International Institute of Tropical Agriculture
Annual Report
2001

www.iita.org

ISSN 0331 4340
IITA is a Future Harvest Center (www.futureharvest.org)

Cover from an original painting by Rosalie-Ann Modder
Layout and typesetting by Green Ink
Printed by Pragati Offset Pvt. Ltd., Hyderabad, India

IITA
Annual Report
2001

International Institute of Tropical Agriculture
Ibadan, Nigeria

Mission statement

IITA aims to enhance the food security, income, and well-being of resource-poor people primarily in the humid and subhumid zones of sub-Saharan Africa by conducting research and related activities to increase agricultural production, improve food systems, and sustainably manage natural resources, in partnership with national and international stakeholders.

Mission

L'IITA *aspire à augmenter la sécurité alimentaire, les revenus et le bien-être des populations pauvres, principalement dans les zones humides et subhumides d'*Afrique *subsaharienne grâce à la recherche et activités connexes en vue d'accroître la production agricole, d'améliorer les systèmes de production alimentaire et de gérer de manière durable les ressources naturelles, en collaboration avec les parties prenantes au niveau national et international.*

Contents

From the Director General

During the past thirty-five years of development efforts, much of the world has made astounding progress. We have seen developing economies turned around and the decline of wars in Africa.

Nevertheless, while Africa produces more food every year, it is not keeping pace with the need and the level of poverty is too high. Often the potent combination of civil war and drought has brought hardship to the people of this continent. Despite the difficulties, there is emerging a growing market economy in Africa. Entrepreneurship and innovation are thriving. Many Africans are risk takers and with their enthusiasm and ideas change is coming. At IITA we will continue to be a part of that change, contributing to the creation of wealth and food security. We will work with all in the food chain who are involved in growing and getting food to the consumer's table. This encompasses the subsistence farm families, buyers, transporters, processors, and policymakers. As the continent's cities continue to grow due to population growth and rural to urban migration, this food system is challenged to be more efficient.

IITA has adopted a new slogan, which is designed to tell the world what we are about. It says, we are an African institution for Africa. We are IITA and we do "Research to Nourish Africa." 2002 will be IITA's 35th year in business. Much has changed in that time and much more will change in the years ahead. At IITA we have a lot of work to do. We who live and work in Africa must take the leadership and initiative to find effective ways to improve the lives of the continent's people.

Hartmann
Director General, IITA

Le mot du Directeur général

Des progrès stupéfiants ont été enregistrés dans une bonne partie du globe ces trente cinq dernières années grâce aux efforts fournis en faveur du développement. Des économies en développement ont été remises sur les rails et les guerres ont reculé sur le continent africain.

Cependant, l'Afrique qui produit davantage d'aliment chaque année, ne parvient pas à satisfaire les besoins alimentaires et le degré de pauvreté demeure trop élevé. Souvent, l'effet conjugué de la guerre civile et de la sécheresse inflige de rudes épreuves aux populations africaines. Malgré ces difficultés, l'économie de marché se développe en Afrique. L'esprit d'entreprise et les initiatives novatrices y sont en plein essor. Beaucoup d'Africains ont le goût du risque, et grâce à leur enthousiasme et leurs idées, un changement s'opère. A l'IITA, nous continuerons de nous inscrire dans cette logique du changement afin de contribuer à la création de la richesse et à la réalisation de la sécurité alimentaire. Nous travaillerons avec tous ceux qui tiennent un rôle dans la chaîne alimentaire, depuis le champ jusqu'à la table du consommateur. Il s'agit, entre autres, des petites familles agricoles, acheteurs, transporteurs, transformateurs et décideurs. Avec le développement des villes africaines occasionné par la poussée démographique et l'exode rural, le système alimentaire se doit d'être plus efficace.

L'IITA a adopté un nouveau slogan qui est sensé renseigner le monde sur ce que nous sommes : une institution africaine pour l'Afrique. Nous

sommes l'IITA, et nous faisons la « Recherche pour nourrir l'Afrique. » l'année 2002 marque le 35e anniversaire de la recherche à l'IITA. Beaucoup de choses ont changé pendant ce temps et davantage de choses changeront dans les années à venir. A l'IITA, nous avons beaucoup à faire. Nous qui vivons et travaillons en Afrique devrons prendre les devants ainsi que l'initiative afin de trouver des moyens efficaces pour améliorer les conditions de vie des peuples du continent.

Hartmann
Directeur général, IITA

Research highlights

IITA's work is structured as 14 multidisciplinary research projects. Some projects focus on production systems for specific crops or crop combinations; others are thematically oriented and can involve many crops. Most of the projects cut across the agroecological zones for which IITA's work is targeted. IITA also serves as the convening institute for the Systemwide Program for Integrated Pest Management and for the Ecoregional Program for the Humid and Subhumid Tropics of Sub-Saharan Africa.

This section presents the highlights of each project for 2001. These summaries are not a complete account of the work begun or completed during the year; rather, they describe some key scientific results and are intended to give the reader an insight into the breadth of the research themes and problems being investigated by IITA scientists.

Points saillants de la recherche

*Les activités de l'*IITA *sont structurées en* 14 *projets de recherche pluridisciplinaire. Certains projets mettent l'accent sur les systèmes de production de cultures spécifiques ou de combinaisons de cultures, d'autres ont une orientation thématique et peuvent concerner plusieurs cultures. La plupart de ces projets couvrent les zones agroécologiques ciblées dans le cadre des activités de l'*IITA. L'IITA *sert également d'institut hôte du Programme de lutte intégrée à l'échelle du système et du Programme écorégional pour les tropiques humides et subhumides d'Afrique subsaharienne.*

Cette section présente les points saillants de chaque projet en 2001. *Ces résumés ne constituent pas un rapport exhaustif des activités qui ont démarré ou qui sont arrivées à terme au cours de l'année, ils mettent plutôt en exergue quelques résultats scientifiques-clés et sont censés fournir aux lecteurs un aperçu de l'ampleur des thèmes de recherche et des problèmes faisant l'objet d'une investigation par les chercheurs de l'*IITA.

Project 1

Conservation and use of plant biodiversity

- A core collection of cowpea comprising 1926 accessions which are representative of morphological diversity and geographical origin was selected from over 12 000 accessions of the world cowpea collection.
- One hundred and twenty-seven local cultivars of cassava and 44 yam cultivars were collected in Sierra Leone and added to the IITA germplasm collection.
- Experiments on cryopreservation of cassava shoot-tips, using encapsulation-vitrification and fast freezing method, gave recovery rates of about 60% in certain genotypes.
- Studies on population growth and stability of in situ wild yam populations in a forest reserve in Ibadan, monitored over a 3-year period, showed a slight increase in population sizes, but no significant change in the gene frequency of selected morphological markers.
- Studies on segregation patterns of mutants in crosses between cowpea varieties confirmed the existence of transposable elements that inhibit or excite gene expression.
- *Musa* genetic diversity studies showed amplified fragment length polymorphism (AFLP) as more powerful than random amplified polymorphic DNAs (RAPDs) in the discrimination of genotypes and the identification of genetic relationships. Plantains from Cameroon were genetically distinct from those of West Africa. Genome composition of all breeding lines and African

landraces of *Musa* has been determined. Sukali Ndizi, considered a diploid, is a triploid with AAB genome composition.

- Germplasm material from genebanks and breeders were provided to national agricultural research and extension systems (NARES) on request. The West and Central Africa Collaborative Maize Research Network (WECAMAN) dispatched 169 kg of maize seed to NARES based on superior performance of varieties tested in 2000. Fifty-eight sets of maize regional uniform variety trials and 26 sets of the regional *Striga* variety trial in the extra-early maturity groups were also distributed to NARES collaborators in West, Central, eastern, and southern Africa. Forty sets of soybean international trials were supplied to 21 NARES collaborators in Africa, 3 in Asia, and 1 in the US. Over 10 000 disease-free cassava in vitro plantlets were given to NARES in 6 African countries, 2 European countries, and the US. In addition, 1400 disease-free in vitro yam plantlets and 13 211 yam mini-tubers were given to NARES worldwide.
- Staining techniques for the isolation and identification of the rust fungi and other microorganisms from infected leaf surfaces of soybean were standardized. *Colletotrichum gloeosporioides* strains causing foliar infection of *Dioscorea* species were classified.

Conservation et utilisation de la biodiversité végétale

Projet 1

- *Une collection de base comprenant 1926 obtentions de niébé représentant une diversité morphologique et d'origine géographique différente a été sélectionnée à partir de 12 000 obtentions de la collection mondiale de niébé.*
- *127 cultivars locaux de manioc et 44 cultivars d'igname ont été collectés en Sierra Leone et ajoutés à la collection de matériel génétique de l'IITA.*
- *Des expériences de cryoconservation de pousses apicales de manioc, menées en utilisant la méthode de vitrification par encapsulation et de congélation rapide ont permis des taux de reprise d'environ 60% chez certains génotypes.*
- *Des études sur la croissance et la stabilité de populations d'ignames sauvages in situ dans une réserve forestière à Ibadan ont indiqué, après une période de suivi de 3 ans, une légère augmentation de la taille des populations mais pas de changement significatif de la fréquence des gènes des marqueurs morphologiques sélectionnés.*
- *Des études sur les schémas de ségrégation de mutants parmi des croisements entre des variétés de niébé ont confirmé l'existence d'éléments transposables qui inhibent ou stimulent l'expression des gènes.*
- *Des études sur la diversité génétique de Musa ont montré que la méthode AFLP est plus puissante que la méthode RAPD en matière de discrimination des génotypes et d'identification des relations génétiques. Des plantains du Cameroun se sont avérés génétiquement distincts des plantains d'Afrique occidentale. La composition du génome de toutes les lignées de sélection et des cultivars locaux de Musa a été déterminée. Sukali Ndizi considéré comme un diploïde s'est révélé un triploïde avec une composition de génome AAB.*
- *Du matériel génétique en provenance des banques de gènes et des sélectionneurs a été fourni aux Systèmes nationaux de recherche et de vulgarisation agricoles (SNRVA) suite à des requêtes. Le Réseau maïs pour l'Afrique occidentale et centrale (WECAMAN) a distribué 169 kg de semences de maïs aux Systèmes nationaux de recherche agricole (SNRA) sur la base de la supériorité de la performance des variétés testées en 2000. Cinquante huit séries d'essais régionaux variétaux uniformes et 26 séries d'essais régionaux sur les variétés de Striga portant sur les groupes de maturité extra-précoce ont été également distribuées aux SNRA partenaires en Afrique occidentale, centrale, orientale et australe. Quarante séries d'essais internationaux sur le soja ont été fournies à différents SNRA partenaires : 21 en Afrique, 3 en Asie et 1 aux Etats-Unis d'Amérique. Plus de 10 000 plantules in vitro de manioc exemptes de maladies ont été distribuées à 6 SNRA d'Afrique, 2 d'Europe et celui des Etats-Unis d'Amérique. En outre, 1400 plantules in vitro d'igname exemptes de maladies ainsi que 13 211 mini-tubercules d'igname ont été distribués aux SNRA à l'échelle mondiale.*

- *Des techniques de teinture pour l'isolation et l'identification du champignon de la rouille et d'autres micro-organismes sur les surfaces de feuilles de soja infectées ont été standardisées. Les souches de* Colletotrichum gloeosporioides *responsables de l'infection foliaire des espèces* Dioscorea *ont été classifiées.*

Project 2

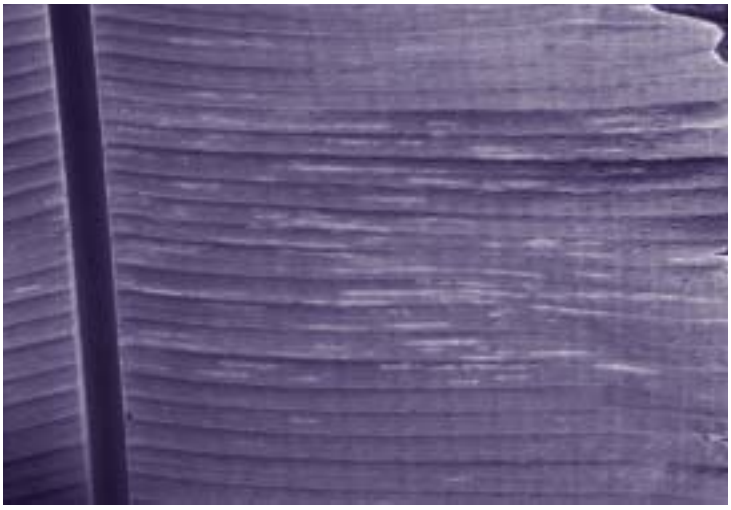
Improving plantain- and banana-based systems

- Tetraploid (4n) x diploid (2n) crosses mostly produce triploid (3n) progeny while 2n x 4n crosses mostly produce 2n progeny, showing that ploidy in offspring is controlled by paternal microsporogenesis.
- A secondary 3n cooking banana hybrid (TM3x30456 [612-74x8075-7]) with excellent plant and fruit traits was selected in Nigeria. Another 3n selection was obtained from 2n parents (TMB2x9722-1 x TMB2x9128-3) in Uganda, demonstrating that unilateral sexual polyploidization can be used to improve East African highland bananas (EAHB).
- Total DNA analysis revealed 3 genetic subspecies in M*usa acuminata* and 2 forms in M. *balbisiana*, suggesting that there are at least 3 A genomes and 2 B genomes. A quantitative assay based on AFLP analysis of ribosomal RNA genes for discrimination of A and B genomes was developed.
- Transmission of B*eauveria bassiana* from infected to uninfected banana weevils was demonstrated while resistance to the pest was identified in Calcutta 4, TMB2x7197-2, and TMB2x8075-7.
- Long-lasting reduction in nematode infestation by hot-water treatment (HWT) of planting materials was demonstrated. Fertilizer application also suppressed nematodes, particularly without HWT. Resistant progenies (TMHx660K-1 and TMHx917K-2) from crosses between Enzirabahima (susceptible) and Calcutta 4 (resistant) were identified, increasing prospects for breeding resistance in EAHB.
- Stable integration of reporter genes was achieved for the control of banana viruses in prelude to genetic transformation against banana streak virus (BSV) and putative nematode vectors of banana die-back virus (BDBV) were identified.
- Significant progress was made in establishing M*usa* breeding operations in the Cameroon benchmark and in the duplication of hybrid propagation for distribution at Ibadan, marking a major shift in the operational mode of plantain research in West and Central Africa. M*usa* breeding and nematology research capacity in Uganda for eastern and southern Africa was restored.
- Three workshops were held to facilitate the delivery of improved hybrids to farmers and large-scale, on-farm variety demonstration plots were established in 11 states across the Nigerian plantain belt.

Projet 2

Amélioration des systèmes à dominante banane et plantain

- *Les croisements entre tétraploïdes* (4*n*) x *diploïdes* (2*n*) *ont essentiellement produit des descendants triploïdes* (3*n*), *tandis que les croisements* 2*n* x 4*n ont eu des descendants* 2*n*, *ce qui indique que la ploïdie des descendants est contrôlée par la microsporogénèse paternelle.*
- U*n hybride secondaire de banane à cuire* 3*n* (TM3x30456 [612-74x8075-7]) *doté d'excellentes caractéristiques de la plante et du fruit a été sélectionné au* Nigéria. U*ne autre sélection* 3*n a été obtenue avec deux parents* 2*n* (TMB2x9722-1 x TMB2x9128-3) *en* Ouganda, *démontrant ainsi que la polyploïdisation sexuelle unilatérale peut être utilisée pour améliorer la banane d'altitude d'*Afrique orientale (EAHB).
- L'*analyse de l'*ADN *total a révélé l'existence de* 3 *sous-espèces génétiques chez* Musa acuminata *et* 2 *formes chez* M. balbisiana, *ce qui suggère qu'il existe au moins* 3 *génomes* A *et* 2 *génomes* B. U*n essai quantitatif basé sur l'analyse* AFLP *des gènes* ARN *de ribosomes pour la discrimination des génomes* A *et* B, *a été mis au point.*
- L*a transmission de* Beauveria bassiana, *des charançons du bananier infectés aux charançons non infectés, a été démontrée, tandis que la résistance au ravageur a été identifiée chez Calcutta* 4, TMB2x7197-2, *et* TMB2x8075-7.



Musa leaf with signs of banana streak virus – *Symptômes du virus de la striure du bananier sur feuille de* Musa

- La réduction de longue durée de l'infestation des nématodes grâce à la méthode de traitement à l'eau chaude (HWT) du matériel de plantation, a été démontrée. L'application d'engrais a également supprimé les nématodes, en particulier sans HWT. Des descendants résistants (TMHx660K-1 et TMHx917K-2) des croisements entre Enzirabahima (sensible) et Calcutta 4 (résistant) ont été identifiés, ce qui augmente les perspectives de sélection pour la résistance chez EAHB.
- Une intégration stable des gènes reporters a été réalisée pour la lutte contre les virus de la banane, en prélude à la transformation génétique pour lutter contre le virus de la striure du bananier (BSV) et les nématodes putatifs vecteurs du virus de la verse du bananier (BDBV) ont été identifiés.
- Des progrès significatifs ont été réalisés dans la mise en oeuvre d'opérations de sélection de Musa dans le site de référence du Cameroun et en matière de duplication de la propagation d'hybrides en vue de leur distribution à Ibadan, ce qui marquerait un changement majeur dans le mode de fonctionnement de la recherche sur la banane et le plantain en Afrique occidentale et centrale. Les activités de sélection de Musa ainsi que la capacité de recherche en nématologie ont été restaurées en Ouganda pour l'Afrique orientale et australe.
- Trois ateliers ont été organisés en vue de faciliter la distribution d'hybrides améliorés aux agriculteurs et des parcelles de démonstration variétale à grande échelle ont été installées dans 11 états dans la « ceinture du plantain » au Nigéria.

Improving cowpea–cereal systems in the dry savannas

Project 3

- A total of 595 new cowpea breeding lines were developed and tested in the moist savanna, dry savanna, and the Sahel. Over 60 promising lines combining high yield potential and resistance to diseases, insect pests, and *Striga* were selected. Of these, IT97K-568-11, IT97K-568-18, IT568-19, IT98K-491-4, IT98K-128-3, IT98K-131-1, IT98K-506-1, IT98K-589-2, IT98K-598-4, IT99K-381-6, IT99K-453-1, IT99K-718-6, IT99K-856-19, IT99K-1152-28, and IT99K-1258 were most promising.
- Improved *Striga*-resistant cowpea variety IT97K-499-38 yielded 50% to 300% higher than the local varieties in *Striga* infested fields in Benin Republic. It also caused high percentage of suicidal germination of *Striga hermonthica* seeds.
- Bruchid-resistant cowpea varieties showed 3–5 eggs/g seed and 12–18% adult emergence compared to 10–20 eggs/g seed and 55%–68% adult emergence in the susceptible varieties. Seed size, color, and texture had no effect on oviposition and adult emergence.
- Drought-tolerant cowpea varieties such as IT97K-499-39, IT97K-1075-7, IT97K-634, and IT97K-819-118, and heat tolerant varieties such as IT99K-1058, IT99K-1059, IT99K-1060, IT88D-643-1, IT88D-867-11, and TVu 4552 were developed.
- Some cowpea varieties were screened for shade tolerance. A 60% reduction in light caused a 56% reduction in grain yield. IT90K-277-2, IT93K-452-1, and IT89KD-391 were more shade tolerant than other varieties.
- A multiple cropping system involving a wheat crop from November to March, heat-tolerant cowpea from March to June, and rice from July to October was developed and tested at the Kadawa (Nigeria) irrigation scheme for 2 years with an annual food production of 8 to 9 t/ha.
- The IITA/ICRISAT/ILRI improved crop–livestock system was adopted by a large number of farmers. Supplementary feeding of only 200 g cowpea haulms per

day along with sorghum stover to young rams doubled their weight gain compared to feeding them sorghum stover alone.

- Significant genetic differences were observed among cowpea varieties for seed quality. The Aloka local cowpea had the hardest seed (9 kg crushing weight) and took longest to cook (57.5 minutes).
- A total of 294 sets of cowpea international trials comprising over 100 improved breeding lines were sent, on request, to national collaborators.

Projet 3

Amélioration des systèmes à dominante niébé-céréales en zone de savane aride

- *Au total, 595 nouvelles lignées de sélection de niébé ont été mises au point et testées en zones de savane humide et aride ainsi que dans le Sahel. Plus de 60 lignées prometteuses combinant un potentiel de rendement élevé et une résistance aux maladies, aux ravageurs et au* Striga *ont été sélectionnées. Parmi ces lignées,* IT97K-568-11, IT97K-568-18, IT568-19, IT98K-491-4, IT98K-128-3, IT98K-131-1, IT98K-506-1, IT98K-589-2, IT98K-598-4, IT99K-381-6, IT99K-453-1, IT99K-718-6, IT99K-856-19, IT99K-1152-28, *et* IT99K-1258 *se sont avérées les plus prometteuses.*
- *La variété améliorée de niébé et résistante au* Striga, IT97K-499-38, *a donné des rendements de l'ordre de 50 à 300% supérieurs à ceux des variétés locales dans des champs infestés de* Striga *en République du Bénin. Elle a également causé un pourcentage élevé de germination suicidaire des graines de* Striga hermonthica.
- *Des variétés de niébé résistantes aux bruches ont indiqué une présence de 3–5 oeufs/g de graines et un taux d'émergence des adultes de 12 à 18% par rapport aux 10–20 oeufs/g de graines et 55% à 68% de taux d'émergence des adultes chez les variétés sensibles. La taille, la couleur et la texture des graines n'ont eu aucun effet sur l'oviposition et l'émergence des adultes.*
- *Des variétés tolérantes à la sécheresse telles* IT97K-499-39, IT97K-1075-7, IT97K-634 *et* IT97K-819-118, *ainsi que les variétés tolérantes à la chaleur,* IT99K-1058, IT99K-1059, IT99K-1060, IT88D-643-1, IT88D-867-11 *et* TVu 4552 *ont été mises au point.*
- *Des variétés de niébé ont été criblées pour la tolérance à l'ombrage. Une réduction de lumière de 60% a entraîné une baisse du rendement en grains de 56%.* IT90K-277-2, IT93K-452-1, *et* IT89KD-391 *se sont avérées plus tolérantes à l'ombrage que les autres variétés.*
- *Un système de cultures multiples comprenant une culture de blé, de novembre à mars, du niébé tolérant à la chaleur, de mars à juin et une culture de riz, de juillet à octobre, a été mis au point et testé en condition d'irrigation à Kadawa (Nigéria) pendant 2 ans avec une production alimentaire de 8 à 9 t/ha.*
- *Le système amélioré agriculture-élevage* IITA/ICRISAT/ILRI *a été adopté par un grand nombre d'agriculteurs. Une supplémentation des aliments de seulement 200 g de paille de niébé par jour avec de la paille de sorgho reçue par de jeunes béliers a doublé leur gain en poids comparé à un régime alimentaire uniquement à base de paille de sorgho.*
- *Des différences génétiques significatives ont été observées chez les variétés de niébé en ce qui concerne la qualité de leurs grains. La variété locale Aloka a présenté le grain le plus dur (9 kg de poids de concassage) et à mis plus de temps pour cuire (57,5 minutes).*
- *Au total, 294 séries d'essais internationaux sur le niébé dont plus de 100 lignées améliorées de sélection ont été fournies aux collaborateurs nationaux suite à leur requête.*

Project 4

Improving maize–grain legume production systems in West and Central Africa

- To identify varieties with a high micronutrient content, 20 early-maturing maize varieties grown in 3 diverse locations were evaluated for iron, zinc, and β-carotene content. One of these varieties grown at Ikenne showed 45% more iron bioavailability than a control variety widely grown in Nigeria. The results indicate that the potential exists to breed early-maturing maize varieties for high and stable mineral content across diverse growing conditions.
- In collaboration with the United States Department of Agriculture (USDA) and various universities and institutions in Nigeria, IITA conducted a national food consumption and nutrition survey. Data were collected on household composition, socioeconomic characteristics, food security, household food

consumption expenditure, and health care issues. Nutrition status was assessed and biological samples collected. Data entry and laboratory analysis of biological samples are in progress.

- An experiment was conducted at Ikenne to compare the performance of 24 early-maturing improved maize varieties developed at IITA and CIMMYT with 25 early-maturing farmers' ecotypes from Senegal under controlled drought stress and sufficient moisture supply. As a group, the improved open-pollinated (OP) varieties out-yielded the local ecotypes by 112% under drought stress and by 94% under sufficient moisture supply.
- A trial consisting of 15 maize varieties was evaluated at 3 levels of nitrogen (N) application in Mokwa and Zaria, Nigeria. The four top-ranking varieties, DTSR-W, LNPC3, ACR8328C7, and LNTP produced higher yields than a widely grown OP variety, TZB-SR, at 30 kg/ha N application. They did not differ from other varieties at 90 kg/ha N.
- Three soybean breeding lines (TGX 1909-7F, TGX 1910-10F, and TGX 1910-11F) which fix about 10% more nitrogen than the current best variety (TGX 1448-2E) were developed. Also, 15 dual-purpose soybean lines with 2–2.5 t/ha grain and 2.5–3.5 t/ha stover yields were identified for distribution to NARES.
- Extra-early (2000 Syn EE-W) and early (EV DT 97 STR C1) maturing *Striga*-resistant varieties evaluated at Férkessedougou outyielded the respective best non-*Striga*-resistant varieties by as much as 46% under artificial *Striga* infestation.

Amélioration des systèmes de production à dominante maïs – légumineuses à graines en Afrique occidentale et centrale

Projet 4

- *Afin d'identifier les variétés à forte teneur en micro nutriments, 20 variétés précoces de maïs cultivées dans 3 localités différentes, ont été évaluées pour leur teneur en fer, zinc et en carotène β. Une de ces variétés cultivées à Ikenne a présenté une bio-disponibilité en fer de 45% supérieure à celle du témoin largement cultivé au Nigéria. Les résultats indiquent l'existence d'un potentiel de sélection de variétés précoces de maïs pour une teneur minérale élevée et stable dans des conditions de culture différentes.*
- *En collaboration avec le Département américain de l'agriculture (USDA) et différentes universités et institutions au Nigéria, l'IITA a mené une enquête nationale sur la consommation alimentaire et la nutrition. Des données ont été collectées sur la composition des ménages, les caractéristiques socio-économiques, la sécurité alimentaire, les dépenses liées à la consommation alimentaire et les soins de santé des ménages. Le statut nutritionnel a été évalué et des échantillons biologiques collectés. La saisie de ces données et l'analyse des échantillons biologiques au laboratoire sont en cours de réalisation.*
- *Une expérience a été menée à Ikenne afin de comparer la performance de 24 variétés précoces de maïs, mises au point à l'IITA et au CIMMYT, à celle de 25 écotypes précoces des agriculteurs du Sénégal en condition de stress de sécheresse contrôlé et d'humidité suffisante. En tant que groupe, les variétés à pollinisation libre (OP) ont eu un rendement plus élevé de 112% en condition de stress de sécheresse et de 94% en condition d'humidité suffisante.*
- *Un essai composé de 15 variétés de maïs a été évalué selon 3 taux d'application d'azote (N) à Mokwa et à Zaria (Nigeria). Les quatre meilleures variétés, DTSR-W, LNPC3, ACR8328C7, et LNTP ont eu des rendements plus élevés que la variété*

***Striga*-resistant maize – *Du maïs résistant au* Striga**

à pollinisation libre largement cultivée, TZB-SR, *à un taux d'application d'azote de* 30 *kg/ha*. *Elles n'ont pas préseté de différence par rapport aux variétés à un taux d'application de* 90 *kg/ha*.

