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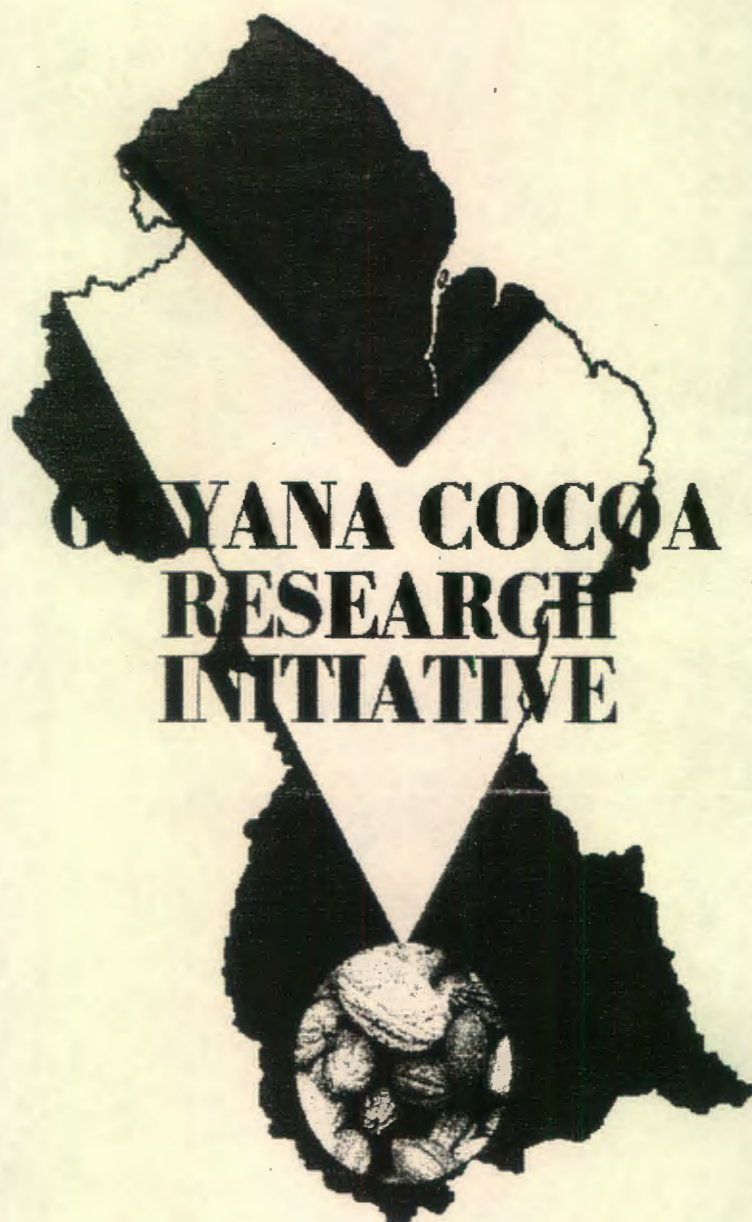
To: Cocoa Research Sub-Committee

From: Michelle End

1 April, 1998

Guyana Cocoa Research Initiative 1998

Please find attached a copy of the Guyana Cocoa Research Initiative produced by Dr. Mark Johnston and colleagues of the University of the West of England. This contains details of the proposed expedition which we agreed to support with a contribution of £5000 at our last meeting.



1998

Working with the full support of the National
Agricultural Research Institute (N.A.R.I), Guyana.

GUYANA COCOA
RESEARCH INITIATIVE
1998

EXPEDITION ADDRESS

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Introduction

The Guyana Cocoa Research Initiative (GCRI) is a collaborative project between British environmental science graduates and Guyanese researchers from the National Agriculture Research Institute (NARI), whose primary objective is to describe, catalogue and collect wild cocoa (*Theobroma cacao* L. Sterculiaceae), from remote forest areas of Southern Guyana which would play a key role in charting and conserving cocoa diversity for the long term benefit of Guyana and its people.

