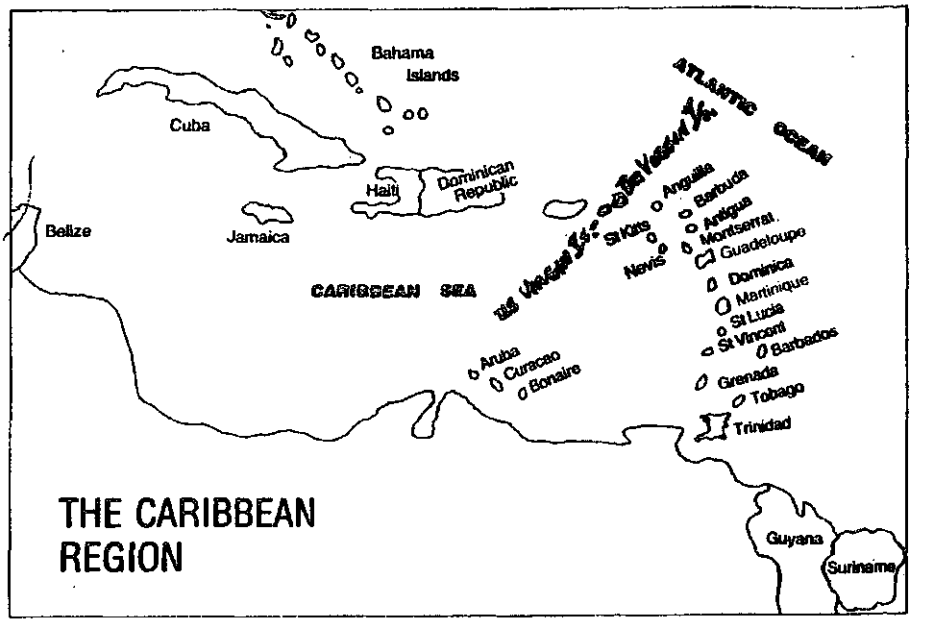
CARIBBEAN DEVELOPMENT AND CO-OPERATION COMMITTEE



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CARIBBEAN DEVELOPMENT AND CO-OPERATION COMMITTEE

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REPORT OF WORKSHOP ON CO-OPERATION BETWEEN THE MEMBER COUNTRIES OF THE CARIBBEAN DEVELOPMENT AND CO-OPERATION COMMITTEE IN RESEARCH AND DEVELOPMENT OF TROPICAL ROOT AND TUBER CROPS (Guadeloupe, 9-10 July 1985)

UNITED NATIONS

ECONOMIC COMMISSION FOR LATIN AMERICA AND THE CARIBBEAN
Subregional Headquarters for the Caribbean

C O N T E N T S

INTRODUCTION

This report summarizes background information, discussions and recommendations of the Workshop at which root and tuber crop researchers from member countries of the Caribbean Development and Co-operation Committee (CDCC)[1/] assessed the state of current research, the levels of production of these crops in their respective countries and considered proposals for functional co-operation in research and related areas of common interest.

The Workshop was conducted within the framework of Project RLA/84/006[2/] and forms a part of the ongoing consultations between CDCC countries. Caribbean agricultural research organizations and international agricultural research centres and agencies aimed at the establishment of a Caribbean Co-operative Agricultural Research Network in keeping with the recognized principles of a TCDC programme.

I. BACKGROUND

At the Workshop on Agricultural Research Policy and Management in the Caribbean, held in Port of Spain in September 1983[3/], the Permanent Secretaries of Agriculture and Directors of Agricultural Research of CDCC countries agreed to strengthen co-operation in agricultural research, particularly in areas of common interest and recommended that such co-operation could best be achieved by the establishment of a co-operative agricultural research network.

1/ Antigua and Barbuda, Bahamas, Barbados, Belize, Cuba, Dominica, Dominican Republic, Grenada, Guyana, Haiti, Jamaica, Saint Christopher/Nevis, Saint Lucia, Saint Vincent and the Grenadines, Suriname and Trinidad and Tobago.

2/ Establishment of a Caribbean Co-operative Agricultural Research Network - RLA/84/006.

3/ Report of the Workshop on Agricultural Research Policy and Management in the Caribbean, (E/CEPAL/CDCC/107) dated 2 December 1983, organized jointly by the ECLAC Subregional Headquarters for the Caribbean and the Caribbean Council for Science and Technology.

The basic concepts of the co-operative programme are sharing of scarce resources for the resolution of common problems, using available resources in an organized manner for the mutual strengthening of the research programmes of participating countries and enhancing their capabilities to develop and deliver useful technology for increasing agricultural productivity. An additional major objective of the co-operative research network would be strengthening national agricultural research systems to cope more effectively with national research and development objectives.

