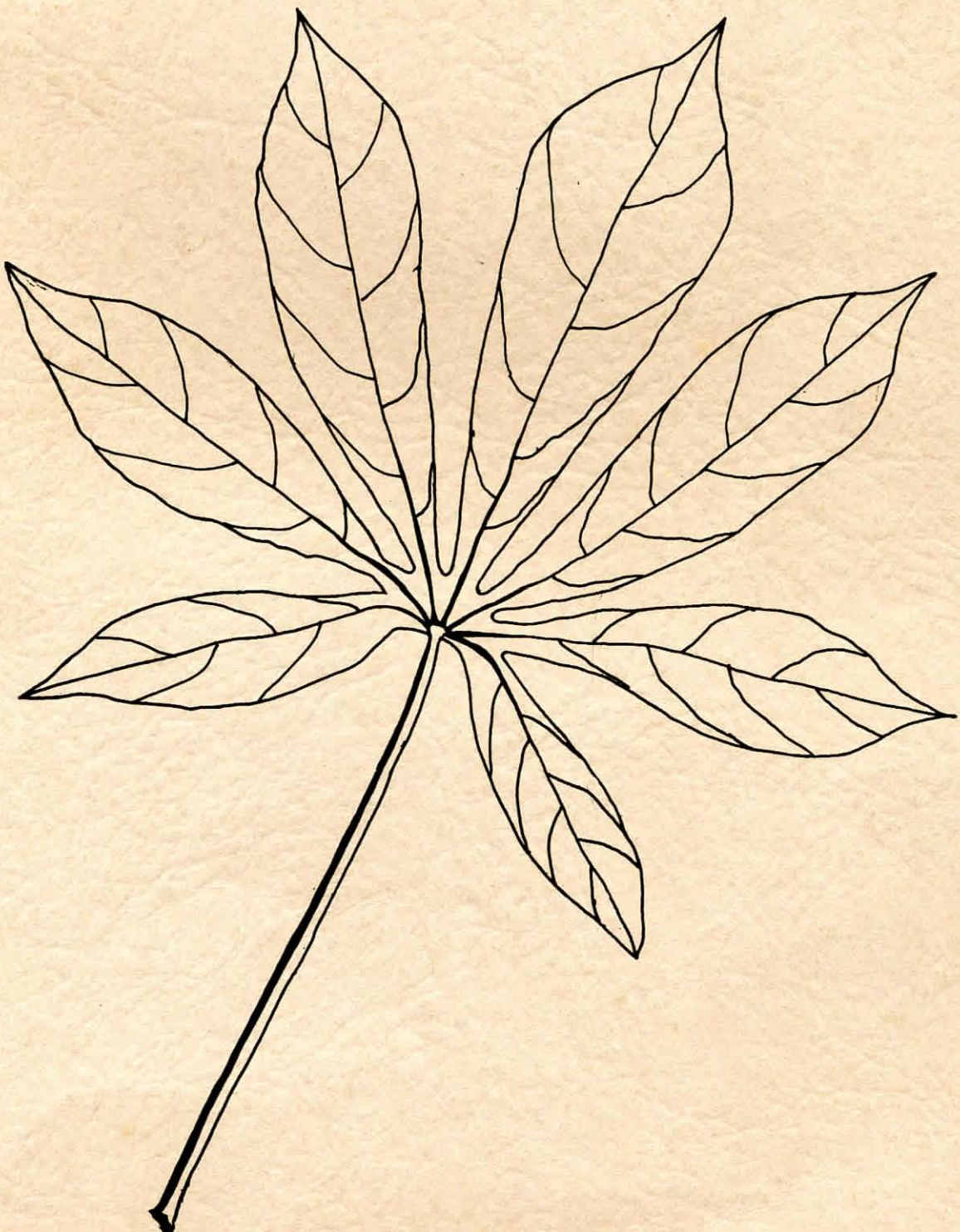
COSCA
Collaborative Study of Cassava in Africa
Working Paper No. 1

1

COSCA Project Description

Felix I. Nweke



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C O S C A

Collaborative Study of Cassava in Africa

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Felix I. Nweke

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PREFACE

THE Collaborative Study of Cassava in Africa (COSCA) is an inter-institutional effort. Its aim is to provide baseline information on cassava over a wide area. Such information is needed to improve the relevance and impact of agricultural research on the crop in Africa in order to realize the potential of cassava in increasing food production and the incomes of the people of Africa.

The COSCA working paper series is published informally by COSCA to quickly disseminate its intermediate output. Publications in the series include methodologies for, as well as preliminary results of, the various components and phases of the COSCA surveys. The series is aimed at scientists and researchers working with national agricultural research systems in Africa (NARS), the international research community, policy makers, donors and members of international development agencies that are interested in cassava. As these papers are not in their final form, comments are welcome. Such comments should be addressed to the respective authors or to the COSCA project leader.

Individuals and institutions may receive single copies free of charge by writing to:

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ACKNOWLEDGEMENTS

THIS report is the result of the deliberations of three planning meetings and two steering committee meetings of COSCA and sets out in detail the COSCA project. Three planning meetings were held; the first in New York in September 1987; the second in London in June 1988; and the third in Ibadan in September 1988. The structure and methodologies of COSCA were discussed on the basis of papers presented by project members (see inside front cover for the list of agencies and collaborators). A 'draft project description' was later put together by the project leader based on the conclusions and recommendations of the third planning meeting.

The steering committee first met in Ibadan in September 1988, and then in London in January 1989, to review the draft project description based on discussions during the second steering committee meeting.

SUMMARY

THE general objective of the Collaborative Study of Cassava in Africa (COSCA) is, to improve the relevance and impact of agricultural research on cassava by international agricultural research centres (IARC) and national agricultural research systems (NARS) in Africa in order to take full advantage of the potential of cassava in increasing food production and incomes in Africa.

The countries participating are Côte d'Ivoire, Ghana, Nigeria, Zaire, Uganda and Tanzania. The major consideration in the choice of these countries is that they represent the important cassava zones of the continent and provide a wide range of ecological and socio-economic conditions. COSCA has adopted a systems approach, with a multi-disciplinary team, in order to collect information on cassava within the context of African farming and food systems. Not only will information be collected on production, processing, marketing and consumption of cassava, but similar information will be collected on other crops which are grown or consumed in the same farming and food systems.

The Collaborative Study of Cassava in Africa will be conducted in three phases: Phase I will involve a broad characterization of the cassava producing zones. Information will be collected by group interviews at the village level and by key informant interviews at the institutional level. Phase II will involve characterization of individual production, processing, marketing and consumption units. The information will be collected on single visits and collection methods will include direct observation, field measurements, and individualized interviews. Phase III is an extension of Phase II, but involves more intensive surveys with repeated interview visits in order to collect information on seasonal variables.

These components of COSCA will be integrated into one study for data collection and analysis. Integration is assured at the data collection stage through the sampling process. Phase II of the survey will be conducted on a subsample of Phase I sites; and Phase III will be conducted on subsamples of Phase II. During the analysis, the study will be further integrated, since each hypothesis will be tested with information collected at different phases and on different components.

The three phases have been spread over a 4-year time frame (1988 - 1992). After each phase is completed the output will be disseminated through a working paper series, research reports, journal articles, books and conference proceedings, in particular the triennial symposia of the African Branch of the International Society of Tropical Root Crops.

ABBREVIATIONS

CBSWG	Cassava Based Systems Working Group
CIAT	Centro Internacional de Agricultura Tropical
COSCA	Collaborative Study of Cassava in Africa
IARC	international agricultural research centres
ICHU	International Child Health Unit
IFPRI	International Food Policy Research Institute
IITA	International Institute of Tropical Agriculture
NARS	national agricultural research systems
ODNRI	Overseas Development Natural Resources Institute
RCMP	Resource and Crop Management Program, IITA
TRIPP	Root, Tuber and Plantain Improvement Program, IITA
UNDP	United Nations Development Program

INTRODUCTION

Background

SINCE its introduction into Africa in the 16th century, cassava has spread throughout sub-Saharan Africa to become one of the dominant starchy staples in the diet of the people. Although the crop is grown in every country of the subcontinent, cultivation is concentrated in the humid, tropical regions. Africa produces 48 million tons of cassava annually from 7.4 million hectares; which translates into an estimated average of more than 200 calories per day for 200 million people (Dorosh 1988). It is the dominant staple, particularly in Central Africa where it constitutes over 50 percent of the average staple food consumption in Zaire, People's Republic of the Congo and in the Central African Republic. In the coastal regions of West Africa, from Côte d'Ivoire to Nigeria, cassava is as important as yam, and further along the West African coast, cassava is the second most important staple after rice. In East Africa, although maize is the dominant staple in most countries, cassava is crucially important in Mozambique, Tanzania, Uganda, Rwanda and Burundi.

