstrate to food control authorities in coffee importing countries that prevention, and the application of best practice, is better than establishing limits.

However, during the course of 2003 maximum tolerance levels for OTA were defined by major consumer countries (e.g. Germany), and the EC set advisory limits on OTA in roasted and soluble coffee products in early 2004. The current advisory limits set by the EC are not as stringent as they could have been, and only relate to roasted and soluble coffee – a decision on a limit for OTA in green coffee will be taken before June 2006. However, each EU member state retains the right to maintain national MRLs by justifying necessity due to, for example, contingent consumption patterns, though this is being challenged.

The project remains aware of the potential impact the imposition limits could have on producing countries, and is endeavouring to ensure that recommendations derived from the project to control OTA are both applicable and sustainable, even in the context of a difficult global coffee market.

There are no evident environmental impacts associated with project implementation.

V.5 – Forward Planning of Project Implementation

- The final ToT course under the project, scheduled for May 2005, will take place in Rwanda, and involve participants from 8 Francophone producer countries from Africa.
- A meeting between the PEA, LMC International and Mick Wheeler to discuss the methodology and scope of a socio-economic study to examine the uptake of hygiene recommendations under the project took place in Rome on February 11th 2005. The final study outline is currently being finalised.
- A short study to evaluate the risk of varying container fill levels is being considered. This will utilise 'mini-containers' which have been developed by Instituto de Tecnologia de Alimentos (ITAL) in Brazil to model international coffee transportation.
- Data and information submitted by collaborators for trials completed in 2003/2004/2005 are being examined by Dr Frank, who will be producing, as a key project output, synthetic 'horizontal' analyses of a number of subject areas, including:
    1. Distribution of OTA producers
    2. Performance of drying systems and management of drying operations and their impact on coffee quality and safety
    3. Impact of non-drying processing routines
    4. Impact of storage conditions on coffee quality and safety and moisture management during transportation of coffee
    5. Assessment of moisture measurement methods and the relation between moisture and A_w of coffee
- Field trials and other field studies are being finalised in all countries according to different start dates associated with harvest schedules, and in light of the recommendations by the core project technical team, and all data is expected to be submitted by May 2005.
- Socio-economic studies in Indonesia, Kenya, India and Côte d'Ivoire are being finalised, and final reports are due for submission by the end of April 2005.
- The final project meeting and workshop is being planned for the end of September 2005, to coincide with the 2nd World Coffee Conference and ICO meetings in Salvador, Brazil. It is expected that there will be a half-day open session on OTA reduction in coffee, followed by a two- or three-day final project meeting.
- Development of a CD-ROM based training and resource manual on food hygiene in the coffee chain is ongoing, and is a major activity under the project. A beta version of this will be circulated for peer review in April 2005. The final English version should be available by the middle of the year, following an online comment and review process. This product will provide important support to training and dissemination activities by national agencies in all coffee-producing countries, and will be made available in English, French and Spanish by the end of the project.

VI. Conclusions and Recommendations

It is critical that national collaborators provide, and continue to provide, full-time supervision of field trials to ensure that experimental protocols are properly followed and that data are recorded correctly – the project obviously must avoid situations where field trials are not implemented as planned or data is collected incorrectly. Given the nature of coffee seasons, the project cannot afford to lose a season through the misapplication or misunderstanding of project protocols at the national level, as this could seriously delay progress, especially as the project is in its final few months. At all of the project collaborating centres a senior technical officer has been assigned to follow project activities, to varying degrees of success. Such arrangements should improve the local execution of project activities, as well as communication with the central project team, but invariably depend on the wider workload, and commitment, of the individuals concerned.

It is important to point out that a project involving seven collaborating countries over three continents makes for an extremely complex enterprise, and is arguably too many to manage convincingly. Close monitoring has proven difficult. This is not to say that the project will not achieve some useful outputs and contributions to the prevention of coffee mould and control of OTA, but to caution against the design of similar multi-country research-based projects in the future.

Nonetheless, administration, communication, co-ordination and management of the project have continued to improve since 2001. The involvement of CIRAD staff, and the hiring of a coffee processing specialist, as noted above, to oversee activities in Indonesia, has helped to ensure the local execution of essential project activities.

The project continues to take a risk-based approach to defining good hygienic practice in relation to the coffee chain. This approach is emphasised in the Training of Trainers programme which is being delivered to groups of senior technical personnel in coffee-producing countries. These groups of trainers will thereafter play a critical role in seeing that all people involved in the national coffee sector can improve their handling of coffee so as to reduce the risk of contamination. This capacity-building represents a core feature of the project.

The development of a HACCP-based model for controlling mould formation continues under Activity 3.1.1. Practices or activities along the chain that may be considered as Critical Control Points are being examined, though working operating limits have been established and incorporated into the Training of Trainer's (ToT) programme. The ToT package has been refined during 2002-2004, and continues to be subject to an iterative process as feedback from ToT courses and project results are processed and incorporated. A key training related activity during 2004/2005 is the development and completion of an interactive training resource on Good Hygiene Practices along the coffee chain, which will be available as a CD-ROM., and, ultimately, accessible from the project website.

The project is also attentive to the fact that any recommendations to farmers and traders must be sustainable in the light of the coffee crisis. The project, therefore, continues to put emphasis on the socio-economic analysis of the coffee chain and low technology equipment, and their viability for use by small-holder farmers under financial pressure. Similarly, the project will continue to examine local practices re: post-harvest processing in order to ensure that any recommendations for changes in practice can be made with reference to an informed critique of indigenous practices, and thus have value.