The working groups which were set up at the 1983 Workshop identified a number of commodities and research topics of common interest in CDCC countries which could be advanced through the mechanism of inter-country co-operation in agricultural research and transfer of technology. The commodities included rice; root and tuber crops; vegetables, with priority on onions; grain legumes and forage grasses and legumes.

So far the main actions taken to implement the recommendations of the 1983 Workshop are:

(i) Senior rice researchers from CDCC countries participated in the Workshop on Co-operation in Rice Research between the Member Governments of the Caribbean Development and Co-operation Committee.[4/] The participants at this Workshop agreed on a networking programme which includes research, exchange visits, dissemination of research results and training. The International Centre for Tropical Agriculture (CIAT) agreed to co-ordinate the rice networking activities during the initial phase with the support of the International Rice Research Institute (IRRI). The rice network would become a commodity programme under the Caribbean Co-operative Network when the latter is established;

(ii) Directors of Agricultural Research of CDCC countries participated in a Workshop held in Kingston, 3-7 December 1984 to consider a draft document setting out the framework for the Establishment of the Caribbean Co-operative Agricultural Research Network. The Directors of Agricultural Research, inter alia agreed that the network activities would cover two broad programme areas:

4/ Ref. LC/CAR/G.119 (SEM.1/1) CDCC/RR/84/1, 23 October 1984.

(a) Research and Development - including scientific research; the development of new technology, reciprocal technical co-operation, advisory services and technology delivery;

(b) Strengthening National Research Systems - including support to national institutions to increase their capability to carry out specific research functions.

The participants at the Kingston Workshop requested the international research centres concerned with root and tuber crops in Latin America and the Caribbean, that is, the International Centre for Tropical Agriculture (CIAT), the International Potato Centre (CIP) and the International Institute for Tropical Agriculture (IITA) to increase their support for research and development of root and tuber crops in the Caribbean. Other international research centres, institutions and agencies, in particular the Food and Agriculture Organization (FAO) were also asked to support the proposed network and to assist with the establishment of the networking programmes which had been identified or which might be identified at a future date.

CIAT, CIP and IITA responded positively to the request for support and indicated that the network would be a useful mechanism through which these centres could increase their support to agricultural research in the Caribbean.

II. ORGANIZATION OF THE WORKSHOP

The present Workshop, organized jointly by CIAT, CIP, IITA and the ECLAC Subregional Headquarters for the Caribbean with the assistance of the Institut National de la Recherche Agronomique, Guadeloupe, was held from 9 to 10 July, 1985 at the Arawak Hotel, Point de la Verdue, Gosier, Guadeloupe.

Each CDCC country was asked to prepare a paper explaining the current position of research, production and demand for root and tuber crops and also the factors which limit the further development of these crops in the particular country. In order to facilitate the preparation of these country papers, CIAT, CIP and IITA jointly contracted a root crop special-

ist from the Caribbean to assist the national scientists. The consultant also prepared a regional position paper. These papers were used as the working documents at the workshop.

Participation

Root crop researchers from 14 CDCC countries participated - Bahamas, Barbados, Belize, Dominica, Dominican Republic, Grenada, Guyana, Haiti, Montserrat, Netherlands Antilles, Saint Christopher/Nevis, Saint Vincent and the Grenadines, Trinidad and Tobago, and the U.S. Virgin Islands. Institutional representation included CIAT, CIP, IITA, CIMMYT, the Caribbean Agricultural Research and Development Institute (CARDI), the University of the West Indies (UWI), the Inter-American Institute for Co-operation on Agriculture (IICA), FAO, the Canadian International Development and Research Centre (IDRC), the Canadian International Development Agency (CIDA), Centro Agronómico Tropical de Investigación y Ensenenza (CATIE), the European Economic Commission (EEC), the CARICOM Secretariat and the Institut National de la Recherche Agronomique (INRA) of the French West Indies.[5/]

Objective

The objectives of the workshop were:

(i) The identification and definition of common problems limiting the further development of root and tuber crops in CDCC countries and priority research of common interest for the resolution of such problems;

(ii) The estimation of the potential for further development of root and tuber crops in the CDCC area;

(iii) The development of a programme for networking activities including research, exchange of genetic material; training and transfer of information and technology.

Agenda

The agenda for the workshop was:

1. Country reports on root and tuber crop programmes including inter alia research, production, demand and development programmes;

2. An overview of root and tuber crop industry in CDCC countries;

5/ A list of the participants is given at Annex I.