The central role played by cassava in the African diet is particularly important because per capita food production in Africa is declining. During the succeeding two decades, after most African countries became independent, the continent has steadily deteriorated into food import dependence, where cereal imports are filling the gap created by unsatisfactory growth in the production of domestic staples. Financing these imports has become more difficult because the balance of trade in African countries has become increasingly negative and the external debt has risen. Falling per capita food production and declining international financial liquidity are particularly serious in light of the fact that an estimated 150 out of 450 million Africans suffer from some form of malnutrition.

The African food problem is commonly traced to inadequate food supplies. Because of stagnant or even falling food production, area expansion which is usually into more marginal agricultural zones, has not been sufficient to keep pace with the rapidly expanding human population demand for food. Moreover, rising population densities in marginal rainfall areas have reduced the buffering capacity of subsistence production units against major variations in rainfall, often resulting in substantial shortfalls in food needs in years when rainfall is especially inadequate. This situation has resulted in periodic famines which have made the African food problem a matter for deep and urgent concern.

Nevertheless, demand-side factors are also operative in defining food needs. The most salient feature in this regard is the very marked rate of growth in the urban population. Although only approximately 25 percent of the African population is estimated to reside in urban areas, the growth rate of the urban population has been high, in most countries exceeding 5 percent per annum. Rapid urbanization usually results in a shift to foods that are relatively convenient to store and prepare in the home. If transport and marketing systems are adequate and farmers are responsive to changes in food demands in the urban diets, urbanization can generate demand-led growth and increased incomes in the agricultural sector. On the other hand, when the domestic agricultural sector is unable to respond to increased urban demand, rising urban food prices have often led governments to intervene by regulating prices and meeting shortfalls through the import of cereals. Prices of imported cereals to urban consumers are often kept relatively low through overvalued exchange rates, food-aid, concessional sales, and sometimes direct subsidies. Such interventions, further retard the development of domestic marketable surpluses, not only of cereals but also of cassava and other substitutes for grain. This is a clear example of the tendency to sacrifice long-term growth and structural adjustment in favor of short-term political needs.

Development Strategies for Cassava

What role can cassava therefore play in bridging the food gap? Food production in Africa is fundamentally based on rain-fed farming systems. This makes African farming inherently risky, with marked variations in seasonal and annual food supplies. This highly variable production situation is made even more unstable in areas where land is scarce because of rapid growth in rural populations, which either reduces the farm size or induces migration to more marginal agricultural areas.

Cassava's adaptability to relatively marginal soils and erratic rainfall conditions, its high productivity per unit of land/labor, the certainty of obtaining some yield even under the most adverse conditions, and the possibility of maintaining continuity of supply throughout the year make this root crop a basic component of the farming system in many areas of Africa. Famine rarely occurs in areas where cassava is widely grown, since it provides a stable base to the food production system. This indicates that cassava has the potential for bridging the food gap. However, the full realization of this potential depends on obtaining more detailed information about cassava growing conditions, production systems, processing methods, marketing, and urban consumption patterns. Authoritative information on these issues is lacking and even the production statistics that are available are at best educated guesses. The COSCA project was therefore initiated to correct these information deficiencies.

Objectives

The broad objective of COSCA is to improve the relevance and impact of agricultural research on cassava by international agricultural research centres (IARC) and national agricultural research systems (NARS) in Africa in order to realize the potential of cassava in raising food production and incomes in Africa. The specific objectives are to:

1. describe the structure of cassava-based cropping systems in principal producing areas;
2. quantitatively and qualitatively characterize the nature and distribution of cassava processing systems;
3. describe the marketing systems for cassava and their implications for incomes;
4. understand present and future problems of the demand for cassava for human consumption and other uses in rural and urban areas;
5. provide general information on the nutritional effects of cassava consumption;
6. evaluate the impact of price and import policies on the production and consumption of cassava.

Hypotheses

In this section, a number of working hypotheses which will guide the COSCA study are listed. The results of tests of these hypotheses will provide directions for research that will help to realize the full potential of cassava in increasing food production and income in Africa. The hypotheses are classified into two groups as follows:

(a) Intensive - Extensive Production Systems Driven Hypotheses

1. As the population density increases, fallow periods decrease, and the importance of cassava increases, but cassava yields decline.

2. In areas of intensive production, high use of purchased inputs and high population pressure, cassava is being replaced by other crops, while cassava yields are increasing.

3. Production of cassava is increasing disproportionately in non-traditional cassava growing areas e.g. low rainfall areas, high altitude and higher latitudes.

4. Cassava is grown using purely traditional technology because marginal returns on purchased inputs, such as fertilizer, are low.

5. Producers seek greater flexibility in timing the harvest through early maturing varieties or varieties that store better in the soil.

6. The major pests and diseases such as cassava mealybug, green spider mite, mosaic virus, and leaf blight seriously reduce cassava yields in many regions.

7. Land tenure systems do not have a significant impact on production practices.

8. There are no economies or diseconomies of scale in cassava production, processing and marketing.

9. National agricultural policies usually accord low priority to cassava production, consequently limiting awareness of improved cassava varieties and cultivation practices.

10. The high labour requirements for harvesting and processing cassava is a major constraint to expanded production.

11. The macro political and economic environment determines relative resource allocation to cassava production which increases during periods of political conflict or economic downturn.

12. The occurrence of drought, general food shortages, inadequate processing, and/or lack of suitable low cyanide cassava varieties lead to increased cassava consumption, and hence to high cyanide content in the food.

13. High cyanide content in the food coupled with generally inadequate nutrition is associated with serious health problems.

(b) Urbanization Driven Hypotheses

1. Market sales or cassava are significant and increasing.

2. Market demand (and not supply) is the constraining factor in the expansion of cassava production.

3. The demand for and production of bitter cassava are expanding more rapidly than sweet cassava.

4. Demand for unfermented cassava flour and starch is increasing.

5. The relative value of cassava leaves is important and increasing.

6. As individual incomes rise, people tend to consume less whole cassava and more of the different forms of processed cassava.

7. Growth in urbanization is increasing the demand for processed cassava products.

8. The high cost of marketing fresh cassava limits its demand in urban centers.

9. The farmers who grow cassava commercially utilize better agronomic practices and are more able to adopt improved cassava varieties.

10. Gender roles in cassava production and processing change as we move to more commercial production.

11. Government pricing and subsidy policies for other crops tend to weaken urban demand for cassava.

12. Lack of market infrastructure is an important constraint to increased demand for cassava.

Data generated in this study will permit full testing of some of these hypotheses. However, for some of them, only partial examination will be possible. Additional studies outside COSCA would need to be undertaken to fully test all of these hypotheses.

Study Countries

The Collaborative Study of Cassava in Africa will be conducted in Côte d'Ivoire, Ghana, Nigeria, Zaire, Uganda, and Tanzania (figure 1). The major consideration in the choice of these countries is the existence of a wide range of ecological conditions (climate, altitude, population density and market access infrastructures). Other considerations include the ability to provide national scientists to coordinate the study and ease of movement into and within the country.