The Government of Guyana embraced the Rio Declaration on the Environment and Development, and has donated a million acres of rainforest (1989) to the international community for experimentation with systems of sustainable management (*Guyana update, July 1997*), to demonstrate its commitment to the sustainable use of its forests resources. Guyana houses a largely un-documented biological diversity and with the forests of Guyana covering over 183,025km² (Harcourt & Sayer, 1996), the forest of Guyana represent an important reservoir of genetic diversity which is central in achieving sustainable development, (Miller *et. al.*, 1996).

A key genetic resource of international importance is cocoa, of which the *ex-situ* and *in-situ* conservation has been priorities by the International Plant Genetic Resources Institute (IPGRI). The GCRI will assist to this vision by helping Guyana realise the potential of the genetic resources of its cocoa opening the way for Guyana to develop its own cocoa production (Watkins, Knowles & Johnston, 1996).



National Agricultural Research Institute

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TO WHOM IT MAY CONCERN

This is to certify that the National Agricultural Research Institute (NARI) is the designated Institute in Guyana to conduct agricultural research and related development, is very supportive of a proposal by Dr. Mark Johnston of the Department of Environmental Health and Science of the Faculty of Applied Sciences of the University of West of England. We are hoping to rehabilitate and re-establish cocoa as a crop in Guyana and in this task, assistance is needed in many areas. Of particular importance is the restoration of the germplasm material which was once established here and the collection of material from more distant localities in the country, characterise them and add them to the collection which would be rehabilitated. The collection would be available for use by all cocoa growing countries.

The work outlined above which is of strategic importance to the success of the crop in Guyana is planned to be executed by Dr. Mark Johnston who is eminently qualified to undertake this task. Any support which can be given to him would be much appreciated and would be to the benefit of the cocoa crop in general.

Professor N. Ahmad
Director

Objectives

The overall aim of the project is to assist in the *ex-situ* conservation and documentation of cocoa in Guyana, with the objective to;

- Describe, catalogue and collect wild cocoa germplasm material from key forest localities in Guyana and to facilitate the restoration of the existing Guyana cocoa germplasm bank at Timehri. Also the incorporation of material collected for future research and commercialisation of cocoa.

Preliminary studies on the current status and history of cocoa in Guyana have already been undertaken (Watkins, Knowles & Johnston, 1996; Johnston, 1997), and this project will expand upon these studies and assist in the facilitation of cocoa germplasm conservation.

Background

World cocoa production has been on a slow increase to 2.3 million tonnes in 1994/95. While 47 countries produce cocoa, approximately 88% of world production originates from only eight producer countries (ICCO, 1994). Demand for cocoa in Europe increased from 39% to 46% of the world market between 1988/89 and 1994/95. In Trinidad, cocoa production increased from 1,550 tonnes in 1993 to 1,737 tonnes in 1995, with over 90% exported. Unlike Trinidad, cocoa in Guyana is not grown on a commercial basis, only grown for local consumption by local farmers and Amerindians.

Currently 86% of the world's cocoa is produced by smallholders with production varying between 400 and 800 kg/ha (ICCO, 1993). However, a key limitation in cocoa production has been the high incidence of fungal diseases, notably Black Pod (*Phytophthora palmivora*) and Witches Broom (*Crinipellis perniciososa*), which can reduce production by over 30% per annum (Lass, 1985, Warren, 1994). This significant reduction in production has contributed to three consecutive years of deficit in global cocoa production (ICCO, 1994), as well as threatening the livelihood of smallhold farmers.

The need for high yielding pest resistant cocoa varieties is most apparent, especially as;
i) cocoa yields and cocoa plantation longevity are significantly reduced by the high incidence of pests and diseases, and; ii) expanding agriculture in developing countries has increased land pressure and therefore acts as a threat to biodiversity conservation.

Studies in French Guiana have indicated that wild cocoa types found in the region are genetically distinct from cocoa found in the Lower Amazon (Lachenaud & Salle, 1993; Laurent *et al.*, 1994). Early indications are that this material shows some resistance to Witches Broom. In Guyana, Watkins *et al.*, (1996) identified 23 previously undocumented wild and abandoned plantation cocoa localities which included varieties morphologically similar to 'wild' types from French Guiana. The GCRI will be visiting key previously un-documented localities identified by Watkins *et al.*, (1996).

