



IFAD
INTERNATIONAL FUND FOR AGRICULTURAL DEVELOPMENT
Executive Board – Sixty-Seventh Session
Rome, 8-9 September 1999

REPORT AND RECOMMENDATION OF THE PRESIDENT

TO THE EXECUTIVE BOARD ON PROPOSED

TECHNICAL ASSISTANCE GRANTS

FOR

AGRICULTURAL RESEARCH AND TRAINING

BY

CGIAR-SUPPORTED INTERNATIONAL CENTRES



TABLE OF CONTENTS

ABBREVIATIONS AND ACRONYMS	III
PART I INTRODUCTION	1
PART II RECOMMENDATION	2
ANNEXES	
I. THE INTERNATIONAL CENTRE FOR RESEARCH IN AGROFORESTRY (ICRAF): DIVERSIFICATION OF SMALLHOLDER FARMING SYSTEMS IN WEST AND CENTRAL AFRICA THROUGH CULTIVATION OF INDIGENOUS TREES	3
II. THE INTERNATIONAL INSTITUTE OF TROPICAL AGRICULTURE (IITA): POVERTY ALLEVIATION AND ENHANCED FOOD AVAILABILITY IN WEST AFRICA THROUGH IMPROVED YAM TECHNOLOGIES	8



ABBREVIATIONS AND ACRONYMS

BMZ	German Federal Ministry for Economic Cooperation and Development
CIFOR	Centre for International Forestry Research
CIRAD	International Cooperation Centre on Agrarian Research and Development
CORAF	Conference des Responsables de Recherche Agricole en Afrique de l'Ouest et du Centre (Consortium of Decision-Makers on Agricultural Research in West and Central Africa)
DfID	Department for International Development (United Kingdom)
ICRAF	International Centre for Research in Agroforestry
IITA	International Institute of Tropical Agriculture
NARS	National Agricultural Research Systems
NGOs	Non-Governmental Organizations



**REPORT AND RECOMMENDATION OF THE PRESIDENT OF IFAD
TO THE EXECUTIVE BOARD ON PROPOSED TECHNICAL ASSISTANCE GRANTS
FOR AGRICULTURAL RESEARCH AND TRAINING BY
CGIAR-SUPPORTED INTERNATIONAL CENTRES**

I submit the following Report and Recommendation on two proposed technical assistance grants for agricultural research and training to CGIAR-supported international centres in the amount of USD 2 250 000.

PART I - INTRODUCTION

1. This report recommends providing support to the research and training programmes of CGIAR-supported international centres: the International Centre for Research in Agroforestry (ICRAF) and the International Institute of Tropical Agriculture (IITA).
2. The documents of the technical assistance grants (TAGs) for approval by the Executive Board are contained in the annexes to this report:
 - I. The International Centre for Research in Agroforestry (ICRAF): Diversification of Smallholder Farming Systems in West and Central Africa through Cultivation of Indigenous Trees
 - II. The International Institute of Tropical Agriculture (IITA): Poverty Alleviation and Enhanced Food Availability in West Africa through Improved Yam Technologies
3. The objectives and content of these applied research programmes are in line with the evolving strategic objectives of IFAD and the policy and criteria of its TAG programme for agricultural research and training.
4. The strategic objectives of IFAD's support for technology development relate to: (a) IFAD's target groups and their household food-security strategies, specifically in remote and marginalized agro-ecological areas; (b) technologies that build on traditional knowledge systems, are gender-responsive, and enhance and diversify the productive potential of resource-poor farming systems by improving productivity and addressing production bottlenecks; (c) access to productive assets (land and water, financial services, labour and technology, including indigenous technology) and sustainable and productive management of such resources; (d) a policy framework that provides the rural poor with an incentive to reach higher levels of productivity, thereby reducing their dependence on transfers; and (e) an institutional framework within which formal and informal, public and private-sector, local and national institutions provide services to the economically vulnerable, according to their comparative advantage. Within this framework, IFAD also intends to develop commodity-based approaches to rural poverty alleviation, specifically targeting those items that are produced and consumed by the rural poor. Finally, a consolidated network for knowledge-gathering and dissemination will enhance the Fund's capacity to establish long-term strategic linkages with its development partners and to multiply the effect of its agricultural research and training programme.