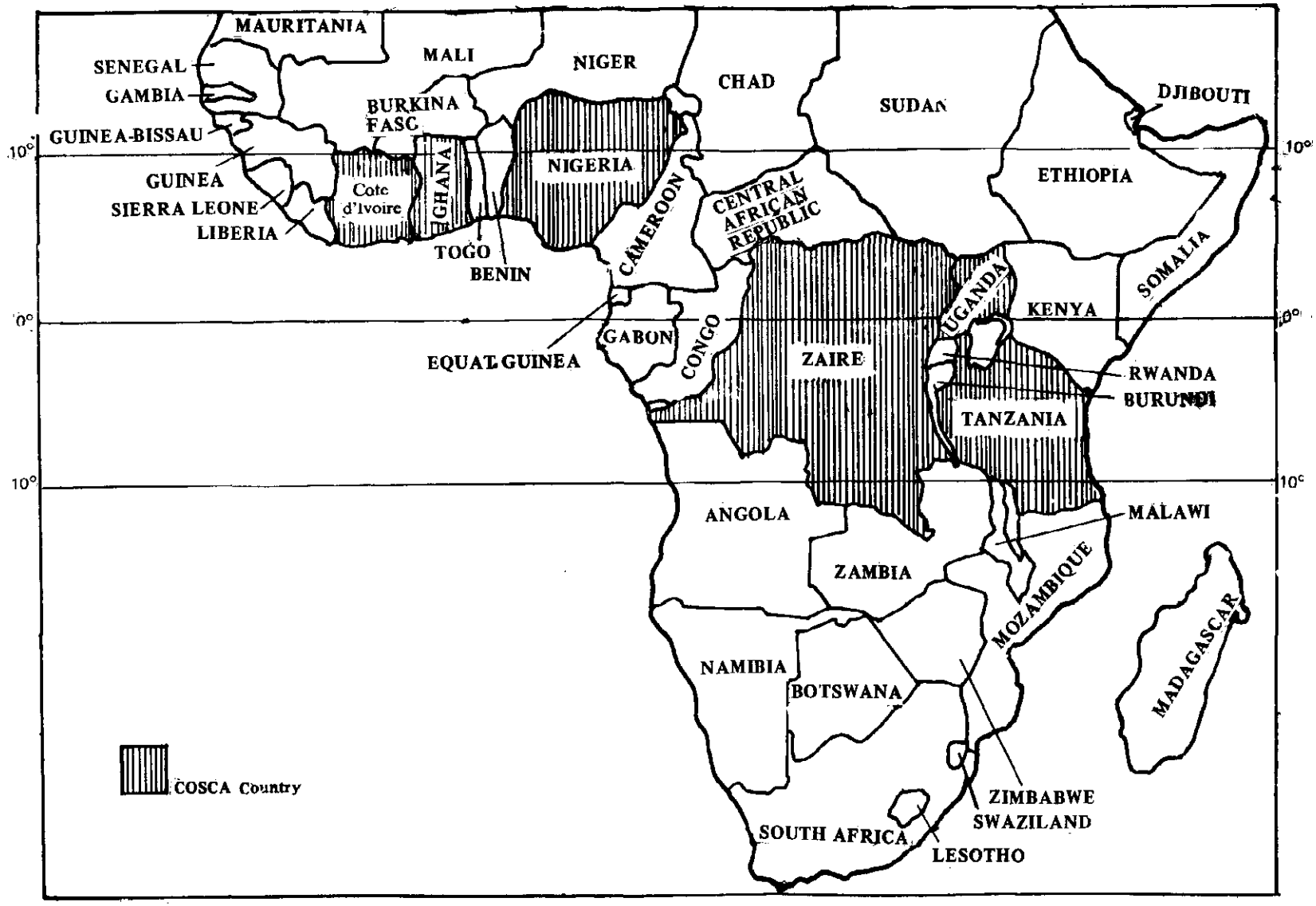

Figure 1 Map of tropical Africa showing COSCA countries

ORGANIZATION OF COSCA

Composition of the Study Team

THE Collaborative Study of Cassava in Africa (COSCA) has a steering committee comprising the director of the Resource and Crop Management Program at the International Institute of Tropical Agriculture (IITA) as Chairman; director of IITA's Root, Tuber and Plantain Improvement Program (TRIPP); director of the Cassava Program at Centro Internacional de Agricultura Tropical (CIAT); the Rockefeller Foundation project officer; one cassava agronomist at IITA, two representatives of the Rockefeller Foundation; one representative each of IITA Board of Trustees, national research systems agronomists, International Food Policy Research Institute (IFPRI); and the COSCA project leader who serves as the secretary.

The project will be coordinated by the project leader, two regional coordinators, one national and one assistant national coordinator in each country, consisting of a social scientist and a biological scientist in agriculture, and six subject matter specialists in the areas of agricultural marketing, agro-geography, food processing technology, processing economics, human nutrition and health, and anthropology. In addition, IITA's RCMP and TRIPP scientists will participate as much as possible (see figure 2).

Roles of Team Members

1. The Steering Committee

defines the broad guidelines for the study and guides the study team on specifications of researchable problems, survey design and methodologies for data collection and analysis.

2. Project Leader

i. participates in the identification of researchable problems and methodologies by developing the methodology framework in his area of expertise, by participating in the discussions of methodologies at the planning meetings and in the design and finalization of the questionnaires

ii. participates and assists in training for village surveys and in the training for intensive surveys

iii. supervises the village surveys and assists in the supervision of enumerators in the intensive surveys

iv. analyzes data and writes reports for the surveys in his area of expertise for all regions and countries

v. assists in the compilation of reports for both the village and intensive surveys at country and regional levels and compiles continental reports

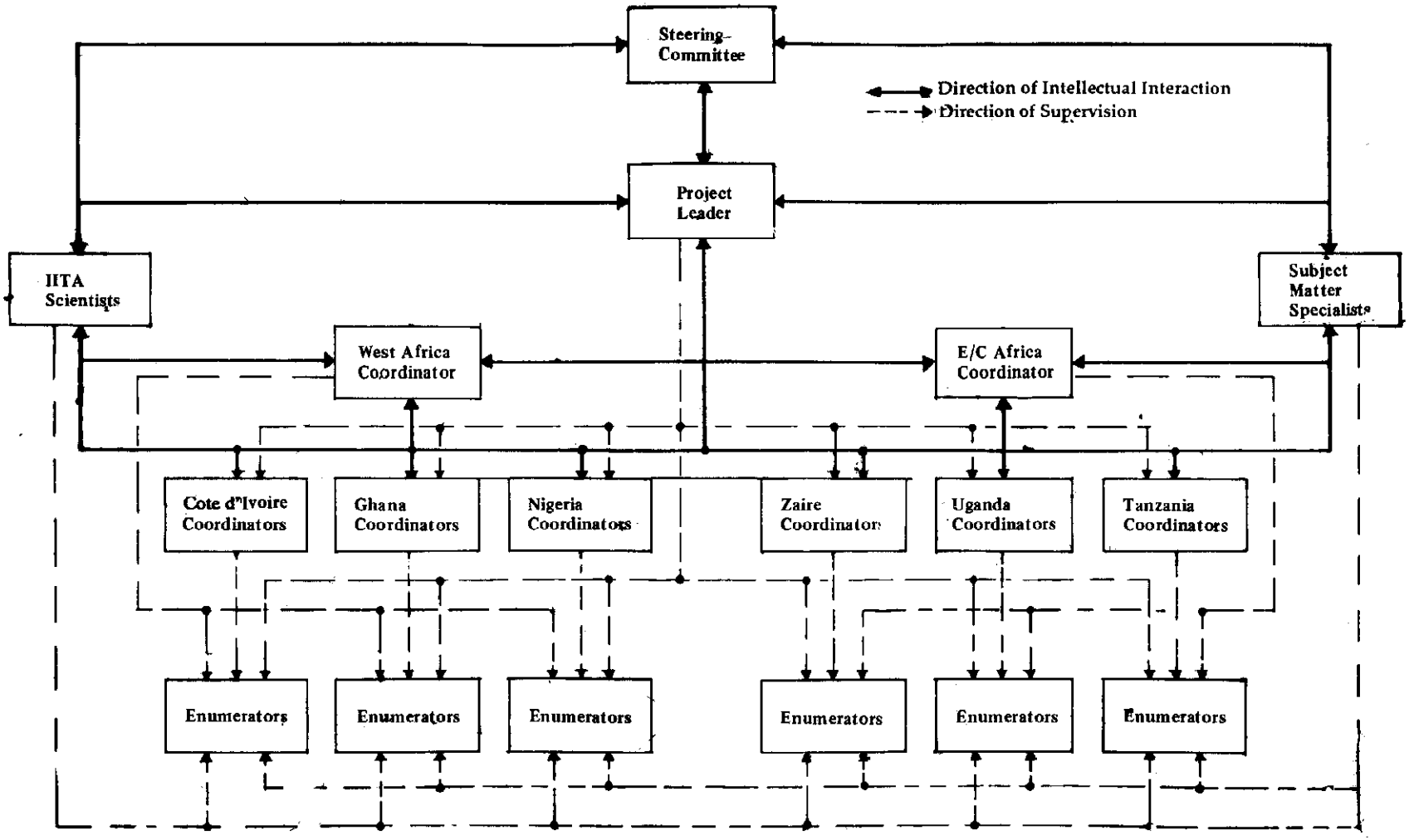

Figure 2. Organogram of Collaborative Study of Cassava in Africa

vi. proposes the study to national governments and assists national ministries of agriculture or agricultural research institutes to nominate national coordinators

vii. recruits regional coordinators, office support staff at the headquarters, and consultants as needed

viii. convenes and organizes planning meetings, training programs and steering committee meetings