- *Trois lignées de sélection de soja* (TGX1909-7F, TGX 1910-10F *et* TGX 1910-11F) *avec un taux de fixation d'azote supérieur de* 10% *à celui de la meilleure variété du moment, ont été mises au point. Par ailleurs,* 15 *lignées de soja à usage double présentant des rendements en graines de* 2 *à* 2,5 *t/ha et de* 2,5 *à* 3,5 *t/ha de paille, ont été identifiées en vue d'une distribution auprès des* SNRA.
- *Des variétés extra-précoces* (2000 Syn EE-W) *et précoces* (EV DT 97 STR C1) *de variétés résistantes au* Striga *évaluées à Férkessedougou ont eu des rendements plus élevés que celui des variétés respectives non résistantes au* Striga *de l'ordre de* 46% *en condition d'infestation artificielle de* Striga.

Project 5

Improving yam-based systems

- Farmers in Oyo and Kwara states of Nigeria were satisfied with the hot-water (53 °C) therapy of seed yams for reducing nematode symptoms and improving germination, tuber quality, and market value. Under high infestation the therapy more than doubled net profit. Users' constraints were evaluated.
- *Dioscorea rotundata* Poir. (white yam) accession TDr 1640 as well as D. *alata* L. (water yam) accessions TDa 291 and TDa 289 are resistant to D. *alata* virus (DAV), D. *alata* bacilliform virus (DaBV), and cucumber mosaic virus (CMV).
- Two gibberellin inhibitors, uniconazole-P (UP) and prohexadione-calcium (PC), coupled with tuber storage at 30 °C, shortened tuber dormancy in D. *alata* accessions TDa 99/00049 and TDa 95/00328.
- Three IITA-derived clones of D. *rotundata* (TDr 89/02461, TDr 89/02565, and TDr 89/02677) were formally released as new varieties in Nigeria.
- About 30 000 seed tubers of new D. *rotundata* varieties were delivered to over 300 farmers in 10 districts of Uganda for farmer-participatory testing.
- Two cultivars of D. *rotundata* planted in December 1999 were harvested in September or December 2000 and stored at ambient conditions until March 2001. Both groups sprouted about the same time but tuber weight loss, spoilage, and edible food losses were greater in the September batch. Better quality foods were made from the December batch. Peeling loss increased, tuber moisture content decreased, and oil absorption of fried yam chips reduced with storage.
- Twelve graduate students conducted research on yams and the entries in a yam R & D personnel directory now exceed 200.
- The IFAD/WECARD/IITA Yam Project organized a work-planning workshop, a workshop on analytical skills for yam economists, and toured yam research activities in Côte d'Ivoire.

Projet 5

Amélioration des systèmes à dominante igname

- *Les agriculteurs dans les états d'*Oyo *et de* Kwara *au* Nigéria *ont été satisfaits du traitement des semenceaux d'igname à l'eau chaude* (53 °C) *en vue de réduire les symptômes de nématodes et d'améliorer la germination, la qualité des tubercules et la valeur marchande*. *En condition de forte infestation le traitement a plus que doublé les bénéfices nets*. *Les contraintes au niveau des utilisateurs ont été évaluées*.
- *Les obtentions de* Dioscorea rotundata (*igname blanche*), TDr 1640 *et de* D. alata (*igname à eau*), TDa 291 *et* TDa 289 *se sont révélées résistantes au virus de* D. alata (DAV), *au virus bacilliforme de* D. alata (DaBV) *ainsi qu'au virus de la mosaïque du concombre* (CMV).
- *Deux inhibiteurs du gibbérelline, uniconazole*-P (UP) *et le calcium prohexadione* (PC), *doublés d'un stockage des tubercules à* 30 °C, *ont permis de raccourcir la dormance chez les obtentions de* D. alata, TDa 99/00049 *et* TDa 95/00328.
- *Trois clones* IITA *dérivés de* D. rotundata (TDr 89/02461, TDr 89/02565 *et* TDr 89/02677) *ont été officiellement homologués en tant que nouvelles variétés au* Nigéria.

- Environ 30 000 semenceaux des nouvelles variétés de D. rotundata ont été distribuées à plus de 300 agriculteurs dans 10 districts en Ouganda en vue d'un test participatif.
- Deux cultivars de D. rotundata plantés en décembre 1999 ont été récoltés en septembre ou décembre 2000 et stockés en condition ambiante jusqu'en mars 2001. Les deux groupes ont germés à peu près en même temps, mais les pertes en poids des tubercules, les avaries et les pertes en aliments comestibles, étaient plus élevées dans le lot de septembre. Des aliments de meilleure qualité ont été obtenus avec le lot de décembre. Les pertes à l'épluchage ont augmenté, la teneur en humidité des tubercules a baissé et l'absorption d'huile par les chips d'igname a baissé suite au stockage.
- Douze étudiants en formation diplômante ont mené des recherches sur les ignames et le nombre des entrées dans un annuaire du personnel R&D appliquée à l'igname dépasse à présent 200.
- Le Projet igname FIDA/CORAF/IITA a organisé : un atelier de planification des activités, un atelier sur les compétences analytiques des économistes spécialistes des ignames et des visites des activités de recherche sur l'igname en Côte d'Ivoire.

Improving cassava-based systems

Project 6

- Over 10 000 tissue culture plantlets of elite cassava germplasm were distributed to collaborators in 5 African and 3 non-African countries, while over 284 000 seeds from 1100 families were distributed to 9 national programs in Africa. In addition, large-scale seedling nurseries with over 100 000 botanical seeds were established at high disease pressure sites in Kenya, Malawi, Mozambique, and Tanzania to intensify the screening effort and accelerate the deployment of improved varieties resistant to cassava brown streak disease in East and southern Africa.
- Benefits from the Uganda cassava multiplication project to combat the cassava mosaic disease pandemic, calculated using the Dynamic Research Evaluation for Management (DREAM) impact model of IFPRI, were approximately US$36 million over 4 years (1998–2001) for an investment of US$0.8 million.
- Cassava plant regeneration efficiency through organogenesis was doubled with the addition of 8 mg/l silver nitrate and an increase (0.8%) of agar concentration in the culture medium. Results from flow cytometry and chromosome counts of field-established cassava regenerants showed few abnormalities.
- The assessment of pasting profiles and granular characteristics of starch of 11 cassava clones indicate considerable differences in starch functionality, peak viscosity (181.9–456.3 RVU), setback viscosity (53.6–111.4 RVU), final viscosity (193.3 and 255.1 RVU), pasting temperature (73.6–75.3 °C), and starch granule sizes (9–20 mm, oval, rounded, and truncated). These results provide directions for cassava selection and improvement for cassava starch-based products, and processing variables.
- Cumulative cassava leaf litter dry matter production in southern Benin over two 12-month periods ranged from 2.4 t/ha (in a low rainfall year without fertilizer) to 4.1 t/ha (in an adequate rainfall year with fertilizer), indicating the potential of cassava to contribute to maintaining soil properties.
- IITA has expanded its collaboration with CIAT, Colombia, to enhance the Southern Africa Root Crops Research Network (SARRNET's) potential to promote expanded utilization, commercialization, and national and regional trade of cassava and sweetpotato. A public–private sector consortium has been formed to provide linkages between research and private sector partners.
- A training course on agro-enterprise development was held for 27 participants in Uganda. Over 100 researchers, technicians, and extension personnel in the region were trained in report and proposal writing, rapid multiplication techniques, and postharvest technology of cassava and sweetpotato. SARRNET has provided 16 items of cassava processing equipment to its member countries for demonstrations to farmers and the private industry.

Projet 6

Amélioration des systèmes à dominante manioc

- Plus de 10 000 plantules sous forme de culture de tissus de germoplasme de manioc élite ont été distribuées aux collaborateurs dans 5 pays africains et dans 3 pays non africains, tandis que plus de 284 000 semences provenant de 1100 familles ont été distribuées à 9 programmes nationaux en Afrique. En outre, des pépinières de plantules à grande échelle avec plus de 100 000 semences botaniques, ont été installées dans des sites à forte pression de maladies dans les pays suivants: Kenya, Malawi, Mozambique et Tanzanie, en vue d'intensifier les efforts de criblage et d'accélérer le déploiement de variétés améliorées résistantes à la maladie de la marbrure du manioc en Afrique orientale et australe.
- Les bénéfices du projet de multiplication de manioc pour combattre la pandémie de la mosaïque du manioc en Ouganda basé sur le modèle impact DREAM de l'IFPRI ont été estimés à environ 36 millions de dollars américains ($US) pendant une période de 4 ans (1998–2001), suite à un investissement de 0,8 millions de $US.
- L'efficacité de la régénération du plant de manioc grâce à l'organogenèse a doublé suite à l'addition de 8mg/l de nitrate d'argent et à l'augmentation (0,8%) de la concentration de l'agar du milieu de culture. Les résultats de la cytométrie en flot et le compte de chromosomes du manioc régénéré qui s'est établi au champ, ont présenté peu d'anomalies.
- L'évaluation des profils de coagulation et des caractéristiques granulaires de l'amidon de 11 clones, indique des différences considérables concernant la fonctionnalité de l'amidon, la viscosité maximum (181,9–456,3 RVU), la viscosité au repos (53,6–111,4 RVU), la viscosité finale (193,3 et 255,1 RVU), la température de coagulation (73,6–75,3°C), et la taille des granules d'amidon (9–20 mm, ovale, arrondie et tronquée). Ces résultats révèlent des directions à suivre en matière de sélection et d'amélioration des produits à base d'amidon de manioc et de variables de transformation.
- Pendant une période de 12 mois dans le sud du Bénin, la production cumulative de matière sèche des débris de feuilles de manioc a été estimée entre 2,4 t/ha (en condition de faible pluviométrie et sans application d'engrais) et 4,1 t/ha (en condition de pluviométrie appropriée et avec application d'engrais), indiquant ainsi le potentiel de contribution du manioc au maintien des propriétés du sol.
- L'IITA a étendu sa collaboration avec le CIAT (Colombie) en vue de renforcer la capacité du SARRNET à promouvoir l'extension de l'utilisation, la commercialisation et le commerce national et régional du manioc et de la patate douce. Un consortium regroupant les secteurs privés et publics a été mis en place afin de servir de lien entre la recherche et les partenaires du secteur privé.
- Un stage de formation sur le développement des agro-entreprises a été organisé à l'intention de 27 participants en Ouganda. Plus de 100 chercheurs, techniciens et agents de vulgarisation de la région ont reçu une formation dans les domaines suivants: rédaction des rapports et des propositions de projet, techniques de multiplication rapide et technologies post-récolte du manioc et de la patate douce. Le SARRNET a fourni 16 équipements de transformation du manioc à ses pays membres en vue des démonstrations pour les agriculteurs et le secteur industriel privé.

Project 7

Biological control and functional biodiversity

- A major international workshop on biopesticide regulatory frameworks for African countries, jointly organized by IITA and Virginia Polytechnic Institute (VPI) with financial support from the US Agency for International Development (USAID), was held at the IITA Benin station from 29 January to 2 February. Consequently, Comité inter-Etat de lutte contre la sécheresse dans le Sahel (CILSS) established a framework for the registration of biopesticides and Green Muscle® obtained the temporary sales permission of Comité Sahélien des Pesticides, the last step before full registration in nine CILSS countries.
- Biological Control Products (BCP), the South African commercial partner of Lutte Biologique contre les Locustes et Sauteriaux (LUBILOSA), has shipped the first large Green Muscle® order to Niger.

- In Mali, several NGOs have committed themselves to the regular use of Green Muscle® for grasshopper control. Green Muscle® will be ordered on a regular basis with the support of donors.
- *Plutella xylostella* granulovirus has been imported from Kenya to Benin, an important step towards improved control of P. *xylostella* in West Africa.
- Scientists and government representatives improved their understanding on aspects of biodiversity, biotechnology, and law of the convention of biological diversity and its implementation during a West African Network for Taxonomy (WAFRINET) workshop, coorganized with the Global Biodiversity Institute (GBDI).
- More than 250 isolates of fungal pathogens of water hyacinth were collected across 3 major river systems in West Africa in different ecological zones.
- The impact of classical biological control of water hyacinth and mango mealybug has been studied, demonstrated, and published.
- Results of a survey on the distribution of African root and tuber scale *Stictococcus vayssierei* across a range of different vegetation types and non-crop host plant species indicate that this pest can be controlled through appropriate fallow management.
- The acquisition and preservation of 19 000 new specimens from faunistic surveys in Benin, Cameroon, Ghana, Nigeria, and Togo collected by IITA's insect museum strengthens its leading position in the provision of taxonomic support to NARES within West Africa.

Lutte biologique et biodiversité fonctionnelle

Projet 7

- *Grâce à un financement de l'*USAID, *un atelier international majeur sur les cadres de réglementation des bio pesticides en Afrique a été conjointement organisé par l'*IITA *et l'Institut Polytechnique de Virginie* (VPI) *à la station de l'*IITA *au Bénin, du 29 janvier au 2 février. Par conséquent, le Comité inter-Etat de lutte contre la sécheresse dans le Sahel* (CILSS) *a mis en place un cadre pour l'enregistrement des biopesticides et Green Muscle® a obtenu une autorisation temporaire de vente du Comité sahélien des pesticides, ce qui constitue la dernière étape avant son enregistrement total dans neuf pays membres du* CILSS.
- *Biological Control Products* (BCP), *le partenaire sud africain du Projet Lutte Biologique contre les Locustes et Sauteriaux* (LUBILOSA), *a expédié au Niger la première grande commande de Green Muscle®.*
- *Au Mali, plusieurs* ONG *se sont engagés à utiliser régulièrement Green Muscle® pour lutter contre les sauteriaux. Green Muscle® fera l'objet de commandes régulières avec l'appui des bailleurs de fonds.*

The water hyacinth menace is now under control in sub-Saharan Africa –
La maîtrise de la jacinthe d'eau est une réalité en Afrique subsaharienne

- Le granulovirus Plutella xylostella a été importé du Kenya au Bénin : un pas important vers l'amélioration de la lutte contre P. xylostella en Afrique occidentale.
- Des chercheurs et représentants du gouvernement ont pu améliorer leur compréhension des aspects de la biodiversité, de la biotechnologie et de la loi relative à la convention sur la diversité biologique et son application au cours d'un atelier du WAFRINET, conjointement organisé avec l'Institut de la biodiversité mondiale (GBDI).
- Plus de 250 isolats de pathogènes fongiques de la jacinthe d'eau ont été collectés dans trois systèmes fluviaux majeurs dans différentes zones écologiques d'Afrique occidentale.
- L'impact de la lutte biologique classique contre la jacinthe d'eau et la cochenille du manguier a fait l'objet d'études, de démonstrations et de publications.
- Les résultats d'une enquête sur la distribution de la cochenille africaine des racines et tubercules Stictococcus vayssierei à travers une gamme de types de végétation et sur différentes espèces de cultures non-hôtes ont indiqué que ce ravageur peut être combattu par une gestion appropriée des jachères.
- L'acquisition et la conservation de 19 000 nouvelles spécimens, suite à des enquêtes sur la faune au Bénin, Cameroun, Ghana, Nigéria, et Togo, collectées par le musée d'insectes de l'IITA renforcent la position de leader de ce dernier en matière de fourniture d'un appui taxonomique aux SNRVA en Afrique occidentale.

Project 8

Integrated management of legume pests and diseases

- Synthetic sex pheromones of *Maruca vitrata* were used to monitor field populations at 3 locations. In central Benin, a good correlation was found between adult catches in the traps and larval populations in the field, indicating the possibility of using the traps as a tool to time pest control interventions. However, adult catches from both Tamale and Kano were low in spite of substantial field infestations, indicating possible behavioral/ physiological differences in migrating M. *vitrata* populations.
- The investigation of natural enemies of the cowpea aphid (*Aphis craccivora*) in southern and central Benin revealed spectacular epizootics of the entomopathogenic fungus *Neozygites* sp. in the Ouémé valley which wiped out aphid colonies. The total absence of hymenopterous parasitoids was confirmed, indicating a potential "off the shelf" bicocontrol project.
- During 2 consecutive years, the early-maturing soybean line TGX 1835-10E was confirmed as moderately resistant to soybean rust (*Phakopsora pachyrhizi*). Some early varieties with relatively shorter pod filling duration had less yield loss in spite of high disease incidence.
- A regional adoption survey (120 farm households per country) showed that neem extracts are being used by 7, 32, and 38% of farmers in Niger, Nigeria, and Ghana, respectively, and papaya extracts by 47% of farmers in Benin. The constraint is mainly labor-intensive processing of leaves. Key factors affecting adoption of cowpea integrated pest management (IPM) are access to extension, profitability, off-farm incomes, farm labor supply, and level of education.
- A study of cowpea IPM technologies in Benin revealed that botanical insecticides are more profitable when applied on improved cowpea varieties (high yielding or pest/disease resistant). The net benefits ranged from US$10/ ha (local varieties), to US$110/ha (improved varieties), and up to US$200/ha with improved market access.
- Farmer field schools (FFS) trained 1112 farmers and 60 NGO and extension agents in cowpea IPM in the 9 PRONAF countries. In northern Ghana farmer-to-farmer diffusion of knowledge following FFS is increasing.

Projet 8

Lutte intégrée contre les ravageurs et les maladies des légumineuses

- Des phéromones sexuelles synthétiques de Maruca vitrata ont été utilisées pour assurer le suivi des populations au champ dans 3 localités. Dans la partie centrale du Bénin, une bonne corrélation a été observée entre les prises d'adultes dans les pièges et la population de larves

au champ, d'où la possibilité d'utiliser les pièges comme instrument de mesure des interventions de lutte contre les ravageurs. Cependant, les prises d'adultes à Tamale et à Kano ont été faibles en dépit des infestations substantielles des champs, d'où la possibilité de différences de comportements/physiologiques chez les populations migrantes de M. vitrata.

- *Des investigations sur les ennemis naturels du puceron du niébé* (Aphis craccivora) *dans le sud et le centre du Bénin, ont révélé des épizooties spectaculaires concernant le champignon entomopathogène* Neozygites *sp. dans la vallée de l'Ouémé où il a décimé des colonies de pucerons. L'absence de parasitoïdes hyménoptères a été confirmée, indiquant ainsi l'existence d'un projet de lutte biologique potentiel presque prêt.*
- *Au cours de 2 années consécutives, la lignée de soja précoce* TGX 1835-10E *a été confirmée comme étant modérément résistante à la rouille du soja* (Phakopsora pachyrhizi). *Certaines variétés précoces dotées d'une période de remplissage des gousses relativement plus courte, ont subi moins de perte de rendement en dépit de la forte incidence de la maladie.*
- *Une enquête d'adoption régionale (120 ménages agricoles par pays) a révélé que les extraits de neem étaient utilisés par 7, 32 et 38% d'agriculteurs au Niger, au Nigéria et au Ghana, respectivement, et les extraits de papaye l'étaient par 47% des agriculteurs au Bénin. La contrainte s'avère être essentiellement la transformation des feuilles à haute intensité de main-d'œuvre. Les facteurs clés affectant l'adoption de la lutte intégrée* (IPM) *contre les ravageurs du niébé sont: l'accès aux services de vulgarisation, la rentabilité, les revenus hors champs, l'offre de main d'oeuvre agricole et le niveau d'éducation.*
- *Une étude sur les technologies* IPM *du niébé menée au Bénin, a révélé que les insecticides botaniques sont plus rentables lorsqu'ils sont appliqués sur les variétés améliorées de niébé (rendement élevé ou résistance aux ravageurs/maladies). Les bénéfices nets ont été estimés entre* 10 $US/*ha (variétés locales) et* 110 $US/*ha (variétés améliorées), jusqu'à* 200 $US/*ha en condition d'accès amélioré au marché.*
- *Les Ecoles paysannes* (FFS) *ont permis à* 1112 *agriculteurs et* 60 *agents d'*ONG *et de vulgarisation de bénéficier d'une formation en* IPM *dans* 9 *pays membres du* PRONAF. *Dans le nord du Ghana, la diffusion des connaissances d'agriculteurs à agriculteurs est à la hausse, suite au fonctionnement des* FFS.

Integrated management of maize pests and diseases

Project 9

- A medical epidemiology survey in the southern Guinea savanna of Benin and Togo revealed that 99% of 479 children were aflatoxin-positive, 33% showed stunted growth, and 29% were underweight. Exposure to aflatoxin was correlated with aflatoxin content of maize, maternal education and socioeconomic status, consumption of maize-based weaning food, and number of L-strain *Aspergillus flavus* colonies in the maize.
- Aflatoxin accumulation in selected IITA maize inbred lines was tested using a kernel screening assay in collaboration with the laboratory of the US Department of Agriculture (USDA) in New Orleans, and was found to be much lower (< 50 ng/g) than the best US resistant line (> 200 ng/g).
- Public awareness campaigns on aflatoxin were launched in Benin, Ghana, and Togo in collaboration with senior national policymakers, ministers of agriculture and of health, representatives of the diplomatic corps, the FAO Regional Office on Post-harvest, and Rotary International.
- Larvae of the maize stem borer *Sesamia calamistis* had a much lower survival rate (1.6%) on new advanced inbred lines 10 days after artificial infestation with 60 eggs/plant.
- Three strains of *Trichoderma* species—T. *harzianum*, T. *pseudokoningii*, and T. *hermatum*—persisted in maize stalks co-inoculated with the causal agent of maize stalk rot, *Fusarium verticillioides*, in screenhouse tests. These 3 strains reduced stalk rot and were also effective against the pathogen in in vitro tests. The mechanism appears to be hyperparasitism.
- Treating maize plants with neem oil at different concentrations in the greenhouse has reduced oviposition by S. *calamistis* by three-quarters even at the lowest concentration tested.

Projet 9

Lutte intégrée contre les ravageurs et les maladies du maïs

- *Une enquête épidémiologique médicale dans la zone de savane sud guinéenne du* Bénin *et du* Togo *a révélé que sur* 479 *enfants,* 99% *ont été testés positifs à l'aflatoxine,* 33% *ont présenté une croissance réduite et* 29% *avaient un poids inférieur à la normale. Une corrélation a été établie entre l'exposition à l'aflatoxine et la teneur en aflatoxine du maïs, à l'éducation maternelle et aux conditions socio économiques, à la consommation d'aliments de sevrage à base de maïs et au nombre de colonies d'*Aspergillus flavus *souche-*L *dans le maïs.*
- *L'accumulation de l'aflatoxine chez une sélection de lignées endogames de maïs de l'*IITA *a été testée en utilisant un essai de criblage des grains en collaboration avec le laboratoire de l'*USDA *en* Nouvelle Orleans *et s'est révélée beaucoup moins élevée* (< 50 *ng/g*) *que celle de la meilleure lignée résistante des* Etats-Unis *d'*Amérique (> 200 *ng/g*).
- *Des campagnes de sensibilisation sur l'aflatoxine ont été lancées au* Bénin, *au* Ghana *et au* Togo *en collaboration avec les décideurs principaux au niveau national, les ministères de l'agriculture et de la santé, les représentants du corps diplomatique, le* Bureau régional de la FAO *chargé des aspects post-récolte et le* Rotary International.
- *Des larves de foreurs de tiges de maïs* Sesamia calamistis *ont présenté un taux de survie plus faible* (1.6%) *sur les nouvelles lignées endogames avancées,* 10 *jours après l'infestation artificielle avec* 60 *oeufs/plant.*
- *Trois souches d'espèces* Trichoderma—T. harzianum, T. pseudokoningii, *et* T. hermatum—*ont persisté dans la tige de maïs co-inoculée avec le vecteur de la pourriture du maïs,* Fusarium verticillioides, *au cours de test en abri grillagé. Ces* 3 *souches ont réduit la pourriture des tiges et se sont également révélées efficaces contre le pathogène au cours de tests in vitro.*
- *Le traitement des pieds de maïs avec de l'huile de neem selon différentes concentrations en condition de serre, a indiqué que l'oviposition de* S. calamistis *était réduite de* 3/4, *même avec les plus faibles concentrations testées.*

Maize has become a cash crop in sub-Saharan Africa – *Le maïs est devenu une culture de rente en* Afrique subsaharienne

Project 10

Integrated management of cassava pests and diseases

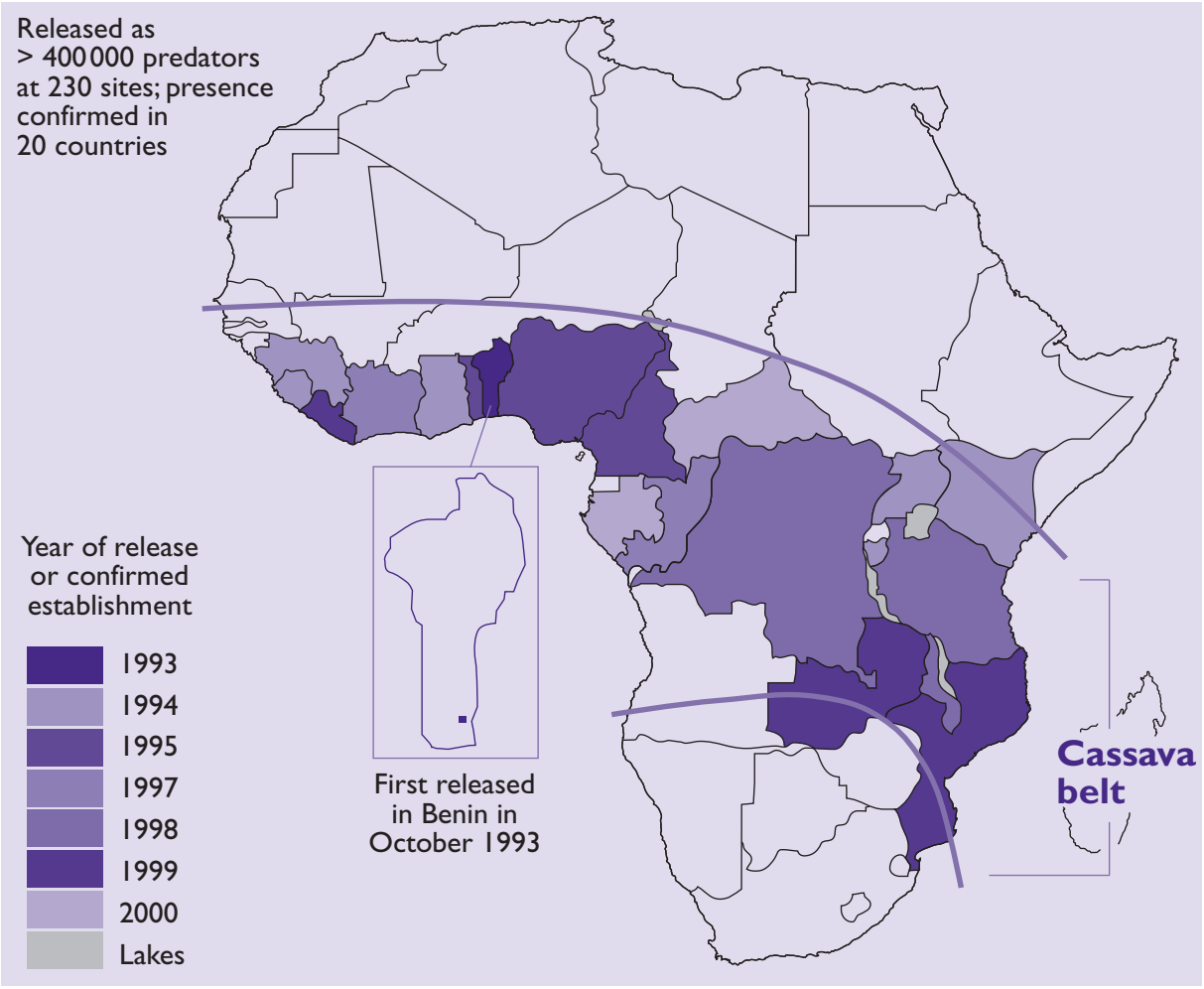
- The exotic phytoseiid predator *Typhlodromalus aripo* continues to persist and further expand its range in 20 countries in sub-Saharan Africa, and is providing effective management of the cassava green mite.
- The preference of T. *aripo* for hairy cassava tips was shown to be widespread and food web surveys in Malawi and Mozambique confirmed that T. *aripo* is restricted to cassava and only affects CGM populations.
- Two Brazilian isolates of *Neozygites tanajoae* introduced in 1999 into cassava fields in southeastern and northern Benin to complement CGM biocontrol by phytoseiid predators continued to persist and produce an average of 25% infection levels in CGM populations in several locations.
- In collaboration with the University of Arizona, USA, molecular techniques were used to demonstrate the association of a distinct cassava-colonizing genotype of *Bemisia tabaci* with the epidemic of severe CMD in Uganda.
- Through an emergency CMD management program in East and Central Africa, IITA, with NARES and NGOs, deployed more than 2000 ha of CMD resistant germplasm, introduced 960 elite CMD-resistant clones into open quarantine sites in Kenya and Tanzania and 158 clones in tissue culture to Congo Republic, transferred 7 newly released varieties from Uganda to Tanzania, and evaluated the performance of more than 50 clones with farmers in technology transfer centers in Kenya, Tanzania, and Uganda.