5. The proposed TAGs respond to the foregoing strategic objectives. The proposed agroforestry programme responds to strategic objectives (a), (b) and (d), as it seeks to identify alternative sources of food and income, through research to promote the utilization of endangered but economically important indigenous fruit trees in four West and Central African countries. The programme will investigate agroforestry land-use systems, ownership and gender-related issues and undertake research to improve marketing arrangements for the fruit so that poor producers, especially women, can capture greater economic benefits. The yams research programme addresses objectives (a) and (b) in particular, as it seeks to remove critical production constraints by increasing the availability of the following: technologies for improving or maintaining soil fertility on a sustainable basis as fallow periods shorten; technologies for the management of pests (including weeds) and diseases; improved varieties of the major cultivated species of yams in West Africa; and post-harvest technologies that lead to improving the income-generation potential of yam producers.

PART II - RECOMMENDATION

6. I recommend that the Executive Board approve the proposed technical assistance grants in terms of the following resolutions:

RESOLVED: that the Fund, in order to finance, in part, the Diversification of Smallholder Farming Systems in West and Central Africa through Cultivation of Indigenous Trees, shall make a grant not exceeding one million United States dollars (USD 1 000 000) to the International Centre for Research in Agroforestry (ICRAF), upon such terms and conditions as shall be substantially in accordance with the terms and conditions presented to the Executive Board in this Report and Recommendation of the President.

FURTHER RESOLVED: that the Fund, in order to finance, in part, the Poverty Alleviation and Enhanced Food Availability in West Africa through Improved Yam Technologies, shall make a grant not exceeding one million two hundred and fifty thousand United States dollars (USD 1 250 000) to the International Institute of Tropical Agriculture (IITA), upon such terms and conditions as shall be substantially in accordance with the terms and conditions presented to the Executive Board in this Report and Recommendation of the President.

Fawzi H. Al-Sultan
President



THE INTERNATIONAL CENTRE FOR RESEARCH IN AGROFORESTRY (ICRAF): DIVERSIFICATION OF SMALLHOLDER FARMING SYSTEMS IN WEST AND CENTRAL AFRICA THROUGH CULTIVATION OF INDIGENOUS TREES

I. BACKGROUND AND RATIONALE

1. The tropical rain forests of West Africa are endowed with a rich biodiversity. Cameroon alone hosts 14 000 species of plants, with 3 500 different tree species. For centuries, wild uncultivated fruit trees and medicinal plants have provided the small farmers of the forest-margins with food, medicine and income-generating opportunities. Unfortunately, logging and unsustainable “slash and burn” agriculture have already impacted on economically useful species, which are becoming extinct, while impoverishing the livelihood of the forest-margin dwellers.

2. Collecting fruit and nuts and bark with medicinal properties from wild trees has always been an important activity for local households. However, population pressure has meant clearing forests to release land for cultivation, which, together with tree-felling by logging companies, has resulted in the loss of economically important indigenous trees. Small farmers can profit from tree cultivation under the appropriate agro-ecological conditions. Fruit and medicinal trees provide an opportunity to diversify income, and the mixture of perennial and annual crops represents an environmentally sound land management system conducive to moisture conservation and soil-erosion control. In recognition of the economic, nutritional and ecological importance of trees, many of these small farmers preserve individual trees during land-clearing operations. In this way, the newly cleared plots of the small farmer may comprise, along with subsistence crops, mature fruit and medicinal trees that were once part of the plant community of the forest. The process is referred to as “tree domestication”.