3. Regional Coordinators

i. participate in the identification of researchable problems and in the development of methodology frameworks in their areas of expertise by participating in the discussions of the methodologies at the planning meetings, and in the design of the questionnaires

ii. participate in the sample design and selection processes by assisting in grid definition for site selection, in selecting zones within countries for village surveys, and by assisting in selecting village sites and individual farm, processing, marketing and household units for intensive surveys

iii. participate and assist in the training for village surveys and in the central training for intensive surveys and also assist in the in-country training of enumerators for intensive surveys

iv. assist in conducting village surveys and supervising the enumerators in the intensive surveys

v. analyze the survey data and write reports for the intensive surveys in their areas of expertise for all study countries

vi. assist in the compilation of final reports for both the village and intensive surveys at the country and continental levels

vii. advise the national ministries of agriculture or agricultural research agencies on the nomination of national coordinators, and assist national coordinators in the recruitment of enumerators and office support staff for the regions

4. National Coordinators

i. participate in the identification of researchable problems and methodologies by: providing information on data within their country; identifying information needs for national agricultural research and agricultural policy planning; carrying out a review of the literature within their countries; participating in the discussions of the researchable problems and methodologies in the planning meetings; and assisting in the determination of methodologies

ii. participate in sample selection processes: by assisting in grid definition for site selection; selecting zones within countries; selecting village sites within the zones for village level surveys; and selecting village sites and individual farm, processing, marketing and household units for intensive surveys

iii. participate in training for the village surveys and in the central training for intensive surveys, conduct in-country training of enumerators for intensive surveys

iv. conduct village surveys and supervise enumerators in the intensive surveys

v. analyze the data and write the country reports for the village surveys, compile the final country reports and assist in the compilation of the regional reports

vi. recruit enumerators for intensive surveys and office support staff for the country level

vii. assist in budget planning, and procure field and office equipment

5. IITA Scientists

i. participate in the identification of researchable problems by identifying information needs in their cassava breeding, production and processing research; and participate in developing methodologies in their areas of expertise by participating in the discussions at the planning meetings

ii. assist in the training at the central level and in-country training of enumerators for the village surveys

iii. participate in field supervision for both the village and intensive surveys

iv. where applicable, analyze data and write survey reports in their areas of expertise for all study countries

6. Non- IITA Scientists

i. participate in the identification of researchable problems and in developing methodology frameworks in their areas of expertise by participating in the discussions of methodologies at the planning meetings and in the finalization of questionnaires

ii. participate in the sample design and selection processes by defining grids for site selection and by participating in the selection of zones within countries for village surveys (where applicable)

iii. assist in the training of enumerators for village and intensive survey data collection (where applicable)

iv. participate in the field supervision of the village and intensive surveys

v. analyze data and write reports for the surveys in their respective areas of expertise for all study countries

STRUCTURE OF COSCA

Phases of COSCA

THE Collaborative Study of Cassava in Africa will be conducted in three phases. During Phase I the emphasis will be on regional characterization with the objective of providing broad-based village and institutional information for generating hypotheses and sampling frames for subsequent phases. During Phase II basic information about individual production, processing, marketing and consumption units will be collected and analyzed. Phase III will extend some of the Phase II information over one calendar year to determine seasonal effects.

Researchable Problems

PHASE I

The key issues to be characterized are:

1. cassava production environment including geographical (altitude, latitude, climate/weather), edaphic, cultural, economic, and related factors

2. cassava production techniques including land use patterns, cropping patterns, calendar of operations, crop disorders, crop varieties and labour utilization

3. cassava consumption by ecology, rural-urban location, ethnicity and type of processed forms

4. market organizations, namely, rural-rural, rural-urban and urban-urban flows and market infrastructures

5. the nature and distribution of cassava processing technologies

6. uses of cassava e.g. for human consumption and non-human consumption by form and by variety, and the relative importance of cassava as a staple in the diet of Africans

7. nutritional and health effects of cassava consumption

PHASES II and III

The key issues are:

1. cassava production objectives at the farm level, resource use and value (private and social) in cassava production versus other farm and non-farm enterprises

2. effect of growing cassava on soil fertility in different environments

3. technical processing parameters including the measurement of HCN levels in different varieties and various processed forms of cassava

4. economic evaluation of choice of available on-farm processing techniques

5. measurement of relative volumes in the channels and estimation of marketing margins in relation to transportation and market infrastructure

6. impact of output markets on development of input markets and on adoption of new production technologies

7. market demand (household consumption and other uses) versus supply and marketing infrastructure as constraining factors in the expansion of cassava farming systems and implications for market diversification into alternative uses

8. the role of price in directing cassava flows through space and time

Information to be Collected

The type of information to be collected and the method or source of collection for Phases I, II and III are set out in table 1.

Integration of COSCA

The integration of the various components of the study will begin at the sampling stage and continue throughout the three phases. Phase II and III samples are the same and are from subsamples of Phase I locations. In certain cases, the same households in a village cluster will serve as production units and market agents, or production and consumption units, or as production units, market agents and consumption units at the same time (figure 3). Similarly in the urban centre, the same households may serve as marketing agents and consumption units. In some cases, the same units could possibly also serve as both urban and rural marketing agents. Every one of the hypotheses of the study will be tested with information collected throughout the three phases (table 2).

Output of COSCA

PHASE I

1. determination of ecological distribution of cassava production practices, varieties grown, pests and diseases, preferred age at harvest, processing techniques, preferred consumption forms, and storage practices and implications for cassava breeding, agronomy and utilization research

2. assessment of input delivery systems and implications for adoption of new production and processing technologies

3. assessment of national cassava production and consumption objectives, food import policies and implications for producer incentives for the adoption of new technologies

4. historical description of cassava movement and prediction of the potential of cassava as a strategic crop in times of crisis

5. assessment of potentials of cassava as a source of industrial raw material and implications for future demand and supply patterns

PHASE II

1. determination of yield at farm levels by variety, by production systems and by ecology and implications for breeding and agronomy research

2. assessment of on-farm resource constraints, processing, storage and marketing costs and implications for breeding, agronomy and utilization research

3. determination of scales of production and implications for ultimate clientele of research focus and for adoption of new technologies

4. explanation of the effects of consumption patterns on varieties grown and forms processed, prediction of their effects on adoption of new technologies

5. understanding of the market structure and processes of price formation and implications for growth in the cassava subsector

PHASE III

1. assessment of resource allocation to cassava relative to other farm and non-farm activities, prediction of the effects of resource allocation on the production potential of cassava

2. estimation of the effects of seasonality, substitutability, relative prices, income and urbanization on cassava consumption by variety and form, prediction of market potential for cassava as human food, and recommendations for new directions in cassava breeding and processing research

3. estimation of the level of efficiency of the cassava marketing system, assessment of the implications for consumer and producer prices and the consequences for product and input markets

4. determination of the effects of cassava cultivation on soil fertility and implications for agronomy research

5. determination of technical processing parameters especially the relationship and influence that may exist between the use of different varieties, processing techniques and qualities of the processed products, and implications for breeding, processing and utilization research

Table 1 Information to be collected

Methods/Sources	Phase I	Phase II	Phase III
Group interviews (Phase I)	Major forms and varieties of cassava consumed Major staples consumed Non-staples consumed along with cassava Infant feeding practices Occurrence of toxicity symptoms		
Direct observations/ measurements	Cassava varieties grown Crop disorders Cropping patterns for cassava Available processing and marketing infrastructures	Field size Yields of cassava by age and by variety Soil samples Varieties grown by field Cropping patterns by field Processing techniques Storage techniques	Intensity of cassava disorders Chemical, physical and micro-biological attributes of processed cassava products Occurrence of toxicity symptoms
Extension agencies	Input delivery system Extension advisory system Extension constraints Use of improved technologies		
Research agencies	Level of commitment to cassava research		
Policy-making agencies	Role of cassava in development plans Production targets Policy objectives with respect to cassava		