- A preliminary impact assessment study of CMD management work in 6 districts of Uganda estimated a net present value benefit of US$36 million shared roughly equally between producers and consumers.
- Surveys of the impact of the released predator, *Teretrius nigrescens*, on beetle pests in cassava chip stores in northern Benin, demonstrated reductions in losses from 45–91% in untreated to 15–70% in treated stores.
- In addition to cassava, the noncultivated plants *Aframomun danielli* and *Costus afer*, and several wild yam species were identified as common hosts of the African root and tuber scale, *Stictococcus vayssierei*, in fallow and young forest vegetation in western and southern Cameroon.
- Project training activities included the completion of 3 MSc and 1 PhD study programs; cassava IPM training of extension workers (and farmers) as follows: 15 (20) in Guinea, 10 (2100) in Kenya, 20 (95) in Malawi, 1000 in Tanzania, 10 (50) in Togo, and 29 (250) in Uganda; the distribution of 300 sets of cassava IPM manuals in Kenya, Tanzania, and Uganda; and the development of an educational leaflet for T. *aripo* conservation.

Lutte intégrée contre les ravageurs et les maladies du manioc

Projet 10

- *Le prédateur phytoseïde exotique* Typhlodromalus aripo *continue de persister et étend sa propagation dans* 20 *pays d'Afrique subsaharienne tout en assurant une lutte efficace contre l'acarien vert du manioc.*
- *La préférence de* T. aripo *pour les pousses apicales pileuses du manioc a été confirmée à grande échelle et des enquêtes sur la toile alimentaire au* Malawi *et au* Mozambique *ont confirmé que* T. aripo *se limite au manioc et n'affecte que les populations d'acariens verts du manioc.*
- *Deux isolats brésiliens de* Neozygites tanajoae *introduits en* 1999 *dans des champs de manioc dans le sud-est et le nord du* Bénin *en vue de renforcer la lutte biologique contre les acariens verts au moyen des prédateurs phytoseïdes, persistent et produisent en moyenne* 25% *de niveau d'infection dans les populations d'acariens verts dans plusieurs localités.*
- *En collaboration avec l'*Université d'Arizona (Etats-Unis d'Amérique) *des techniques moléculaires ont été utilisées pour démontrer l'association entre un génotype de* Bemisia tabaci *distinct et colonisateur du manioc et l'épidémie sévère de la mosaïque du manioc en* Ouganda.
- *Dans le cadre d'un programme d'urgence de lutte contre la mosaïque du manioc mené en Afrique orientale et centrale, l'*IITA, *en collaboration avec les* SNRVA *et les* ONG, *a déployé plus de* 2000 *ha de germoplasme résistant à la mosaïque, introduit* 960 *clones élites résistant à la mosaïque dans les sites de quarantaine ouverts au* Kenya *et en* Tanzanie *ainsi que* 158 *clones sous forme de culture de tissus en* République du Congo, *transféré, de l'*Ouganda *en* Tanzanie, *7 variétés nouvellement homologuées et évalué la performance de plus de* 50 *clones avec les agriculteurs dans les centres de transfert de technologies au* Kenya, *en* Tanzanie *et en* Ouganda.
- *Une étude sur l'évaluation préliminaire de l'impact portant sur les activités de lutte contre la mosaïque du manioc au niveau de* 6 *districts de l'*Ouganda *a estimé le bénéfice actuel net à* 36 *millions de* $US *pratiquement partagé entre les producteurs et les consommateurs.*
- *Des enquêtes sur l'impact du prédateur,* Teretrius nigrescens, *lâché sur les coléoptères ravageurs des cossettes de manioc stockées, dans le nord du* Bénin, *ont révélé des réductions de pertes de l'ordre de* 45 *à* 91% *dans les stocks non traités et de* 15 *à* 70% *dans les stocks traités.*
- *En plus du manioc, les plants non cultivés de* Aframomun danielli *et* Costus afer, *ainsi que plusieurs espèces sauvages d'ignames, ont été identifiés comme hôte communs de la cochenille africaine des racines et des tubercules,* Stictococcus vayssierei, *dans les jachères et la végétation des jeunes forêts dans les parties occidentales et du sud du* Cameroun.
- *Les activités de formation des projets ont permis les réalisations suivantes : l'achèvement de* 3 *programmes de* Maîtrise *et d'*1 *programme de troisième cycle ainsi qu'une formation des agents de vulgarisation (et des agriculteurs) en lutte intégrée contre les ravageurs du manioc:* 15 (20) *en* Guinée, 10 (2100) *au* Kenya, 20 (95) *au* Malawi, 1000 *en* Tanzanie, 10 (50) *au* Togo *et* 29 (250) *en* Ouganda; *la distribution de* 300 *séries de manuels de lutte intégrée contre les ravageurs du manioc au* Kenya, *en* Tanzanie *et en* Ouganda *et l'élaboration d'un dépliant didactique sur la conservation de* T. aripo.



Countries in sub-Saharan Africa with established T. *aripo* populations – *Pays d'Afrique subsaharienne où les populations de* T. aripo *se sont établies*

Protection and enhancement of vulnerable cropping systems

Project 11

- In the forest margins benchmark area (FMB), annual maize production in a *Mucuna*/*Pueraria* cover crop/relay system was sustained for 5 years at 2.5 t/ha. Maize grain yields after *Mucuna* var. *jaspaeda* were the highest over 3 consecutive years over other *Mucuna* varieties.
- Three soybean varieties were identified for various farmer circumstances in the FMB. High nodulation was observed in shorter fallow areas, with consequent higher yields. Farmers in the northern benchmark, where yields exceed 1 t/ha without inputs, are now adopting soybean.
- In a study in the northern Guinea savanna and derived savanna benchmark areas to identify target options for herbaceous legumes, farmer participation doubled over the previous year. Four field days involving some 130 farmers were held, and new methodologies tested during farmer workshops.
- Some 280 kg of herbaceous legume seed consisting of 117 seedlots were distributed to IARCs, NARES, and NGOs.
- Successful stakeholders' workshops on weed management strategies were conducted in Zaria and Makurdi. Steering committees on *Striga* and *Imperata* were formed to coordinate research. Two seed companies and the Nigerian Participatory Rural Appraisal Network agreed to assist with workshops and scaling-up activities.
- *Mucuna* was shown to suppress speargrass by reducing available solar radiation and other mechanisms.

- The Rockefeller Foundation provided a grant to research the effect of genotype and environment on the concentration of L-Dopa in *Mucuna* seed and other plant parts.
- For the 2001 growing season, research and development projects in Benin have purchased more than 2000 kg of *Mucuna* from Centre d'information et d'exchanges sur les plantes de coverture en Afrique (CIEPCA). The CIEPCA newsletter was produced and posted on the Web, and 4 issues of *Mucuna News* have been produced.
- A standpoint survey found *Acacia auriculiformis* woodlots to be the most popular soil fertility enhancing technology coming out of 10 to 15 years of work on improved fallows in southern Benin.

Protection et renforcement des systèmes de production vulnérables

Projet 11

- *Dans la zone de référence de lisière forestière* (FMB), *la production annuelle de maïs dans un système de relais de culture de couverture* Mucuna/Pueraria, *a été maintenue pendant 5 ans avec un rendement de l'ordre de 2,5 t/ha. Les rendements en grains du maïs après* Mucuna *var.* jaspaeda *étaient les plus élevés après 3 années consécutives par rapport aux autres variétés de* Mucuna.
- *Trois variétés de soja ont été identifiées pour différentes circonstances agricoles dans la* FMB. *Une nodulation élevée a été observée dans les zones de jachère de courte durée avec des rendements élevés consécutifs. Les agriculteurs dans la zone de référence du nord où les rendements ont dépassé 1 t/ha sans intrants, adoptent à présent le soja.*
- *Dans le cadre d'une étude dans les zones de référence de la savane nord guinéenne et de savane dérivée visant à identifier les options cibles pour les légumineuses herbacées, la participation des agriculteurs a doublé par rapport à l'année précédente. Quatre journées agricoles ont été organisées avec la participation d'environ 130 agriculteurs et de nouvelles méthodologies ont été testées au cours des ateliers paysans.*
- *Environ 280 kg de semences de légumineuses dont 117 lots de semences ont été distribués aux* CIRA, SNRA *et* ONG.
- *Des ateliers à l'intention des parties prenantes portant sur les stratégies de lutte contre les adventices ont été organisés et couronnés de succès à Zaria et Makurdi. Des Comités directeurs relatifs au* Striga *et* Imperata *ont été mis en place en vue de coordonner les activités de recherche. Deux sociétés de production de semences et le Nigerian Participatory Rural Appraisal Network ont accepté d'appuyer les ateliers et les activités de renforcement.*
- Mucuna *a prouvé sa capacité de suppression d'*Imperata *à travers la réduction de la radiation solaire et d'autres mécanismes.*

Farmer participation is vital in the spread of new technologies – *La participation des paysans est essentielle pour la diffusion des nouvelles technologies*

- La Fondation Rockefeller a alloué une subvention pour la recherche sur l'effet du génotype et de l'environnement sur la concentration de L-Dopa dans les semences de Mucuna et dans d'autres parties de la plante.
- Pour la campagne de culture de 2001, les projets de recherche et développement au Bénin, ont acheté plus de 2000 kg de Mucuna auprès du Centre d'information et d'échanges sur les plantes de couverture en Afrique (CIEPCA). Le bulletin du CIEPCA a été produit et rendu accessible sur Internet et 4 numéros de Mucuna News ont été produits.
- Une enquête d'opinion a révélé que les lots d'Acacia auriculiformis constituent la technologie d'amélioration de la fertilité du sol la plus populaire, suite à leur production au cours d'une période de 10 à 15 ans, dans des jachères améliorées dans le sud du Bénin.

Project 12

Improvement of high-intensity food and forage crop systems

- On-farm trials conducted from 1999 to 2000 in 19 *Striga hermonthica*-infested fields in the dry savanna agroecozone of Nigeria showed that integrated S. *hermonthica* control was highly effective, in comparison to traditional practices, both in reducing S. *hermonthica* incidence by more than 70% and in increasing maize grain yields by more than 60%.
- Maize herbicide evaluation trials conducted in Ibadan and Ilorin showed that postemergence application of nicosulfuron at 50 to 400 g a.i./ha resulted in lower I*mperata cylindrica* biomass (4 to 19 g/m^2) than in the unweeded control plots (63 g/m^2) at crop harvest. The effect of weeding 5 times on I. *cylindrica* biomass was equivalent to that of nicosulfuron at rates of 200 to 400 g a.i./ha.
- Comparative economic evaluation and appropriate technology targeting of 10 legume rotation treatments showed that the grain legume and dual-purpose varieties gave cumulative net benefits ranging between US$914 and US$1233, an increase of over 150% above the least profitable system at Ibadan fertile derived savanna (DS) site. The same trends were observed in the northern Guinea savanna where the most profitable system outperformed the green manure system economically by over 500%.
- The monitoring of N and P in Zouzouvou, DS site in Benin, indicates that the N balance was negative. N exports through harvest products and removal/burning of crop residues constituted the largest loss term. The annual P balance ranged between a surplus of 42 kg P/ha and a deficit of 30 kg P/ha.
- Preliminary maize yield data for the on-farm, farmer-managed demonstration trials confirmed earlier findings that maize grain yields in the sole fertilizer treatment were similar to yields in the mixture treatment in which about 40% of the fertilizer N was substituted by manure. Farmers' practices led to about 30% lower yields than in either of the other treatments.
- Growing maize after soybean resulted in significantly higher grain yield (1.2- to 2.3-fold increase compared to maize control) except for the maize cultivar Oba Super 2 (8644-27) an N-efficient hybrid.

Projet 12

Amélioration des systèmes intensifs de production vivrière et fourragère

- Des essais en milieu réel menés de 1999 à 2000 dans 19 champs infestés de Striga hermonthica dans l'agroécozone de savane aride du Nigéria ont indiqué que la lutte intégrée contre S. hermonthica était plus effective que les pratiques traditionnelles aussi bien en ce qui concerne la réduction, de plus de 70%, de l'incidence de S. hermonthica que l'augmentation des rendements en grains du maïs supérieure à 60%.
- Des essais d'évaluation des herbicides du maïs menés à Ibadan et à Ilorin, ont indiqué que l'application post-émergence d'un herbicide du maïs, le nicosulfuron selon des doses de 50 à 400 g p.a./ha a entraîné la réduction de la biomasse d'Imperata cylindrica (4 à 19 g/m^2) par rapport aux parcelles témoins non défrichées (63 g/m^2) à la récolte. L'effet de 5 défrichages sur la biomasse de I. cylindrica a été équivalent à celui du nicosulfuron à des doses de 200 à 400 g p.a./ha.
- L'évaluation économique comparative et un ciblage technologique approprié de 10 traitements de rotation de légumineuses ont révélé que la légumineuse à graines et les variétés à usage double

***Striga*: beautiful to behold, but deadly to maize –**
Striga: *belle plante mais ennemi mortel du maïs*

ont produit un bénéfice cumulatif net de 914 *à* 1233 $US, *une augmentation de plus de* 150% *supérieure à celle du système le moins rentable dans le site fertile de savane dérivée d'*Ibadan. *Les mêmes tendances ont été observées dans la savane nord guinéenne où la plupart des systèmes rentables ont eu une performance économique supérieure, de plus de* 500%, *à celle du système d'engrais vert.*

- *Le suivi de la teneur en* N *et en* P *à* Zouzouvou, *le site de savanne dérivée au* Bénin, *indique que le bilan de* N *était négatif. Les exportations de* N *à travers les produits de la récolte et l'enlèvement/brûlis des résidus de culture ont représenté les plus grandes pertes. Le bilan annuel de* P *s'est situé entre un surplus de* 42 *kg* P/*ha et un déficit de* 30 *kg* P/*ha.*
- *Des données préliminaires de rendement de maïs provenant des essais de démonstration en milieu réel et gérés par les agriculteurs ont confirmé des résultats précédents selon lesquels les rendements en grains de maïs d'un seul traitement étaient supérieurs à ceux du traitement mixte dans lequel presque* 40% *de l'engrais azoté étaient remplacés par la fumure. Les pratiques paysannes ont entraîné environ* 40% *de réduction de rendement que dans les deux autres traitements.*
- *La culture du maïs après le soja a produit des rendements en grains significativement plus élevés (une augmentation de* 1,2 *à* 2,3 *fois plus élevée que le maïs témoin), à l'exception du cultivar de maïs* Oba Super 2 (8644-27) *un hybride à utilisation efficace de* N.

Integrated perennial and annual cropping systems

Project 13

- Efforts to establish tree-based assets on deforested land in southern Cameroon continued. The cocoa hybrids from Côte d'Ivoire have demonstrated significantly superior establishment vigor and growth and 3 of the 4 hybrids had a significantly greater number of flowers relative to the landraces and local hybrid. The survival of all cocoa seedlings through the second dry season was significantly greater when integrated with shade providing plantain (*Musa* spp.).
- In a remote area of the southern Cameroon Atlantic rainforest, the Sustainable Tree Crops Program (STCP) and its partners assisted about 200 small cocoa producers to create a farmers' union of village-based organizations. Cocoa marketed through the union in its initial year yielded a 33% higher price than cocoa marketed individually and inputs purchased by the union were bought at a 7% discount. The lessons learned from this are being used by STCP and its partners to reinforce farmer organizations throughout southern Cameroon and West Africa.
- An on-farm experiment evaluated the productive capacity of a mature cocoa agroforest after a 2-year abandonment with particular focus on the management of the fungal blackpod disease, the most important constraint to production. Two levels of fungicide treatment were applied and compared to a no fungicide control. A yield of over 300 kg/ha was obtained which is in excess of the average yield for this part of southern Cameroon. Yield at the no fungicide control was less than 50 kg/ha indicating the importance of the constraint.
- An on-farm experiment in southern Cameroon compared the decomposition rates in 4 types of land use—the complex cocoa agroforest, forest, *Chromolaena odorata* fallow land, and *Imperata cylindrica* fallow land. The conclusion is that the cocoa agroforest retains more ecosystem functionality when compared to short fallow cropping land-use systems.

Projet 13

Systèmes de production intégrée cultures pérennes et cultures annuelles

- Les efforts visant l'établissement de produits arboricoles sur des terres ayant subi une déforestation se poursuivent dans le sud du Cameroun. Les variétés hybrides de cacao en provenance de la Côte d'Ivoire ont présenté une vigueur et une croissance significativement supérieures après leur établissement et 3 des 4 hybrides ont donné un nombre de fleurs significativement plus élevé que celui des cultivars et des hybrides locaux. La survie de tous les jeunes plants de cacao pendant la seconde saison sèche a été substantiellement plus élevée en condition d'intégration du plantain (Musa spp.) qui a fourni un ombrage.
- Dans une zone éloignée de la forêt ombrophile de l'Atlantique, dans le sud du Cameroun, le Programme pour le développement durable des cultures pérennes (STCP), en collaboration avec ses partenaires, a apporté une assistance à environ 200 petits exploitants de cacao en vue de la création d'une union des organisations communautaires de base. Le cacao vendu par le canal de l'union a permis, au cours de la première année, une augmentation des prix de 33% par rapport au cacao vendu individuellement; en outre, les intrants achetés par l'union ont fait l'objet d'une réduction de 7%. Les leçons tirées de cette expérience seront utilisées par le STCP et ses partenaires en vue de renforcer les organisations paysannes à la fois dans le sud du Cameroun et en Afrique occidentale.
- Une expérience en milieu réel a permis d'évaluer la capacité de production d'une agroforêt de cacao mature après un abandon de 2 ans en mettant un accent particulier sur la lutte contre la maladie cryptogamique de la gousse noire, la principale contrainte à la production. Deux doses de traitement au fongicide ont été appliquées et comparées à un traitement sans fongicide. Un rendement de plus de 300 kg/ha a été obtenu, ce qui représente un surplus par rapport aux rendements moyens dans cette partie du sud Cameroun. Dans la parcelle témoin sans fongicide, le rendement a été inférieur à 50 kg/ha, ce qui est une indication de l'importance de la contrainte.
- Une expérience en milieu réel dans le sud du Cameroun a permis la comparaison des taux de décomposition de 4 types d'utilisation des terres – le complexe agroforestier cacao, la forêt, une jachère de Chromolaena odorata et une jachère d'Imperata cylindrica. La conclusion est que l'agroforêt cacao conserve plus de fonctionnalité de l'écosystème par rapport aux systèmes de production en condition de jachère courte.

Project 14

Impact, policy, and systems analysis

- A household expenditure survey in 4 cities of the forest zone of Cameroon confirmed that demand prospects for domestic products (yam, plantain, cassava, maize, and sorghum) are high because they are more desired by urban dwellers than imported products such as rice.
- A new micro "Market Information Systems" model developed by FOODNET, with support from the Technical Center for Agricultural and Rural Cooperation (CTA), disseminates the information to about 5 million people in 8 districts of eastern Uganda.
- An efficiency analysis of about 560 mixed crop–livestock farms in the northern Guinea savanna of Nigeria showed that the 10% most efficient farms were smaller in size, experienced high pressure on land, were managed by younger farmers, and had higher integration between crops and livestock.
- A new, easy, and quick "GPS transect walk" method was successfully tested to quantify the spread and intensity of the adoption and adaptation processes of "best bet" cowpea technologies in the savanna zone of Nigeria.
- Positive effects of technological change and policy on the profitability of cowpea systems were found in Couffo département, southern Benin. Financial returns for systems with an improved cowpea variety and botanical insecticide (Neem) to control pests in storage generated an advantage of CFA92250/ha over systems without an improved variety. An additional gain of CFA59305/ha was recorded for systems with improved variety and Neem and located in areas with good road infrastructure.
- A landscape model of human and land resources for the forest margins was developed in Cameroon. The model links the "human" side and the "land" side

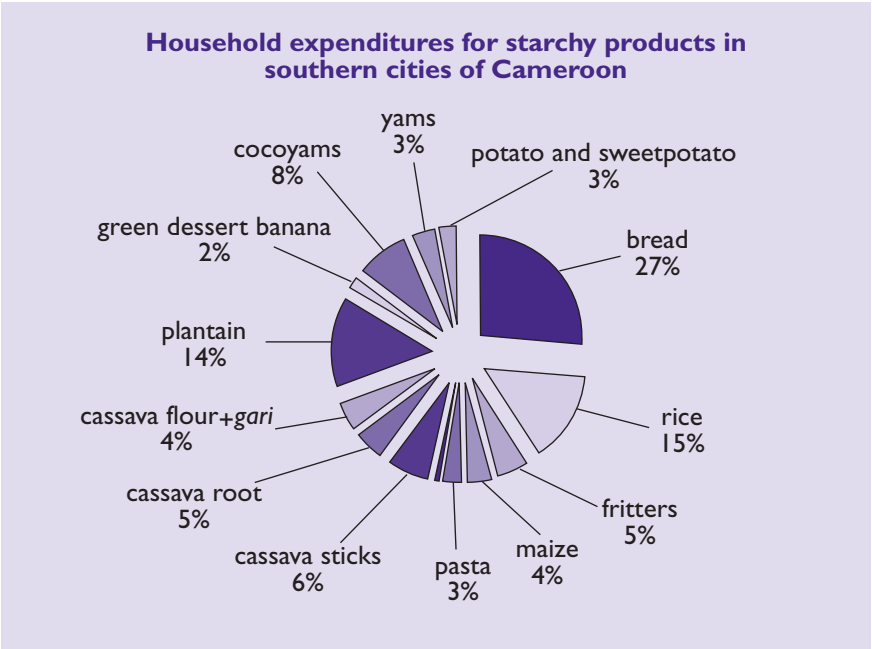
through land tenure systems and combines geo-positioning system (GPS), socioeconomic, and biophysical data in a geographic information system (GIS).

- The capability for the application of GIS techniques by IITA and NARES has greatly improved through special training of 61 scientists in eastern and West Africa. Refresher courses were held for 20 NARES scientists in West Africa on advanced methods for impact and economic analyses while 8 local manufacturers in Tanzania were trained in the maintenance and repair of processing equipment.

