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COUNTRY AND INTERCOUNTRY PROGRAMMES AND PROJECTS

CONSIDERATION AND APPROVAL OF GLOBAL AND INTERREGIONAL PROGRAMMES AND PROJECTS

Project recommendation of the Administrator

Assistance for a global project

Technology Transfer on Root and Tuber Crops (Phase II)
(GLO/82/002)

Estimated UNDP contribution: US\$2,811,000

Duration: Five years

Executing Agency: UNDP

I. Background

1. Edible roots and tubers have always been a basic component of the staple diets of many people throughout the world. In fact, potatoes, cassava and sweet potatoes singly outrank the average production of energy per hectare per day produced by each of the most popular foods in tropical developing countries, including dry beans, chick-peas, rice and maize. Cassava, with a total of 13.1 million hectares of production, is almost exclusively produced and consumed in developing countries, and 98 per cent of the world's 15 million hectares of sweet potatoes is grown in developing countries.

2. Of the world's 18.2 million hectares in potato production, 46 per cent is in the developing countries. In spite of the potential of these crops to produce an enormous amount of energy per hectare, they have received much less attention than cereals in terms of research on improvement of yields, nutritional quality and range of adaptation. Recognizing these facts and the three crops' potential

for alleviating world hunger, the international research centres - International Centre for Tropical Agriculture (CIAT), International Potato Centre (CIP) and International Institute of Tropical Agriculture (IITA) - have been mandated by the Consultative Group on International Agricultural Research (CGIAR) to conduct research on these crops with the objective of assisting national programmes to adapt and generate new technologies for increased production. Each of these centres of the CGIAR system has been assigned a specific mandate: CIAT in cassava (world-wide), CIP in white potato and IITA in cassava (for Africa), sweet potato, yams and cocoyams. Their institutional framework is geared to their respective mandates and to the world-wide or regional focus of each centre.

3. CIAT's Cassava Programme started in 1971 and is composed at present of 10 senior scientists in the disciplines of breeding, physiology, pathology, entomology, agronomy-cultural practices, utilization and economics. A support staff of 22 professionals assist their research and training endeavours. In addition to in-house and off-campus research, these scientists travel to co-operating countries in Latin America, the Caribbean, Asia and the Pacific to develop collaborative ties with national programmes. Adequate physical facilities of the centre at Palmira, Colombia, are available for high-quality research and training. Support services include station operations, a germ-plasm unit with a tissue culture facility, laboratory services, greenhouses, screenhouses, communication services for publication and reproduction of training materials and a well-stocked library and documentation services. An efficient administration and management assures adequate level and rate of operations. A large proportion of the research is carried on at the other stations in Colombia: Caribia, Carimagua, Santander. A large set of regional trials for different ecologies operate in Colombia and a growing network of country trials is developing with the centre's trained professionals from national programmes.

4. CIAT's Cassava Programme seeks to develop technology to increase the productivity of cassava in areas where it is presently grown, as well as to increase cassava production in the acid, infertile soils of the lowland tropics. After having produced and evaluated a great number of hybrids, numerous high-yielding, disease and pest resistant lines have been obtained for further testing. Improved agronomic practices have been evaluated with the new clones in both regional trials and in on-farm evaluation trials. Results from regional trials in Colombia have shown that with low-input and improved technology, local clones yield an average 20 tons/ha. - against a national average of 8.0 tons/ha. These data illustrate the potential for CIAT technology to double yield at selected locations without even changing varieties. This potential has been realized at the commercial level in at least one country with state or co-operative farms. On-farm validation has shown that small farmers can readily use this new technology and obtain yield levels similar to those obtained in the regional trials.