3. Families consume many of the fruits collected from the forest and domesticated trees, which form an important nutritional supplement to the staple foods, especially for children, providing them with vitamins. Fruits, medicinal nuts and bark are also sold to generate income, contributing significantly to household food security. Much of the produce is sold locally, often at the roadside, to itinerant traders who transport it to urban areas. The differential in price between that received by the farmer and that paid by the urban consumer can be very large. Unaware of this, farmers lose a substantial portion of the rents available from tree domestication and production.

4. With its headquarters in Nairobi, Kenya, the ICRAF has been active in West Africa since 1987. Early research focused on improved fallow management to restore soil fertility lost as a result of unsustainable shifting cultivation practices. While researching, it was found that farmers understandably showed a preference for fallow management systems that enhance their incomes, including trees with saleable products in the fallow system. Additionally, it was observed that the remaining areas of natural forest are increasingly unable to sustain the demand for fruit and medicinal barks, etc. Research methods need to be developed to improve the tree domestication process and bring superior species and clones of indigenous trees both into cultivation and preserve them so as to protect biodiversity. Parallel socio-economic research in the forest-margin areas showed that among the non-crop sources of revenue (including sales of fuel-wood, bush-meat, fish, livestock, palm wine, indigenous fruits, petty commerce and wage-earning), indigenous fruits consistently ranked number one. Of the three locations studied, an average of 51% of farm-households sold indigenous fruits, but 89% of them were unaware of the real market value of the merchandise. Thus, they lost out on a significant income-generating opportunity. Other studies indicate that farmers would benefit from higher fruit prices if the tree clones that produce fruit outside of the main season could be identified.



5. The ICRAF identified the preferred indigenous tree species as *Irvingia gabonensis* and *I. wombolu* (“Bush Mangoes”), *Dacryodes edulis* (“African Plum”) and *Ricinodendron heudelotti* (a medicinal bark). Farmer preferences for species and individual trees reflected a requirement for early bearing habit and acceptable yields, and in the case of fruit trees, for sweet fruit of saleable size. Recognizing the rapid rate of forest clearing in the region, and the threat that this poses to biodiversity, the ICRAF, together with local institutions, began sampling and conserving examples of priority tree species, including the wild fruit-bearing species and those that produce medicinal bark and nuts preferred by local farmers and consumers. Germ plasm has been collected in Cameroon, Equatorial Guinea, Gabon, Ghana and Nigeria. Preliminary research on *Irvingia gabonensis*, the top priority fruit tree (in the farmers’ opinion), showed that vegetative propagation (essential if clonal characteristics are to be maintained) is possible using ‘air-layering’ techniques, but that the success rate was unacceptably low. Many research questions on *I. gabonensis* remain unanswered, while research on other indigenous fruit and medicinal tree species has not even begun. The unimproved nature of the trees, coupled with the marked intraspecific diversity within them, augurs well for genetic improvement through a farmer-participatory selection and multiplication approach.

II. THE PROPOSED PROGRAMME

6. The proposed research programme seeks ways to better identify, characterize and propagate superior clones of priority indigenous fruit and medicinal tree species. Seven species have been selected: *Cola nitida* (“Kola-nut”); *Dacryodes edulis* (“African Plum”); *Garcinia sp.*, *Irvingia sp.* (“Bush Mango”); *Pausinystalia johimbe* (“Yohimbe” - a medicinal bark); *Prunus africana* (“Pygeum”); and *Ricinodendron heudelottii* (a medicinal bark). Since research will be conducted with farmers, they will control the direction of the research. Application of findings will be targeted towards the most appropriate areas (densely populated and deforested areas where there is a market for fruit and traditional medicines) and interested farmers. Recent information collected with remote-sensing techniques will be used to select the areas. Research will also expand market opportunities for fruit and cross border trade is a possibility. Similarly, input markets will be researched (e.g., for superior clonal planting material). The ICRAF recognizes the importance of ensuring that farmers maintain a broad array of genetic diversity among the agroforestry trees on their farms. This reduces the likelihood that only a limited number of tree clones will be cultivated (representing a narrow range of species diversity), with all the associated vulnerability. The proposed programme will allow ICRAF to develop further its evolving strategies in this area, in four countries, in partnership with national research institutions.