Analyse de l'impact, des politiques et des systèmes

Projet 14

- *Une enquête menée sur les dépenses des ménages dans 4 villes de la zone de forêt du Cameroun a confirmé que les perspectives de demande en produits domestiques (igname, plantain, manioc, maïs et sorgho) étaient élevées parce qu'ils sont plus prisés par les citadins que les produits importés, le riz par exemple.*
- *Un nouveau micro modèle, le Système d'information sur le marché, mis au point par* FOODNET, *en collaboration avec le Centre technique de coopération rurale et agricole* (CTA) *permet la diffusion d'informations à environ 5 millions de personnes dans 8 districts dans l'est de l'Ouganda.*
- *Une analyse d'efficacité d'environ 560 exploitations mixtes agriculture-élevage dans la savane nord guinéenne du Nigéria a indiqué que 10% des exploitations les plus efficaces étaient de taille plus réduite, subissaient une forte pression sur les terres, étaient gérés par des agriculteurs plus jeunes et présentaient une plus grande intégration entre l'agriculture et l'élevage.*
- *Une nouvelle méthode de découpage en section par le Système de positionnement géographique* (SPG), *facile et rapide, a été testée avec succès dans la quantification de la progression et l'intensité des processus d'adoption et d'adaptation des meilleures technologies du niébé dans la zone de savane du Nigéria.*
- *Les effets positifs des changements technologiques et politiques sur la rentabilité des systèmes de production de niébé ont été confirmés dans le département de Couffo, dans le sud du Bénin. Les revenus financiers des systèmes à base de variétés améliorées de niébé et d'insecticide botanique* (Neem) *pour lutter contre les ravageurs du niébé stocké, a généré un bénéfice de 92250 CFA/ha par rapport aux systèmes sans variété améliorée. Un gain supplémentaire de 59305 CFA/ha a été enregistré avec les systèmes à base de variétés améliorées et de* Neem *et situés dans des zones dotées de bonnes infrastructures routières.*



Diversity of the starchy diet – *Une gamme riche de féculents*

- *Un modèle sur l'aménagement des ressources humaines et des terres pour les zones de lisière forestière a été mis au point au Cameroun. Ce modèle permet d'établir un lien entre l'aspect humain et le volet terre à travers les systèmes fonciers et combine le système de positionnement géographique* (SPG), *les données socioéconomiques et biophysiques dans un système* SIG.
- *La capacité d'application des techniques du* SIG *par l'*IITA *et les* SNRA *a été considérablement augmentée grâce à une formation spéciale dont ont bénéficié* 61 *chercheurs de l'Afrique orientale et occidentale. Des stages de recyclage ont été organisés pour* 20 *chercheurs des* SNRA *d'Afrique occidentale et ils ont porté sur les méthodes avancées d'analyse de l'impact et d'étude économique, tandis que* 8 *fabricants locaux ont été formés en entretien et en réparation des équipements de transformation en Tanzanie.*

SP-IPM

Systemwide program on integrated pest management

- Characterized the agronomic, socioeconomic, and epidemiological features of whiteflies and whitefly-transmitted viruses in cassava, legumes, and sweetpotato in Latin America, Africa, the Caribbean, and Mexico, and initiated strategic research to develop appropriate IPM options.
- Developed vision of farmer participatory research (FPR) and participatory learning (PL) to advise on what would need to be done differently at the level of farmers, community organizations, extension workers, researchers, and policymakers if FPR/PL were to be successful in IPM.
- Recorded significant yield gains by farmers at 6 pilot sites in Africa where intercropping, habitat management, crop rotation schemes, and pest-tolerant crop varieties were introduced as "best-bet" IPM options to control the parasitic weeds *Striga* and *Orobanche* in maize–legume cropping systems. The participatory approach and processes at the sites assisted organizations to develop effective partnerships to increase the understanding and adoption of IPM options.
- Increased public and donor awareness of the benefits of IPM through information materials including news stories, a brochure, and a CD-ROM of information resources.

Programme de lutte intégrée contre les ravageurs à l'échelle du système

- *Caractérisation des traits agronomiques, socioéconomiques et épidémiologiques des mouches blanches et des virus transmis par les mouches blanches au manioc, aux légumineuses et à la patate douce en Amérique latine, en Afrique, aux Caraïbes au Mexique et lancement d'une stratégie de recherche en vue d'élaborer des options de lutte intégrée appropriées.*
- *Elaboration de méthodes de recherche participative* (MARP) *et de formation participative* (FP) *en vue de déterminer les besoins d'action à la fois au niveau des agriculteurs, des organisations communautaires, des vulgarisateurs, des chercheurs et des décideurs afin d'assurer la réussite de la* MARP/FP *dans la lutte intégrée contre les ravageurs.*
- *Enregistrement de gains de rendement significatifs par les agriculteurs dans 6 sites pilotes en Afrique, suite à l'introduction de l'association culturale, de la gestion de l'habitat, de la rotation culturale et des variétés tolérantes aux ravageurs en tant que meilleure technologie de lutte intégrée contre les phanérogames parasites* Striga *et* Orobanche *dans des systèmes de production maïs-légumineuses. L'approche et les méthodes participatives adoptées au niveau des sites ont aidé les organisations à développer des partenariats effectifs en vue d'accroître la compréhension et l'adoption des options de luttée intégrée.*
- *Renforcement de la prise de conscience du public et des bailleurs de fonds des bénéfices de la lutte intégrée grâce au matériel d'information comprenant des articles de presse, une brochure et un* CD ROM *contenant des données d'information.*

Graduate research completed in 2001

Degree	Country	University	Sponsor	Name	M/F	Research topic
Crop Improvement Division						
MSc	Cameroon	University of Ibadan	Self	Acha, A.	M	Variation in suitability to rapid multiplication in yams (*Dioscorea* spp.)
MSc	Nigeria	University of Ibadan	Self	Oso, R.	F	In vitro regeneration and propagation of African cultivars of banana and plantain
PhD	Cameroon	University of Göttingen	IITA	Abang, M.	M	Population and pathotype structure of *Colletotrichum gloeosporioides* from yam (*Dioscorea* spp.) in Nigeria
PhD	Nigeria	University of Port Harcourt	Self	Adeleke, M.	F	Meiotic studies in the genus *Musa*
PhD	Nigeria	University of Ibadan	Self	Adesoye, A.O.	M	In vivo and in vitro approaches to cowpea transformation
PhD	Nigeria	University of Port Harcourt	Self	Aziagba, P.C.	M	Cytogenetic studies in diploid and polyploid *Musa* species
PhD	Nigeria	Ahmadu Bello University, Zaria	Self	Baba, I.	M	Productivity of sorghum/cowpea and millet/cowpea intercrops as affected by cowpea genotype and row arrangement
PhD	Nigeria	University of Ibadan	Self	Egesi, C.	M	Influence of planting date, location, tuber milking, and ploidy level on flowering in *Dioscorea alata* (L.)
PhD	Nigeria	University of Port Harcourt	SMRP	Nwakanma, D.C.	M	DNA fingerprinting in the genus *Musa* L.
PhD	Nigeria	University of Ibadan	GCF	Odu, B.	M	Identification of resistance to yam viruses in *Dioscorea* species and genetic analysis of resistance to yam mosaic virus in D. *rotundata* Poir.
PhD	Nigeria	University of Ibadan	It.	Ogbe, F.O.	M	Survey of cassava begomoviruses in Nigeria and the response of resistant cassava genotypes to African cassava mosaic begomovirus infection
PhD	Nigeria	University of Ibadan	Self	Onyeka, J.T.	M	Genetic variability for resistance to root rot pathogens in cassava germplasm
PhD	Nigeria	University of Ibadan	Self	Salami, A.	M	Response to selection for yield and other agronomic traits in two tropically adapted complementary maize populations
PhD	Nigeria	University of Ibadan	Self	Udoh, E.	M	Population dynamics and genetic diversity of in situ wild yam germplasm
PhD	Nigeria	Rivers State University of Science and Technology	SMRP	Wilson, V.	F	Improving pollination efficiency and propagation for decentralization of *Musa* breeding
Plant Health Management Divison						
MSc	Benin	Université Nationale du Benin	IITA	Fagbemissi, R.	F	Importance of the role of rural women in the biological control against green mites in Benin
MSc	Benin	Université Nationale du Benin	IITA	Soukossi-Hessou, A.	F	Studies on the impact of aphid, *Aphis craccivora* Koch (Homoptera: Aphididae) on cowpea, *Vigna unguiculata* (Walp.) and assessment of natural enemies associated with the pest in Benin Republic
PhD	Nigeria	University of Ibadan	Self	Babalola, O.	F	Physiological and microbiological interactions of *Striga hermonthica* and rhizosphere bacteria in maize and sorghum
PhD	Benin	University of Hannover	EC	Banito, A.	M	Development and ecozonal adaptation of integrated control measures of cassava bacterial blight in Togo
PhD	Nigeria	University of Ibadan	Self	Dongo, E.	F	Identification and characterization of cucumber mosaic virus infecting *Musa* sp. in Nigeria
PhD	Nigeria	University of Ibadan	Self	Ittah, M.A.	M	Inheritance studies and mapping of resistance genes to some seed-borne viruses of cowpea (*Vigna unguiculata* [L.] Walp.)

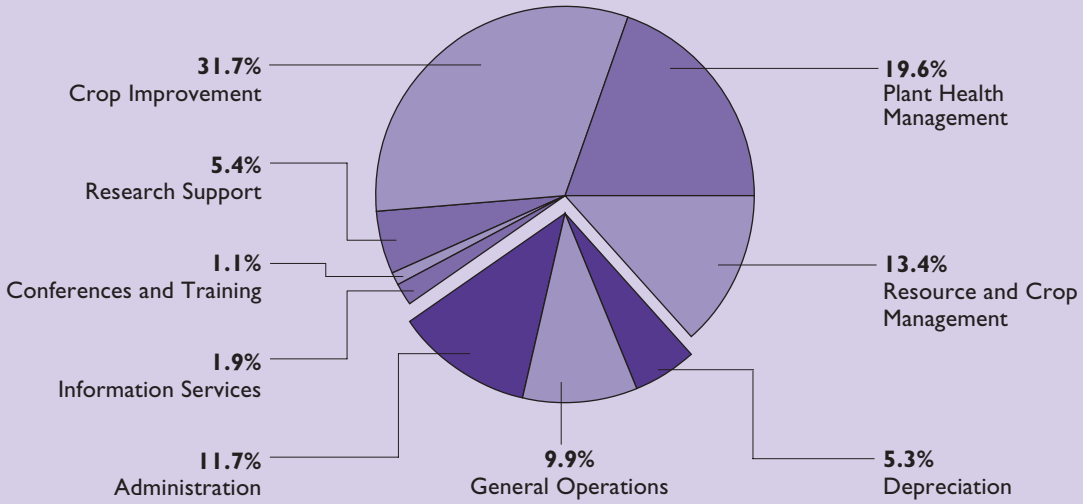
Graduate research completed in 2001

Degree	Country	University	Sponsor	Name	M/F	Research topic
PhD	Cameroon	University of Yaoundé	IITA	Ngakou, A.	M	Potential of beneficial microorganisms on cowpea pest management in three agroecological zones of Cameroon
PhD	Nigeria	University of Ibadan	IITA	Sobowale, A.	M	Biological control of F*usarium moniliforme* Sheld. on maize stems by some fungal isolates from maize phyllosphere and rhizosphere
PhD	Benin	University of Hannover	EC	Zinsou, V.	M	Integrated control of cassava bacterial blight adapted to ecozones of Benin with special emphasis on host plant resistance and resistance markers and mechanisms
Resource and Crop Management Division						
MSc	Nigeria	University of Ibadan	Self	Emerole, C.	F	Statistical investigation of some nutritional characteristics of boarding students in King's College, Lagos
MSc	Portugal	University of Reading	Self	Maridalho, P.A.	F	Soil degradation in maize
MSc	Eritrea	Georg-August University, Germany	Self	Tsegai, D.	M	Determinants of urban household demand for cassava and cassava products in northern Nigeria
PhD	Benin	University of Hohenheim	GTZ-BMZ	Akouegnon, G.E.	M	Development of strategies for the promotion of herbaceous legumes in West Africa

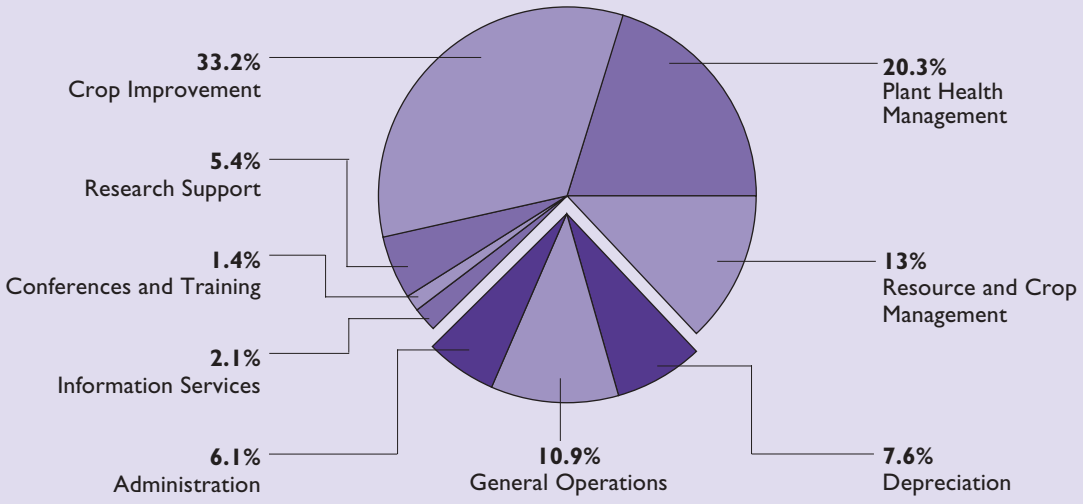
Sponsors:

EC:	European Community
GCF:	Gatsby Charitable Foundation
GTZ/BMZ:	Gesellschaft für Technische Zusammenarbeit/ Bundesministerium für Wirtschaftliche Zusammenarbeit und Entwicklung (Germany)
It.:	Government of Italy
SMRP:	Strategic M*usa* Research Project (Government of Belgium)

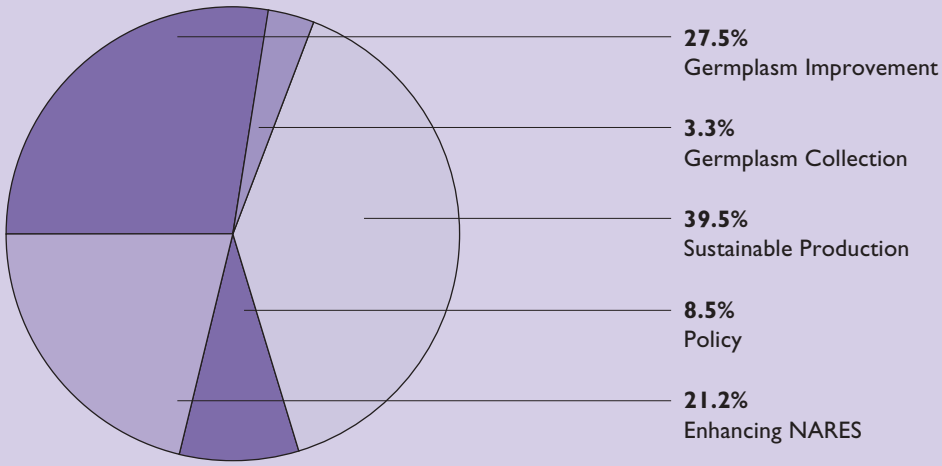
Core costs by operating segment, 2001



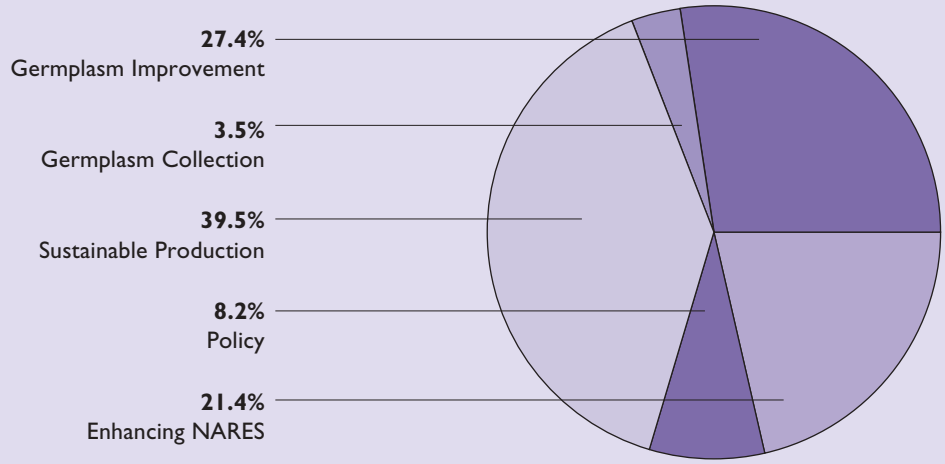
Core costs by operating segment, 2000



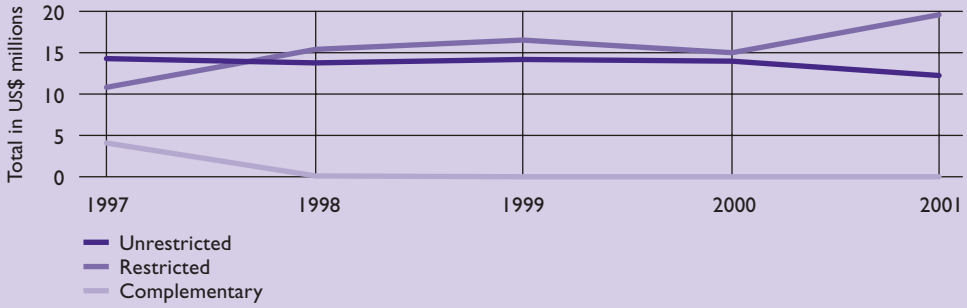
Core research expenditure by CGIAR output, 2001



Core research expenditure by CGIAR output, 2000



Core (unrestricted and restricted) with complementary funding, 1997–2001



Note: The core budget is used to fund those research-related activities essential in meeting CGIAR objectives for developing countries.

Statement of Financial Position

For the year ended 31 December—in US$ thousands

		2001	2000
Assets			
Current assets			
Cash and cash equivalents		18,869	17,258
Accounts receivable:	Donors	2,238	6,361
	Others	1,012	470
Inventories		918	966
Prepaid expenses		199	106
Other assets		81	173
Total current assets		**23,317**	**25,334**
Fixed assets			
Property, plant and equipment		28,283	37,929
Less: accumulated depreciation		(21,482)	(30,783)
Total fixed assets – net		**6,801**	**7,146**
Total assets		**30,118**	**32,480**
Liabilities and net assets			
Current liabilities			
Bank indebtedness and overdrafts		942	–
Accounts payable:	Donors	3,118	5,688
	Employees	6,552	5,282
	Others	730	721
Accruals and provisions		1,723	1,546
Total current liabilities		**13,065**	**13,237**
Net assets			
Unrestricted:	Unappropriated	11,492	13,323
	Appropriated	5,561	5,920
Restricted (temporary)		–	–
Total net assets		**17,053**	**19,243**
Total liabilities and net assets		**30,118**	**32,480**

Statement of Activity

For the year ended 31 December—in US$ thousands

	2001			2000
	Unrestricted	Temporarily restricted	Total	Total
Revenue				
Grants	12,282	19,547	31,829	28,962
Other revenues	1,965	–	1,965	1,267
Total revenue	**14,247**	**19,547**	**33,794**	**30,229**
Expenses				
Program related expenses	9,210	19,547	28,757	24,966
Management and general expenses	8,595	–	8,595	6,729
Total expenses	17,805	19,547	37,352	31,695
Indirect cost recovery	(2,072)	–	(2,072)	(1,637)
Net expenses	**15,733**	**19,547**	**35,280**	**30,058**
Change in net assets	**(1,486)**	**–**	**(1,486)**	**171**
Net assets at 1 January, 2001	19,243	–	19,243	41,748
Write-off of net book value of fixed assets	(704)	–	(704)	(22,728)
	18,539	–	18,539	19,020
Gain on disposal of fixed assets	–	–	–	52
Change in net assets during the year (deficit)/ surplus	(1,486)	–	(1,486)	171
Net assets at 31 December, 2001	17,053	–	17,053	19,243

Statement of Cash Flows

For the year ended 31 December—in US$ thousands

	2001	2000
Cash flows from operating activities		
(Shortfall)/excess of revenue over expenses	(1,486)	171
Adjustments to reconcile net cash		
Provided by operating activities:		
Depreciation	2,015	2,418
Write-off of disposed assets	25	135
Decrease (Increase) in assets:		
Accounts receivable: Donors	4,123	(557)
Others	(542)	131
Inventories	48	239
Prepaid expenses	(93)	92
Other assets	92	19
Increase (Decrease) in liabilities:		
Bank indebtedness and overdrafts	942	–
Accounts payable: Donors	(2,570)	(942)
Employees	1,270	10
Others	9	(89)
Accruals and provisions	177	(791)
Total adjustments	5,496	665
Net cash provided by operating activities	**4,010**	**836**
Cash flow used in investment activities:		
Acquisition of fixed assets	(2,399)	(1,801)
Net increase/(decrease) in cash and cash equivalents	**1,611**	**(965)**
Cash and cash equivalents: Beginning of year	17,258	18,223
End of year	**18,869**	**17,258**

Donor Funding

For the year ended 31 December—in US$ thousands

	2001	2000
Austria	532	456
Belgium	535	1,206
BMZ, Germany	984	873
Brazil	–	20
Canada	694	733
Commission of the European Communities	1,170	53
Denmark	1,790	1,356
Department for International Development (DFID) – UK	972	667
Food and Agriculture Organization	(1)	–
Ford Foundation	–	15
France	461	453
Gatsby Charitable Foundation	289	417
International Centre for Research in Agroforestry	–	(16)
International Development Research Centre	12	(11)
International Fund for Agricultural Development	1,166	893
International Institute of Biological Control	277	258
Italy	384	234
Japan	3,073	3,831
Korea, Republic of	50	50
Netherlands	707	749
Nigeria	–	1,004
Norway	775	581
NRI	123	95
Rockefeller Foundation	955	628
Sasakawa Africa Association	139	85
South Africa	50	50
Sweden	419	392
Switzerland	758	831
United Nations Development Programme	315	237
United States Agency for International Development	10,568	8,451
United States Department of Agriculture	120	13
World Bank	3,715	3,362
Miscellaneous/Multiple Projects	797	996
Closed Projects	–	–
Total	**31,829**	**28,962**

Publications by IITA *staff*

Contributions by IITA staff to scientific literature that became available during 2001, including journal articles, books and book chapters, papers in monographs or conference proceedings, published abstracts, research notes, and disease reports. Also included are publications based on work done by IITA staff prior to their joining IITA, especially where the work reported is of interest to IITA, and publications by staff who have left IITA, which are based on work done while they were at the Institute.

Journal articles

Adekunle, A.T., K.F. Cardwell, D.A. Florini, and T. Ikotun. 2001. Seed treatment with *Trichoderma* species for control of damping-off of cowpea caused by *Macrophomina phaseolina*. Biocontrol Science and Technology 11: 449–457.

Ajeigbe, H.A., S.G. Mohammed, B.B. Singh, and S.A. Tarawali. 2001. Crop–livestock integration for sustainable agricultural production in sub-Saharan Africa—A prognosis. Journal of Sustainable Tropical Agricultural Research 1: 1–9.

Akele, S.E.A., N.U. Isirimah, A.A. Brisibe, and R. Ortiz. 2000. The role of extension services for the successful introduction of new *Musa* cultivars in southeastern Nigeria. Acta Horticulturae 540: 63–71.

Akparobi, S.O., A.O. Togun, and I.J. Ekanayake. 2000. Temperature effects on leaf growth of cassava (*Manihot esculenta* Crantz) in controlled environments. African Root and Tuber Crops Journal 4(1): 1–5.

Akparobi, S.O., I.J. Ekanayake, and A.O. Togun. 2000. The effect of weather regimes on the leaf area development and dry matter production in cassava. The Nigerian Meteorological Society Journal 2(2): 24–32.

Asante, S.K., M. Tamò, and L.E.N. Jackai. 2001. Integrated management of cowpea insect pests using elite cultivars, date of planting and minimum insecticide application. African Crop Science Journal 9: 655–666.

Baiyeri, K.P. and R. Ortiz. 2000. Agronomic evaluation of plantains and other triploid banana. Acta Horticulturae 540: 125–135.

Baiyeri, K.P., B.N. Mbah, and A. Tenkouano. 1999. Comparing yield stability of *Musa* genotypes in Nigeria using four statistical methods. Journal of Tropical Forest Resources 15: 53–67.

Baiyeri, K.P., B.N. Mbah, and A. Tenkouano. 2000. Relationships between phenological and yield traits of the plant crop and first ratoon crop of *Musa* genotypes as affected by ploidy level and genomic group. Agro-Science 1: 113–121.

Blomme, G. and R. Ortiz. 2000. Preliminary assessment of root systems morphology in *Musa*. Acta Horticulturae 540: 259–266.

Bosque-Perez, N.A., G.D. May, and C.J. Artzen. 2000. Applicability of an *Agrobacterium*-based system for the transformation of *Musa* species with diverse genomic constitution and ploidy level. Acta Horticulturae 540: 193–201.

Brown, R.L., Z.-Y. Chen, A. Menkir, T.E. Cleveland, K. Cardwell, J. Kling, and D.G. White. 2001. Resistance to aflatoxin accumulation in kernels of maize inbreds selected for ear rot resistance in West and Central Africa. Journal of Food Protection Research Note 64: 396–400.

Cardwell, K.F. 2001. Mycotoxin contamination of foods in Africa: anti-nutritional factors. Food and Nutrition Bulletin 21: 488–492.

Carsky, R.J., B.B. Singh, and B. Oyewole. 2001. Contribution of early season cowpea to late season maize in the savanna zone of West Africa. Biological Agriculture and Horticulture 18: 303–318.

Carsky, R.J., B. Oyewole, and G. Tian. 2001. Effect of phosphorus application in legume cover crop rotation on subsequent maize in the savanna zone of West Africa. Nutrient Cycling in Agroecosystems 59: 151–159.

Chabi-Olaye, A., F. Schulthess, H.-M. Poehling, and C. Borgemeister. 2001. Factors affecting the biology of *Telenomus isis* (Polaszek) [Hymenoptera: Scelionidae], an egg parasitoid of cereal stem borers, in West Africa. Biological Control 21: 44–54.

Chabi-Olaye, A., F. Schulthess, H.-M. Poehling, and C. Borgemeister. 2001. Host location and host discrimination behavior of *Telenomus isis* (Polaszek) (Hymenoptera: Scelionidae), an egg parasitoid of the African cereal stem borer *Sesamia calamistis* Hampson (Lepidoptera: Noctuidae). Journal of Chemical Ecology 27: 663–678.

Chikoye, D. and F. Ekeleme. 2001. Growth attributes of ten *Mucuna* accessions and their effect on speargrass (*Imperata cylindrica*) dry matter. Biological Agriculture and Horticulture 18: 191–201.

Chikoye, D. and F. Ekeleme. 2001. Weed flora and soil seedbanks in fields dominated by *Imperata cylindrica* in the moist savannah of West Africa. Weed Research 41: 475–490.

Chikoye, D., F. Ekeleme, and U.E. Udensi. 2001. Cogongrass suppression by intercropping cover crops in corn/cassava systems. Weed Science 49: 658–667.

Coyne, D. and A. Daudi. 2001. Nematodes: the farmers' hidden enemy. Horticulture in Malawi 3: 18–22.

Coyne, D.L., M. Smith, and R.A. Plowright. 2001. Plant parasitic nematode populations on upland and hydromorphic rice in Côte d'Ivoire: relationship with moisture availability and crop development on a valley slope. Agriculture, Ecosystems and Environment 84(1): 31–43.

Craufurd, P.Q., R.J. Summerfield, R. Asiedu, and P.V. Vara Prasad. 2001. Dormancy in yams. Experimental Agriculture 37: 75–109.