Documentation and conservation of cocoa in Guyana would;
i) guarantee a genetic stock for future commercialization, ii) conserve genetic material *ex-situ* for incorporation into international genebanks, and iii) provide genetic material with possible disease resistance. Guyana attempted commercial production of cocoa in the 1960s, but attempts failed due to the high incidence of disease.

Project Outcomes

The main expected outcomes of the GCRI project are as follows:

- The conservation of cocoa varieties will help to provide a starting point for the re-establishment of cocoa production in Guyana, by adding to existing expertise and knowledge. Plants both in the germplasm bank and ones which are subsequently discovered may also have an intrinsic value by containing resistance to diseases, lacking in known varieties. By claiming and conserving these varieties, the country will gain an important resource of recognised value.
- Restoration of the germplasm bank will check the deterioration of the site and ensure the survival of the existing "new" varieties of cocoa, as well as acting as a receiving point for the new varieties brought in by the expedition or subsequent research. The process of restoring the germplasm bank will also provide people with experience of both what is required to achieve the restoration and conservation of species and working with people from a different culture. It is hoped that the co-operative effort will be rewarding for both expedition members and local people. It is expected that closer links will be forged with NARI.
- Training of the members of the expedition in Trinidad in collection and curation techniques will be valuable not only to themselves but to local researchers to whom that training and knowledge will be passed. In such a way, expedition members will learn how to pass on information and expertise, and Guyanese expertise will be improved allowing continuation of the project and thus giving greater autonomy to local researchers.

The description and mapping of varieties of cocoa growing in Guyana will add to knowledge about cocoa variety and distribution within the country and help in the building of a complete picture of the country's cocoa resources and history of its distribution. This will aid the further search and discovery of cocoa varieties.

Study Area

Guyana is on the North cost of South America, bordering Venezuela in the West, Brazil in the South and Suriname in the East. The area of Guyana is 214,970 km² with a population of 729,425 (1994 estimate), with 90% living in the coastal region. The population is over 50% East Asian, 30% black, 11% mixed and 5% Amerindian. Descendants of the Amerindian tribes are divided into nine ethnic groups, for example Arawak, Carib, Wapishana and the Warao. Dense tropical rainforest covers most of the interior, though south-western Guyana features an extensive savannah between the Rupununi River and the border with Brazil.

Two main areas of study, A and B, have been chosen, based upon known cocoa localities from previous studies undertaken in 1995 (Watkins *et al*, 1996) and 1996. Each selected locality is shown in Figure 1.

Study Area A: Primo's Inlet and Rewa Creek.

Primo's Inlet, Essequibo (locality 1: 03° 53.26' N ; 58° 22.57' W). The cocoa here is a naturalised old Dutch plantation with approximately 347 trees (Johnston, M.A. 1996). The nearest settlement to Primo's Inlet is the Amerindian settlement of Apoteri which is approximately 35 km down stream.

Rewa Creek, Rupununi River (locality 2: 03° 08.50' N ; 58° 38.00' W). This was first described by Myers (1930) as having wild cocoa.

Study Area B: Kuyuwini and Kassikaityu Creek.

Kuyuwini Creek, Essequibo River (locality 3: 02° 15.5' N ; 58° 55.0' W). This is situated on the border between the Essequibo and the Rupununi which runs from the Essequibo south west to the Brazilian border.

Kassikaityu Creek, Essequibo River (locality 4 : 01° 45.5' N ; 58° 50.0' W). The cocoa in both of these localities were described as being "plentiful" by Myers (1930).



The word Guyana means "Land of many waters", a fact in no dispute as the country has many large rivers running through it, (Fig. 1, below). Of interest to the expedition team are the Essequibo and the Rewa and their tributaries.

The germplasm bank at Timehri is located just outside the capital city Georgetown. The initial landing sites of the two expedition teams are also marked, these being Apoteri and Gunn's airstrip.

Once in the field the teams can expect dense rainforest, (Fig. 2, left). The need for local knowledge is clear when cocoa trees need to be spotted in such an environment.



MAP SOURCE: PERRY - CASTANEDA LIBRARY MAP COLLECTION, THE UNIVERSITY OF TEXAS, AUSTIN.