7. The programme’s goal is to increase the incomes of rural communities in four humid West African countries – Cameroon, Equatorial Guinea, Gabon and Nigeria – by formulating and implementing integrated strategies for the domestication of priority high-value agroforestry tree species and the marketing of their produce. The programme’s five chief objectives are to:

- Collect and maintain germ plasm of high-value agroforestry trees as a basis for further research and development activities and to ensure their conservation.
- Characterize the indigenous trees of economic value in terms of non-timber products that are being grown on farms (in terms of species and number).
- Compare the cultivation of high-value trees with other land-use systems, and study the associated gender and ownership issues.
- Carry out market research with a view to assisting farmers in capturing a greater proportion of economic rent from sales of tree products.
- To multiply improved germ plasm in participation with farmers.



8. The ICRAF organized a stakeholders workshop in Yaounde, Cameroon, from 8-10 October 1998. Thirty-five people attended the workshop, including representatives of all four participating countries, who collaborated to design the programme and agreed on the operational plan.

III. EXPECTED OUTPUTS/EXPECTED BENEFITS

9. The programme has four main outputs:

- Output 1** Germ plasm of three priority high-value tree species collected and established in gene banks located in all four participating countries.
- Output 2** High-value tree species growing on at least 200 farms in at least two participating countries characterized, and their agricultural potential diagnosed.
- Output 3** Information on market, consumer preferences and demand for two priority tree species in all four participating countries.
- Output 4** Capacity developed in non-governmental organizations (NGOs) and farmer groups to disseminate and monitor diffusion of at least two priority high-value tree species in all four participating countries.

10. The first beneficiary group will be the more entrepreneurial among the poor farmers, who experiment with and adopt the improved germ plasm made available as a result of the research. This group will likely be the first to set up private multiplication units and will derive early returns from the sale of propagules. The programme will not provide any germ plasm free of charge in order to prevent depressing an incipient market for planting material. Small farmers collaborating in the research programme will pay in kind (land, labour and feedback) for the planting material that the programme provides.

11. For the group of farmers who collaborate in the programme, cash income from the sale of high-value tree products will be a direct benefit. Although some vegetative propagules may bear fruit early (i.e., after two-three years), the income benefits will not accrue substantially until after programme completion. The incorporation of several tree species in the programme will minimize dependency on the price of single commodities and help stabilize income. In addition, the production of tree products on-farm will substitute for currently purchased products and thus save alternate income. The switch from extractivism to cultivation of trees will help preserve forest ecosystems in the participating countries, and enable permanent (e.g., multi-strata) agroforestry systems to replace unsustainable slash and burn agriculture.

12. This research will benefit women as they are largely responsible for satisfying the nutritional requirements of the household, and they, more than men, market non-timber forest-products. National partners will benefit from the programme's strategic planning and empirical research. They and others will be able to apply the same or modified approaches of tree domestication to other species that farmers demand. Results from the programme will be transmitted by a variety of means. The collected germ plasm will be disseminated to farmers through on-farm trials and the establishment of multiplication units. The results of farmer surveys will be published (jointly with the National Agricultural Research Systems (NARS)) as research notes for communication to other partners, extensionists and even farmers. Newsletters will be published that provide market information and opportunities to farmers and extensionists. IFAD will prepare one or more draft technical advisory notes to programme planners and subject-matter specialists working in countries in the region with humid forests.