Publications

Crouch, H.K., J.H. Crouch, S. Madsen., D. Vuylsteke, and R. Ortiz. 2000. Comparative analysis of phenotypic and genotypic diversity among plantain landraces (*Musa* spp., AAB group). Theoretical and Applied Genetics 101: 1056–1065.

Crouch, J.H., R. Ortiz, H.K. Crouch, B.V. Ford-Lloyd, E.C. Howell, and H.J. Newbury. 2000. Utilization of molecular genetic techniques in support of plantain and banana improvement. Acta Horticulturae 540: 185–191.

Dahal, G., R. Ortiz, A. Tenkouano, J.d'A. Hughes, G. Thottappilly, D. Vuylsteke, and B.E.L. Lockhart. 2000. Relationship between natural occurrence of banana streak badnavirus and symptom expression, relative concentration of viral antigen, and yield characteristics of some micropropagated *Musa* spp. Plant Pathology 49: 68–79.

Dahal, G., C. Pasberg-Gauhl, F. Gauhl, G. Thottappilly, and J.d'A. Hughes. 2000. Studies of a Nigerian isolate of banana streak badnavirus: II. Effect of intraplant variation in virus antigens on reliability of virus diagnosis by ELISA. Annals of Applied Biology 132: 263–275.

Dahal, G., J.d'A. Hughes, F. Gauhl, C. Pasberg-Gauhl, and K.S. Nokoe. 2000. Symptomatology and development of banana streak: a disease caused by banana streak badnavirus, under natural conditions in Ibadan, Nigeria. Acta Horticulturae 540: 361–375.

Dahlberg, J.A., R. Bandyopadhyay, W.L. Rooney, G.N. Odvody, and P. Madera-Torres. 2001. Evaluation of sorghum germplasm used in US breeding programmes for sources of sugary disease resistance. Plant Pathology 50: 681–689.

Dansi, A., H.D. Mignouna, J. Zoundjihékpon, A. Sangaré, R. Asiedu, and N. Ahoussou. 2000. Identification of some Benin Republic's guinea yam (*Dioscorea cayenensis*/*Dioscorea rotundata* complex) using random amplified polymorphic DNA. Genetic Resources and Crop Evolution 47: 619–625.

Dansi, A., M. Pillay, H.D. Mignouna, O. Dainou, F. Mondeil, and K. Moutairou. 2000. Ploidy level of the cultivated yams (*Dioscorea cayenensis*–*Dioscorea rotundata* complex) from Benin Republic determined by chromosome counting and flow cytometry. African Crop Science Journal 8: 355–364.

Dansi, A., H.D. Mignouna, J. Zoundjihékpon, A. Sangaré, R. Asiedu, and N. Ahoussou. 2000. Using isozyme polymorphism to assess genetic variation within cultivated yams (*Dioscorea cayenensis*–*Dioscorea rotundata* complex) of the Republic of Benin. Genetic Resources and Crop Evolution 47: 371–383.

Dansi A., H.D. Mignouna, M. Pillay, and S. Zok. 2001. Ploidy level of some cultivated yams (*Dioscorea cayenensis*–*Dioscorea rotundata* complex) from Cameroon as determined by flow cytometry. Euphytica 119: 301–307.

De Schutter, B., P.R. Speijer, C. Dochez, A. Tenkouano, and D. De Waele. 2001. Evaluating host plant reaction of *Musa* germplasm to *Radopholus similis* by inoculation of single primary roots. Nematropica 31(2): 297–301.

Diels, J., B. Vanlauwe, N. Sanginga, E. Coolen, and R. Merckx. 2001. Temporal variations in plant delta ^{13}C values and implications for using the ^{13}C technique in long-term soil organic matter studies. Soil Biology and Biochemistry 33: 1245–1251.

Douro Kpindou, O.K., C. Lomer, J. Langewald, T. Togo, and D. Sagara. 2001. Effet de l'application d'un mélange lambda-cyhalothrin (pesticide chimique) et de spores de *Metarhizium anisopliae* (*flavoviride*) var. *acridum* Driver & Milner (biopesticide) appliqué sur les larves de sauteriaux au Mali. Journal of Applied Entomology 125: 249–253.

Douthwaite, B. and R. Ortiz. 2001. Biotechnology issues for developing countries: technology transfer. The Electronic Journal of Biotechnology 4(2). http://www.ejb.org/content/vol4/issue2/issues/02/index.html

Douthwaite, B., J.D.H. Keatinge, and J.R. Park. 2001. Why promising technologies fail: the neglected role of user innovation during adoption. Research Policy 30(5): 819–836.

Douthwaite, B., N. de Haan, V.M. Manyong, and J.D.H. Keatinge. 2001. Blending 'hard' and 'soft' science: the 'Follow the Technology' approach to analyzing and evaluating technology change. Conservation Ecology 5(2): 13. http://www.consecol.org/Journal/vol5/iss2/art13/index.html

Ekanayake, I.J. and C.M. Githunguri. 2000. Implications of biophysical site characteristics on growth and sustainable cassava production in the savannas of Nigeria. The Nigerian Meteorological Society Journal 2(2): 33–45.

Elsen, A., P.R. Speijer, R. Swennen, and D. De Waele. 2000. Nematode species densities, root damage and yield of bananas (*Musa* spp.) in Uganda. African Plant Protection 6: 31–36.

Ferris, R.S.B., S. Korie, P. Walker, R. Ortiz, and D. Vuylsteke. 2000. Statistical tools to evaluate sensory data for testing fruit quality of *Musa*. Acta Horticulturae 540: 545–560.

Fokunang, C.N., A.G.O. Dixon, T. Ikotun, E.A. Tembe, C.N. Akem, and R. Asiedu. 2001. Anthracnose: an economic disease of cassava in Africa. Pakistan Journal of Biological Science 4(7): 920–925.

Fokunang, C.N., P.T. Tomkins, A.G.O. Dixon, E.A. Tembe, B. Salwa, E.N. Nukenine, and I. Horan. 2001. Cyanogenic potential in food crops and its implication in cassava (*Manihot esculenta* Crantz) production. Pakistan Journal of Biological Science 4(7): 926–930.

Fokunang, C.N., A.G.O. Dixon, T. Ikotun, C.N. Akem, and E.A. Tembe. 2001. Rapid screening method of cassava cultivars for resistance to *Colletotrichum gloeosporioides* f. sp. *manihotis*. Journal of Phytopathology 149: 1–7.

Gauhl, F., C. Pasberg-Gauhl, B.E.L. Lockhart, J.d'A. Hughes, and G. Dahal. 1999. Incidence and distribution of banana streak badnavirus in the plantain production region of southern Nigeria. International Journal of Pest Management 45: 167–171.

Gauhl, F., C. Pasberg-Gauhl, A. Bopda-Waffo, J.d'A. Hughes, and J.S. Chen. 1999. Occurrence of banana streak badnavirus on plantain and banana in 45 villages in southern Cameroon, Central Africa. Zeitschrift fur Pflanzenkrankheiten und Pflanzenschutz 106: 174–180.

Gnanvossou, D., R. Hanna, M. Dicke, and S.J. Yaninek. 2001. Attraction of the predatory mites *Typhlodromalus manihoti* and *Typhlodromalus aripo* to cassava plants

infested by cassava green mite. Entomologia Experimentalis et Applicata 101: 291–298.

Gold, C.S., E.B. Karamura, A. Kiggundu, A.M.K. Abera, F. Bagamba, M. Wejuli, D. Karamura, R. Ssendge, and R. Kalyebara. 2000. Geographic shifts in highland banana production in Uganda. Acta Horticulturae 540: 55–62.

Hill, J., W.W. Wagoire, R. Ortiz, and O. Stølen. 2001. Analysis of a combined F_1/F_2 diallel cross in wheat (*Triticum aestivum*). Theoretical and Applied Genetics 102: 1076–1081.

Hjalmarsson, I. and R. Ortiz. 2001. Lingonberry: botany and horticulture. Horticultural Reviews 27: 79–123.

Ishiyaku, M.F. and B.B. Singh. 2001. Inheritance of shortday induced dwarfing in photosensitive cowpeas. African Crop Science Journal 9: 1–8.

Jackai, L.E.N., S. Nokoe, B.O. Tayo, and P. Koona. 2001. Inferences on pod wall and seed defenses against the brown cowpea coreid bug, *Clavigralla tomentosicollis* Stal (Hemiptera: Coreidae) in wild and cultivated *Vigna* species. Journal of Applied Entomology 125: 277–286.

Karamura, D., B. Pickersgill, D.R. Vuylsteke, C.S. Gold, E. Karamura, and A. Kiggundu. 2000. Multivariate analysis of supposedly duplicate accessions of East African highland bananas in germplasm collections in Uganda. Acta Horticulturae 540: 89–97.

Legg, J., B. James, A. Cudjoe, S. Saizonou, B. Gbaguidi, F. Ogbe, N. Ntonifor, S. Ogwal, J. Thresh, and J. Hughes. 1997. A regional collaborative approach to the study of ACMD epidemiology in sub-Saharan Africa. African Crop Science Conference Proceedings 3: 1021–1033.

Lomer, C.J., R.P. Bateman, D.L. Johnson, J. Langewald, and M.B. Thomas. 2001. Biological control of locusts and grasshoppers. Annual Review of Entomology 46: 667–702.

Mahalakshmi, V. and R. Ortiz. 2001. Plant genomics and agriculture: from model crops to other crops, the role of data mining for gene discovery. Electronic Journal of Biotechnology 4(3). http://ejb.ucv.cl/content/vol4/issue3/full/5/index.html

Manyong, V.M., K.O. Makinde, N. Sanginga, B. Vanlauwe, and J. Diels. 2001. Fertilizer use ad definition of farmer domains for impact-oriented research in the northern Guinea savanna of Nigeria. Nutrient Cycling in Agroecosystems 59: 129–141.

Marley, P.S., R. Bandyopadhyay, R. Tabo, and O. Ajayi. 2001. Availability of sorghum germplasm with multiple resistance to anthracnose and grey leaf spot in Nigeria. Tropical Science 41: 44–49.

Maziya-Dixon, B., J.G. Kling, A. Menkir, and A. Dixon. 2000. Genetic variation for total carotene, iron and zinc content in maize genotypes and cassava clones. Food and Nutrition Bulletin (Special Edition) 21(4): 419–422.

Meikle, W.G., A. Cherry, N. Holst, B. Hounna, and R.H. Markham. 2001. The effects of an entomopathogenic fungus, *Beauveria bassiana* (Balsamo) Vuillemin (Hyphomycetes), on *Prostephanus truncatus* (Horn) (Col.: Bostrichidae), *Sitophilus zeamais* (Col.: Curculionidae) and grain losses in stored maize in the Benin Republic. Journal of Invertebrate Pathology 77(3): 198–205.

Mignouna, H.D., M.M. Abang, K.R. Green, and R. Asiedu. 2001. Inheritance of resistance in water yam (*Dioscorea alata*) to anthracnose (*Colletotrichum gloeosporioides*). Theoretical and Applied Genetics 103: 52–55.

Mignouna, H.D., P. Njukeng, M.M. Abang, and R. Asiedu. 2001. Inheritance of resistance to yam mosaic virus, genus *Potyvirus*, in white yam (*Dioscorea rotundata*). Theoretical and Applied Genetics 103: 1196–2000.

Mira da Silva, L., J.R. Park, J.D.H. Keatinge, and P.A. Pinto. 2001. A decision support system to improve planning and management in large irrigation schemes I. Agricultural Water Management 51: 187–201.

Mira da Silva, L., J.R. Park, J.D.H. Keatinge, and P.A. Pinto. 2001. A decision support system to improve planning and management in large irrigation schemes II: The use of the DSSIPM in the Alentejo region of southern Portugal. Agricultural Water Management 51: 203–215.

Mohapatra, S. and R. Ortiz. 2001. Safeguarding the future of food security in the semi-arid tropics: the role of ICRISAT's genetic resource collection. Entwicklung + Ländlicher Raum. 1/2001: 29–31.

Muhr, L., S.A. Tarawali, M. Peters, and R. Schultze-Kraft. 2001. Acceptability of forage legumes for improved fallows—first experiences of agropastoralists in subhumid Southwest Nigeria. Experimental Agriculture 37: 495–507.

Nansen, C., S. Korie, W.G. Meikle, and N. Holst. 2001. Sensitivity of *Prostephanus truncatus* (Horn) (Coleoptera: Bostrichidae) flight activity to environmental variables in Benin, West Africa. Environmental Entomology 30(6): 1135–1143.

Nansen, C., A. Tchabi, and W.G. Meikle. 2001. Successional sequence of forest types in a disturbed dry forest reserve in southern Benin, West Africa. Journal of Tropical Ecology 17(4): 525–539.

Nansen, C., W.G. Meikle, and S. Korie. 2002. Spatial analysis of *Prostephanus truncatus* (Horn) (Coleoptera: Bostrichidae) flight activity near maize stores and in different forest types in southern Benin, West Africa. Annals of the Entomological Society of America 95(1): 66–74.

Ndemah, R., F. Schulthess, M. Poehling, and C. Borgemeister. 2001. Spatial dynamics of lepidopterous pests on *Zea mays* (Linnaeus) and *Pennisetum purpureum* (Moench) in the forest zone of Cameroon and their implications for sampling schemes. Journal of Applied Entomology 125: 1–8.

Ndemah, R., F. Schulthess, S. Korie, C. Borgemeister, and K.F. Cardwell. 2001. Distribution, relative importance and effect of lepidopterous borers on maize yields in the forest zone and mid-altitude of Cameroon. Journal of Economic Entomology 94: 1434–1444.

Ndemah, R., F. Schulthess, M. Poehling, C. Borgemeister, and G. Goergen. 2001. Natural enemies of lepidopterous borers on maize and elephant grass in the forest zone of Cameroon with special reference to *Busseola fusca* (Fuller) (Lepidoptera: Noctuidae). Bulletin of Entomological Research 91(3): 205–212.

Neuenschwander, P. 2001. Biological control of the cassava mealybug in Africa. Biological Control 21: 214–229.

Publications

Ngoko, Z., W.F. Marasas, J.P. Rheeder, G.S. Shephard, M.J. Wingfield, and K.F. Cardwell. 2001. Fungal infection and mycotoxin contamination of maize in the humid forest and the western highlands of Cameroon. Phytoparasitica 29: 352–360.

Nkamleu, B. and O. Coulibaly. 2000. Analyse des déterminants du choix des méthodes de lutte contre les pestes dans les plantations de cacao et café au sud-Cameroon. Economie Rurale 259: 75–85.

Nokoe, S. and S. Zewdie. 2000. A procedure for allocating heterogeneous units to treatment groups. Discovery and Innovation 12(3/4): 179–198.

Ntawuruhunga, P., P.R. Rubayihayo, J.B.A. Whyte, A.G.O. Dixon, and D.S.O. Osiru. 2001. Additive main effects and multiplicative interaction analysis for storage root yield of cassava genotypes evaluated in Uganda. African Crop Science Journal 9(4): 591–598.

Ntawuruhunga, P., P.R. Rubayihayo, J.B.A. Whyte, A.G.O. Dixon, and D.S.O. Osiru. 2001. Inter-relationships among traits and path analysis for yield components of cassava: a search for storage root yield indicators. African Crop Science Journal 9(4): 599–606.

Odu, B.O., J.d'A Hughes, S.A. Shoyinka, and L.N. Dongo.1999. Isolation, characterization and identification of a potyvirus from *Dioscorea alata* L. (water yam) in Nigeria. Annals of Applied Biology 134: 65–71.

Ogazi, P.O., F.A. Oyewusi, A.U. Ozumba, H.O. Ogundipe, B.O.A. Osifo, and F.A. Lukambi. 2000. Development and sensory evaluation of soyamusa: a soybean–plantain babyfood. Acta Horticulturae 540: 575–582.

Okoro, J., D.R. Vuylsteke, and R. Ortiz. 2000. Effect of male bud removal on the yield of *Musa* genotypes in a humid forest zone of West Africa. Acta Horticulturae 540: 279–283.

Ortiz, R. 2000. Understanding the *Musa* genome: an update. Acta Horticulturae 540: 157–168.

Ortiz, R. 2001. Dedication: Dirk R. Vuylsteke: *Musa* scientist and humanitarian. Plant Breeding Reviews 21: 1–25.

Ortiz, R. and Z. Huamán. 2001. Allozyme polymorphism in tetraploid potato gene pools and the effect of human selection. Theoretical and Applied Genetics 103: 792–796.

Ortiz, R., S. Madsen, W.W. Wagoire, J. Hill, S. Chandra, and O. Stølen. 2001. Additive main effect and multiplicative interaction model for diallel cross analysis. Theoretical and Applied Genetics 102: 1103–1106.

Ortiz, R., W.W. Wagoire, J. Hill, S. Chandra, S. Madsen, and O. Stølen. 2001. Heritability of and correlations among genotype-by-environment stability statistics for grain yield in bread wheat. Theoretical and Applied Genetics 103: 469–474.

Osuji, J.O., B.E. Okoli, and R. Ortiz. 2000. Taxonomic value of calcium oxalate crystals in *Musa* germplasm. Acta Horticulturae 540: 137–146.

Owoeye, L.G., R. Ortiz, M.P. Gichuru, and D. Vuylsteke. 2000. Variation in soil nutrient levels under multi-species hedgerow cropping with plantain. Acta Horticulturae 540: 301–308.

Oyewole, B.D. and R.J. Carsky. 2001. Multiple purpose tree use by farmers using indigenous knowledge in subhumid and semiarid northern Nigeria. International Tree Crops Journal 11: 295–312.

Pasberg-Gauhl, C. and F. Gauhl. 2000. Response of East African highland bananas to black Sigatoka and *Cladosporium* leaf speckle under tropical humid forest lowland conditions in West Africa. Acta Horticulturae 540: 325–334.

Pillay, M. and M.T.V. Adeleke. 2001. Silver staining of *Musa* chromosomes. Cytologia 66: 33–37.

Pillay, M. and K.C. Armstrong. 2001. Maternal inheritance of chloroplast DNA in interspecific crosses of *Bromus*. Biologia Plantarum 44: 47–51.

Pillay, M., E. Ogundiwin, D.C. Nwakanma, G. Ude, and A. Tenkouano. 2001. Analysis of genetic diversity and relationships in East African banana germplasm. Theoretical and Applied Genetics 102: 965–970.

Robert, L.B., C. Zhi-Yuan, A. Menkir, T.E. Cleveland, K.F. Cardwell, J.G. Kling, and D.G. White. 2001. Resistance to aflatoxin accumulation in kernels of maize inbreds selected for ear rot resistance in West and Central Africa. Journal of Food Protection 64(3): 396–400.

Rotimi, M.O., P. Speijer, and D. De Waele. 1999. On-farm assessment of the influence of oil palm bunch refuse on the growth response of plantain (cv. Agbagba) to parasitic nematodes. Journal of Tropical Forest Resources 15: 121–129.

Salako, F.K. and G. Tian. 2001. Litter and biomass production from planted and natural fallows on a degraded soil in southwestern Nigeria. Agroforestry Systems 51: 239–251.

Schulthess, F., A. Chabi-Olaye, and G. Goergen. 2001. Seasonal fluctuations of noctuid stem-borer egg parasitism in southern Benin with special reference to *Sesamia calamistis* Hampson (Lepidoptera: Noctuidae) and *Telenomus* spp. (Hymenoptera: Scelionidae) on maize. Biocontrol Science and Technology 11: 765–777.

Sharma, H.C., K.K. Sharma, N. Seetharama, and R. Ortiz. 2001. Biotechnology in agriculture: risks and opportunities for the rural poor. Current Science 80: 1495–1508.

Speijer, P.R. and C. Kajumba. 2000. Yield loss from plant parasitic nematodes in East African highland banana (*Musa* spp. AAA). Acta Horticulturae 540: 453–459.

Speijer, P.R., F. Ssango, and D. Vuylsteke. 2000. Evaluation of host plant response to nematodes in *Musa* germplasm in Uganda. Acta Horticulturae 540: 225–232.

Speijer, P.R., C.S. Gold, E.B. Karamura, B. Goossens, A. Elsen, and D. De Waele. 2000. Rate of nematode infestation of clean banana planting material (*Musa* spp. AAA) in Uganda. Acta Horticulturae 540: 461–467.

Speijer, P.R. and D. De Waele. 2001. Nematodes associated with East African Highland cooking bananas and cv. Pisang Awak (*Musa* spp.) in Central Uganda. Nematology 3: 535–541.

Speijer, P.R., M.O. Rotimi, and D. De Waele. 2001. Plant parasitic nematodes associated with plantain (*Musa* spp., AAB-group) in southern Nigeria and their relative importance compared to other biotic constraints. Nematology 3(5): 423–436.

Tian, G., F.K. Salako, and F. Ishida. 2001. Replenishment of C, N, and P in a degraded Alfisol under humid

tropical conditions: effect of fallow species and litter production. Soil Science 166(9): 614–621.

Tshiunza, M., J.I. Lemchi, and A. Tenkouano. 2001. Determinants of market production of cooking banana in Nigeria. African Crop Science Journal 9(3): 537–547.

Upadhyaya, H.D. and R. Ortiz. 2001. A minicore subset for capturing diversity and promoting utilization of chickpea genetic resources in crop improvement. Theoretical and Applied Genetics 102: 1292–1298.

Vanlauwe, B., N. Sanginga, and R. Merckx. 2001 Alley cropping with *Senna siamea* in southwestern Nigeria: I. Recovery of 15N labeled urea by the alley cropping system. Plant and Soil 231: 187–199.

Vanlauwe, B., N. Sanginga, and R. Merckx. 2001. Alley cropping with *Senna siamea* in southwestern Nigeria: II. Dry matter, total N, and urea-derived N dynamics of the *Senna* and maize roots. Plant and Soil 231: 201–210.

Vanlauwe, B., K. Aihou, S. Aman, E.N.O. Iwuafor, B.K. Tossah, J. Diels, N. Sanginga, O. Lyasse, R. Merckx, and J. Deckers. 2001. Maize yield as affected by organic inputs and urea in the West African moist savanna. Agronomy Journal 93: 1191–1199.

Vanlauwe, B., K. Aihou, P. Houngnandan, J. Diels, N. Sanginga, and R. Merckx. 2001. Nitrogen management in 'adequate' input maize-based agriculture in the derived savanna benchmark zone of Benin Republic. Plant and Soil 228: 61–71.

Vuylsteke, D. 2000. Breeding bananas and plantains: from intractability to feasibility. Acta Horticulturae 540: 149–156.

Books/book chapters

Badu-Apraku, B., M.A.B. Fakorede, M. Ouédraogo, and R.J. Carsky. (eds.) 2001. Impact, challenges and prospects of maize research and development in West and Central Africa. Proceedings of a Regional Maize Workshop, IITA-Cotonou, Benin Republic, 4–7 May 1999. WECAMAN and IITA copublication. Available at IITA, Ibadan, Nigeria.

Carsky, R.J., M. Becker, and S. Hauser. 2001. *Mucuna* cover crop fallow systems: potential and limitations. Pages 111–135 *in* Sustaining soil fertility in West Africa, edited by G. Tian, F. Ishida, and J.D.H. Keatinge. Soil Science Society of America (SSSA) Special Publication no. 58. SSSA and American Society of Agronomy, Madison, WI, USA.

Cherry, A.J. and T. Willams. 2001. Control de los insectos mediante los baculovirus. Pages 389–450 *in* Los baculovirus y sus aplicaciones como bioinsecticidas, edited by P. Caballero, M. López-Ferber, and T. Williams. Universidad Pública de Navarra and Phytoma-España, Spain.

Coyne, D. and I. Hoeschle-Zeledon. 2001. Handbook: major pests and diseases of important crops in Malawi. Deutsche Gesellschaft für Technische Zusammenarbeit and Malawi Ministry of Agriculture and Irrigation, Malawi.

Craenen, K., R. Ortiz, E.B. Karamura, and D.R. Vuylsteke. (eds.) 2000. Proceedings of the First International Conference on Banana and Plantain for Africa. Acta Horticulturae 540. International Society for Horticultural Science, The Netherlands.

Diels, J., K. Aihou, E.N.O. Iwuafor, R. Merckx, O. Lyasse, N. Sanginga, B. Vanlauwe, and J. Deckers. 2001. Options for soil organic carbon maintenance under intensive cropping in the West African savanna. Pages 299–312 *in* Integrated plant nutrient management in sub-Saharan Africa: from concept to practice, edited by B. Vanlauwe, J. Diels, N. Sanginga, and R. Merckx. CAB International, Wallingford, Oxon, UK.

Iwuafor, E.N.O., K. Aihou, J.S. Jaryum, B. Vanlauwe, J. Diels, N. Sanginga, O. Lyasse, J. Deckers, and R. Merckx. 2001. On-farm evaluation of the contribution of sole and mixed applications of organic matter and urea to maize grain production in the savanna. Pages 185–197 *in* Integrated plant nutrient management in sub-Saharan Africa: from concept to practice, edited by B. Vanlauwe, J. Diels, N. Sanginga, and R. Merckx. CAB International, Wallingford, Oxon, UK.

Keatinge, J.D.H., H. Breman, V.M. Manyong, B. Vanlauwe, and J. Wendt. 2001. Sustaining soil fertility in West Africa in the face of rapidly increasing pressure for agricultural intensification. Pages 1–22 *in* Sustaining soil fertility in West Africa, edited by G. Tian, F. Ishida, and J.D.H. Keatinge. Soil Science Society of America (SSSA) Special Publication no. 58. SSSA and American Society of Agronomy, Madison, WI, USA.

Lyasse, O., B.K. Tossah, B. Vanlauwe, J. Diels, N. Sanginga, and R. Merckx. 2001. Options for increasing P availability from low reactive rock phosphate. Pages 225–237 *in* Integrated plant nutrient management in sub-Saharan Africa: from concept to practice, edited by B. Vanlauwe, J. Diels, N. Sanginga, and R. Merckx. CAB International, Wallingford, Oxon, UK.

Merckx, R., J. Diels, B. Vanlauwe, N. Sanginga, K. Denef, and K. Oorts. 2001. Soil organic matter and soil fertility. Pages 69–89 *in* Sustaining soil fertility in West Africa, edited by G. Tian, F. Ishida, and J.D.H. Keatinge. Soil Science Society of America (SSSA) Special Publication no. 58. SSSA and American Society of Agronomy, Madison, WI, USA.

Neuenschwander, P. and R. Markham. 2001. Biological control in Africa and its possible effects on biodiversity. Pages 127–146 *in* Evaluating indirect ecological effects of biological control, edited by E. Wainberg, J.S. Scott, and P.C. Quimby. CAB International, Wallingford, Oxon, UK.