PICTURE SOURCE: M. JOHNSTON

Project Methodologies

In order to achieve the objectives of the GCRI four distinct methodological tasks will be undertaken;

Task 1: Development of techniques in germplasm collection and curation.

Before undertaking the field investigations members the team will spend 5-7 days in Trinidad at the Cocoa Research Unit (CRU) being trained in cocoa collection and curation techniques, (Engels *et. al.*, 1994). These techniques will then be transferred to Guyana through the re-establishment of the Guyana cocoa germplasm bank at Timehri and the incorporation of wild material collected.

Task 2: Re-establishment of the Timehri Germplasm Bank.

At present there is a disused research centre based in Timehri which will be restored to an operational standard by the expedition team and a representative of NARI. Task 2 is an important pre-requisite to Task 3, whereby the existing cocoa stock at the Timehri Germplasm Bank will be restored prior to the sample collection. Task 2 will first involve the clearing of the vegetation overgrowing the existing cocoa trees, and the digging of drainage canals for irrigation. This preparation of the germplasm bank is essential to ensure the long-term conservation and survivalship of the cocoa trees in the bank, and techniques in germplasm curation will follow recognised procedures (notably Guarino *et. al.*, 1995).

Once restored, new root stock material will be prepared at Timehri in order to accept and establish the material collected during Task 3. The necessary skills in the restoration of the germplasm bank, and the establishment of the root stock will be undertaken during Task 1 (see Workprogramme Outline above), under supervision from the Cocoa Research Unit, Trinidad.

Task 3: Collection and documentation of wild cocoa.

From previous studies it has emerged that cocoa species predominately grow along, or in close proximity to river systems. (Watkins *et al.*, 1996; Lachenaud *et al.*, 1997). It is a fact that each river possesses a variety of cocoa distinct from those encountered in other rivers, Tropical Agricultural Association (1994).

Due to the habitat and locality of the majority of cocoa trees therefore this study will be targeted at as wide a geographical area as possible to provide the greatest range of genetic variability. The GCRI will concentrate on the visiting known cocoa localities identified by Watkins *et al.*, (1996) in 1995, and specifically those localities where the cocoa remains uncharacterised, and where no representative samples of the cocoa occur in existing germplasm banks.

These uncharacterised cocoa localities have been identified and prioritised in discussion with Dr. Mark Johnston, and two key geographical areas have been identified (see Study Area & Logistics). Travel within the rainforest environment is at the best of times difficult. These river systems also therefore provide easy access to our potential study localities. The expectation of the GCRI is that cocoa trees will usually be found as a constituent of the lower story of small trees, in a relatively shaded habitat. Trees may sometimes be found singularly, but as a rule are found in groups of 2 - 5, (Kew Bulletin 1930).

Documentation and description of cocoa types.

Although the habitat of the cocoa tree is relatively well established, field identification for the GCRI may be a complex process due to the density of the vegetation present. Therefore, local indigenous people to Guyana will be hired to aid in locating the cocoa trees. Once a tree has been found its position will be logged using Global Positioning System (GPS) to the nearest possible locality, and using the best available maps. Each cocoa tree found will then be tagged and systematically described in accordance with internationally accepted botanical characteristics known as crop descriptors.

For each tree located, official IBPGR crop descriptors (IBPGR, 1981; see End, Wadsworth, Hadley, 1993), will be recorded in order to assist in the identification of the cocoa type/variety, and provide additional information in the genetic analysis of cocoa material. The crop descriptors will include a selection of key descriptors covering leaf, flower, fruit and seed characteristics.

In addition to these crop descriptors both the height (if possible), and the girth at breast height of the tree (gbh), will be noted. Other general observations recorded will be evidence of disease through fungal and bacterial infection (Witches Broom *Crinipellis perniciosus* and Black Pod), and damage from pests (Cocoa pod borer *Conotrachelus humeropictus* Fiedler, and the Cocoa Mealy Bug).

Collection of Cocoa samples

From each tree located three representative samples will be collected;

- (i) Budwood (for root stock grafting at the Timehri Germplasm Bank);
- (ii) Cocoa seeds/pods (for seed propagation at Timehri), and;
- (iii) Leaf material (for genetic analysis).