3. Identification of priority research needs for root and tuber crops in CDCC countries;

4. Recommendations for networking activities.

III. SUMMARY OF PROCEEDINGS[6/]

During the opening session Dr. James Cock of CIAT spoke on behalf of CIAT, CIP and IITA. These three centres consider that the proposed Caribbean Co-operative Agricultural Research Network could provide a useful mechanism through which they could assist Caribbean countries to increase productivity of root and tuber crops. Consequently, the centres had allocated resources to assist in holding the present workshop. These centres are prepared to give joint support to root and tuber crop programmes as a means of helping to strengthen national research capabilities; they will also make staff available to visit the region as research advisers and to assist in regional training activities as appropriate, provided such activities were planned well in advance. Additionally, the centre would supply, free-of-charge, small quantities of pathogen-tested germplasm, available publications and training materials.

Mr. C. Walter, Economic Affairs Officer responsible for Agriculture in the ECLAC Subregional Headquarters for the Caribbean welcomed the participants on behalf of the Director of that Office, thanked the representatives of CIAT, CIP and IITA for the financial and technical support provided by the centres. He also thanked the representative of INRA for hosting the workshop and the many agencies and Caribbean root crop researchers for their participation. Mr. Walter gave a brief background of the events leading up to the workshop, pointed out the need to focus attention on the immediate objective of arriving at concensus on a practical programme for priority research, technology transfer, and in-service training which together could contribute to the development and increased productivity of root and tuber crops in the Caribbean.

6/ A fuller report of the Workshop, including the papers which were presented, the discussions and recommendations will be prepared for publication by CIAT on behalf of the sponsors of the Workshop.

The root and tuber crop industry in the CDCC countries

Each country representative presented a paper on the current state of research, production and utilization of root and tuber crops in their respective countries. Attention was also given to development proposals, the resources devoted to root and tuber crops, and in general the problems, the needs and actions being taken at the national level to increase production and productivity. Considerable time was devoted to discussion of the country papers and this resulted in an increased understanding of the problems, aims and prospects for increasing the production of root and tuber crops in the various countries. Most importantly, the participants became better informed of the ongoing activities in member countries and obtained a greater appreciation of the many common problems being experienced and the potential to participate in complementary programmes.

After presentation and discussion of the country papers, the consultant presented an overview of the root and tuber crop industry in the CDCC countries including some proposals for co-operative activities.

The following is a synthesis of those presentations and discussions:

Production

Root and tuber crops are the third most important energy food in the Caribbean - wheat and rice being of greater importance.[7/] The annual production of roots and tubers is estimated at just over 2,000,000 metric tons per annum (Table 1) and although there is marked seasonality in production, some supplies are available throughout the year; the continuing supply was considered to be most important with respect to food availability.

Traditionally, most of the root and tuber crops are produced by large numbers of small farmers on scattered, small plots usually on sloping, marginal lands. The size of these plots usually vary from less than one hectare and seldom exceed five hectares in size. In recent years, efforts have been made to organize production in Dominica, Jamaica and Saint Vincent

7/ FAO Food Balance Sheets 1979-1981.

and the Grenadines for export to areas in North America and Britain where people of West Indian origin are concentrated and also to intra-Caribbean markets. However, only a small percentage of the total production of tropical root and tuber crops are traded, the bulk being consumed locally. So far, the export of root and tuber crops may be considered of economic importance only in Dominica and Saint Vincent and the Grenadines.

The only root crop which is imported into the Caribbean is the potato. Over 100,000 metric tons are imported annually with Cuba, Trinidad and Tobago and Barbados being the largest importers. Trinidad and Tobago is the only country which imports significant quantities of the other root crops - sweet potatoes, yam, aroids and cassava - which are supplied mainly by Saint Vincent and the Grenadines with small quantities coming from Dominica, Grenada and Barbados. Recently, frozen cassava has been imported into Trinidad and Tobago from Costa Rica and the Dominican Republic.

Current Production Problems

In general, small and subsistence farmers are the major producers of root and tuber crops in the Caribbean. Systems of production are mainly traditional, with high manual labour input under rain-fed conditions utilizing low levels of fertilizer application and minimal pest and disease control.

Unimproved cultivars which have been maintained by farmers over many years are usually planted and consequently, yields are relatively low (Table 2). The year round maintenance of planting material on the farmers' plots with minimum pest and disease control measures is often a contributing factor to the high threshold level of pests and diseases which reduce biological yield but more often, marketable yield and quality.

Marketable yields are further reduced by damage during harvest, and by post-harvest losses due to poor handling, transport and storage conditions as well as the failure to practice known methods of treatment to reduce deterioration of the harvested crop. It is estimated that in general, post-harvest losses account for 25-30 per cent of production in most Caribbean countries.