Nokoe, S. 2001. Age/growth modeling. Pages 32–41 *in* Encyclopedia of environmetrics Vol. 1, edited by Abdel El-Shaarawi and Walt Piegorsch. John Wiley, UK.

Ortiz, R. 2001. The state of use of potato genetic diversity. Pages 181–200 *in* Broadening the genetic bases of crop production, edited by H.D. Cooper, C. Spillane, and T. Hodgkin. Food and Agriculture Organization of the United Nations (FAO), IPGRI, Rome, Italy, and CAB International, Wallingford, Oxon, UK.

Pillay M., A. Tenkouano, and J. Hartman. 2001. Future challenges in *Musa* breeding. Chapter 8 *in* Crop improvement for the 21st century, edited by M.S. Kang. Food Products Press, New York, USA.

Sanginga, N., J.A. Okogun, B. Vanlauwe, J. Diels, R.J. Carsky, and K. Dashiell. 2001. Nitrogen contribution of promiscuous soybeans in maize-based cropping systems. Pages 157–177 *in* Sustaining soil fertility in West Africa, edited by G. Tian, F. Ishida, and J.D.H. Keatinge. Soil Science Society of America (SSSA) Special Publication no. 58. SSSA and American Society of Agronomy, Madison, WI, USA.

Schilder, A.M.C., D.A. Florini, D.K. Berner, J.d'A. Hughes, S.Y.C. Ng, N.Q. Ng, G. Thottappilly, and T.W. Haug. 1999. Containment facilities and safeguards at the International Institute of Tropical Agriculture. Pages 65–78 *in* Containment facilities and safeguards for exotic plant pathogens and pests, edited by R.P. Kahn and S.B. Mathur. APS Press, St Paul, Minnesota, USA.

Schulz, S., R.J. Carsky, and S.A. Tarawali. 2001. Herbaceous legumes: the panacea for West African soil fertility problems? Pages 179–195 *in* Sustaining soil fertility in West Africa, edited by G. Tian, F. Ishida, and J.D.H. Keatinge. Soil Science Society of America (SSSA) Special Publication no. 58. SSSA and American Society of Agronomy, Madison, WI, USA.

Sharma, H.C., B.U. Singh, and R. Ortiz. 2001. Host plant resistance to insects: measurement, mechanisms, and plant–insect–environment interactions. Pages 133–159 *in* Insect and plant defense dynamics, edited by T.N. Anathakrishnan. Oxford and IBH Publishing Co. Pvt. Ltd., New Delhi, India; Science Publishers Inc., Enfield, New Hampshire, UK.

Singh, U., J. Diels, J. Henao, and H. Breman. 2001. Decision support systems for improving the application of integrated nutrient management technologies. Pages 305–321 *in* Sustaining soil fertility in West Africa, edited by G. Tian, F. Ishida, and J.D.H. Keatinge. Soil Science Society of America (SSSA) Special Publication no. 58. SSSA and American Society of Agronomy, Madison, WI, USA.

Tarawali, S.A., A. Larbi, S. Fernandez-Rivera, and A. Bationo. 2001. The role of livestock in the maintenance and improvement of soil fertility. Pages 281–304 *in* Sustaining soil fertility in West Africa, edited by G. Tian, F. Ishida, and J.D.H. Keatinge. Soil Science Society of America (SSSA) Special Publication no. 58. SSSA and American Society of Agronomy, Madison, WI, USA.

Thomas, J.E., M.L. Iskra-Caruana, L.V. Magnaye, D.R. Jones, B.E.L. Lockhart, J.d'A. Hughes, M. Tessera, and A.J. Quimio. 1999. Diseases caused by viruses. Chapter 6 *in* Diseases of banana, abaca and ensete, edited by D.R. Jones. CABI Publishing, Wallingford, Oxon, UK.

Tian, G., F. Ishida, and J.D.H. Keatinge. (eds.) 2001. Sustaining soil fertility in West Africa. Soil Science Society of America (SSSA) Special Publication no. 58. SSSA and American Society of Agronomy, Madison, WI, USA.

Vanlauwe, B., J. Diels, K. Aihou, E.N.O. Iwuafor, O. Lyasse, N. Sanginga, and R. Merckx. 2001. Direct interactions between N fertilizer and organic matter: evidence from trials with 15N-labeled fertilizer. Pages 173–184 *in* Integrated plant nutrient management in sub-Saharan Africa: from concept to practice, edited by B. Vanlauwe, J. Diels, N. Sanginga, and R. Merckx. CAB International, Wallingford, Oxon, UK.

Vanlauwe, B., J. Wendt, and J. Diels. 2001. Combined application of organic matter and fertilizer. Pages 247–279 *in* Sustaining soil fertility in West Africa, edited by G. Tian, F. Ishida, and J.D.H. Keatinge. Soil Science Society of America (SSSA) Special Publication no. 58. SSSA and American Society of Agronomy, Madison, WI, USA.

Conference papers

Adekunle, A.A., M.O. Adekunle, and D. Fielding. 2001. The training and visit system of extension and the challenge of commercialisation of extension services. Pages 345–357 *in* Impact, challenges and prospects of maize research and development in West and Central Africa. Proceedings of a Regional Maize Workshop, IITA-Cotonou, Benin Republic, 4–7 May 1999. WECAMAN and IITA copublication. Available at IITA, Ibadan, Nigeria.

Adeniji, M.O., G.O. Obigbesan, R. Asiedu, and M. Bokanga. 2001. Influence of fertilizers on yield, storage, and food qualities of yams. Pages 307–310 *in* Root crops in the 21st century, Proceedings of the 7th Triennial Symposium of the International Society for Tropical Root Crops—Africa Branch, October 1998, compiled by M.O. Akoroda and J.M. Ngeve. ISTRC—AB and Government of Benin, Available at IITA, Ibadan, Nigeria.

Aighewi, B.A., M.O. Akoroda, and R. Asiedu. 2001. Producing seed yams (*Dioscorea rotundata*) from sprouts. Pages 297–299 *in* Root crops in the 21st century, Proceedings of the 7th Triennial Symposium of the International Society for Tropical Root Crops—Africa Branch, October 1998, compiled by M.O. Akoroda and J.M. Ngeve. ISTRC—AB and Government of Benin, Available at IITA, Ibadan, Nigeria.

Aighewi, B.A., M.O. Akoroda, and R. Asiedu. 2001. Seed yam (*Dioscorea rotundata* Poir.) production, storage and quality in some yam zones of Nigeria. Pages 300–303 *in* Root crops in the 21st century, Proceedings of the 7th Triennial Symposium of the International Society for Tropical Root Crops—Africa Branch, October 1998, compiled by M.O. Akoroda and J.M. Ngeve. ISTRC—AB and Government of Benin, Available at IITA, Ibadan, Nigeria.

Ajayi, S.A. and M.A.B. Fakorede. 2001. Physiological maturity and maximum seed quality in tropical maize: the need for a re-definition. Pages 296–304 *in* Impact, challenges and prospects of maize research and development in West and Central Africa. Proceedings of a regional maize workshop, 4–7 May 1999, Cotonou, Benin, edited by B. Badu-Apraku, M.A.B. Fakorede, M. Ouedraogo, and R.J. Carsky. WECAMAN and IITA copublication. Available at IITA, Ibadan, Nigeria.

Akintoye, H.A., E.O. Lucas, and J.G. Kling. 2001. Economics of N fertilizer usage in maize production in three ecological zones of Nigeria. Pages 365–375 *in* Impact, challenges and prospects of maize research and development in West and Central Africa. Proceedings of a regional maize workshop, 4–7 May 1999, Cotonou, Benin, edited by B. Badu-Apraku, M.A.B. Fakorede, M. Ouedraogo, and R.J. Carsky. WECAMAN and IITA copublication. Available at IITA, Ibadan, Nigeria.

Akoroda, M.O., A.G.O. Dixon, and R.U. Okechukwu. 2001. Relating early growth traits to root productivity for cassava breeding schemes. Pages 391–394 *in* Root crops in the 21st century. Proceedings of the 7th Triennial Symposium of the International Society for Tropical Root Crops—Africa Branch, October 1998, compiled by M.O. Akoroda and J.M. Ngeve. ISTRC—AB and Government of Benin, Available at IITA, Ibadan, Nigeria.

Amans, E.B., M. Tshiunza, B. Ahmed, A.G.O. Dixon, M. Mud, and M. Bokanga. 2001. Promotion of cassava in the semiarid zones of sub-Saharan Africa: status of cassava in northern Nigeria. Pages 35–42 *in* Root crops in the 21st century. Proceedings of the 7th Triennial Symposium of the International Society for Tropical Root Crops—Africa Branch, October 1998, compiled by M.O. Akoroda and J.M. Ngeve.

ISTRC—AB and Government of Benin, Available at IITA, Ibadan, Nigeria.

Ariyo, O.A., A.G.O. Dixon, and G.I. Atiri. 2001. Relative resistance of some newly developed cassava cultivars to African cassava mosaic disease. Pages 541–545 *in* Root crops in the 21st century, Proceedings of the 7th Triennial Symposium of the International Society for Tropical Root Crops—Africa Branch, October 1998, compiled by M.O. Akoroda and J.M. Ngeve. ISTRC—AB and Government of Benin, Available at IITA, Ibadan, Nigeria.

Badu-Apraku, B. and M.A.B. Fakorede. 2001. Progress in breeding for *Striga hermonthica* resistant early and extra-early maize varieties. Pages 147–162 *in* Impact, challenges and prospects of maize research and development in West and Central Africa. Proceedings of a regional maize workshop, 4–7 May 1999, Cotonou, Benin, edited by B. Badu-Apraku, M.A.B. Fakorede, M. Ouedraogo, and R.J. Carsky. WECAMAN and IITA copublication. Available at IITA, Ibadan, Nigeria.

Carsky, R.J., N. Wolo, V.M. Manyong, and G. Tian. 2001. Nutrient balance model for design of sustainable yam cropping systems. Pages 198–209 *in* Root crops in the 21st century, Proceedings of the 7th Triennial Symposium of the International Society for Tropical Root Crops—Africa Branch, October 1998, compiled by M.O. Akoroda and J.M. Ngeve. ISTRC—AB and Government of Benin. Available at IITA, Ibadan, Nigeria.

Chikaleke, V.A., R. Asiedu, and C.A. Fatokun. 2001. Influence of tuber sett-weights on flowering in *Dioscorea rotundata* Poir. Pages 304–307 *in* Root crops in the 21st century, Proceedings of the 7th Triennial Symposium of the International Society for Tropical Root Crops—Africa Branch, October 1998, compiled by M.O. Akoroda and J.M. Ngeve. ISTRC—AB and Government of Benin. Available at IITA, Ibadan, Nigeria.

Dansi, A., H.D. Mignouna, A. Sangare, J. Zoundjihekpon, R. Asiedu, and F.M. Quin. 2001. Characterisation and conservation of yam biodiversity for sustainable use for food and agriculture in Benin Republic. Pages 424–430 *in* Root crops in the 21st century, Proceedings of the 7th Triennial Symposium of the International Society for Tropical Root Crops—Africa Branch, October 1998, compiled by M.O. Akoroda and J.M. Ngeve. ISTRC—AB and Government of Benin, Available at IITA, Ibadan, Nigeria.

De Waele, D. and P.R. Speijer. 1999. Nematode resistance. Pages 119–126 in *Musa*. Mobilizing IPM for sustainable banana production in Africa. Proceedings of a workshop on banana IPM, Nelspruit, South Africa, 23–28 November 1998, edited by E.A. Frison, C.S. Gold, E.B. Karamura, and R.A. Sikora. INIBAP, Montpellier, France.

Di Umba, U., K.E. Dashiell, D. Berner, and U.U. Ebong. 2001. Effect of soybean cultivars on *Striga* emergence and yield of the subsequent maize crop. Pages 321–329 *in* Impact, challenges and prospects of maize research and development in West and Central Africa. Proceedings of a regional maize workshop, 4–7 May 1999, Cotonou, Benin, edited by B. Badu-Apraku, M.A.B. Fakorede, M. Ouedraogo, and R.J. Carsky. WECAMAN and IITA copublication. Available at IITA, Ibadan, Nigeria.

Dongo, L.N., J.d'A. Hughes, and G.I. Atiri. 2001. Three new isometric viruses infecting yams in Nigeria. Pages 652–661 in Root crops in the 21st century. Proceedings of the 7th Triennial Symposium of the International Society for Tropical Root Crops—Africa Branch, October 1998, compiled by M.O. Akoroda and J.M. Ngeve, ISTRC—AB and Government of Benin. Available at IITA, Ibadan, Nigeria

Egesi, C.N., R. Asiedu, and J.K. Egunjobi. 2001. Flowering in yams (*Dioscorea* spp.). Pages 434–437 *in* Root crops in the 21st century, Proceedings of the 7th Triennial Symposium of the International Society for Tropical Root Crops—Africa Branch, October 1998, compiled by M.O. Akoroda and J.M. Ngeve. ISTRC—AB and Government of Benin, Available at IITA, Ibadan, Nigeria.

Ekanayake, I.J. and O. Lyasse. 2001. Growth and productivity of long season cassava: efficacy of predictive models and systems research approach. Pages 343–350 *in* Root crops in the 21st century, Proceedings of the 7th Triennial Symposium of the International Society for Tropical Root Crops—Africa Branch, October 1998, compiled by M.O. Akoroda and J.M. Ngeve. ISTRC—AB and Government of Benin. Available at IITA, Ibadan, Nigeria.

Ekanayake, I.J. and U.C. Okarter. 2001. Cassava-based farming systems in the semiarid zone: need for a change in agronomic practices. Pages 241–245 *in* Root crops in the 21st century, Proceedings of the 7th Triennial Symposium of the International Society for Tropical Root Crops—Africa Branch, October 1998, compiled by M.O. Akoroda and J.M. Ngeve. ISTRC—AB and Government of Benin. Available at IITA, Ibadan, Nigeria.

Fakorede, M.A.B., J.M. Fajemisin, S.O. Ajala, J.G. Kling, and A. Menkir. 2001. Hybrid maize and hybrid seed production in Nigeria: lessons for other West and Central African countries. Pages 31–59 *in* Impact, challenges and prospects of maize research and development in West and Central Africa. Proceedings of a regional maize workshop, 4–7 May 1999, Cotonou, Benin, edited by B. Badu-Apraku, M.A.B. Fakorede, M. Ouedraogo, and R.J. Carsky. WECAMAN and IITA copublication. Available at IITA, Ibadan, Nigeria.

Fakorede, M.A.B., B. Badu-Apraku, O. Coulibaly, and J.M. Fajemisin. 2001. Maize research and development priorities in sub-Saharan Africa in the next millennium. Pages 31–59 *in* Impact, challenges and prospects of maize research and development in West and Central Africa. Proceedings of a regional maize workshop, 4–7 May 1999, Cotonou, Benin, edited by B. Badu-Apraku, M.A.B. Fakorede, M. Ouedraogo, and R.J. Carsky. WECAMAN and IITA copublication. Available at IITA, Ibadan, Nigeria.

Githunguri, C.M., J.A. Cheweya, I.J. Ekanayake, and A.G.O. Dixon. 2001. Climatic and growth stage influence on tuberous root yield, cyanogenic potential, leaf water potential and leaf area duration of divergent cassava (*Manihot esculenta* Crantz) clones. Pages 272–279 *in* Root crops in the 21st century, Proceedings of the 7th Triennial Symposium of the International Society for Tropical Root Crops—Africa Branch, October 1998, compiled by M.O. Akoroda and J.M. Ngeve. ISTRC—AB and Government of Benin. Available at IITA, Ibadan, Nigeria.

Hughes, J.d'A. 1999. Integrated management of viruses infecting *Musa* spp. Pages 189–198 *in* Mobilizing IPM for sustainable banana production in Africa. Proceedings of a workshop on banana IPM held in Nelspruit, South Africa, 23–28 November 1998, edited by E.A. Frison, C.S. Gold, E.B. Karamura and R.A. Sikora. 1999. INIBAP, Montpellier, France.

Publications

Ilona, P.C. and A.G.O. Dixon. 2001. Genetic variability for vascular streaking in cassava. 2001. Pages 430–434 *in* Root crops in the 21st century, Proceedings of the 7th Triennial Symposium of the International Society for Tropical Root Crops—Africa Branch, October 1998, compiled by M.O. Akoroda and J.M. Ngeve. ISTRC—AB and Government of Benin, Available at IITA, Ibadan, Nigeria.

Kapinga, R., N. Wanyera, R. Asiedu, B. Chirimi, and S. Kaare. 2001. Yams in the Tanzanian food and farming systems: implications for research and development. Pages 230–236 *in* Root crops in the 21st century, Proceedings of the 7th Triennial Symposium of the International Society for Tropical Root Crops—Africa Branch, October 1998, compiled by M.O. Akoroda and J.M. Ngeve. ISTRC—AB and Government of Benin, Available at IITA, Ibadan, Nigeria.

Kwoseh, C., R.A. Plowright, J. Stanfield, and R. Asiedu. 2001. Culturing *Scutellonema bradys* on yam tuber slices. Pages 575–576 *in* Root crops in the 21st century, Proceedings of the 7th Triennial Symposium of the International Society for Tropical Root Crops—Africa Branch, October 1998, compiled by M.O. Akoroda and J.M. Ngeve. ISTRC—AB and Government of Benin, Available at IITA, Ibadan, Nigeria.

Lokko, Y., A.G.O Dixon, and S. Offei. 2001. Combining ability analysis of resistance to cassava mosaic disease in cassava. Pages 438–443 *in* Root crops in the 21st century, Proceedings of the 7th Triennial Symposium of the International Society for Tropical Root Crops—Africa Branch, October 1998, compiled by M.O. Akoroda and J.M. Ngeve. ISTRC—AB and Government of Benin, Available at IITA, Ibadan, Nigeria.

Manyong, V.M., R. Asiedu, and G.O. Olaniyan. 2001. Farmers' perceptions of, and actions on, resource management constraints in the yam-based systems of western Nigeria. Pages 156–167 *in* Root crops in the 21st century, Proceedings of the 7th Triennial Symposium of the International Society for Tropical Root Crops—Africa Branch, October 1998, compiled by M.O. Akoroda and J.M. Ngeve. ISTRC—AB and Government of Benin, Available at IITA, Ibadan, Nigeria.

Nakayama, O., A.E. Okoruwa, G.I. Adenekan, and A.O. James. 2001. Utilization of maize *ogi* fermenting liquor as a coagulant for tofu (soycheese) making. Pages 482–488 *in* Impact, challenges and prospects of maize research and development in West and Central Africa. Proceedings of a regional maize workshop, 4–7 May 1999, Cotonou, Benin, edited by B. Badu-Apraku, M.A.B. Fakorede, M. Ouedraogo, and R.J. Carsky. WECAMAN and IITA copublication. Available at IITA, Ibadan, Nigeria.

Ngendahayo, M. and A.G.O. Dixon. 2001. Effect of varying stages of harvest on tuber yield, dry matter content, starch content, dry matter yield, starch yield and harvest index of cassava in Ibadan and Onne. Pages 661–667 *in* Root crops in the 21st century, Proceedings of the 7th Triennial Symposium of the International Society for Tropical Root Crops—Africa Branch, October 1998, compiled by M.O. Akoroda and J.M. Ngeve. ISTRC—AB and Government of Benin, Available at IITA, Ibadan, Nigeria.

Nnodu, E.C. and A.G.O. Dixon. 2001. Evaluation of newly improved low cyanide cassava varieties in different agroecozones of Nigeria. Pages 384–390 *in* Root crops in the 21st century, Proceedings of the 7th Triennial Symposium of the International Society for Tropical Root Crops—Africa Branch, October 1998, compiled by M.O. Akoroda and J.M. Ngeve. ISTRC—AB and Government of Benin, Available at IITA, Ibadan, Nigeria.

Ntawuruhungha, P., P. Rubaihayo, J.A. Whyte, D.S.O. Osiru, and A.G.O. Dixon. 2001. Performance of cassava genotypes at low, mid and highland altitude in Uganda. Pages 410–416 *in* Root crops in the 21st century, Proceedings of the 7th Triennial Symposium of the International Society for Tropical Root Crops—Africa Branch, October 1998, compiled by M.O. Akoroda and J.M. Ngeve. ISTRC—AB and Government of Benin, Available at IITA, Ibadan, Nigeria.

Odu, B.O., S.A. Shoyinka, J.d'A. Hughes, R. Asiedu, and O.A. Oladiran. 2001. Yam viruses in Nigeria. Pages 631–633 *in* Root crops in the 21st century, Proceedings of the 7th Triennial Symposium of the International Society for Tropical Root Crops—Africa Branch, October 1998, compiled by M.O. Akoroda and J.M. Ngeve. ISTRC—AB and Government of Benin, Available at IITA, Ibadan, Nigeria.

Ogbe, F.O., G.I. Atiri, G. Thottappilly, A.G.O. Dixon, H.D. Mignouna, and F.M. Quin. 2001. Evidence of double infection and random occurrence of cassava begomoviruses in sub-Saharan Africa. Pages 524–529 *in* Root crops in the 21st century, Proceedings of the 7th Triennial Symposium of the International Society for Tropical Root Crops—Africa Branch, October 1998, compiled by M.O. Akoroda and J.M. Ngeve. ISTRC—AB and Government of Benin, Available at IITA, Ibadan, Nigeria.

Ogoke, I.J., R.J. Carsky, A.O. Togun, and K. Dashiell. 2001. Maize yield following phosphorus-fertilized soybean in the Nigerian Guinea savanna. Pages 205–213 *in* Impact, challenges and prospects of maize research and development in West and Central Africa. Proceedings of a regional maize workshop, 4–7 May 1999, Cotonou, Benin, edited by B. Badu-Apraku, M.A.B. Fakorede, M. Ouedraogo, and R.J. Carsky. WECAMAN and IITA copublication. Available at IITA, Ibadan, Nigeria.

Oikeh, S.O., R.J. Carsky, J.G. Kling, V.O. Chude, and W.J. Horst. 2001. Response of N-use efficient and N-inefficient maize and traditional grain sorghum to nitrogen in the northern Guinea savanna of Nigeria. Pages 236–247 in Impact, challenges and prospects of maize research and development in West and Central Africa. Proceedings of a regional maize workshop, 4–7 May 1999, Cotonou, Benin, edited by B. Badu-Apraku, M.A.B. Fakorede, M. Ouedraogo, and R.J. Carsky. WECAMAN and IITA copublication. Available at IITA, Ibadan, Nigeria.

Okechukwu, R., F.M. Quin, A.G.O. Dixon, and R. Asiedu. 2001. Tuber and root information system (TRIS): an essential tool for research, planning and development. Pages 104–109 *in* Root crops in the 21st century, Proceedings of the 7th Triennial Symposium of the International Society for Tropical Root Crops—Africa Branch, October 1998, compiled by M.O. Akoroda and J.M. Ngeve. ISTRC—AB and Government of Benin, Available at IITA, Ibadan, Nigeria.

Olaniyan, G.O., V.M. Manyong, and B. Oyewole. 2001. The dynamics of the root and tuber cropping systems in the middle belt of Nigeria. Pages 75–82 *in* Root crops in the 21st century, Proceedings of the 7th Triennial Symposium of the International Society for Tropical Root Crops—Africa Branch, October 1998, compiled by M.O. Akoroda and J.M. Ngeve. ISTRC—AB and Government of Benin, Available at IITA, Ibadan, Nigeria.

Onalo, J.I., R. Asiedu, and S.O. Adesiyan. 2001. Control of the yam nematode (*Scutellonema bradys*) with neem fruit powder. Pages 634–637 *in* Root crops in the 21st century, Proceedings of the 7th Triennial Symposium of the International Society for Tropical Root Crops—Africa Branch, October 1998, compiled by M.O. Akoroda and J.M. Ngeve. ISTRC—AB and Government of Benin, Available at IITA, Ibadan, Nigeria.

Onyeka, T.J., A.G.O. Dixon, T. Ikotun, and K. Wydra. 2001. Reactions of elite cassava genotypes to root rot disease and the role of different microorganisms. Pages 648–652 *in* Root crops in the 21st century, Proceedings of the 7th Triennial Symposium of the International Society for Tropical Root Crops—Africa Branch, October 1998, compiled by M.O. Akoroda and J.M. Ngeve. ISTRC—AB and Government of Benin, Available at IITA, Ibadan, Nigeria.

Otoo, J.A., A. Missah, C. Osei, A.G. Carson, E. Okai, R. Sagoe, and A.G.O. Dixon. 2001. Analysing genotype x environment interaction for sweet potato in Ghana using Additive Main Effects and Multiplicative Interaction Model (AMMI). Pages 368–377 *in* Root crops in the 21st century, Proceedings of the 7th Triennial Symposium of the International Society for Tropical Root Crops—Africa Branch, October 1998, compiled by M.O. Akoroda and J.M. Ngeve. ISTRC—AB and Government of Benin, Available at IITA, Ibadan, Nigeria.

Raji, A.A., A.G.O. Dixon, and T.A.O. Ladeinde. 2001. Genetic diversity among Nigerian cassava landraces resistant to cassava mosaic disease. Pages 443–453 *in* Root crops in the 21st century, Proceedings of the 7th Triennial Symposium of the International Society for Tropical Root Crops—Africa Branch, October 1998, compiled by M.O. Akoroda and J.M. Ngeve. ISTRC—AB and Government of Benin, Available at IITA, Ibadan, Nigeria.

Seetharama, N., H.C. Sharma, K.K. Sharma, T.R. Rani, and R. Ortiz. 2001. How irresistible are transgenic crops in developing countries. Pages 21–23 *in* Proceedings of the Seminar on Biotechnology—Current Prospectives, edited by C.S.V. Ramachandra Rao. Departments of Microbiology and Biochemistry, School of Sciences, Montessori Mahila Kalasala, Vijayawada, India.

Singh, A., R.J. Carsky, E.O. Lucas, and K. Dashiell. 2001. Grain yield response of maize to previous soybean crop and residue management in the Guinea savanna of Nigeria. Pages 214–224 in Impact, challenges and prospects of maize research and development in West and Central Africa. Proceedings of a regional maize workshop, 4–7 May 1999, Cotonou, Benin, edited by B. Badu-Apraku, M.A.B. Fakorede, M. Ouedraogo, and R.J. Carsky. WECAMAN and IITA copublication. Available at IITA, Ibadan, Nigeria.

Tenkouano, A. 2001. Current issues and future directions for M*usa* genetic improvement research at the International Institute of Tropical Agriculture. Pages 11–23 *in* Advancing banana and plantain R & D in Asia and the Pacific. Proceedings of the 10th INIBAP-ASPNET Regional Advisory Committee meeting held at Bangkok, Thailand, 10–11 November 2000, edited by A.B. Molina, V.N. Roa, and M.A.G. Maghuyop. International Network for the Improvement of Banana and Plantain–Asia and the Pacific Network, Los Baños, Laguna, The Philippines.