This material will be preserved for the remainder of the expedition, using techniques established at the CRU Trinidad, until such time as it can be transferred to the Germplasm Bank previously prepared in Task 2.

Task 4: Incorporation of wild cocoa material into existing germplasm bank

Material collected from the field investigations will be incorporated back into the Guyana germplasm bank at Timehri using techniques and experience gained at the CRU, (Task 1). It will be grafted onto the prepared root stock producing a clone of the mother tree, thus conserving Guyana's wild cocoa populations, and also providing material for future genetic studies. The establishment of a genetic basis to disease resistance is a characteristic sought after by cocoa producers. Techniques will be passed to the NARI representative at Timehri.

Genetic analysis of cocoa material

Leaf material collected from each tree found will be taken to the School of Plant Sciences, University of Reading for genetic analysis. The School of Plant Sciences is currently undertaking detailed genetic analysis of cocoa material, a project funded by the Biscuit, Cake, Chocolate & Confectionery Alliance (BCCCA) (Charter *et. al.* 1996a & 1996b). Information from the analysis will then be returned to Guyana (NARI), and used in the identification of the different cocoa types held at the germplasm bank. Analysis will also assist in the preliminary identification of cocoa types which may be genetically resistant to fungal pathogens. This information will be absolutely essential to authorities in the possible future development of the cocoa industry in Guyana.

The leaf material exported from Guyana will only be used for this analysis, will not have any economic value, and cannot be used to propagate cocoa (see Property Rights section).



FIG. 3, Three cocoa *Theobroma cacao* varieties found at the Guyana cocoa germplasm bank, Timehri, Guyana. (M. Johnston)

Research Permission and Collaboration

In order for the project to meet its objectives and outcomes the GCRI project is working in close collaboration with two key regional institutions. Technical co-operation and guidance is being provided through the CRU, of the University of the West Indies (UWI) in order to achieve task 1 objectives.

In Guyana the project will be working with NARI, through links developed by Dr. Mark Johnston and the 1995 Guyana Cocoa Diversity Project. NARI staff will be actively involved in tasks 2 & 4 of the project and a representative from NARI will be joining tasks 2,3 and 4, The project has full approval from the Director of NARI, Professor Nazir Ahmad.

Logistical support for the project is to be provided by the Guyana Defence Force, including the use of radio communications, hire of boats and internal flights.

The project is likely to be working with CIRAD, from French Guiana, who have a vested interest in the documentation and characterisation of Guyana's Cocoa.

The GCRI project is supported and approved by the Department of Environmental Health and Science of the University of the West of England, Bristol (UWE).

Property Rights

When carrying out work in a foreign country there are certain ethical guidelines which should be adhered to, based on the Manila Declaration. The GCRI will be collecting genetic material of national ownership and economic value. Here we emphasize that our primary objective is the conservation of cocoa material in **Guyana**, through the establishment of the germplasm bank. The leaf material collected for genetic analysis will have no economic value and will be exported for genetic analysis only. No germplasm material (i.e. material which may be used to propagate or cultivate cocoa) will be exported from Guyana during this project.

The International Code of Conduct for Plant Germplasm Collection and Transfer (FAO 1996) guiding principle is that 'the conservation of plant genetic resources is a common concern of humankind', and that 'nations have sovereign rights over their plant genetic resources in their territories'. The code also enumerates that the benefits of germplasm collecting should be shared with local communities, farmers and host countries (article 14). Article 14 of the code is central to the project objectives and workpackages. These Code of Conduct guidelines are also covered in articles 9 and 14 of the Convention on Biological Diversity (CBD).

Throughout, the project will follow the guidelines of the Code of Conduct and the CBD, and adhere to national legislation and control mechanisms of the Ministry of Agriculture in the respective host countries. NARI will be responsible for ensuring that their national legislation is followed.

During the collection of leaf and seed material from the different localities, strict guidelines will be adhered to, notably that no more material than is strictly necessary will be collected.

In addition photographs and slides will be left for the host institute, and copies of research reports and publications sent to collaborators and host institutes.

Logistics

The following outline programme has been devised to allow the maximum time in the field and to reduce expedition costs by keeping the periods spent in Trinidad and Georgetown to a minimum.