The development of post-harvest technology, the adaption of technology developed in other countries and the application of such technology in post-harvest loss reduction programmes are crucial for the development of the root and tuber crop industry. These needs are emphasized since processing

of roots and tubers is virtually non-existent. Except for the production of small quantities of farine from cassava, these crops are consumed fresh.

The main problems being experienced with specific root and tuber crops may be summarized as follows:

(i) Sweet Potato: There is widespread use of old cultivars with low yield potential. There is a high threshold level of pests, in particular weevils which render tubers unusable, and also a high incidence of defoliating larvae with a wide host range against which most farmers practice minimal crop protection. The predominance of manual harvesting restricts acreage. The high incidence of damage to tubers during harvest and the limited knowledge of curing and preservation techniques compatible with small farmer operations reduce post-harvest life and introduce an additional risk factor in sweet potato production;

(ii) Yam: During the last decade, most countries have experienced serious pest and disease problems which cause severe reductions in the yield of yam. Widespread nematode infestations and the incidence of viruses, bacteria and fungi which may occur separately or in combination pose serious problems particularly where improved production technology is not used. Although simple technology has been developed to control deterioration and sprouting of harvested tubers without the need for special structures or refrigeration, the use of particular chemical formulations may be necessary and neither the small farmers nor the public sector marketing organizations have made much use of such technology;

(iii) Cassava: This crop is produced mainly for direct human consumption, however, some countries have indicated interest in production for animal feed. The main problems associated with cassava production include the use of unimproved cultivars with low yield potential, cultivars with high levels of susceptibility to certain bacteria, the high incidence of viruses and insect pests which are known to cause severe yield reductions, unimproved methods of production and poor post-harvest handling;

(iv) Aroids: The production of aroids (Xanthasoma and Collocasia) is important in Cuba, Dominica, Dominican Republic, Jamaica, Saint Lucia, Saint Vincent and the Grenadines and Trinidad and Tobago. These crops have received scant research attention in the Caribbean. In recent years, the producing countries have sought to solve a number of production problems, mainly the control of nematodes and diseases which cause very large reduction in yields. Nematode and disease problems have become particularly severe in Dominica, Saint Lucia and Saint Vincent and the Grenadines during recent years.

(v) Potato (Solanum spp.): This is a new crop in the Caribbean. The varieties used are selections from those produced for North American and European environments. Recent breeding programmes by CIP which aim to produce varieties adapted to tropical lowland environments hold some promise for viable potato production in the Caribbean.

Production is presently limited to a few CDCC countries with Cuba, Dominican Republic and Jamaica being the main producers. However, most CDCC countries are large per caput consumers and at least six non-producing countries are now trying to enter into production for local consumption. Experience in those Caribbean countries which produce potato indicates that the high cost of seed potato, low multiplication rates, the poor performance of locally selected second and third generation seed potato and a high incidence of pests and diseases often result in low yields and financial losses. The crucial factor to be considered at this time is whether advances in plant breeding and production technology offer a viable potential for potato production in the Caribbean islands.

Potential for development

The production of sweet potato, yam and cassava in the seven main producing countries (Barbados, Cuba, Dominican Republic, Haiti, Jamaica, Saint Vincent and the Grenadines and Trinidad and Tobago) has remained at approximately 1.3 million metric tons per annum during the period 1975-1983. Notwithstanding the difficulties with production, the increased demand for these crops appear to be influenced by the availability and relative price of other major carbohydrate goods, in particular rice. More recently there are indications that the inability of low income groups to purchase imported carbohydrate foods have forced a shift to the increased use of locally produced root and tuber crops in some areas of the Caribbean. Other important factors which have direct impact on availability, and help to determine usage, include seasonality, preservation of the quality of fresh tubers and problems with processing.

Quantitative estimates of the potential to increase acreage and production, based on projected demand are not available. However, it is known that in general, the per caput consumption of tropical root and tuber crops

has declined during the last two decades, whereas consumption of Salanum potato, and alternate foods such as rice and wheat have increased.[8/] In most countries, land availability, which is the most important production factor does not appear to be a serious constraint to increasing the acreage and by inference, the production of root and tuber crops. A clearer understanding of the potential role of these crops in agricultural development and diversification programmes, and their possible contribution to the national food supply is necessary so that the support systems may be put in place to help promote and to realize potential production.

Ongoing research

Most CDCC countries carry out some aspect of root crop research which may range from the simple measurement of yield under specific conditions to more complex programmes which include breeding and selection. The current root and tuber crop research activities in CDCC countries is summarized at Table 3.

In addition to the research carried out by the Ministries of Agriculture there are national development institutions, national scientific councils, regional and subregional research institutions as well as universities concerned with various aspects of research and development of root and tuber crops in CDCC countries. Some of these institutions have developed bilateral programmes with the international agricultural research centres through which the countries obtain improved genetic material, participate in training programmes conducted by the centres and receive technological information.