Tshiunza, M. and A.G.O. Dixon. 2001. Place du manioc dans les systemes de production des zones semi-arids de l'Afrique centrale et occidentale. Pages 249–255 *in* Root crops in the 21st century, Proceedings of the 7th Triennial Symposium of the International Society for Tropical Root Crops—Africa Branch, October 1998, compiled by M.O. Akoroda and J.M. Ngeve. ISTRC—AB and Government of Benin, Available at IITA, Ibadan, Nigeria.

Ude, G., A. Tenkouano, and M. Pillay. 2001. Biotechnology in horticulture. Proceedings of the 19th Annual Conference of the Horticulture Society of Nigeria, 28 May–1 June 2001, University of Nigeria, Nsukka, Nigeria.

Wydra, K., A. Fanou, A.G.O. Dixon, and K. Rudolph. 2001. Effect of cassava bacterial blight on cassava root yield in different ecozones and influence of the environment on symptom development. Pages 562–569 *in* Root crops in the 21st century, Proceedings of the 7th Triennial Symposium of the International Society for Tropical Root Crops—Africa Branch, October 1998, compiled by M.O. Akoroda and J.M. Ngeve. ISTRC—AB and Government of Benin, Available at IITA, Ibadan, Nigeria.

Abstracts

Akparobi, S.O., I.J. Ekanayake, and A.O. Togun. 2001. Screening cassava genotypes for low temperature tolerance using leaf stomatal conductances. Pages 51–52 *in* Book of Abstracts, 8th Triennial Symposium of the International Society for Tropical Root Crops?Africa Branch.

Aighewi, B.A. and I.J. Ekanayake. 2001. Determining photosynthetic efficiency, canopy dynamics and productivity of seed yams derived from minisetts of white Guinea yams (*Dioscorea rotundata* Poir). Pages 22–23 *in* Book of Abstracts, 5th Biennial Conference of the African Crop Science Society, Lagos, Nigeria, 21–26 October 2001.

Ajala, S.O., V.M. Manyong, V. Adenle, K.O. Makinde, A. Akintunde, J. Olufowote, M. Bolaji, and B. Bolaji. 2001. An approach to rapid deployment of agricultural technologies—the case of downy mildew resistant maize in Ogbomoso, southwest Nigeria. Page 75 *in* Abstracts, Fourth Biennial West and Central Africa Regional Maize Workshop, Cotonou, Benin Republic, 14–18 May 2001.

Ajala, S.O., J.G. Kling, A. Menkir, K.F. Cardwell, and J.A. Adetoro. 2001. Breeding strategies to improve maize (*Zea mays* L.) for downy mildew (*Perenosclerospora sorghi*) resistance in West and Central Africa. Page 63 *in* Book of Abstracts, 5th Biennial Conference of the African Crop Science Society, Lagos, Nigeria, 21–26 October 2001.

Ajala, S.O., F. Schulthess, and K.F. Cardwell, 2001. Recent advances in breeding maize for resistance to stem borers. Page 21 *in* Abstracts, 4th Biennial West and Central Africa Regional Maize Workshop, Cotonou, Benin Republic, 14–18 May 2001.

Akano, A., A.G.O. Dixon, C. Mba, E. Barrera, and M. Fregene. 2001. Genetic mapping of a dominant gene conferring resistance to cassava mosaic disease. Page S5–01 *in* Book of Abstracts, 5th International Scientific Meeting of the Cassava Biotechnology Network, St Louis, Missouri, USA, 4–9 November 2001.

Akano, A.O., M.A. Fregene, A.G.O. Dixon, N.J. Taylor, and C.M. Fauquet. 2001. Light as a crucial factor for the induction of somatic embryogenesis in Latin American and African cassava cultivars. Page S7-2 *in* Book of Abstracts, 5th International Scientific

Meeting of the Cassava Biotechnology Network, St Louis, Missouri, USA, 4–9 November 2001.

Alabi, S.O., J.G. Kling, S.G. Ado, E.O. Iyovbisere, S.O. Ajala, F.A. Showemimo, and B.D. Tarfa. 2001. Progress in breeding for low nitrogen stress in the northern Guinea savanna. Page 17 *in* 4th Biennial West and Central Africa Regional Maize Workshop, Cotonou, Benin Republic, 14–18 May 2001.

Anderson, J.V., M. Gedil, H.P. David, and A. Dixon. 2001. Preliminary studies directed towards the development of Euphorbiaceae-specific micro-arrays. Page S5–02 *in* Book of Abstracts, 5th International Scientific Meeting of the Cassava Biotechnology Network, 4–9 November 2001, St Louis, Missouri, USA.

Asafo-Adjei, B., K. Dashiell, and N. Sanginga. 2001. Dual purpose soybean lines for the Guinea savanna zone of Nigeria. Page 64 *in* Book of Abstracts, 5th Biennial Conference of the African Crop Science Society, Lagos, Nigeria, 21–26 October 2001.

Asiedu, R., H. Mignouna, B. Odu, and J.d'A Hughes. 2001. Yam breeding. Page 16 *in* Book of Abstracts, First Conference on Plant Virology in Sub-Saharan Africa, IITA, Ibadan, 4–8 June 2001.

Badu-Apraku, B., S.O. Ajala, R. Obubo, and C. Okafor. 2001. Meeting the training needs for maize research and development in West and Central Africa: accomplishments of WECAMAN and planned activities for the immediate future. Page 79 *in* Book of Abstracts, Fourth West and Central Africa Regional Maize Workshop, IITA Benin Republic, 14–18 May 2001.

Badu-Apraku, B. 2001. Towards sustainable maize production in West and Central Africa: strategies adopted by WECAMAN to promote the adoption of improved maize technologies. I*n* Book of Abstracts, 4th West and Central Africa Regional Maize Workshop, IITA Benin Republic, 14–18 May 2001.

Benesi, R.M., A.P. Mtukuso, R.F.N. Sauti, J. Mkumbira, C.C. Moyo, and N.M. Mahungu. 2001. Cassava research and production to enhance commercialization in Malawi. Pages 35–37 *in* Book of Abstracts, Symposium on the Promotion of Cassava Commercialization in Malawi, Blantyre, Malawi, 21–23 May 2001.

Benesi, I.R.M., C.C. Moyo, J. Mkumbira, F.P. Chipungu, A.P. Mtukuso, and N.M. Mahungu. 2001. Cassava: becoming a giant crop in Malawi—current status. I*n* Book of Abstracts, 5th International Scientific Meeting of the Cassava Biotechnology Network, St Louis, Missouri, USA, 4–9 November 2001.

Chandra, Z.H., S. Hari Krishna, and R. Ortiz. 2001. Optimal sampling strategy and core collection size of Andean tetraploid potato based on isozyme data—a simulation study. Page 50 *in* Abstracts of XV EUCARPIA: Plant Breeding—Sustaining the Future, Edinburgh, 9–14 September 2001.

Coulibaly, O., C. Aïtchédji, and Y. Quenum. 2001. Rentabilité financière et économique des technologies améliorées du niébé. Second International Workshop of the African Network of Research Bruchids, Cotonou, Benin, 12–17 November 2001.

Coulibaly, O., R. Hanna, J.S. Yaninek, and V.M. Manyong. 2001. Economic impact assessment of classical biological control of cassava green mite in West Africa: an economics surplus model. Page 4 *in* Book of Abstracts, 8th Triennial Symposium of the International Society for Tropical Root Crops—Africa Branch, IITA, Ibadan, Nigeria, 12–16 November 2001.

Delalibera Jr., I., A. Hajek, R.A. Humber, and A.J. Cherry. 2001. Long-term implementation of classical biological control using a mite pathogenic fungus in Africa: from exploration to detection of establishment. ABS 16 *in* Proceedings of the 34th Annual Meeting of the Society for Invertebrate Pathology, The Netherlands, August 2001.

Dixon, A.G.O., J.B.A. White, N.M. Mahungu, B.W. Khizzah, M. Fregene, A.A. Akano, and M. Gedil. 2001. Advances in breeding for resistance to cassava mosaic disease in sub-Saharan Africa. Page 15 *in* Book of Abstracts, 1st Conference on Plant Virology in Sub-Saharan Africa, IITA, Ibadan, Nigeria, 4–8 June 2001.

Dixon, A.G.O., J.B.A. Whyte, N.M. Mahungu, and S.Y.C. Ng. 2001. Tackling the cassava mosaic disease (CMD) challenge in sub-Saharan Africa: the role of host-plant resistance and germplasm deployment. I*n* Book of Abstracts, 5th International Scientific Meeting of the Cassava Biotechnology Network, St Louis, Missouri, USA, 4–9 November 2001.

Dixon, A.G.O., R. Asiedu, J.B.A. Whyte, and N.M. Mahungu. 2001. Utilization of genetic resources for the improvement of cassava in sub-Saharan Africa (SSA). Page S6–09 *in* Book of Abstracts, 5th International Scientific Meeting of the Cassava Biotechnology Network, St Louis, Missouri, USA, 4–9 November 2001.

Ekanayake, I.J. 2001. Morphological characterization of fibrous root system growth of cassava in Nigerian savannas. Page 50 *in* Book of Abstracts, 8th Triennial Symposium of the International Society for Tropical Root Crops—Africa Branch, IITA, Ibadan, Nigeria, 12–16 November 2001.

Ekanayake, I.J. and O. Lyasse. 2001. Environment, genotypic diversity and food quality traits of cassava. Page S6–09 *in* Book of Abstracts, 5th International Scientific Meeting of the Cassava Biotechnology Network, St Louis, Missouri, USA, 4–9 November 2001. http://www.danforthcenter.org/iltab/cassavanet/cbnv/abstracts/session6/s6-09.htm

Ekanayake, I.J. and U.C. Okarter. 2001. Morphological characterization of fibrous root system of cassava germplasm in Sudan savanna zone of Nigeria. Pages 68–69 *in* Book of Abstracts, 5th Biennial Conference of the African Crop Science Society, Lagos, Nigeria, 21–26 October 2001.

Fagbamessi, R., R. Hanna, O. Coulibaly, and M. Toko. Factors affecting variety choice by small farmers and sustainable biological control of cassava green mite in Benin. Page 62 *in* Book of Abstracts, 8th Triennial Symposium of the International Society for Tropical Root Crops—Africa Branch, IITA, Ibadan, Nigeria, 12–16 November 2001.

Fregene, M., M. Suarez, J. Mkumbira, H. Kulembeka, E. Ndedya, A. Kulaya, S. Mitchel, U. Gullberg, H. Rosling, A. Dixon, and S. Kresovich. 2001. Genetic differentiation in cassava (*Manihot esculenta*) landraces as assessed by simple sequence repeat (SSR) markers. Page S4-02 *in* Book of Abstracts, 5th International Scientific Meeting of the Cassava Biotechnology Network, St Louis, Missouri, USA, 4–9 November 2001.

Fregene, M., H. Matsumura, A. Akano, A. Dixon, and R. Terauchi. 2001. Progress towards cloning the single

dominant gene conferring immunity to cassava mosaic disease. Page S5–09 *in* Book of Abstracts, 5th International Scientific Meeting of the Cassava Biotechnology Network, St Louis, Missouri, USA, 4–9 November 2001.

Githunguri, C.M. and I.J. Ekanayake. 2001. Water deficits and growth stage influence on transpiration, stomatal conductance and root yield of divergent cassava clones in three agroecological zones of Nigeria. Page 73 *in* Book of Abstracts, 5th Biennial Conference of the African Crop Science Society, Lagos, Nigeria, 21–26 October 2001.

Githunguri, C.M., I.J. Ekanayake, and J.K. Imungi. 2001. Effects of different growing zones on the leaf area index, leaf area duration and bulking rate of cassava in Nigeria. Pages 73–74 *in* Book of Abstracts, 5th Biennial Conference of the African Crop Science Society, Lagos, Nigeria, 21–26 October 2001.

Githunguri, C.M., I.J. Ekanayake, J.K. Imungi, and K. Waithaka. 2001. Accumulation of cyanogenic compounds in the cassava tuberous roots as influenced by leaf expansion rate and crop growth rate. Pages 14–15 *in* Book of Abstracts, 8th Triennial Symposium of the International Society for Tropical Root Crops—Africa Branch, IITA, Ibadan, Nigeria, 12–16 November 2001.

Hankoua, B.B., S.Y.C. Ng, J. Puonti-Kaerlas, I. Fawole, A.G.O. Dixon, and M. Pillay. 2001. Regeneration and transformation of African cassava (*Manihot esculenta* Crantz) germplasm. Page S7–13 *in* Book of Abstracts, 5th International Scientific Meeting of the Cassava Biotechnology Network, St Louis, Missouri, USA, 4–9 November 2001.

Hanna, R., D. Ojo, M. Toko, A. Onzo, G. Paraiso, D. Gnanvossou, and A.G.O. Dixon. 2001. Cassava apex hairiness affects the abundance of *Typhlodromalus aripo*, an exotic phytoseiid predator of cassava green mite. Page 67 *in* Book of Abstracts, 8th Triennial Symposium of the International Society for Tropical Root Crops—Africa Branch, IITA, Ibadan, Nigeria, 12–16 November 2001.

Hell, K., G.A. Ayeni, and K.F. Cardwell. 2001. APS-Conference, Salt Lake City, USA. Management practices for the control of *Aspergillus flavus* and aflatoxin contamination in stored maize in West Africa. Proceedings of the APS Conference, Salt Lake City, USA, 25–30 August 2001. http://www.apsnet.org/meetings/2001/abstracts/a01ma273.htm

Hughes, J.d'A., O. Olatunde, E. Canning, S. Seal, L. Kenyon, and S.K. Offei. 2000. Comparative sensitivity of triple-antibody sandwich enzyme-linked immunosorbent assay (TAS-ELISA) and immunocapture-reverse transcription polymerase chain reaction (IC-RT-PCR) for the detection of yam mosaic virus, genus *Potyvirus*, in yam. Pages 25–26 *in* Book of Abstracts, 18th Annual National Conference of the Nigerian Institute of Science Technology, Maiduguri, Nigeria, 28 November–1 December 2000.

Hughes, J.d'A., S.A. Shoyinka, L. Kenyon, and B.O. Odu. 2001. An overview of viruses infecting yams in sub-Saharan Africa. Page 9 *in* Book of Abstracts, 1st Conference on Plant Virology in Sub-Saharan Africa, IITA, Ibadan, Nigeria, 4–8 June 2001.

Hughes, J.d'A., R.A. Naidu, and S.A. Shoyinka. 2001. Strategy for strengthening plant virus research in sub-Saharan African agriculture. Pages 17–18 *in* Book of Abstracts, 1st Conference on Plant Virology in Sub-Saharan Africa, IITA, Ibadan, Nigeria, 4–8 June 2001.

Ikie, F.O., A.M. Emechebe, S. Ogunyemi, S. Schulz, and A.O. Togun. 2001. Laboratory screening of cowpea varieties for suicidal germination of seeds of *Striga hermonthica*. In Book of Abstracts, 5th Biennial Conference of the African Crop Science Society, Lagos, Nigeria, 21–26 October 2001.

Kamara, A.Y. and A.G.O. Dixon. 2001. Physio-morphological changes associated with the genetic improvement of cassava (*Manihot esculenta* Crantz) in West and Central Africa over the last 30 years: growth, yield, leaf area index and light interception. Page 22 *in* Book of Abstracts, 8th Triennial Symposium of the International Society for Tropical Root Crops—Africa Branch, IITA, Ibadan, Nigeria, 12–16 November 2001.

Kamara, A.Y. and J.G. Kling. 2001. Vertical root-pulling resistance and its effects on lodging and yield of 18 maize S1 lines in the southern Guinea savanna, Nigeria. Page 32 *in* Fourth Biennial West and Central Africa Regional Maize Workshop, Cotonou, Benin Republic, 14–18 May 2001.

Kamara, A.Y. and A. Menkir. 2001. Contrasting responses of 12 maize cultivars to terminal drought. Pages 76–77 *in* Book of Abstracts, 5th Biennial Conference of the African Crop Science Society, Lagos, Nigeria, 21–26 October 2001.

Kamara, A.Y., I.O. Akobundu, N. Sanginga, and S.C. Jutzi. 2000. Differences in the response of maize (*Zea mays* [L.]) to leaf extracts and mulch from selected multipurpose trees (MPTs). Page 35 *in* Book of Abstracts, Conference on Balanced Nutrient Management Systems for the Moist Savanna and Humid Forest Zones of Africa, Cotonou, Benin Republic, 9–12 October 2000.

Kamara, A.Y., J. Kling, N. Sanginga, and S.O. Ajala. 2001. Performance of improved maize varieties under low and high N conditions in the Guinea savannas of Nigeria. Page 127 *in* Deutscher Tropentag, Bonn, Germany, 9–11 October 2001.

Kimmins, F.M., L. Kenyon, S.A. Shoyinka, and J.d'A. Hughes. 2001. Summary and survey of existing facilities for research and training in sub-Saharan Africa. Book of Abstracts, 1st Conference on Plant Virology in Sub-Saharan Africa, IITA, Ibadan, Nigeria, 4–8 June 2001.

Lahai, M.T., I.J. Ekanayake, and J.B. George. 2001. Chlorophyll content and root yield of cassava in an inland valley. Pages 52–53 *in* Book of Abstracts, 8th Triennial Symposium of the International Society for Tropical Root Crops—Africa Branch, IITA, Ibadan, Nigeria, 12–16 November 2001.

Langewald, J.P. and R. Stolz. 2001. Large-scale environmental impact of biological control and the future of grasshopper control in the sahel. International Conference on Orthopteroid Insects, Montpellier, France, 19–22 August 2001.

Lum, A.F., D. Chikoye, and S.O. Adesiyan. 2001. Evaluation of nicosulfuron for speargrass (*Imperata cylindrica* [L.] Raueschel) control in Nigeria. Page 129 *in* Book of Abstracts, 5th Biennial Conference of the African Crop Science Society. Lagos, Nigeria, 21–26 October.

Mahalakshmi, V., T.J.L. van Hintum, and R. Ortiz. 2001. Enhancing germplasm utilization to meet specific user needs through interactive core selections. Page 50 *in* Abstracts of XV EUCARPIA: Plant Breeding—Sustaining the Future, Edinburgh, 9–14 September 2001.

Publications

Makumbi-Kidza, N.N., P.R. Speijer, I.J. Ekanayake, and R.A. Sikora. 2001. Sprouting of cassava stem cuttings affected by *Meloidogyne incognita*. Pages 69–70 *in* Book of Abstracts, 8th Triennial Symposium of the International Society for Tropical Root Crops—Africa Branch, IITA, Ibadan, Nigeria, 12–16 November 2001.

Mkumbira J., L. Chiwona-Karltum, U. Lagercrantz, N.M. Mahungu, J. Saka, A. Mhone, M. Bokanga, L. Brimer, U. Gullberg, and H. Rosling. 2001. Classification of cassava into "bitter" and "cool" in Malawi, the farmers' method. I*n* Book of Abstracts, 5th International Scientific Meeting of the Cassava Biotechnology Network, St Louis, Missouri, USA, 4–9 November 2001.

Naidu, R.A. and J.d'A. Hughes. 2001. Methods for the detection of plant viruses. Page 1 *in* Book of Abstracts, 1st Conference on Plant Virology in Sub-Saharan Africa, IITA, Ibadan, Nigeria, 4–8 June 2001.

Ng, N.Q., A.G.O. Dixon, R. Asiedu, B.B. Singh, A. Menkir, A. Tenkouano, B. Asafo-Adjei, S.Y.C. Ng, J.B.A. Whyte, B. Badu-Apraku, N.M. Mahungu, and R. Ortiz. 2001. Access to and sharing of plant biodiversity: the case of IITA in helping African nations to fight famine. Page 91 *in* Book of Abstracts, 5th Biennial Conference of the African Crop Science Society, Lagos, Nigeria, 21–26 October 2001.

Ngwuta, A.A, S.O. Ajala, I.U. Obi, and E.E. Ene-Obong. 2001. Potential sources of resistance to maize stem borers (*Sesamia calamistis* Hampson) and E*ldana saccharina* (Walker) in local populations of southeastern Nigeria. Page 91 *in* Book of Abstracts, 5th Biennial Conference of the African Crop Science Society, Lagos, Nigeria, 21–26 October 2001.

Ntawuruhunga, P., J.B.A. Whyte, R. Rubaihayo, and A.G.O. Dixon. 2001. Effect of altitude on tuberization and yield performance of cassava genotypes grown at three different elevations in Uganda. Page S6–21 *in* Book of Abstracts, 5th International Scientific Meeting of the Cassava Biotechnology Network, St Louis, Missouri, USA, 4–9 November 2001.

Odu, B.O., R. Asiedu, J.d'A. Hughes, S.A. Shoyinka, and A.O. Oladiran. 2001. Potential of West African white yam (*Dioscorea rotundata* Poir.) genotypes as sources of resistance to yam mosaic virus (genus P*otyvirus*; family P*otyviridae*). I*n* Book of Abstracts, 5th Biennial Conference of African Crop Science Society, Lagos, Nigeria, 21–26 October 2001.

Ogbe, F.O., A.G.O. Dixon, G.I. Atiri, and G. Thottappilly. 2001. The use of bud grafting to evaluate cassava for resistance to African cassava mosaic disease. Page S8–14 *in* Book of Abstracts, 5th International Scientific Meeting of the Cassava Biotechnology Network, St Louis, Missouri, USA, 4–9 November 2001.

Ogbe, F.O., G.I. Atiri, A.G.O. Dixon, and G. Thottappilly. 2001. Cassava mosaic disease (CMD): the Nigerian situation. Page 9 *in* Book of Abstracts, 1st Conference on Plant Virology in Sub-Saharan Africa, IITA, Ibadan, Nigeria, 4–8 June 2001.

Ortiz, R., I. Ekanayake, V. Mahalakshmi, A. Menkir, S.N. Nigam, N.P. Saxena, and B.B. Singh. 2001. Development of drought resistant and water stress tolerant crops through traditional breeding. Page 5 *in* Abstracts of the 8th JIRCAS International Symposium on Water for Sustainable Agriculture in Developing Regions, Japan International Research Center for Agricultural Sciences (JIRCAS), Tsukuba, Japan, 27–28 November 2001.

Ortiz, R., I.J. Ekanayake, V. Mahalakshmi, A. Kamara, A. Menkir, S.N. Nigam, B.B. Singh, and N.P. Saxena. 2001. Breeding of drought resistant and water stress tolerant crops. I*n* Abstracts, IWMI Water Week, IWMI, Colombo, Sri Lanka, 13–15 November 2001.

Oyetunji, O., I.J. Ekanayake, and O. Osonubi. 2001. Alley cropping in the derived savanna zone of Nigeria, West Africa: influence of VAM fungi on maize growth intercropped with cassava. Pages 31–32 *in* Book of Abstracts, 5th Biennial Conference of the African Crop Science Society, Lagos, Nigeria, 21–26 October 2001.

Oyetunji, O.J., I.J. Ekanayake, and O. Osonubi. 2001. The influence of VAM fungi, mulch and fertilizer application on the yield of yam (*Dioscorea* spp.). Page 51 *in* Book of Abstracts, 8th Triennial Symposium of the International Society for Tropical Root Crops—Africa Branch, IITA, Ibadan, Nigeria, 12–16 November 2001.

Oyetunji, O.J., I.J. Ekanayake, and O. Osonubi. 2001. The role of vesicular arbuscular mycorrhizal (VAM) fungi on cassava productivity in alley cropping systems with two tree species. Page 53 *in* Book of Abstracts, 8th Triennial Symposium of the International Society for Tropical Root Crops—Africa Branch, IITA, Ibadan, Nigeria, 12–16 November 2001.

Oyewole, B., S. Schulz, and R. Tanko. 2001. Economic assessment of cereal–legume rotations in the derived savanna and northern Guinea savanna agroecozones of Nigeria. Page 40 *in* Book of Abstracts, Deutscher Tropentag 2001, One World, Research for a Better Quality of Life. Margraf Verlag Publishers, Weikersheim, Germany.

Raji, A.A., A.G.O. Dixon, I. Fawole, and M. Gedil. 2001. Diversity analysis of African landraces of cassava assessed with agrobotanical and molecular markers. Page S6–25 *in* Book of Abstracts, 5th International Scientific Meeting of the Cassava Biotechnology Network, St Louis, Missouri, USA, 4–9 November 2001.

Roing, K. J. Diels, B. Vanlauwe, and N. Sanginga. 2001. Effect of fallow legumes on mineral N soil dynamics in the derived savanna zone. Page 118 *in* Book of Abstracts, 5th Biennial Conference of the African Crop Science Society, Lagos, Nigeria, 21–26 October 2001.

Sandifolo, V., N.M. Mahungu, C.H. Mwale, A. Mhone, and F. Gondwe. 2001. Enhancement of cassava commercialization by improved processing technologies. Pages 18–19 *in* Book of Abstracts, Symposium on the Promotion of Cassava Commercialization in Malawi. Blantyre, Malawi, 21–23 May 2001.

Shiwachi, H., T. Ayankanmi, and R. Asiedu. 2001. A technique for grafting of water yam (*Dioscorea alata*). Page 52 *in* Book of Abstracts, 8th Triennial Symposium of the International Society for Tropical Root Crops—Africa Branch, IITA, Ibadan, Nigeria, 12–16 November 2001.

Shiwachi, H., T. Ayankanmi, and R. Asiedu. 2001. Effect of day length on the enlargement and maturation of tubers in yams (*Dioscorea* spp.). Pages 33–34 *in* Book of Abstracts (Vol 44–2), 89th conference of the Japanese Society for Tropical Agriculture, Tokyo, Japan, 29–31 March.

Shiwachi, H., T. Ayankanmi, and R. Asiedu. 2001. Induction of germination in dormant yam (*Dioscorea* spp.) tubers with inhibitors of gibberellins. Pages 52

in Book of Abstracts, 8th Triennial Symposium of the International Society for Tropical Root Crops—Africa Branch, IITA, Ibadan, Nigeria, 12–16 November 2001.

Simwambana, M.C.M. and I.J. Ekanayake. 2001. Leaf mineral contents of cassava in relation to stage of flowering. Plant Biology Abstracts No. 0490.

Singh, B.B. 2001. Genetic variability for drought tolerance, heat tolerance and root architecture in cowpea. Page 94 *in* Book of Abstracts, 5th Biennial Conference of the African Crop Science Society, Lagos, Nigeria, 21–26 October 2001.

Singh, B.B. 2001. Genetic variability for physical properties of cowpea seed and their effect on cooking quality. Page 95 *in* Book of Abstracts, 5th Biennial Conference of the African Crop Science Society, Lagos, Nigeria, 21–26 October 2001.