Laboratory capacity in participating has received much attention, as indicated above. Competent OTA analytical services will provide important support to the national effort in preventing OTA contamination of coffee. It is hoped that building this capacity will benefit neighbouring coffee growing countries that are not part of this project, through the development of associated technical co-operation programmes.

EC advice on limits for OTA in roast (5 ppb) and soluble coffee (10 ppb) in February 2004, and more stringent limits imposed by Germany in the summer of 2003 (3 ppb and 6ppb respectively), have not altered the main objective of the project - which is a risk-based approach centred on the reduction in the risk of OTA contamination in coffee by introducing improved GAP/GMP practices throughout the coffee chain, which can be sustainably applied in all coffee-producing countries.

Annex I: Summary of Missions (January 2004 – April 2005)

Mission to Kenya and Côte d'Ivoire: CIRAD (January 2004)

Technical support missions by Dr Duris (Kenya) and Dr Fourny (Côte d'Ivoire).

Mission to Brazil: R. Clarke (February 2004)

Meeting with project counterparts from Brazil, CIRAD and Colombia to plan the content and preparation of a CD-ROM based resource manual on food hygiene in the coffee chain; to finalise protocols for field work to be carried out in the upcoming coffee season and initiate arrangements for their implementation in Brazil, visiting all relevant collaborating institutions.

Mission to Indonesia: R. Clarke, T. Marsh (February/March 2004)

Technical backstopping of project in Indonesia, in conjunction with Consultant hired to work with ICCRI during 2004. Decided on trials to be implemented in Indonesia during coming harvest; identified activities to be undertaken in preparation for field trials; decided on key objectives of the socio-economic survey; identified national staff to participate in the implementation of the survey; discussed plans for further information dissemination on OTA prevention.

Mission to Uganda: CIRAD (March 2004)

Preparatory and planning work for socio-economic study to be coordinated by CIRAD (E. Cheyns and B. Sallée) in conjunction with UCDA and the national socio-economic consultant - defined detailed objectives of the study and methodology; determined organization of responsibilities; preliminary diagnosis of the coffee commodity chain; field visits; and drawing up of work schedule and resource requirements.

Mission to Brazil: M. Frank (April 2004)

Technical backstopping of project in Brazil, specifically in Lavras and Vicosa, with specific objective of supervising the setting up of trials (drying, processing of descascado, and contact of cherries with soil) in Zona da Mata; supervising and monitoring the start-up of other field trials; and training on mycological analysis and data handling as required.

Mission to FAO, Italy: M. Frank, D. Duris, F. Bonnot (April 2004)

Project team meeting to review results and data obtained in 2003/2004 and plan future field work and activities for the remainder of 2004.

Mission to Indonesia: CIRAD (May 2004)

Preparatory and planning work for socio-economic study to be coordinated by CIRAD (E. Cheyns and B. Sallée) in conjunction with ICCRI and the national socio-economic consultant. Workshop held to define detailed methodology and objectives of the 3 studies; determined organization of responsibilities; preliminary interviews and field visits; and drawing up of work schedule and resource requirements.

Mission to FAO, Italy: C. Montagnon, CIRAD (May 2004)

Meeting with CIRAD management to review progress against the Letter of Agreement between FAO and CIRAD.

Mission to ICO, United Kingdom: J. Jackson (May 2004)

To attend ICO Council meetings and deliver project progress update to ICO Council.

Mission to Colombia: M. Frank (May 2004)

Technical backstopping of project in Colombia with specific objectives of planning implementation of all field trials proposed for 2004; supervising the setting up of the fermentation protection protocol; monitoring start-up of other field trials; and backstopping training on mycological activities as required.

Mission to Indonesia: T. Marsh (May 2004)

Supervisory mission to assist in the planning and preparation of 2004 drying and storage trials developed during mission in March 2004.

Mission to Kenya and Uganda: D. Duris (June 2004)

Technical backstopping of project in both Kenya and Uganda, with aim of preparing detailed implementation and delivery plans for coming season; overseeing setting up of initial trial runs (delayed processing; hindered drying; defects investigations; impact of stirring); providing hands on guidance re: recording and reporting of data.

Mission to Uganda: CIRAD (June/July 2004)

Follow-up mission re: socio-economic coordinated by CIRAD (E. Cheyns and B. Sallée) in conjunction with UCDA and the national socio-economic consultant.

Mission to FAO, Italy: M. Frank, D. Duris, F. Bonnot (September 2004)

Project team meeting to review results and data obtained in 2003/2004 and plan final field work and activities for 2004/2005.

Mission to ICO, United Kingdom: J. Jackson (September 2004)

To attend ICO Council meetings and deliver project progress update to ICO Council.

Mission to India: M. Frank and R. Clarke (October/November 2004)

To attend ASIC meeting in Bangalore, presenting project results and update, and to deliver a 1-week refresher ToT course to national participants selected by Coffee Board of India. Dr Frank stayed in India to technically backstop field trials

Mission to Indonesia: T. Marsh and R. Clarke (December 2004)

Supervisory mission to assist in the preparation and setting up of 2004/5 drying and storage trials and to discuss socio-economic study being completed by Dr Wayan Susila, national consultant. CFC Project Supervisory Mission arranged to coincide with this mission.

Mission to India: M. Frank (January 2005)

Backstop progress made on the previous mission and start off the experimental programme planned for the Indian robusta harvest.

Mission to FAO, Italy: M. Wheeler and G. Stapleton (February 2005)

Meeting to discuss scope and methodology for final socio-economic study on uptake of hygiene recommendations of the project.