The ongoing research on root and tuber crops in CDCC countries may be summarized as follows:

(i) Sweet Potato: Trials are carried out in most countries with emphasis on the identification of high yielding cultivars, pest control and selection for improved storage and handling characteristics. Attention is also given to skin colour, the texture, colour and nutrient value of the tuber;

8/ FAO Food Balance Sheets (various issues). FAO Production Yearbooks (various issues). FAO Yearbook of International Trade Statistics (various issues).

(ii) Yam: General agronomic studies including fertilizer response and the control of weeds and diseases are carried out in islands where yam production is an important activity. The problem of severe yield depressions caused by the use of virus-infested planting material has been reduced in the Eastern Caribbean since CARDI has introduced systems for the production and rapid multiplication of virus-free planting material;

(iii) Cassava: Emphasis is being placed on the introduction and identification of high yielding cultivars with resistance/tolerance to pests and diseases, general agronomic investigations such as spacing and also on weed, pest and disease control. In recent years virtually all of the new cultivars introduced into the Caribbean countries have been obtained from the CIAT breeding programme;

(iv) Aroids: There is little research being carried out on aroids. CARDI is conducting a multi-island project to find clones of edible aroids with high yield and consumer acceptability, high levels of adaptability, and tolerance/resistance to the main diseases of aroids in the Eastern Caribbean. Particular attention is being given to root-rot disease of tannia. Rapid multiplication techniques for pathogen-free propagation of selected material is also included in this programme;

(v) Solanum potato: Research on this crop is carried out in only a few Caribbean countries and relate mainly to the identification of varieties with potential for economic yields in particular environments, the development of production systems and planting schedules to obtain both high tuber yields and economic returns;

Root and Tuber Crop Research Personnel in the CDCC countries

The number of active root crop researchers in each country and the institution of affiliation are shown at Table 4.

A review of the personnel and resources allocated to root and tuber crop research in the CDCC area indicates that whereas approximately 60 persons can be identified, they are dispersed throughout some 15 countries and many of the root crop researchers are required to devote substantial periods of time to other programmes.

Most of the research staff in Caribbean countries are trained in crop production and agronomy and the unavailability of specialist staff have, in some cases resulted in the dissipation of research effort. The smaller countries often find it difficult to organize and manage planned research activities or to carry through some projects to a conclusive stage.

These adverse conditions have persisted for a number of years and as a consequence, national capability in root and tuber crop research is limited in most of the CDCC countries. This limited capability may be the major reason for the low levels of research activity indicated in the country papers.

The universities and research institutes possess the highest concentration of research personnel and consequently have the technical capability to give significant support to the national research effort. There is the obvious and urgent need for the countries to organize their own programmes and resources so that they may obtain increased technical support and transfer of technology from institutions in the Caribbean and also from the international research centres. The objective of such programmes would be to enhance the research capability of a limited cadre of national staff.

The participants identified a number of factors which need to be addressed in order to improve national agricultural research capability and in particular, root and tuber crop research; these factors include:

(i) Clear guidelines on national agricultural development and food policies;

(ii) The allocation and personnel and other resources necessary for the management of priority research which must be carried out at the national level to have potential impact on food production;

(iii) The increased flow of information relating to advances in research and development of root and tuber crops;

(iv) Increased support from regional and international agencies and the removal of existing constraints which restrict ready access to specialist technical expertise to assist with in-field problems which may be experienced only on occasions but may be crucial;

(v) The establishment of mechanisms for the transfer of technology from research centres to national staff and from the research establishment to the production sector;

(vi) Systems for the rapid, disease-free multiplication and safe distribution of improved genetic material between the various countries.

IV. CONCLUSIONS AND RECOMMENDATIONS

The participants agreed that a clearly defined and well co-ordinated programme to address priority areas of common interest could make significant contributions toward achieving national goals in the production of root and tuber crops.

The participants recommended that networking activities would include:

(i) Co-operation in root and tuber crop research to solve priority problems of common interest and also to assist participating countries with problems which may not be widespread but of crucial importance to certain countries;

(ii) Dissemination of information. Special efforts will be made to encourage researchers to document and communicate their research findings. It is generally held that a significant part of the root and tuber crop research carried out in CDCC countries remains unpublished, this results in the loss of information and also unnecessary repetition of research effort;

(iii) Training with emphasis on short-term technical courses;

(iv) Monitoring Tours and Workshops which provide opportunities for researchers to interact, to exchange experiences, gain first-hand information through discussions and demonstrations of advances achieved in various countries.