Table 1 continued

Methods/Sources	Phase I	Phase II	Phase III
	Government marketing board activities with respect to cassava, where they exist Strategic roles of cassava		
Secondary sources	Geographical location (latitude, longitude) Soil classification Weather (rainfall, insolation, temperature, etc.) Market prices for cassava by forms and related food items Production trends (production, area, yield) for cassava and other staples Official exchange rates Real (black market) exchange rates Population census data Land area by village/zone, etc. Import/export trade in cassava and in substitutes National income trends Trends in industrial uses of starch and glues Trends in production and consumption of sweeteners and confectioneries Research institutes' reports		

Table 1 continued

Methods/Sources	Phase I	Phase II	Phase III
Group interviews in Phase I and individual interviews in Phases II and III	Calendar of farm activities	Cropping history of land by field	Calendar of farm operations
	Farm land tenure systems (ownership, acquisition systems, etc.)	Source of planting materials by farm household	Resource allocation to cassava and other farm and non-farm enterprises
	Sources of basic farm inputs (labour, planting materials, fertilizers, others)	Fertilization and soil improvement practices including fallow practices	Amount of inputs purchased and outputs marketed
	Production objectives and strategic roles of cassava	Farmer production objectives	Market volumes
	Relative importance of various processed cassava forms	Farm resource endowments (land, labour, capital equipment, and other inputs)	Marketing costs (labour, transportation etc.)
	Ownership of processing facilities by gender	Farm ownership by gender	Prices of cassava products and other major food items
	Relative importance of processed cassava for home consumption and marketing	Storage/arbitrage/ speculative functions	Household consumer expenditure
	Source of roots for processing	Vertical integration in production, processing, and marketing	Household consumption levels for cassava and other major food items
	Market infrastructures		
	Cassava products marketed	Horizontal integration in production, processing, and marketing	Sources and quantities of roots and other inputs for on-farm processing
		Market information sources	

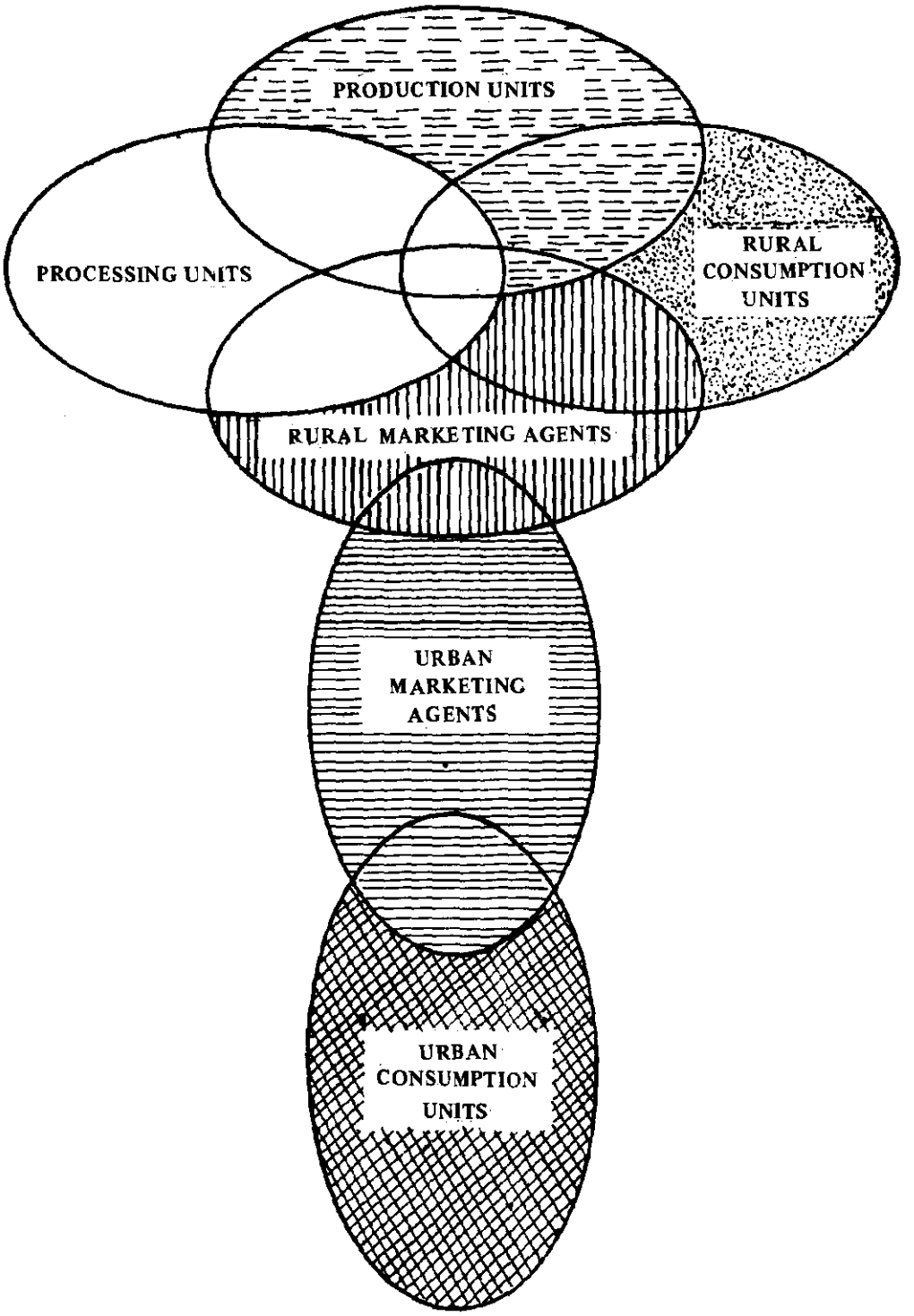

Figure 3 Integration through sampling procedures

Table 2 Source of information (by phase) that will be used to test various hypotheses

Hypothesis	Phase I	Phase II	Phase III
1. As population density increases fallow periods decrease and the importance of cassava increases but cassava yields decline	Human population Land area	Field history Cassava yield	Household consumption Resource allocation
2. In areas of intensive production, high use of purchased inputs and high population pressure, cassava is being replaced by other crops and cassava yields are declining	Human population Land area	Field history Cassava yield	Use of purchased inputs Resource allocation
3. Production of cassava is increasing disproportionately in non-traditional cassava growing areas, e.g. low rainfall, high altitude, and higher latitude areas	Crop production history Weather Location		Resource allocation
4. Cassava is grown using purely traditional technology because marginal returns to purchased inputs such as fertilizer are low		Crop yields Crop varieties Use of purchased inputs Market prices	Resource allocation among crops
5. Producers seek greater flexibility in timing of harvest through early maturing varieties or varieties that store better in the field	Advantages of varieties grown Disadvantages of varieties grown	Varieties grown Age at harvest	Calendar of farm operations
6. Cassava mealybug, green spider mite, mosaic virus and leaf blight seriously reduce cassava yields in many regions			Cassava yields
7. Land tenure systems do not have a significant impact on production practices	Control of farm land Farm land acquisition	Soil management practices Crop varieties grown Cropping patterns Field sizes Market volumes Marketing inputs	

Table 2 continued

Hypothesis	Phase I	Phase II	Phase III
8. There are no economies or diseconomies of scale in cassava production, processing and marketing		Resource endowments Vertical/horizontal integration Processing techniques Field sizes Market volumes Marketing inputs	
9. National agricultural policies usually attach low priority to cassava production, consequently awareness of improved cassava varieties and cultivation practices is limited	Roles of cassava in development plans National production objectives Input delivery systems Extension advisory systems National production targets Varieties grown Cropping patterns Market prices Production trends	Farm production objectives Soil improvement practices Sources of planting materials	Calendar of farm operations Resource allocation Use of purchased inputs
10. High labour requirements for harvesting and processing cassava is a major constraint to expanding production	Source of labour Source of other farm inputs Wage rates	Farm labour availability Availability of other farm inputs Marketing inputs Level of integration Processing techniques Field sizes	
11. The macro political and economic environment determines relative resource allocation to cassava with cassava production increasing during periods of political conflict or economic downturn	Role in development plans National production targets National strategic role Market price trends Weather trends Production trends Exchange rates National income trends Import/export trends in food		
12. General food shortages, drought, inadequate processing and/or lack of suitable low cynaide cassava varieties lead to high cassava consumption, and hence high cyanide in food	Strategic role of cassava Varieties grown Occurrence of toxicity National food production trends Human population trends Food import/export trends National income trends Weather trends	Sources of planting materials Processing techniques	Prices of processed cassava by form Household consumption levels Varieties processed Occurrence of malnutrition