IV. IMPLEMENTATION ARRANGEMENTS

13. The ICRAF will implement the programme in partnership with the national agricultural research institutions, universities and NGOs of the four participating countries, and international research and development institutions. The latter comprise the CAB International (CABI-UK); the Centre for International Forestry Research (CIFOR); the International Institute for Tropical Agriculture (IITA); and the Institute of Terrestrial Ecology (ITE-UK). In Cameroon, the principle collaborators will be the Agricultural Research Institute for Development (IRAD), the Dschang National University (UDN), the International Cercle for Promotion of Creation (CIPCRE) and the Support Service to the Local Development Initiatives (SIALD). In Equatorial Guinea, the Rational Conservation and Utilization of Forest Ecosystems (CUREF) will be the principle collaborator. Similarly, the National Centre for Scientific Research (CENAREST) will be the principle collaborator in Gabon. In Nigeria, the principle collaborators will be the National Horticultural Research Institute (NIHORT), River State University and the Centre for Environment, Renewable Natural Resources Management Research and Development (CENRAD). Representatives from all collaborating institutions participated in the participatory workshop. A total of thirty-five will be involved in implementing the various aspects of the programme. The programme builds upon recent germ plasm collection and conservation work in Cameroon by ICRAF (funded by the German Federal Ministry for Economic Cooperation and Development (BMZ)), the United Nations Educational, Scientific and Cultural Organization (UNESCO)-funded *Prunus africana* collections, and the Boehringer Ingelheim Ltd-funded inventory of *Pausinystalia johimbe*.

14. Within each participating country, a national team leader will oversee and coordinate the programme. The ICRAF will consolidate reports prepared at the national level into progress reports every six months, and into a final report at the end of the three-year funding period. Planning and training workshops for NGOs and farmers groups will be organized at an early stage. In partnership with both, the ICRAF will identify superior specimens of fruit trees and organize the monitoring of fruit production and the quality of the produce. Farmers will be intimately involved in the selection of superior trees to be propagated in order that their socio-cultural preferences and marketing considerations be taken into account. Planting material will be multiplied in conjunction with national research institutes, the extension services and NGOs. Finally, farmers, in conjunction with NGOs, will be trained in propagation methods, using a participatory approach.

15. The programme will have a steering committee that will include representatives of IFAD, ICRAF, the participating national research institutions, selected NGOs and representatives of both farmers and processors. It will review the plan of work and budgets, evaluate work in progress and provide general guidance. Progress will be monitored on the basis of indicators agreed to at the stakeholders workshop, which will include: (a) maps showing distribution of priority high-value tree species and sites from where germ plasm was collected; (b) reports on the following: tree management methods and tree ownership patterns in different villages in at least two countries; and the structure, conduct and performance of rural, urban and cross-border markets for the produce from at least two priority tree species; and (c) the number of the following indicators: propagules of priority high-value tree species and sites from where germ plasm was collected; gene banks established; clones propagated; propagules of superior high-priority tree species produced; farmers that have planted propagules of superior high-priority tree species; meetings and workshops held; reciprocal visits by researchers made; extension pamphlets produced and distributed; and technical advisory notes drafted. The programme will be reviewed at mid-term and again during the final year. The staff of IFAD's West and Central Africa Division will be engaged in supervising the programme and will participate in steering committee meetings to ensure close linkages with IFAD-financed projects in the region. The programme will be carried out over a period of three years.

**V. INDICATIVE PROGRAMME COSTS AND FINANCING**

16. The programme will be cofinanced by ICRAF, the BMZ, the Overseas Development Institute (ODI)/the Institute of Terrestrial Ecology (ITE), the Department for International Development (DfID-UK) and participating research institutions from the four participating countries. The total cost of this three-year programme is estimated at USD 2 438 200.