The general areas and problems recommended for priority attention in the root and tuber crop networking programme are:

(i) Improvement in propagation and production technology practices for tropical root and tuber crops in CDCC countries;

(ii) Improvements in the technology and practices for the control of pests and diseases of tropical root and tuber crops in CDCC countries;

(iii) Improving the marketability of tropical root and tuber crops through:

(a) The introduction and/or development of cultivars with improved handling and storage characteristics;

(b) The improvement of the technology and practices employed during harvesting and post-harvest handling, packaging and storage of root and tuber crops; and

(c) The development of processed products from root and tuber crops.

(iv) Development of mechanisms to encourage the publication and sissemination of results obtained from national research; the rapid and widespread dissemination to root crop researchers of advances in production technology and communication of information on development programmes including production, marketing and use of root and tuber crops;

(v) Promotion of training programmes which should include:

(a) Short-term technical training carried out in selected countries best suited to host the specific course;

(b) Short-term in-service training in specific research and/or production technologies by attachment to international centres, regional institutions or national research agencies;

(c) Post-graduate training in selected areas of specialization necessary for strengthening networking activities;

(vi) Workshops and exchange visits.

Extensive discussions of the national research needs indicated in the country papers and in the consultant's overview led to the identification of some 21 research topics which are listed in Table 5. Of these 21 topics, those of priority interest to particular countries are indicated in Table 6. The participants agreed the listings in Tables 5 and 6 are preliminary and are subject to review.

Organization of the Root and Tuber Crop Networking Activities

The participants emphasized that the networking activities in root and tuber crop research would be an integral component of the Caribbean Co-operative Agricultural Research Network.

Follow-up

The conclusions and recommendations of this workshop are to be forwarded to the Working Group of Directors of Agricultural Research charged with the responsibility to prepare the proposal for establishment of the Caribbean Co-operative Agricultural Research Network. This is being done so that the recommendations may be given appropriate consideration when the work programme for networking activities in root and tuber crops is being finalized as a component of the networking activities.

TABLE 1

THE PRODUCTION OF ROOT CROPS IN CDCC COUNTRIES 1982/83

(Metric tons)

Country	Yams	Cassava	Sweet Potato	Dasheen	Eddoe	Tannia	Potato	Total
Antigua and Barbuda	273	44	352			(20)		(689)
Bahamas			254					254
Barbados	4,500	60	4,300		122			8,982
Belize	(70)	(100)	(10)	(10)		(10)		(200)
Cuba	5,400	330,000	200,000			(75,000)	235,000	845,000
Dominica	5,000	775	1,480	11,000	-	7,400	50	25,705
Dominican Republic	8,000	93,000	54,000	NA	NA	35,000	25,000	215,000
Grenada	448	4,500	271	850	40	400	-	6,509
Guyana	24,947	15,000	(5,000)	(2,000)	(500)		(50)	(47,497)
Haiti	120,000	265,000	280,000				9,000	674,000
Jamaica	130,607	17,145	24,084	13,220	-	11,764	8,010	204,830
Montserrat	(50)		143					(193)
Saint Christopher/Nevis	1,000	68	312					1,380
Saint Lucia	713	(1,000)	297	3,000		1,000		(6,010)
Saint Vincent and the Grenadines	1,750	3,000	3,197	4,000	9,500	4,735		26,182
Suriname	370	2,660	75	(50)		(50)		(3,205)
Trinidad and Tobago	1,274	2,662	966	4,092	1,233	375		10,602
TOTAL	304,402	735,014	574,741	38,222	11,395	135,754	277,110	2,076,638

N.B. Data in Parentheses are estimates by T.U. Ferguson - Subject to confirmation.
Data for British Virgin Islands, United States Virgin Islands and Netherlands Antilles were not available.

Source: FAO Production Yearbook 1982 volume 37. Agricultural Statistics 1984 volume VI UN ECLAC.
Data supplied - Workshop Country Papers. Data compiled by T.U. Ferguson, UWI, St. Augustine, T'dad.

TABLE 2

THE PRODUCTIVITY OF ROOT CROPS IN SELECTED CDCC COUNTRIES
1980-1983
(Tons/ha)

Country	Yams	Cassava	Sweet Potato	Dasheen	Eddoe	Tannia	Potato
Antigua and Barbuda	4.5	3.1	7.3			4.0	
Bahamas			1.1				
Barbados	18.0	25.0	17.2		3.4		
Belize	4.5						
Cuba		4.5	4.6				19.3
Dominica	13.8	13.8	13.8	12.3		10.3	10.4
Dominican Republic	6.4	5.6	5.8				12.5
Grenada	2.5	4.0	2.8				
Guyana							
Haiti	3.3	4.1	4.0				15.0
Jamaica	12.4	8.6	10.0				11.4
Montserrat		2.5					2.5
Saint Christopher/Nevis	5.6		5.0				8.4
Saint Lucia	4.0	3.5	5.5	5.0			
Saint Vincent and the Grenadines	10.3	11.7	2.1	9.5	15.9	5.0	
Suriname		6.5	3.7				
Trinidad and Tobago	5.1	5.5	4.3	6.4	5.4	4.2	

Source: FAO Production Yearbook 1983 Volume 37
UN ECLAC Agricultural Statistics 1984 Volume VI
Data supplied by Workshop Country Papers
World Potato Facts - CIP 1982.