The expedition will be initially split into three groups :

1. Four personnel will travel to Trinidad to learn the scientific techniques previously described.
2. An advanced party of three persons will travel to Georgetown to supervise expedition logistics, equipment purchasing and make the necessary local contacts.
3. The remaining personnel will travel to Georgetown seven days after group 1, when the training in Trinidad will be complete.

Once all the expedition personnel have assembled in Georgetown work will commence on the restoration of the Timerhi germplasm bank. It is estimated that five days will be required to complete this task.

After the completion of the genebank's restoration the expedition will travel, by air, to Apoteri airstrip and split into two equally sized groups:

- A. Travel from Apoteri, by boat, to Primos inlet and subsequently along the Rewa River.
- B. Continue, by air, to Gunn's airstrip and travel, by boat, along the upper reaches of the Essequibo river, the Kassikaityu river and the Kuyinwini river.

Completion of the field work is expected within 56 days, including travel to and from the study areas. All expedition personnel will then return to Georgetown for four days to complete the post field work prior to returning to the UK.

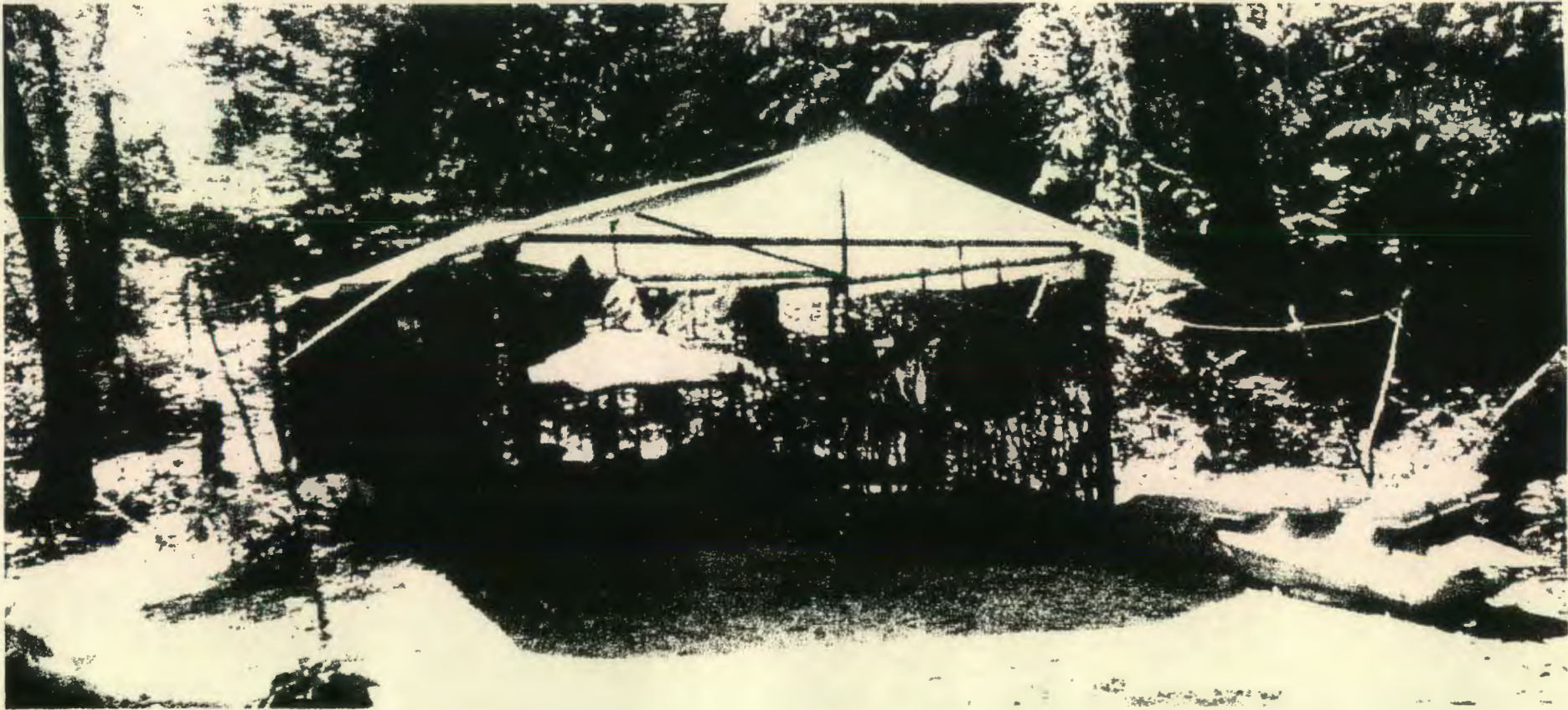


FIG. 4, Typical accommodation for the majority of the expeditions stay in the Guyanese rainforest.