**COSTS AND FINANCING PLAN
(USD)**

Cost Category	IFAD	ICRAF	BMZ	ODI-ITE	DfID	NARS	TOTAL
Research staff costs	476 200	75 000	243 400	27 600	124 700	100 000	1 046 900
Travel	148 700	25 000	30 000	10 200	35 000	10 000	258 900
Equipment/supplies	161 000	150 000	71 000	20 500	56 000	50 000	508 500
Meetings/training	79 000	50 000	28 000		9 500	10 000	176 500
Administrative overhead (9%)	86 841	192 980	74 480		44 840		399 141
Technical backstopping (IFAD)	48 259	-	-	-	-	-	48 259
Total	1 000 000	492 980	446 880	58 300	270 040	170 000	2 438 200



THE INTERNATIONAL INSTITUTE OF TROPICAL AGRICULTURE (IITA): POVERTY ALLEVIATION AND ENHANCED FOOD AVAILABILITY IN WEST AFRICA THROUGH IMPROVED YAM TECHNOLOGIES

I. BACKGROUND

1. A generally declining resource base for food production has led to a precarious food situation in parts of West Africa. Increased and diversified food production, and appropriate post-harvest systems, are essential for coping with the subregion's increasing population and urbanization. Approximately 93% of the world's annual yam production of about 32 million tonnes is produced in West and Central Africa. In the region, the crop contributes more than 200 dietary calories per person each day to millions of people and is an important source of income. Yams bring flexibility through the multiplicity of species and cultivars, broad agro-ecological adaptation, diverse maturity periods and options for storage and utilization. As a crop that originated in West Africa, yams hold a central position in the traditions and culture of many ethnic groups in the coastal countries of the region.

2. Despite the yam's tremendous importance to the subregion, research and technology have generally neglected and underfunded them. At a March 1999 project design stakeholder workshop in Cotonou, Benin, regional experts gathered to discuss the most important constraints to yam development in West Africa. Management of soil fertility was deemed a major challenge to maintaining the high productivity of yam-based production systems. The traditional long fallows that characterized these systems in the past are now impossible in many yam-growing areas due to increased pressure on cultivable land from the increased population. Yam production needs to be sustained by alternative strategies compatible with the trends in socio-economic and physical conditions in these areas. These various constraints are discussed in more detail in the next section.

II. RATIONALE/RELEVANCE TO IFAD

3. Pest pressures are mounting in yam fields as the traditional fallows in the yam belt are shortening. For example, mapping of yam-growing areas in West and Central Africa through a geographic information system reveals a concentration of fields infested with nematodes in areas where the length of fallow was less than four years. Viruses reduce field performance as well as restrict exchange of germ plasm. Anthracnose disease, which is caused by *Colletotrichum gloeosporioides*, continues to threaten the cultivation of *D. alata* in Africa. Biologically suppressing pathogens of yams remains a relatively unexplored option in the effort to increase productivity of yam-based production systems in West Africa. The feasibility of introducing pathogen-suppressive microbes into the yam rhizosphere could be usefully assessed, as could further protecting yam tubers with such micro-organisms during the post-harvest phase. Pests and pathogens play major roles in the losses incurred during storage. Most pathological causes of loss in storage can be attributed to an interplay of nematodes, fungi and bacteria, moderated by environmental factors such as temperature and humidity. The majority of these losses originate from pre-harvest invasion or infection and/or damage during harvest and transit. Moreover, poor quality planting materials tend to carry problems from the barn back to the field, adversely affecting the field establishment and lowering tuber yields.

4. Efforts need to be redoubled to develop and disseminate improved varieties. Farmers have relied upon natural genetic variation for their selection of suitable yam cultivars to cope with the deteriorating resource base in the major yam-producing areas of West Africa. However, they have not been able to keep pace with the challenges in the physical and socio-economic environment. Farmer-participatory testing, which combines farmers' indigenous knowledge and long experience with the expertise of breeders, would be ideal for the selection of new cultivars that are more suited to the



current situation. This process will draw upon the many new cultivars developed in the region through collaboration between IITA and the various national programmes. The selection of improved cultivars from IITA-derived seed populations has reached the advanced stages in the yam programmes in Benin, Nigeria and Togo.