TABLE 3

SUMMARY OF ON-GOING RESEARCH ON ROOT AND TUBER CROPS IN CDCC COUNTRIES (1985)

Country	C R O P				
	Sweet Potato	Cassava	Yam	Aroids	Potato
Antigua and Barbuda	8				
Bahamas					
Barbados	2,5,8		2,8,9		2,8
Belize					
British Virgin Islands					
Cuba					
Dominica	1	1	1,3,4,6,8	2,4,6,7,8	
Dominican Republic	1,2,4,5,8	1,2,4,5,8	1,2,4,5,8	1,2,4,8	1,2,4,5,6,8
Grenada	8			2,4,5,6	
Guyana					
Haiti	8	8			
Jamaica	1		1,7		1,2,8
Montserrat					
Netherlands Antilles					
Saint Christopher/Nevis	2				
Saint Lucia				2,4,5,8	
Saint Vincent and the Grenadines	2		8	2,4,5,8	
Suriname					
Trinidad and Tobago	1,2,3,4,5,8	1,2,3,4,5,8	1,2,3,4,5,6 7,8,9	1,2,4,5,8	1,2,4,5,8
United States Virgin Islands	1,2,4,5,8	1,2,4,5,8	2,4,5,8		

1 = Introduction and testing new varieties
2 = Varietal selection
3 = Identification of varieties
4 = Disease control
5 = Pest control
6 = Rapid propagation techniques
7 = Post-harvest studies
8 = General agronomic studies
9 = Virus tested material

N.B. Information in this table is indicative only; includes all research being carried out by national research systems, subregional and regional institutions, universities and programmes linked to international agencies and centres.

TABLE 4

LOCATION AND NUMBERS OF ACTIVE ROOT AND TUBER CROP RESEARCH SCIENTISTS IN CDCC COUNTRIES 1985

Country	Institution	No. of Active Root Crop Scientists
Antigua and Barbuda	Ministry of Agriculture	1
	CARDI	0
Bahamas	Ministry of Agriculture	4
Barbados	Ministry of Agriculture	2
	CARDI	1
Belize	Ministry of Agriculture	0
	CARDI	0
Cuba		
Dominica	Ministry of Agriculture	1
	CARDI	3
	FTC	1
Dominican Republic	CESDA	
	CENDA	7
	Potato Project	
	Universities	
Grenada	Ministry of Agriculture	0
	CARDI	1
Guyana	Ministry of Agriculture/NARI	2
	CARDI	0
Haiti	FAMV	1
	CRDA	
	CRD La Valle	
	ODN	
	DARNDR	
Jamaica	Ministry of Agriculture	2
	CARDI	1
	UWI	3
	IITA	1
Montserrat	Ministry of Agriculture	0
	CARDI	0
Saint Christopher/Nevis	Ministry of Agriculture	1
	NACO	1
	CARDI	0
Saint Lucia	Ministry of Agriculture	1
	CARDI	3
Saint Vincent and the Grenadines	Ministry of Agriculture	0
	CARDI	2
Suriname	Ministry of Agriculture	
Trinidad and Tobago	Ministry of Agriculture	6
	CARDI	3
	UWI	15
	CARONI (1975) Ltd.	1
	CIBC	1

N.B. Other scientists are working on projects in a number of national development institutions eg. CARIRI, Food and Agriculture Corporation and CARONI (1975) Ltd. in Trinidad and Scientific Councils in Jamaica and Guyana.

TABLE 5

PROPOSED NETWORKING ACTIVITIES IN ROOT AND TUBER CROPS

1. TITLE : Collection and maintenance of elite germplasm.
   OBJECTIVE: To collect and maintain elite germplasm of yams, cassava, sweet potato, tannia, dasheen, eddoe and potato for evaluation, propagation and distribution in the region.

2. TITLE : Development of improved systems of yam propagation.
   OBJECTIVE: To develop improved systems of propagation to produce and clean planting material for Dioscorea rotundata, D. cayenensis and D. alata.

3. TITLE : Seed Potato Production.
   OBJECTIVE: To develop or adapt for regional use methods of producing cheap and clean planting material of adapted germplasm.