Table 2 continued

Hypothesis	Phase I	Phase II	Phase III
13. High cyanide in the food coupled with generally inadequate nutrition is associated with serious health problems	Occurrence of malnutrition Infant feeding practices	Processing techniques Storage techniques Processed forms consumed Varieties grown	Household consumption levels Occurrence of malnutrition
14. Market sales of cassava are significant and increasing	Relative importance of home consumption Cassava products marketed Marketing board activities Market price trends Role in development plans Policy objectives Human population trends Food import/export trends	Farmer production objectives	Market volumes
15. Market demand not supply is the constraining factor in the growth of cassava production	Marketed surplus Cassava products marketed Marketing board activities Market price trends Production trends Population trends Food import/export trends National income trends	Farmer production objectives	Prices of major food items by season Household consumption levels Household consumer expenditure
16. Demand for and production of bitter cassava is growing more rapidly than sweet cassava	Varieties grown Processing techniques Leaf consumption Forms consumed	Farmer production objectives Varieties grown Forms consumed Processing techniques Yield by variety	Prices by variety Household consumption levels Sources of tubers processed
17. Demand for unfermented cassava flour and starch is growing	Cassava products marketed Trends in industrial uses	Processing techniques Processed forms consumed	Household consumption levels Prices of processed products
18. The relative value of cassava leaves is important and increasing	Consumption of cassava leaves		Non-staple consumption Cassava leaves consumption
19. As individual incomes rise, people tend to consume less whole cassava and more cassava in different forms	Wage rates	Household characteristics Household composition	Prices of major food items Prices of cassava products Household consumption levels Household consumer expenditure

Table 2 continued

Hypothesis	Phase I	Phase II	Phase III
20. Growth in urbanization is increasing the demand for processed cassava	Human population trends Wage rates	Household characteristics Household composition	Prices of major food items Prices of cassava products Household consumption levels Household consumer expenditure
21. The high cost of marketing fresh cassava limits its demand in urban centres	Market infrastructure Location of markets Means of transportation Market price trends	Cassava products marketed Cassava products consumed Cassava varieties produced Location of processing facilities Prices of cassava products Household characteristics Household composition	Market volumes Marketing costs Market prices Household consumption levels Prices of major food items Household consumer expenditure
22. Farmers who grow cassava commercially are using better agronomic practices and are more apt to adopt modern varieties		Source of planting material Use of fertilizer Farm resource endowments Vertical/horizontal integration Varieties grown Cropping patterns Field sizes Yields attained Soil samples analysis	
23. Gender roles in cassava production and processing change as commercialization of products increases	Household decision making	Farm ownership Processing techniques Production for market Farm resource endowments Vertical/horizontal integration	Use of purchased inputs
24. Government pricing and subsidy policies for other crops, tend to weaken urban demand for cassava	Food import/export trends Exchange rates Production trends Marketing board activities Input supply and distribution		
25. Lack of market infrastructure is an important constraint to increased demand for cassava	Market infrastructure Market price trends	Cassava products marketed Cassava products consumed Cassava varieties produced Location of processing facilities	Market volumes Marketing costs Market prices Household consumption Prices of major food items Prices of cassava products Household consumption levels Household consumer expenditure

Training

There will be three group training programs for data collection and analysis. The first is for Phase I and this will be field-oriented as far as possible. The second and third training programs will be for Phases II and III. One will be conducted at IITA, Ibadan for the team members, some of whom will also serve as resource persons. The third training program will be an in-country training of enumerators, with the same content as the IITA training program, but to be conducted by the national coordinators.

Higher degree training will be arranged for those candidates who are also national coordinators or other nationals collaborating in COSCA. For such people, COSCA will only cover research costs. The study program will be arranged in such a manner that it does not interfere with COSCA activities.

Calendar of Activities

Preparatory activities: Three regional coordinators were interviewed at IITA and two appointed for eastern and western Africa between January and April, 1988. The COSCA study was proposed to eight countries namely: Cameroun, Côte d'Ivoire, Congo, Ghana, Nigeria, Tanzania, Uganda and Zaire between March and June 1988. National coordinators were nominated between April and August, 1988.

A second planning meeting was held in June, 1988 in London, the first having been held in 1987. At the second planning meeting responsibility for developing the methodologies for the study was assigned and the third planning meeting scheduled. The development of methodologies was started in July, 1988.

The third planning meeting was held at IITA, Ibadan, early in September, 1988. Draft methodologies, the organizational structure and the calendar of activities for the study were discussed (see calendar below).

Country literature reviews will commence in October, 1988. Between October and December, 1989, the budget will be planned, office and field equipment procured and support staff recruited for the central, regional and country levels.

Grid maps for country zonation will be prepared between October, 1988 and January, 1989.

Phase I: In-country zone selection will be made between February and March, 1989; sampling and training for village surveys in April, 1989.

The village surveys will be conducted from May to October, 1989. Analysis of the data and writing of the report of the survey will be done from November, 1989 to June, 1990.

Phase II: When the village survey report is being written, preparation for intensive surveys will be made with selection of sites and development of data management systems in November and December, 1989. These will be followed by central training (at IITA) in January and in-country training in February, 1990.

The intensive surveys will commence during March and April, 1990. Data transcription starts soon after and runs concurrently with the surveys. Towards the end of the surveys and data transcription, when enough feeling for the data has been acquired, the data base system will be constructed and programming begun. Analyses and report writing will be extended from June, 1990 to October, 1991, because those activities will run concurrently with the supervision of the Phase III intensive survey.

Phase III: The intensive survey will run continuously from Phase II and will be completed by May, 1991. Data transcription will be concurrent with the survey. The data base construction which will start in May, 1990 with Phase II, will be completed by August, 1991. Programming will also continue until December, 1991. Analyses and report writing will be completed by June, 1992.