III. THE PROPOSED PROGRAMME

5. Under the overall coordination of IITA, the programme will operate in the five most important yam-producing countries of the region: Benin, Côte d'Ivoire, Ghana, Nigeria and Togo. Key programme objectives are to increase the availability of the following: technologies for improving or maintaining soil fertility in a sustainable fashion as fallow periods shorten; technologies for the management of pests (including weeds) and diseases in a sustainable fashion as fallow periods shorten; improved varieties of major cultivated species of yams in West Africa; and post-harvest technologies (by building linkages with other research programmes currently operating in the region). These objectives translate into the following programme components and cross-cutting activities.

6. **Management of soil fertility.** A thorough review of past and current research on, and recommendations for, the use of inorganic fertilizers in yam cultivation will be conducted. The nutrient requirements of yam and efficient use of fertilizers in yam-based systems will then be studied on-station and on-farm as necessary. Various crop rotation systems will be assessed on-farm for their usefulness in maintaining soil fertility. Testing improved legume cover crop and tree fallows will be emphasized for increasing soil organic matter and nutrients, and for improving soil structure in yam-growing areas of two countries. The socio-economic viability and acceptability of planted legume fallows as a means of soil fertility maintenance for yam cultivation in short fallow systems will also be established.

7. **Management of pests and diseases.** The influence of cultural practices on pest dynamics (insects, pathogens and weeds) in yam fields under short fallows will be studied on-farm. Botanicals will be tested for their efficacy in controlling major yam storage pests which will be carried out on-station for the first two years before on-farm testing of promising selections. Other programme activities will comprise: characterizing flora and fauna associated with yam tubers; assessing the influence of yam genotypes on the microflora ecology of the tubers; looking for potential antagonists among the microflora; and evaluating the interaction of various yam genotypes with potential biological control agents. The economic impact of using "clean" seed tubers for yam cultivation will be installed on-farm as a major component of economic analysis of the yam seed sector in the region.

8. **Introduction, testing and dissemination of new varieties.** A workshop of collaborators will be organized to review and standardize methodologies for regional field evaluation of yam germ plasm. *D. alata* landraces will be introduced from the South Pacific region, in collaboration with the South Pacific Yam Network and the International Cooperation Centre on Agrarian Research and Development (CIRAD), to expand the genetic base of this introduced species in the subregion. Introductions of advanced clones of *D. rotundata* and *D. alata* from IITA into participating national programmes will be evaluated in multisite trials and compared with popular local varieties. Evaluations will be conducted on-station during the first two years, followed by on-farm testing of selected genotypes. Other activities will cover identifying elite local cultivars through farmer-participatory on-farm trials and exchanging elite local cultivars among countries in the region.

9. **Post-harvest technology.** There are already two major programmes on post-harvest technology of yams in the subregion: the European Union-funded international cooperation programme on yam post-harvest and consumption; and the programme on valorization of yams for urban markets. The proposed programme will lend modest support to these ongoing efforts, by enabling NARS personnel from Ghana and Togo (not currently covered under the international cooperation and valorization projects) to attend coordination meetings and benefit from technology transfer activities (fresh tuber storage, processing of tubers into chips).



10. **Cross-cutting activities.** Socio-economic studies will be an integral part of the programme. The economic viability and acceptability of the new production and processing technologies at multiple spatial scales will be analysed, covering farm, household and community levels. Since both sexes are involved in the yam economy, special attention will be given to gender analysis in order to incorporate gender parameters into the development of technologies.

11. Information will be inventoried and updated regularly regarding available manpower resources for yam research and development, research and development projects on yams, as well as improved technologies (including varieties) available for testing with yam producers and processors in West Africa.

12. Finally, interaction with NARS over the years, in the subregion has, exposed serious gaps in the availability of trained manpower for yam research, especially in Benin and Togo. It is proposed that some of the research be conducted by NARS scientists in fulfilment of the requirements for M.Sc. or Ph.D. degrees by universities in the region. Other training events are propounded for technicians and farmers under the various research themes.