Budget**Pre-departure costs**

Flights	£800 pp	£8,800
Insurance	£80 pp	£880
Administration		£800
Equipment		£1,600
Medical Kit		£400
Sub-total		£12,480.00

Field costs

Phase I	Accommodation	£20 pppd	£400
	Living costs	£12 pppd	£240
	Transport		£100
Sub-total			£740.00

Phase II	Accommodation	£10.00 pppd	£740
	Living costs	£8.50 pppd	£629
	Transport		£200
Sub-total			£1,569.00

Phase III	Accommodation		£250
	Living costs		£4,004
	Internal flights		£4,500
	Boat hire (inc. petrol)		£3,000
	Local guides		£800
Sub-total			£12,554.00

Phase IV	Accommodation	£10.00 pppd	£440
	Living costs	£8.50 pppd	£374
Sub-total			£814.00

Post-field costs

Final report		£500
Photography		£160
Administration		£150
Sub-total		£810.00

TOTAL **£28,967.00**

Contingency (5%) **£1,448.35**

Personal Contributions

Less £500 per member £5,500

Total to be raised **£24,915.35**

Team Members

Vic Jennings BSc. (Hons) Environmental Science, 2.1.

Co-ordinator. 14/07/74

Recently graduated from the University of the West of England (UWE) with modules including Plant Growth and Survival, Environmental Plant Physiology and Ecological Survey. Interests include long distance walking: hiking independently along the length of Scotland; and also journeying further afield, most notably travelling extensively around Australia for 12 months before University. Being a member of the University Sub-aqua Club for four years enabled the pursuit of the sport and the achievement of the internationally recognised diving qualification Dive Leader, as well as relevant skills like Diving First Aid. Confidently looking towards a productive and successful three month research project working closely with the people of Guyana to aid and assist in their country's future scientific and agricultural development.

David Molesworth BSc. (Hons) Environmental Studies, 2.2.

Assistant Co-ordinator. 29/04/60

Senior technician in Environmental Biology at UWE working for two years in the laboratory and in the field with both undergraduates and postgraduates. Previously worked at Bath University and Avon Wildlife Trust on conservation and ecology projects as well as teaching English abroad and restoration of antique china. Also has considerable experience in taxonomy of British Flora and marine fishes and has travelled overland through Africa and South America. Degree course was taken at Sunderland Polytechnic and school studies conducted at Oswestry Boys High School. Will provide specific technician experience and support for the project, notably through Tasks 2 - 4.

Susannah Spink BSc. (Hons) Environmental Science, 2.2.**Assistant Co-ordinator. 15/5/76**

Recently graduated from UWE specialising in the study of the survival of *E.coli* in the estuarine environment and it's potential as a biological indicator, final year modules included Ecological Survey and Environmental Biotechnology. Previously studied at Carisbrooke High School, Isle of White, where A-Level Biology ecological field trips first inspired field research. Hobbies include being an active swimmer whose membership of the SCUBA Diving Club at university resulted in NoviceII qualification.

Spencer Thorn BSc. (Hons) Environmental Science, 2.1.**Science Officer. 28/11/75**

Bristol based member of the expedition party who has recently graduated from UWE specializing in plant physiology and agricultural management which lead to dissertation research in integrated crop management at Long Ashton Research Station, England. Currently working for telecommunications company as a Communications Advisor. Interest in the expedition is to further knowledge of botanical research whilst experiencing the Guyanese culture. Studied at Kingsfield Sixth Form for A-levels and participated in an exchange trip to Greece to study environmental problems of the country with Greek students. Actively participates in rugby and cricket at club level and enjoys coarse fishing.