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5. The mandate of CIP, located in Lima, Peru, is the expansion and adaptation of research necessary to develop technology which will solve the major constraints limiting potato production in the developing countries. One of CIP's major assets is the World Potato Collection, which includes many previously unavailable genetic resources that can be used by potato researchers world-wide to help overcome production problems. CIP's strategy is first to identify research priorities for potato production and improvement, and then to define which research the centre itself is best qualified to conduct and which can be done equally well or better by other institutions. Work for which CIP has an advantage centres around CIP's world germ-plasm collection (including maintenance of the collection), its facilities for using the collection, and its ability to distribute disease-free material to user agencies around the world. CIP seeks to establish and strengthen national and regional capacities to evaluate, adapt, and redistribute technology. CIP's programme is organized around nine major research areas (thrusts), namely: collection and classification of germ-plasm; maintenance, utilization and distribution of germ-plasm; control of important fungus, bacterial and virus diseases; control of nematodes and insect pests; physiology and agronomy of potatoes; storage and processing technology; and seed production technology.

6. CIP also has a strong regional research and training programme organized around seven designated regions of the world. From the initiation of the Centre, funds have been allocated for the development of a world-wide network of scientists whose principal role is to evaluate improved methodology. This regional programme also evaluates and distributes improved germ-plasm emerging from the various breeding programmes. Seven regional locations have been established in different locations around the world, and 75 per cent of CIP training is carried out at these or in countries within the regions. Already, through the regional research programmes, large numbers of competent national scientists have been trained. In addition, the regional scientists have identified several cells of expertise within national institutions which are capable of training scientists in neighbouring programmes. It is CIP's stated policy in its long-term profile that, as early as possible, it will try to catalyze the process of horizontal transfer of existing technology between national programmes using national capabilities.

7. Some of the recent scientific progress made at CIP includes: identification of potato clones with resistance to late and early blight; resistance to the destructive potato tuber moth; biological control of potato root-knot nematodes by means of a fungus; development of true seed in potato which could revolutionize potato production in developing countries; evaluation of on-farm trials in farmers' fields to optimize potato productivity; and a study of potato production trends in developing countries which revealed rapid growth rates in Asia and Africa with average yields in South Asia increasing by 40 per cent over the last 20 years.

8. The Root and Tuber Improvement Programme of IITA, which is located at Ibadan, Nigeria, started in 1971 and is charged with the improvement of the root and tuber crops including cassava, sweet potato, yams and cocoyams. The objectives are to improve the root and tuber crops for high stable yields with consumer acceptance quality in the tropics. The ultimate goal of the programme is to help improve

the research and extension capacities of the national root and tuber improvement programme through training the nationals and providing them with improved technologies and plant material. The programme consists of a core programme at IITA, Ibadan, Nigeria, and two co-operative programmes: the Programa Nacional Manioc in Zaire (PRONAM) and the Cameroon National Root and Tuber Improvement Programme (CNRCIP) in the United Republic of Cameroon. The programmes have adopted an interdisciplinary team approach with 10 scientists specialized in agronomy, breeding, entomology (host plant resistance and biological control), pathology, nematology, biochemistry/food technology and tissue culture. The PRONAM has eight professional staff and the CNRCIP has two staff. It receives support from the Farming Systems Programme for the improvement of the root crop based farming systems. It also receives support from its virology unit for virus indexing and the germ-plasm unit for germ-plasm collection, preservation and distribution. IITA's core programme collaborates with the Training Programme for identifying candidates for training, organizing and executing the training courses. The other support services include laboratory analytical service, computer/biometrics, library, medical unit, conference unit and farm management.

9. IITA scientists have identified sources of genetic resistance to cassava mosaic disease and cassava bacterial blight, major diseases of the crop. This resistance has been incorporated into high-yielding cultivars. Improved disease-resistant cassava clones, distributed to farmers in Nigeria, are yielding about 30 tons per hectare, compared with yields of 10 tons from traditional varieties. The major insect problems of cassava - mealybug and green spider mite - receive a major emphasis. Prospects for genetic resistance to green spider mite and biological control of mealybug seem to be good. Using recently developed techniques for propagating yam from seed, IITA researchers have grown more diversity of plant and tuber types, flowering and fruiting habits, and insect and disease resistances. These materials are being used by breeders at the institute and in national programmes around the world to produce improved varieties.