IV. EXPECTED OUTPUTS/EXPECTED BENEFITS

13. Carrying out these activities will do the following: expand the programme for the selection and dissemination of *D. rotundata* and *D. alata* varieties with high and stable yields, and good food and storage qualities; identify farming practices that provide soil organic matter, replenish nutrients and improve soil structure for increased productivity; enhance integrated management of major pests and diseases of yams; increase the availability of information on environmental and human resources, and technologies relevant to yam cultivation and utilization; and establish linkages between ongoing regional yam post-harvest research programmes and NARS in Ghana and Togo.

14. The programme will improve access by resource-poor, smallholder farmers to quality seed yams of productive cultivars, and raise the quality of seed yams used by farmers. It will increase the yield, area and production of yam cultivation, reduce pests and the losses they cause in the field and during storage and lower the cost of production. Finally, it will increase the volume and efficiency of post-harvest processing and trade in yams, and improve food security and poverty alleviation in rural areas.

V. IMPLEMENTATION ARRANGEMENTS

15. The IITA will coordinate programme execution, as it has extensive links with the national agricultural research and extension systems and the relevant NGOs in the region. The programme will be implemented within the policy umbrella afforded by the regional research coordinating body, the Consortium of Decision-Makers on Agricultural Research in West and Central Africa (CORAF). A steering committee comprised of NARS scientists, CORAF officials, IITA scientific coordinators and an IFAD representative (with observer status) will discuss issues affecting the programme and approve budgets based on the annual plan of work.

16. The NARS will conduct day-to-day programme implementation. Links will be established with relevant projects, and public and private-sector organizations in the subregion. Agreements will be signed between IITA and such agencies, wherever necessary, to ensure the efficiency and effectiveness of cooperation. The lead national agencies will be: the National Centre for Agricultural Research (CNRA), Côte d'Ivoire; the Crops Research Institute (CRI), Ghana; the National Agricultural Research Institute (INRAB), Benin; the Institute for Agricultural Research (ITRA), Togo; and the National Root Crops Research Institute (NRCRI), Nigeria.

VI. INDICATIVE PROGRAMME COSTS AND FINANCING

17. The total cost of this four-year programme is estimated at USD 3 287 000. The IITA will contribute USD 892 000, which will largely consist of professional and administrative staff time. The NARS of the five countries and in-country collaborators will contribute USD 1 145 000, providing expertise in various disciplines, land, germ plasm, laboratory and office space, as necessary, to facilitate programme activities. Table 1 summarizes the financing by source of funds. IFAD's proposed contribution is USD 1 250 000, which will be allocated as outlined in Table 2.

**Table 1: Financing Plan
(USD '000)**

ITEM	SOURCE OF FUNDS			TOTAL
	IFAD	IITA*	NARS and Collaborators	
Personnel costs, related expenses and staff time	312	800	720	1 832
Capital items	205	42	140	387
Research materials, equipment and operating costs	245	20	50	315
Germ plasm (in-kind)		30	200	230
NARS fellowships and in-country training	230			230
Workshops and monitoring	90			90
IFAD technical backstopping	63			63
Administrative support	105		35	140
Total	1 250	892	1 145	3 287

* IITA overhead calculated at 12% of the IFAD grant amount (excluding capital items and IFAD technical backstopping).

**Table 2: Proposed Budget for IFAD Funds ^a
(USD '000)**

ITEM	ESTIMATED COST BY YEAR				TOTAL
	Year 1	Year 2	Year 3	Year 4	
IITA coordination	58	58	58	58	232
Workshops and monitoring	20	22	23	25	90
Technical backstopping	20	20	20	20	80
NARS research operations	58	60	62	65	245
NARS fellowships and training	20	80	70	60	230
NARS capital items	205				205
IFAD technical backstopping	16	16	16	16	64
IITA overhead	26	26	26	26	105
Total	423	282	275	270	1 250

^a Discrepancies in totals are due to rounding.