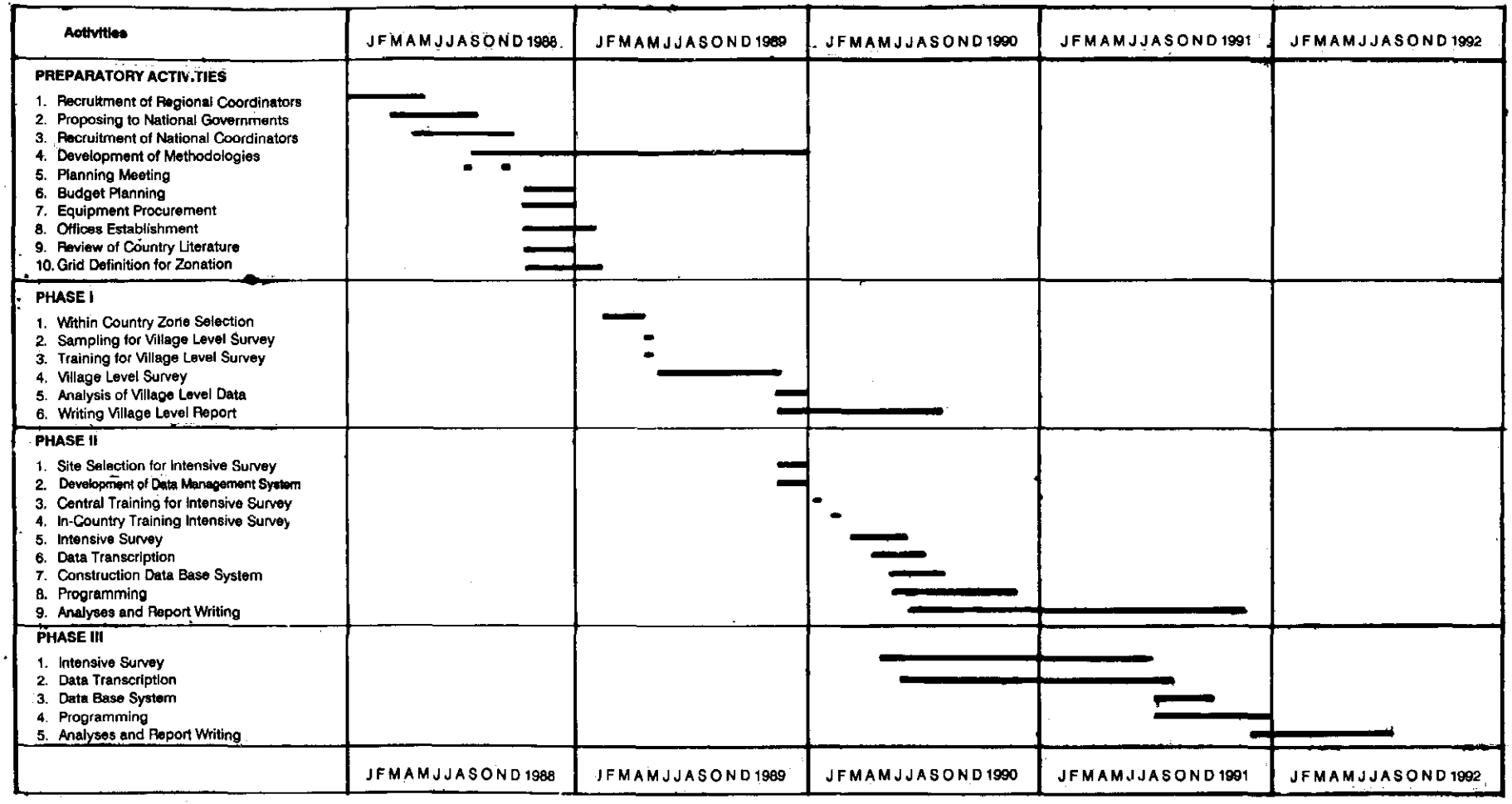

Figure 4 Calendar of research activities

CONDUCT OF COSCA

Sampling Procedure (figure 5)

THE sampling procedure involves identification and selection of zones within countries, sites within zones and individual units of production, processing, marketing and consumption.

Selection of Zones: COSCA Working Paper No. 2, entitled *COSCA Site Selection Procedure* by S. E. Carter and P. G. Jones will provide details for the selection of the zones and the sites. The process is briefly summarized here. Factors such as climate, human population densities, and market access infrastructure which significantly influence cassava production and consumption (Carter 1988) form the basis for zoning each study country for the selection of sites (figure 6). The climatic environments favourable for cassava production in Africa are listed in table 3. Each study country is stratified into these climatic zones, each zone is further stratified according to population density while each population density zone is substratified according to availability of market access infrastructure.

In Uganda, Ghana, and Côte d'Ivoire, cassava is important only in the lowland humid tropical zone and in Nigeria only in the lowland semi-hot isothermic climatic zone (table 3). In these countries therefore, population density and infrastructure were used as the bases for zonation; thus reducing the maximum sample frame for zone selection to only four in each of these countries.

Table 3 Percentage distribution of African cassava crop area by climate class (major zones)

	Climate class	Percentage crop area	Countries
A	Lowland humid tropical	33.26	Zaire, Uganda, Cameroun, Ghana, Côte d'Ivoire
C	Lowland semi-hot isothermic	16.62	Tanzania, Nigeria
E	Lowland hot isothermic	9.45	Zaire, Angola
J	Highland humid tropical	7.17	Rwanda, Zaire
M	Highland continental isothermic	7.15	Burundi, Tanzania, Angola
G	Lowland semi-arid isothermic	4.84	Tanzania
F	Lowland hot non-isothermic	4.39	Mozambique

Source: (Carter 1988).