10. Sweet potato lines bred at IITA exhibit conspicuous resistances to virus and weevil. Yields of these insect- and disease-resistant materials average 20 to 30 tons per hectare without fertilizers, compared with farmers' yields of about 8 tons with traditional varieties. Cocoyams are grown throughout West Africa and are especially important in the United Republic of Cameroon and Ghana. Erratic flowering of the plant under natural conditions has impeded efforts to breed improved varieties. Using new techniques to induce flowering, IITA researchers have grown 1,000 seedlings for selection and further crossing to produce improved cultivars.

11. At its twenty-seventh session in June 1980 (DP/PROJECTS/R.13/Add.2), the Governing Council of UNDP approved a two-year project for \$600,000 to launch a co-ordinated effort to transfer technology to selected developing countries in three economically important root crops: cassava, potatoes and sweet potatoes. The project is being implemented by CIAT as the lead institution,

and by CIP and IITA as close collaborators. The project has two goals:

(a) To strengthen the root and tuber crop research and extension capabilities of selected national programmes concerned with cassava, sweet potatoes and potatoes, which are economically significant crops; and

(b) To promote the transfer of technology emerging from international centres conducting research on the above-mentioned crops.

12. Although the project has been operational for about 18 months, significant progress has been achieved in various types of training for adaptive research, for validative research and extension and for specialized support. The project has also strengthened the interactions of the concerned international centres with developing country national programmes. Additionally, the project has facilitated the distribution of improved germ-plasm of the crops in question to country collaborators around the world. Over 450 developing country personnel from Asia, Latin America, Africa and the Middle East have received training of varying durations in specialized areas, some at the concerned international centres and others within the region organized singly or jointly by CIAT, CIP and IITA.

13. The work of the project was evaluated in November 1981 by a UNDP consultant team which concluded that the project had made excellent progress in terms of achieving its stated goals. In the present project, with limited UNDP inputs, the three international centres have conducted training activities designed to strengthen the capacity of national root and tuber crop programmes to do adaptive research and extension. In addition, personnel from countries without national root/tuber crop programmes have been trained in order to help establish such programmes. The project has assisted in bringing the international centres into closer contact with the reality and needs of the recipient countries. The project has also helped to provide a regional and a global focus for certain activities where problems, such as the rapid propagation and transfer of disease-free germ-plasm, transcend national boundaries. Although the progress made in the current two-year project is highly satisfactory, much still remains to be done to expand and strengthen activities with national programmes, especially those which have not yet been involved in the project. In fact, at the time the current two-year project was submitted for the Governing Council's approval in June 1980, it was specifically stated that in view of the limited duration and modest UNDP inputs, there would be need for an expanded effort of longer duration to develop and strengthen collaborative links between the three international centres and developing countries and to establish a sound mechanism for training personnel and for disseminating improved technology on cassava, potatoes and sweet potatoes.

II. The project

14. The main purpose of the phase II project will be to continue, expand and intensify current efforts to: (a) strengthen research and extension capabilities of selected developing country programmes concerned with cassava, potatoes and

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sweet potatoes; and (b) promote the active collaboration among the three international centres concerned to better equip them to transfer, on an increased scale, the crop technology emanating from these centres to national programmes around the world.

15. The specific project activities in support of the above-mentioned goals will be carried out more or less under the same groupings established for the phase I project. Six sets of activities will be conducted jointly by at least two of the centres. Thirteen others will be conducted by each centre separately: four by CIAT, three sets by CIP and six by IITA. These activities are:

A. Joint Activities

16. CIAT and IITA will hold a workshop on root and tuber crops breeding and germ-plasm in Asia in March 1983; CIAT/CIP/IITA will co-operate on the following: a global workshop on root and tuber crops propagation in September 1983, courses on tissue culture techniques and propagation to be held at different dates and venues, a course on integrated production, processing and utilization of root and tuber crops in June 1983, a global workshop on integrated pest management in March 1986, and several workshops on germ-plasm exchange and quarantine considerations in March, June and July 1982.