4. TITLE : Yam cultivar Evaluation.
   OBJECTIVE: To evaluate elite yam cultivars in specific ecological zones in the region for agronomic, storage and processing characteristics.

5. TITLE : Sweet potato cultivar evaluation.
   OBJECTIVE: To evaluate elite sweet potato germplasm in specific ecological zones for agronomic, storage and processing characteristics.

6. TITLE : Cassava cultivar evaluation.
   OBJECTIVE: To evaluate elite cassava germplasm in specific ecological zones for agronomic, disease resistance, storage and processing characteristics.

7. TITLE : Potato germplasm evaluation.
   OBJECTIVE: To evaluate elite potato germplasm for adaptability to the conditions in the region.

8. TITLE : Control of sweet potato borer.
   OBJECTIVE: To develop methods of control of sweet potato borer (Megastes grandalis) through selection for resistant cultivars and chemical or biological control.

9. TITLE : Control of sweet potato weevil.
   OBJECTIVE: To develop methods of control of sweet potato weevil (Eucepes and Cylas) through selection for resistant cultivars and chemical or biological control.

10. TITLE : Control of Nematodes in yams.
    OBJECTIVE: To control nematodes in yams through the use of clean seed and by the development of cultural and chemical means.

11. TITLE : Control of Anthracnose in yams.
    OBJECTIVE: To develop suitable methods for the anthracnose control through an intensive selection programme for resistance and improved methods of chemical control.

CONT'D

TABLE 5 (CONT'D)

12. TITLE : Studies on the characterisation and control of yam viruses.
OBJECTIVE: To characterise the viruses of economic importance on yams in the Caribbean and to devise suitable methods of control.

13. TITLE : Control Tannia Burning Disease.
OBJECTIVE: To identify resistant germplasm and to develop chemical and cultural methods of control.

14. TITLE : Integrated Pest and Disease Control in Potato.
OBJECTIVE: To develop suitable methods to minimise the effect of pests and disease in potato production in the lowland tropics.

15. TITLE : The development of improved cultural methods of root crop production.
OBJECTIVE: To develop more efficient systems of root crop production by reducing labour inputs and increasing yields.

16. TITLE : Evaluation of storage methods for cassava, sweet potato and dasheen.
OBJECTIVE: To develop methods for increasing the storage life of yams, cassava, sweet potato and dasheen.

17. TITLE : Handling and packaging techniques for root crops.
OBJECTIVE: To develop commercially feasible methods for handling and packaging tropical root crops.

18. TITLE : Root Crop Processing.
OBJECTIVE: To develop improved methods of processing selected products using traditional and non-traditional methods.

19. TITLE : Training of Research Scientists.
OBJECTIVE: To increase the number and capability of Research personnel in the region through technical and specialized post-graduate training.

20. TITLE : Technology Transfer.
OBJECTIVE: To establish a technology transfer programme and to increase the number of trained extension and production personnel in the region.

21. TITLE : Information
OBJECTIVE: To make information on tropical root and tuber crops more readily available to research, extension and production personnel.

TABLE 6

SUMMARY OF ROOT AND TUBER CROP RESEARCH ACTIVITIES OF PARTICULAR INTEREST TO CDCC COUNTRIES[1/]

COUNTRY	RESEARCH ACTIVITY AS DETAILED AT TABLE 5																			
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21
Antigua and Barbuda																					
Bahamas						A												A	A		
Barbados		L	A	R	R	R	A		A					A	R	R	R	R	R	R	R
Belize	R	R		R	R	R									R	R	R	R	R	R	R
British Virgin Islands																					
Cuba																					
Dominica		R	A				R			L				A			A	A	R	R	R
Dominican Republic				A	A	A	A	R	A	R	A	R	R	R	A	A	R	A	A	A	
Grenada			A		A																
Guyana		A		A	A										R	R		R		R	R
Haiti	A	R		A	A	R			A	R	R			A		A		R	R	A	
Jamaica																					
Montserrat			R				A							R		R	R	R		R	R
Netherlands Antilles																					
Saint Christopher/Nevis				A	A		A		A		A								R	R	
Saint Lucia																					
Saint Vincent and the Grenadines				R					R		R				R		R	R		R	R
Suriname																					
Trinidad and Tobago	R	R		R	R	L		R		R	A		A		R	R	A		R	R	R
United States Virgin Islands				A	A	A	A		L												

A = Indicates desire to participate actively in research activity as set out at Table 5.
L = Potential for leadership role in specific research activity based on personnel and/or on-going programmes.
R = Indicates specific interest in obtaining information and material output from particular research activity, also technical co-operation assistance.

1/ The information included in this table is preliminary only and is subject to revision.

ANNEX I

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