Esther Lay BSc. (Hons) Environmental Science, 2.1.**Science Officer. 9/2/76**

Currently working as a Technician Ranger for Bexley London Borough Council Environmental Protection Team. Presently involved in voluntary conservation work in the North West Kent area and working with Traidcraft which provides fair marketing for third world countries. Previously studied ethnobotany and ecological survey and is hoping to extend knowledge in these areas. Carried out research into hedgerow management with Long Ashton Research Station, Bristol and hopes to gain further

experience in field research techniques to better equip a future career in research. Attended Chislehurst and Sidcup Grammar School Sixth Form for A-level study.

Andrew Lewis.

Equipment Officer. 25/6/78

Currently studying for a BSc (Hons) in Applied Biological Science with main interests being Plant Growth and Survival and the Biotechnology modules. Hopes to further interest and experience of these areas of study and also contribute to the ongoing development of Guyana's role as a cocoa producer. Worked as a volunteer for Brecon Beacons National Park helping with ecological surveys and regeneration of damaged sites. Held the position of Equipment Officer for a mountain and hill walking club, and fulfilled role of Course Rep. at the UWE Student Union.

Nick Watt.

Equipment Officer. 07/04/69

Worked in retail banking for eight years before returning to study. Currently at UWE reading for a BSc (Hons) in Environmental Science with modules including Applied Ecology, Plant Growth and Survival, Industrial Studies and Agricultural Systems. Became interested in the environment as a result of a passion for hill walking and is looking to pursue a career in research after gaining valuable experience from this expedition. Actively interested in cycling holding membership of Sustrans which promotes sustainable transport. Holds position of an RAF volunteer reserve officer with the Air Cadets.

Dave Hanks BSc. (Hons) Environmental Science. 2.2

Medical Officer. 12/2/76

Developed an interest in this area of study during degree course through various modules including Environmental Plant Physiology and Plant Growth and Survival. Attended Mangotsfield Sixth Form for A level studies. Leads an active and adventurous lifestyle including commitment to local football and boxing clubs and formally a member of Army Cadets holding the rank of Warrant Officer Class 1 with RSM and

CSM appointments. Hoping to gain expedition experience to launch military or overseas field research career.

Jo Ridge BSc. (Hons) Environmental Science. 2.2

Medical Officer. 8/1/76

Keen interest in environmental issues with dissertation specialising in the health effect of the Chernobyl disaster on children. Currently working for a finance company and undertaking voluntary conservation work with BTCV. Attended Llanishen High School, Cardiff. Enjoys keeping active through snowboarding, mountain biking and swimming. Has always wanted to explore a tropical rainforest and hopes to gain valuable experience for use in a future career.

Kate Waller BSc. (Hons) Environmental Science. 2.2

Logistics Officer. 15/6/75

A graduate of UWE specializing in the movement of Whiting in the River Severn, England. Final year modules included: Plant Growth and Survival, Applied Ecology and Ecological Survey. Previous study was based at Weymouth college of higher education, assisting the RSPB with the conservation of reed beds in the Dorset area. Actively participates at Scuba diving, swimming, and canoeing and enjoys reading and conservation work.

Rae Morris BSc (Hons) Environmental Science. 2.2

Logistics Officer. 21/10/74

Degree areas covered that will be of aid on this expedition include; Ecological Survey, Plants for People (including Ethnobotany) as well as field trips, giving good experience in field and group work. From the GCRI project it is hoped that knowledge of travelling, working as part of a team, organising logistics and experiencing different cultures will lead to future expedition work. Took part in A-Level study at Esher 6th form college, Wimbledon.

Sarah Jameson BSc. (Hons) Environmental Science. 2.2**Photographic Officer. 11/9/75**

An ideal candidate for this expedition to Guyana in terms of energy and confidence, acquired through the participation of various sports including the martial arts. Very enthusiastic about experiencing other cultures first hand and this expedition will provide a perfect opportunity to work with such cultures, enabling further travel in the future. Degree studies were conducted at UWE and final year modules included Spanish and Ecological Survey, dissertation specialization was the environmental and legislative impact of oil spills. Before attending UWE A-Level studies were conducted at Wanstead high school, East London.

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