B. Individual Centre's Activities

17. Several categories of training will be conducted at each centre to help strengthen research and extension capabilities of national programmes and foster interaction and information exchange. Training for adaptive research will include internship, a regional training course on cassava research for Asian countries, and degree programmes at the Master's level for five participants at each centre. Training for validative research and extension will seek to assist national programmes to test, validate and spread to farmers new improved technologies for increasing yields - CIAT will conduct 24 in-country courses for extension personnel; CIP will conduct 8 two-week regional potato storage courses, 2 one-month regional courses on potato production, and one regional seed production course, all in co-operating countries; and IITA will hold 5 nine-week yearly courses on production of cassava, sweet potato, yams and cocoyams. Training for specialized research support functions is designed to increase the technical expertise of selected personnel in national crop improvement programmes - 4 courses are planned jointly by the centres in critical support services, mainly tissue culture and propagation, and 5 additional three-week courses will be conducted by IITA for this purpose. Finally, interaction with national programmes for information exchange and research strategy will encompass workshops and other follow-up assistance to national programmes and centre-trained personnel to help the exchange, testing, adaptation, validation and application of new technologies - CIAT will provide visiting staff for technical support and information to co-operating national cassava programmes, CIP will follow up with technical backstopping for its training course participants through regionally posted staff, and IITA will conduct 5 regional workshops for representatives of

root and tuber crops programmes for priority research problems, to include provision of technical advice, follow-up support, and limited amounts of equipment, supplies and labour costs to start experiments if local funds are not available.

18. Built into the activities stated under the above categories of training will be the production of appropriate training materials such as manuals, articles, bulletins and audio-tutorials.

19. The training programmes and other activities described above, for which full descriptions including the countries expected to participate in them will be made available to UNDP on project approval, will be implemented by CIAT in collaboration with CIP, IITA and national research institutions of developing countries. Special conferences, seminars and workshops will be arranged as needs arise. Participants in those events as well as training courses will be carefully selected by CIAT in consultation with CIP, IITA and appropriate national and international agencies. While CIAT will act as the lead institution for the project, the thrust of the project's activities will be focused in relation to the different strategies and existing programmes of the three co-operating international centres in this project.

20. In order to assess the impact of the project activities at the farm level and to measure the effectiveness of the various training programmes, UNDP will provide, under its own direct costs component, funds for required consultancies in order to undertake an independent evaluation. Such an assessment will be made at two different periods, midway in the course of the project and at the end. Visits will be made to selected countries around the world in order to provide adequate coverage of the countries involved so that the assessment will be meaningful. Special attention will be given in that evaluation to the outcome of the project in regard to strengthening national root and tuber crop improvement and extension programmes and the utilization of new technologies by farmers resulting in increased production.

21. The Administrator intends, through contractual arrangements between CIAT and UNDP, to entrust the implementation of this project to CIAT, with the clear understanding that the Director-General of CIAT will seek the advice of the Food and Agriculture Organization of the United Nations (FAO) as needed. As in the past, UNDP will follow closely all the developments in this global project and, together with FAO, will participate in the Project Advisory Committee which will be established for the project. A concerted effort will be made to link the training and research activities with field work being undertaken at the country and intercountry levels. Close collaboration will be maintained at all times with international agricultural research centres participating in the project. The Project Advisory Committee, which will include representatives of selected national agencies and international agricultural research centres, normally will meet once a year, or at such times and places as deemed appropriate by the three centres. It will appraise the ongoing training and collaborative research programmes and advise on its future direction. Towards the end of the project, UNDP will, in consultation with CIAT, undertake a review of the accomplishments of the project to be carried out by a team of

independent consultants. This review will take place in conjunction with the assessment referred to in paragraph 20 above.

22. The expenditure components of the proposed UNDP assistance are:

	<u>\$</u>
Subcontract	2 511 000
UNDP direct costs	<u>300 000</u>
Total	<u>2 811 000</u>

The proposed UNDP contribution will be contained within the Global IPF established by the Governing Council for the current cycle.