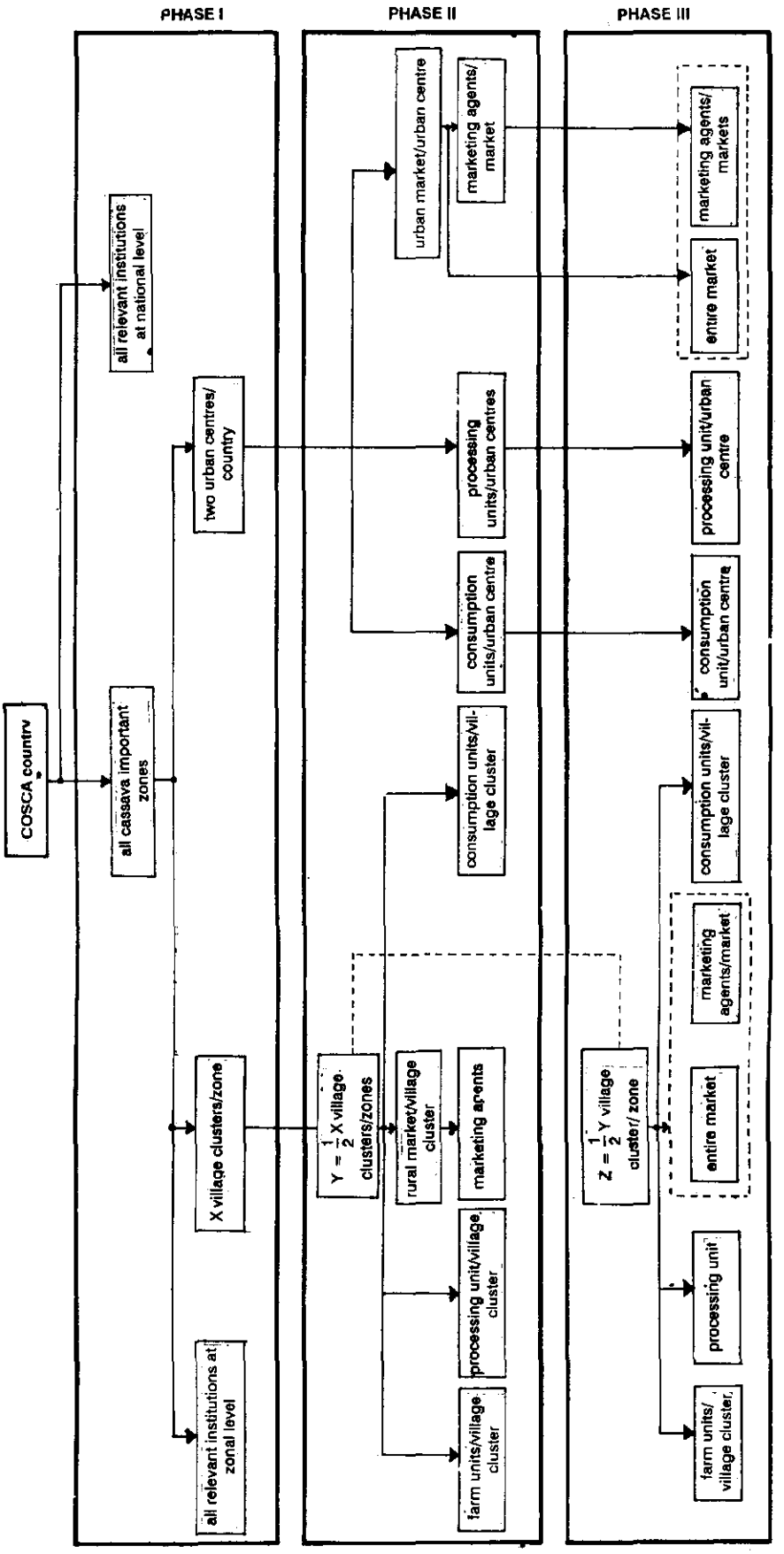

Figure 5 Sampling procedure

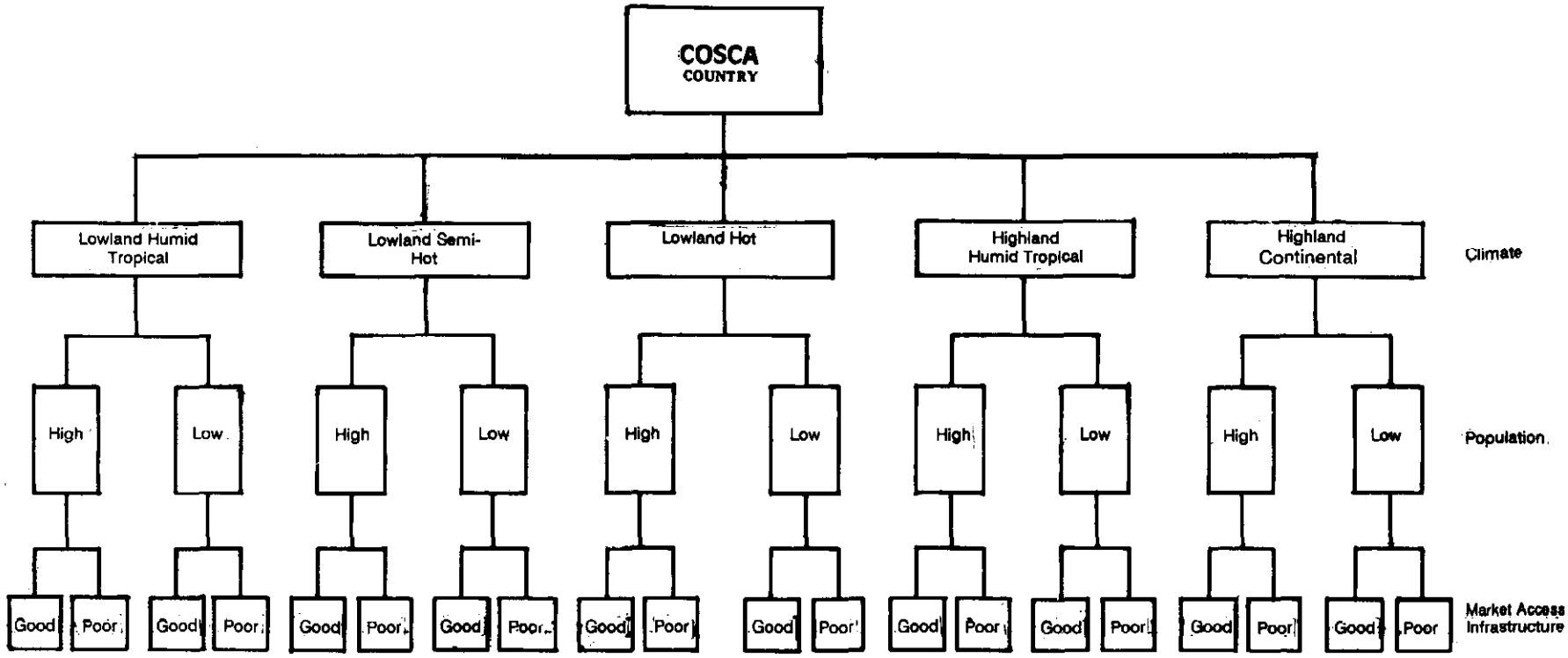

Figure 6 Bases for country zonation

In Tanzania, cassava is important in two climatic zones, namely, lowland semi-hot isothermic and highland continental isothermic; reducing the sample frame to eight. In Zaire, cassava is important in three of the climatic zones, namely, lowland and highland humid tropical and lowland hot isothermic, yielding a sample frame of twelve.

Site Selection: Phase I consists of institutions, urban and village components. Institutions and urban components will cover entire countries. For the village component, each zone will be divided into 20 sq km grid cells (Carter 1988). Cells will be selected in each country depending on the size of the country and resource availability. The number of cells will be distributed among the relevant zones in proportion to zone size. Within each zone, the cells will be selected randomly. The survey will be conducted in the village cluster nearest the centre of each cell.

Phases II and III consist of village and urban components. For the village component, Phase II will have a subsample which is 50 percent of Phase I, and Phase III a subsample which is 50 percent of Phase II sites. An urban centre in the most important, and another in the least important cassava zone will also be randomly selected.

Selection of Individual Units: Village clusters are the units of analysis in Phase I of the survey. The selection of individual units is therefore in relation to Phases II and III. Production units, processing units, marketing agents and consumption units will be selected in each rural site which make up the village cluster; marketing agents and consumption units will be selected in each urban site (figure 5). Selection will be random for the production, processing and consumption units. Market agents will be first stratified by function and a random selection method will be adopted within each stratum. Sizes of the various samples will be based on considerations of the need for representativeness for the purposes of extrapolation of the results and on financial, logistic and time constraints.

Data Collection

PHASE I: The national coordinators will be the primary enumerators for the Phase I survey. They will be assisted by local guides/interpreters in each village cluster. The project leader, regional coordinators, relevant IITA scientists and non-IITA scientists will participate as much as possible.

PHASE II: One enumerator will be assigned to each village cluster and one to each urban centre for data collection. The enumerators will be supervised primarily by the national coordinators, and periodically by the regional coordinators and the project leader and as frequently as possible by IITA and non-IITA scientists.

As much as possible, enumerators will be selected from the community where they will work in order to win the confidence of the respondents and facilitate the enumeration process. This arrangement will also be cost effective since it will significantly reduce the transportation costs of the enumerators.

Phase II survey will involve interviews and direct observations, soil sampling, yield (Ezumah and Lawson 1988) and field area measurements. These measurements are subject to bias and errors from many sources, therefore to maintain consistency, the same assistant with experience in such measurements will guide local enumerators at every site. This means that the production survey component of Phase II will not run concurrently in all countries but sequentially, one country at a time, starting with the first country to complete its Phase I survey.

PHASE III: Phase II enumerators will continue to Phase III and the supervision process will be the same. The production survey will run for 13 calendar months. Interviews will be conducted fortnightly; the recall period will also be fortnightly. A minimum of 26 interviews per farm unit will be conducted during the 13 calendar months.

The marketing survey and market price data collection in the rural and the urban areas will also run for 13 calendar months. Marketing interviews will be quarterly, but recall periods will not exceed one month. There will be a minimum of five interviews per marketing agent during the 13 calendar months. The market price data will be collected at a minimum frequency of 7 days.

The rural and urban consumption surveys will also run for 13 calendar months, with fortnightly interview visits to the urban, and monthly visits to the rural households. Recall periods are 24 hours for food consumption, one month for non-durable and quarterly for durable expenditures. There will be a minimum of 26 interviews per consumption unit in the urban and 13 in the rural sites during the 13 calendar months.

Data Transcription

Data will be transcribed centrally at IITA, Ibadan using a suitable data base management computer program, in order to reduce errors and maintain consistency. A diskette copy of the data and the questionnaire for each country will be returned to the national coordinators for their own use.

Data Analyses and Report Writing

Each team member is required to analyze and write up the data collected for publication; credit should be given to COSCA and relevant team members. The same data will also be analyzed at Ibadan. Comprehensive reports incorporating individual reports, will also be written centrally, and these will give full professional credit to the individual authors.

To accomplish the above, suitable computer hard and software facilities will be provided at Ibadan. Depending on need and budget allocation, micro computers may be provided in some countries. Data management consultants may be used at the initial stages to develop the data base and the team's expertise in the management of the data.

Dissemination of Reports

Technical reports that may be required by the funding agency will be prepared. In addition, technical reports will be disseminated through regular professional media such as working/discussion papers, research reports, annual reports, journal articles, monographs, books and conference proceedings – especially the triennial symposia of the African Branch of the International Society of Tropical Root Crops.

BUDGET

Available Fund

THE total available fund is US $ 2,127,500 (table 4), provided mainly by the Rockefeller Foundation. The International Institute of Tropical Agriculture will contribute the 18 percent overhead recovery and the cost of the administrative manager, which will not be charged. The United Nations Development Programme (UNDP) contribution covers Training for Diagnostic Skills in Root Crops in Africa and is to be administered by IITA. It is specifically for training in field work.

Table 4 Distribution of cash budget by contributing agencies

Contributing Agencies	US $
The Rockefeller Foundation	1,975,000
Less 18%, overhead recovery charge	(355,500)
IITA: 18%, overhead recovery not charged	355,500
Administrative manager's position cost	127,500
UNDP (Training for Diagnostic Skills in Africa)	25,000
Total cash available	2,127,500

Budget Summary

The major component of the budget (42 percent) covers international position costs (table 5). However, another 41 percent is budgeted for data collection and analysis and equipment. International travel allocation and contingencies together amount to 6 percent of total budget costs.

Sixty percent of the budget will be spent in the second and in the third years of the study (table 6). Most of the equipment will be purchased in the second year and field work activities will be concentrated in the third year. Some field work will also be done in the fourth year. While the first year has been the project's preparatory phase, the fifth year will be mainly for report preparation and minimal field work which will be mainly field revisits to verify information.

Table 5 Distribution of budget by major items

Major Items	US $	%
International Positions	893,550	42
Data Collection and Analysis (incentive allowances, enumerators, data transcribers, drivers, vehicle maintenance, survey, travel)	595,700	28
Equipment and Supplies (field vehicles, field equipment, office equipment, office supplies, computer)	276,575	13
Miscellaneous (processing, nutrition, history studies, meetings, training and consultants)	170,200	8
International Travel	63,825	3
Office Support	42,550	2
Contingency	85,100	4
Total	2,127,500	100

Table 6 Distribution of budget by year

Year	US $	%
1988	127,650	6
1989	659,525	31
1990	616,975	29
1991	510,600	24
1992	127,650	6
Contingency	85,100	4
Total	2,127,500	100

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