Singh, B.B. and H. Ajeigbe. Breeding improved cowpea varieties for different cropping systems and agro-ecologies in West Africa. Page 96 *in* Book of Abstracts, 5th Biennial Conference of the African Crop Science Society, Lagos, Nigeria, 21–26 October 2001.

Tata Hangy, K., R. Hanna, and M. Toko. 2001. Classical biological control of cassava green mite in the Democratic Republic of Congo: population dynamics of the exotic predator *Typhlodromalus aripo* and its impact on cassava green mite. Page 64 *in* Book of Abstracts, 8th Triennial Symposium of the International Society of Tropical Root Crops—Africa Branch, IITA, Ibadan, Nigeria, 12–16 November 2001.

Tata Hangy, K., R. Hanna, K.M. Lema, M.S. Bidiaka, and N. Ndambi. 2001. Status of *Stictoccocus vayssierei* Richard and its impact on cassava root yield in the Bas-Fleuve district of the Democratic Republic of Congo. Page 37 *in* Book of Abstracts, 8th Triennial Symposium of the International Society of Tropical Root Crops—Africa Branch, 12–16 November 2001.

Thé, C., B. Badu-Apraku, J.G. Kling, C. Zonkeng, and A. Menkir. 2001. Breeding for *Striga hermonthica* tolerance: combining ability studies across three tropical African countries. I*n* Book of Abstracts, 4th West and Central Africa Regional Maize Workshop, IITA Benin Republic, 14–18 May 2001.

Tindo, M., R. Hanna, G. Goergen, and L. Zapfack. 2001. Native host plants of the African root and tuber scale in Cameroon. Page 62 *in* Book of Abstracts, 8th Triennial Symposium of the International Society of Tropical Root Crops—Africa Branch, 12–16 November 2001.

Tukamuhabwa, P., K.E. Dashiell, and B. Asafo-Adjei. 2001. Evaluation of seven fungicides for the control of rust caused by P*hakopsora pachyrhizi*. Pages 55–56 *in* Book of Abstracts, 5th Biennial Conference of the African Crop Science Society, Lagos, Nigeria, 21–26 October 2001.

Udensi, U.E., D. Chikoye, and S. Ogunyemi. 2001. Influence of artifical and M*ucuna* shade on dry matter of speargrass (I*mperata cylindrica* [L.] Raueschel) in Nigeria. Page 52 *in* Book of Abstracts, 5th Biennial Conference of the African Crop Science Society, Lagos, Nigeria, 21–26 October 2001.

Wydra, K., B. Ahohuendo, A. Banito, R.M.C. Cooper, A. Dixon, R.B. Kemp, K. Kpemoua, K. Rudolph, F. Witt, V. Verdier, and V. Zinsou. 2001. Adaptation and implementation of integrated control measures of cassava bacterial blight through collaborative research between European partners, IITA and NARS in Africa. Page S8–24 *in* Book of Abstracts, 5th International Scientific Meeting of the Cassava Biotechnology Network, St Louis, Missouri, USA, 4–9 November 2001.

Other

Alhassan, W.S. 2001. The status of agricultural biotechnology in selected West and Central African countries. IITA, Ibadan, Nigeria.

Asafo-Adjei, B., K. Dashiell, and A.A. Adekunle. 2001 Characteristics of some released IITA soybean varieties and promising breeding lines. IITA, Ibadan, Nigeria.

Bassa, S., C. Mestres, D. Champiat, K. Hell, P. Vernier, and K.F. Cardwell. 2001. First report of aflatoxin in dried yam chips in Benin. Plant Disease 85(9): 1032.

Bentley, W., L. Martin, and R. Hanna. 2001. Impact of gray field ant exclusion from vines on grape mealybug abundance, parasitism, and infestation: a progress report. UC Plant Protection Quarterly 11(3): 3–6.

Blomme, G., R. Swennen, A. Tenkouano, R. Ortiz, and D. Vuylsteke. 2001. Estimation of root development from shoot traits in plantain and banana (M*usa* spp.). InfoMusa (10)1: 15–17.

Cardwell, K.F., A. Desjardins, S.H. Henry, G. Munkvold, and J. Robens. 2001. Mycotoxins: The cost of achieving food security and food quality. APSnet feature story. (http://www.apsnet.org/online/feature/mycotoxin/)

Cherry, A.J. 2001. Microbial insecticides for horticultural pests in West Africa. Pesticide Management in West Africa, September 2001. FAO/ECOWAS.

Dochez, C., P.R. Speijer, J. Hartman, D. Vuylsteke, and D. De Waele. 2000. Screening M*usa* hybrids for resistance to R*adopholus similis*. InfoMusa 9(2): 3–4.

Dodds, J., R. Ortiz, J.H. Crouch, V. Mahalakshmi, and K.K. Sharma. 2001. Biotechnology, the gene revolution, and proprietary technology in agriculture: a strategic note for the World Bank. IP Strategy Today 2. http://www.biodevelopments.org/ip/index.htm

Douthwaite, B. 2001. The role of science in sustainable agriculture. Social Issues Research Centre. Published 20 June 2001 on http://www.sirc.org/articles/sustainable_agriculture.shtml, and reproduced on the Biotech-Info.Net website http://www.biotech-info.net/rating-biotech.html

Douthwaite, B., J. Langewald, and J. Harris. 2001. Development and commercialization of the Green Muscle biopesticide. Impact Series. IITA, Ibadan, Nigeria.

Gold, C.S. 2000. Many hands tackle weevil problem. Biocontrol News and Information 21: 62–64.

Gold, C.S. and S. Gowen. 2000. Pearls of banana research. Biocontrol News and Information 21: 61.

Gold, C.S. and S. Messiaen. 2000. M*usa* pest fact sheet on the banana weevil C*osmopolites sordidus*. Fact Sheet no. 4. INIBAP, Montpellier, France.

Keese, P. 2001. Even 'free access' is still beyond the means of most scholars in Africa. Nature 410: 1021.

Publications

Menkir, A. 2001. Maize international trial report for 1998 and 1999. IITA, Ibadan, Nigeria.

Menkir, A., J.G. Kling, B. Badu-Apraku, S.O. Ajala, and A.A. Adekunle. 2001. Available improved maize varieties from IITA. IITA, Ibadan, Nigeria.

Neuenschwander, P., J.d'A. Hughes, F.R. Ogbe, J.M. Ngatse, and J.P. Legg. 2001. New reports of the occurrence of the Uganda variant of East African cassava mosaic virus (EACMV-Ug) from western Democratic Republic of Congo and the Congo Republic define the westernmost extent of the CMD pandemic in East/ Central Africa. New Disease Reports 4. www.bspp.org.uk/ndr/reports.htm

Nolte, C., J. Kotto-Same, A. Moukam, P.S. Thenkabail, S.F. Weise, P.L. Woomer, and L. Zapfack. 2001. Land-use characterization and estimation of carbon stocks in the alternatives to slash-and-burn benchmark area of Cameroon. RCMD Research Monograph No. 28. IITA, Ibadan, Nigeria.

Okike, I., M.A. Jabbar, V.M. Manyong, J.W. Smith, J.A. Akinwumi, and S.K. Ehui. 2001. Agricultural intensification and efficiency in the West African savannas: Evidence from northern Nigeria. Socioeconomics and Policy Research Working Paper 33. ILRI-Nairobi, IITA-Ibadan, and UI-Ibadan.

Ortiz, R. 2001. Agro-biotechnology for improving agriculture in sub-Saharan Africa: rationale, philosophy and summary of ongoing research at IITA. Plant Breeding News 130, II 4 or Biotech Weekly Newsletter 2 November 2001.http: www.checkbiotech.org/DevelopingWorld/Agriculture/ documents

Ortiz, R. 2001. Dirk R. Vuylsteke: strategies for utilization of genetic variation in plantain improvement. InfoMusa 10(1): 47–48.

Otoo, J.A., O.O. Okoli, and P. Ilona. 2001. Improved production of seed yams. IITA Research Guide No. 63. IITA, Ibadan, Nigeria.

Peters, M., P. Horne, A. Schmidt, F. Holmann, P.C. Kerridge, S.A. Tarawali, R. Schultze-Kraft, C. Lascano, P. Argel, W. Stur, S. Fujisaka, K. Muller-Samann, and C. Wortmann. 2001. The role of forages in reducing poverty and degradation of natural resources in tropical production systems. AgREN Network Paper No. 117.

Speijer, P.R. and D. De Waele. 1997. Evaluation du matériel génétique de M*usa* pour la résistance aux nématodes. INIBAP Guides Techniques 1. INIBAP, Montpellier, France.

Speijer, P.R. and D. De Waele. 1997. Screening of M*usa* germplasm for resistance and tolerance to nematodes. INIBAP Technical Guidelines 1. INIBAP, Montpellier, France.

Governing board

Enrico Porceddu, Chair
Professor, Universita degli Studi della Tuscia
Viterbo, Italy

Alhaji Guda Abdullahi+, *
Permanent Secretary, Federal Ministry of Agriculture and Natural Resources
Abuja, Nigeria

Abdoulaye Babale
Chair, Institute of Agricultural Research for Development (IRAD)
Yaoundé, Cameroon

Lukas Brader+, **
Director General, IITA
Ibadan, Nigeria

Limamoulaye Cissé
Head, Agronomy Division
Institut mondial du phosphate, Casablanca, Morocco

Michael Collinson
Consultant
Oxon, UK

Erastus O. Gyang+
Vice Chancellor, University of Agriculture
Makurdi, Nigeria

Peter Hartmann+
Director General, IITA
Ibadan, Nigeria

Masa Iwanaga
Director, Biological Resources Division
Japan International Research Center for Agricultual Sciences (JIRCAS)
Tsukuba, Japan

Jørgen Jakobsen
Research Director, Danish Institute of Agricultural Sciences
Slagelse, Denmark

Assétou Kanouté
Executive Secretary, Association for the Development of Activities of Promotion and Formation (ADAF)
Bamako, Mali

Joy Kwesiga
Dean, Faculty of Social Sciences
Makerere University, Kampala, Uganda

Anastasios Leventis**
Leventis Overseas
London, UK

Geoffrey Mrema**
Executive Secretary, Association for Strengthening Agricultural Research in East and Central Africa (ASARECA)
Entebbe, Uganda

Mortimer Neufville
Executive Vice President
National Association of State Universities and Land-Grant Colleges
Washington, DC, USA

Kyoko Saio**
Tokyo Metropolitan Food and Technology Research Center
Tokyo, Japan

Gry Synnevag
Agricultural University of Norway
Ås, Norway

Eric Tollens
Professor, Faculty of Agricultural Sciences, Katholieke Universiteit Leuven
Hervelee, Belgium

Hans J. von Lengerke
Volkswagen Stiftung,
Hannover, Germany

B.D. Usman+
Permanent Secretary, Federal Ministry of Environment
Abuja, Nigeria

* Passed away in 2001
** Left in 2001
\+ Ex-officio

Professional staff

Director General
L. Brader, PhD, Ibadan, *Nigeria***
P. Hartmann, Ibadan, *Nigeria*

Office of the Director General
R.H. Booth, PhD, deputy director general, *Ibadan*
J. Cramer, BA, executive assistant to the director general, *Ibadan*
F.O. Oke, record/archival officer, *Ibadan*

Internal Audit
A. Ajakaiye, ACA, intermediate auditor, *Ibadan***
R.A. Fagbenro, ACA, senior internal auditor, *Ibadan*

Division Directors
S.A. Adetunji, PhD, a/director, corporate services division, *Ibadan*
K.E. Dashiell, PhD, director, crop improvement division, *Ibadan***
J.D.H. Keatinge, PhD, director, resource and crop management division, *Ibadan*
P. Neuenschwander, PhD, director, plant health management division, Cotonou, *Benin*
R. Ortiz, PhD, director, crop improvement division, *Ibadan*
P. Watts, BSc, director, corporate services division, *Ibadan***

Agroecological Zone Working Group Leaders
R.J. Carsky, PhD, moist savanna working group, *Benin*
B.B. Singh, PhD, dry savanna working group, Kano, *Nigeria*
S. Weise, PhD, humid forest working group, Yaoundé, *Cameroon*
J.B.A. Whyte, PhD, midaltitude working group, *Uganda*

IITA Stations and Officers in Charge
P. Austin, BSc, High Rainfall Station, Onne, *Nigeria*
P. Neuenschwander, PhD, Biological Control Center for Africa, *Benin*
B.B. Singh, PhD, Kano Station, *Nigeria*
S. Weise, PhD, Humid Forest Ecoregional Center (HFC), *Cameroon*
J.B.A. Whyte, PhD, Eastern and Southern Africa Regional Center (ESARC), *Uganda*

Project Coordinators
R. Asiedu, PhD, Improving yam-based systems, *Ibadan*
E.A. Atayi, PhD, Ecoregional program for the humid and subhumid tropics of sub-Saharan Africa (EPHTA), *Ibadan*
A.G.O. Dixon, PhD, Improving cassava-based systems, *Ibadan*
J. Gockowski, PhD, Development of integrated annual and perennial cropping systems, *Cameroon*
B. James, PhD, Systemwide program for integrated pest management, *Benin*
J. Langewald, PhD, Biological control and functional biodiversity, *Benin*
J. Legg, PhD Integrated management of cassava pests, *Benin*
V.M. Manyong, PhD, Impact, policy and systems analysis, *Ibadan*
R.H. Markham, PhD, Systemwide program for integrated pest management (SP-IPM), *Ibadan***
A. Menkir, PhD, Improving maize–grain legume systems in West and Central Africa, *Ibadan*
N.Q. Ng, PhD, Conservation and use of plant biodiversity, *Ibadan*
N. Sanginga, PhD, Improvement of high intensity food and forage crop systems, *Ibadan*
B.B. Singh, PhD, Improving cowpea–cereal systems in the dry savannas, *Kano*
M. Tamò, PhD, Integrated management of maize and legume pests, *Benin*
A. Tenkouano, PhD, Improving plantain- and banana-based systems, *Onne*
J. Wendt, PhD, Protection and enhancement of vulnerable cropping systems, *Cameroon*

Crop Improvement Division
K.E. Dashiell, PhD, breeder/geneticist, director, *Ibadan***
R. Ortiz, PhD, geneticist, director, *Ibadan*

Scientists
S.O. Ajala, PhD, maize breeder/geneticist, *Ibadan*
M.I. Andrade, PhD, agronomist, *Mozambique*
B. Asafo-Adjei, PhD, soybean breeder/geneticist, *Ibadan*
R. Asiedu, PhD, yam breeder/geneticist, *Ibadan*
B. Badu-Apraku, PhD, breeder, coordinator WECAMAN, *Côte d'Ivoire*
W. Bertenbreiter, PhD, project coordinator, IITA/GTZ/CSIR seed project, *Ghana*
M. Bokanga, PhD, biochemist and food technologist, *Ibadan***
A.G.O. Dixon, PhD, cassava breeder/geneticist, *Ibadan*
C.A. Fatokun, PhD, legume biotechnologist and PRONAF coordinator, *Ibadan*
A.J.G. van Gastel, PhD, project coordinator, IITA/GTZ/CSIR seed project, *Ghana***
I. Ingelbrecht, PhD, head, biotechnology laboratory, *Ibadan*
I.N. Kasele, PhD, multiplication expert, *Zimbabwe***
B.W. Khizzah, PhD, agronomist, *Uganda*
J.S. Machuka, PhD, molecular biologist, *Ibadan***
N. Mahungu, PhD, agronomist, coordinator SARRNET, *Malawi*
B. Maziya-Dixon, PhD, maize food technologist, *Ibadan*
A. Menkir, PhD, maize breeder/geneticist, *Ibadan*
H.D. Mignouna, PhD, molecular biologist, *Ibadan***
N.Q. Ng, PhD, germplasm scientist, *Ibadan*
S.Y.C. Ng, MSc, tissue culture specialist, *Ibadan*
M. Pillay, PhD, *Musa* breeder, *Uganda*
B.B. Singh, PhD, cowpea breeder/geneticist, *Kano*
A. Tenkouano, PhD, *Musa* breeder/geneticist, *Cameroon*
P. Vernier, PhD, yam specialist, CIRAD, *Benin***
J.B.A. Whyte, PhD, breeder, coordinator EARRNET, *Uganda*

Associate Scientist
A. Melake Berhan, PhD, maize biotechnologist, *Ibadan*

Postdoctoral Fellows
K. Amegbeto, PhD, yam economist, *Ibadan*
M. Gedil, PhD, molecular geneticist, *Ibadan***
A. Kamara, PhD, maize physiologist, *Ibadan*
H. Matsui, PhD, physiologist, *Kano***
H. Shiwachi, PhD, yam physiologist, *Ibadan*
G. Ude, PhD, molecular geneticist, *Onne***

Associate Expert
S. Gilis, Ir, *Musa* agronomist (VVOB), *Onne*

Visiting Scientists
P.K. Keese, PhD, molecular biologist/virologist, *Ibadan*
J. Lemchi, PhD, economist, *Musa* germplasm delivery specialist, *Onne*
P.O. Oyekan, PhD, breeder/geneticist, *Ibadan***
N. Wanyera, PhD, yam agronomist, *Uganda***

Consultant
A. Okoruwa, MSc, soybean food technologist, *Ibadan*

Research Farms Unit
F.O. Adunoye, BSc, farm superintendent, *Abuja*
P. Austin, BSc, unit head, *Onne*
J. Olobasola, BSc, assistant unit head, *Ibadan*

Administration and Support Services
S.J. Udoh, AMNIM, station administrator, *Uganda*
R.A. Adeleke, international trials manager, *Ibadan*
J.N. Agba, BSc, station administrative manager, *Onne*
M. Umaru, BSc, station administrative manager, *Kano*

Plant Health Management Division

P. Neuenschwander, PhD, entomologist, director, *Benin*
Scientists
R. Bandyopadhyay, PhD, pathologist, *Ibadan*
K.F. Cardwell, PhD, pathologist, Benin/*Ibadan***
A. Cherry, PhD, entomologist (joint appointment with NRI), *Benin*
D.Coyne, PhD, nematologist, *Ibadan*
A. Emechebe, PhD, pathologist, *Kano*
G. Goergen, PhD, entomologist, *Benin*
C. Gold, PhD, entomologist, Uganda
W.N.O. Hammond, PhD, entomologist and PRONAF coordinator, *Benin*
R. Hanna, PhD, acarologist, *Benin*
J.d'A. Hughes, PhD, virologist, *Ibadan*
B.D. James, PhD, entomologist, *Benin*
J. Langewald, PhD, insect pathologist, *Benin*
P. Le Gall, PhD, entomologist (IRD), *Benin*
J. Legg, PhD, virologist (joint appointment with NRI), *Uganda*
R.H. Markham, PhD, entomologist, *Ibadan***
W. Meikle, PhD, entomologist, *Benin***
F. Schulthess, PhD, ecologist, *Benin***
M. Tamò, PhD, insect ecologist, *Benin*
Postdoctoral Fellows
T. Adati, PhD, entomologist, *Kano*
F. Beed, PhD, weed pathologist, *Benin*
K. Hell, PhD, pathologist, *Benin*
B. Niere, PhD, mycologist, *Uganda*
L. Tripathi, PhD, molecular virologist, *Ibadan*
Associate Experts
A. Auwerkerken, Ir, nematologist (VVOB), *Onne*
C. Dochez, MSc, biologist, *Uganda*
S. Egal, MSc, geographer, *Benin*
T. Hoffstadt, MSc, fungal ecologist, *Benin*
K. Jacobsen, MSc, nematologist, *Cameroon*
J.C. Meerman, MSc, nematologist, *Ibadan***
Visiting Scientists
O. Coulibaly, PhD, agricultural economist, *Benin*
A. Hounsa, MD, medical epidemiologist, *Benin***
C. Nankinga, PhD, insect pathologist, *Uganda*
S.H.O. Okech, PhD, entomologist, *Uganda*
P. Ragama, PhD, statistician, *Uganda*
S. Shoyinka, PhD, virologist, *Ibadan***
M. Tindo, PhD, entomologist, *Cameroon*
M. Toko, PhD, entomologist, *Benin*
Germplasm Health Unit
M. Ayodele, PhD, plant pathologist, *Ibadan*
J.d'A. Hughes, PhD, unit head, *Ibadan*
Administration and Support Services
C.A. Soboyejo, MPhil, station administrator, *Benin*
J.B. Akinwumi, MSc, engineer, *Benin*
S. Korie, MSc, statistician, *Benin*
S. Nyampong, executive assistant to the director, *Benin*
B. Ronellenfitch, BSc, training documentation specialist (on secondment from COL, Canada), *Ibadan*
F. Tossé, DECF, chief accountant, *Benin*
R.W. Yussuf, MA, multimedia specialist, *Benin*

Resource and Crop Management Division

J.D.H. Keatinge, PhD, agronomist, director, *Ibadan*
Scientists
V. Aggarwal, PhD, breeder, coordinator ISAR/IITA/USAID project, *Rwanda***
R.J. Carsky, PhD, agronomist, *Benin*
D. Chikoye, PhD, weed scientist, *Ibadan*
J. Diels, PhD, modeler, *Ibadan*
S. Ferris, PhD, enterprise development specialist, *Uganda*
J. Gockowski, PhD, agricultural economist, *Cameroon*
L.S. Halos-Kim, MSc, food and agricultural engineer, *Ibadan*
S. Hauser, PhD, soil physicist, *Cameroon*
F. Ishida, PhD, soil scientist, *Ibadan**
C. Legg, MSc, landscape ecologist, *Cameroon*
V.M. Manyong, PhD, agricultural economist, *Ibadan*
C. Nolte, PhD, soil fertility specialist, *Cameroon*
J.L. Rueda, PhD, agronomist and STCP coordinator, *Cameroon*
N. Sanginga, PhD, soil microbiologist, *Ibadan*
S.A. Tarawali, PhD, agronomist (joint appointment with ILRI), *Ibadan*
G. Tian, PhD, soil fertility specialist, *Ibadan***
S. Weise, PhD, weed scientist and officer-in-charge HFC, *Cameroon*
J. Wendt, PhD, soil chemist, *Cameroon*
Associate Scientists
B. Douthwaite, PhD, impact assessor, *Ibadan*
S. Kolijn, MSc, postharvest specialist, SARRNET, *Tanzania*
S. Schulz, PhD, agronomist, *Ibadan*
B.P. Vanlauwe, PhD, soil microbiologist, *Ibadan***
Postdoctoral Fellows
P. Kormawa, PhD, agricultural economist, *Ibadan*
F-B. van der Meer, PhD, GIS specialist, *Ibadan*
Associate Experts
N. de Haan, PhD, rural sociologist, *Ibadan*
A. Ghebreysus, MSc, agronomist, *Ibadan*
O. Lyasse, Ir, agronomist (VVOB), *Ibadan*
O.K. Nielsen, MSc, weed scientist, *Ibadan*
V. Robiglio, MSc, GIS specialist, *Cameroon*
K. Roing, MSc, agronomist, *Ibadan*
Visiting Scientists
S. Dury, PhD, agricultural economist (CIRAD), *Cameroon*
L. Norgrove, PhD, STCP/MARS scientist, *Cameroon*
Consultants
W. Adekunle, PhD, technology transfer specialist, RUSEP project, *Ibadan*
C. Ezedinma, PhD, agricultural economist, RUSEP project, *Ibadan*
O. Makinde, PhD, marketing economist, (Winrock International), *Ibadan*
G. Tarawali, PhD, agronomist, NARS collaboration, *Ibadan*
Analytical Services Unit
J. Uponi, MSc, laboratory manager, *Ibadan*
Biometrics Unit
S. Nokoe, PhD, biometrician, unit head, *Ibadan*
N.A. Akintunde, MSc, research database manager, *Ibadan*
S. Korie, MSc, statistician, *Benin*
Administration and Support Services
Y. Aboubakar, MA, station administration supervisor, *Cameroon*
E. Ndindjock, MBPA, finance officer, *Cameroon*
E.O. Oyewole, research administration manager, *Ibadan*
C. Yumga, station assistant, *Cameroon*

Professional staff

Communications and Information Services
R.P. Eaglesfield, BSc, head, communications and information, *Ibadan***
D. Mowbray, MSc, head, communications and information, *Ibadan*
A. Moorhead, MSc, chief science editor, *Ibadan***
O. Ogunyinka, PhD, coordinator, ICS-Nigeria, *Ibadan*
P. Philpot, BA, multimedia unit manager, *Ibadan*
Y. Adedigba, MA, head, library and documentation, *Ibadan*
J.I. Adeyomoye, MLS, principal librarian, *Ibadan***
T. Babaleye, MCA, public information manager, *Ibadan*
E.O. Ezomo, MLS, principal librarian, *Ibadan*
Y. Olatunbosun, BSc, editor, *Ibadan*
T.T. Owoeye, MLS, coordinating editor, *Ibadan*
A. Oyetunde, MA, editor, *Ibadan*
R. Umelo, BA, consultant editor, *Ibadan*

External Liaison Office

Project Liaison
A.P. Uriyo, PhD, head, *Ibadan***
NARS Liaison
E.A. Atayi, PhD, agricultural economist, coordinator, EPHTA, *Ibadan*
Training
M. Ajayi, MSc, research training specialist, *Ibadan*
R. Obubo, MSc, research training specialist, *Ibadan*
C. Okafor, MBA, manager, individual training, *Ibadan*
Interpretation and Translation Unit
C.H. Dia, MA, head, *Ibadan***

Scientists of Other IARCs/AROs Resident at IITA

J.J. Adu-Gyamfi, PhD, agronomist, ICRISAT, *Ibadan*
R. Brummett, PhD, ICLARM scientist, *Cameroon*
A. Cherry, PhD, entomologist, (joint appointment with NRI), *Benin*
S. Dury, PhD, agricultural economist, CIRAD, *Cameroon*
R. Fashola, PhD, postdoctoral fellow, Hirose project, *Ibadan*
F. Idachaba, PhD, principal research fellow, ISNAR, *Ibadan*
A. Larbi, PhD, agronomist, ILRI, *Ibadan*
P. Le Gall, PhD, entomologist, IRD, *Benin*
J. Legg, PhD, entomologist, NRI (joint appointment with IITA), *Uganda*
O. Munyemana, PhD, project scientist, WARDA, *Ibadan*
J. Niezen, PhD, ruminant nutritionist, ILRI, *Ibadan*
O. Ndoye, PhD, forest economist, CIFOR, *Cameroon*
O. Osiname, PhD, soil scientist, WARDA, *Ibadan*
S.A. Tarawali, PhD, agronomist (joint appointment with ILRI), *Ibadan*
P. Vernier, PhD, yam specialist, CIRAD, *Benin***
T.O. Williams, PhD, agricultural economist, team leader, ILRI, *Ibadan*

Corporate Services Division

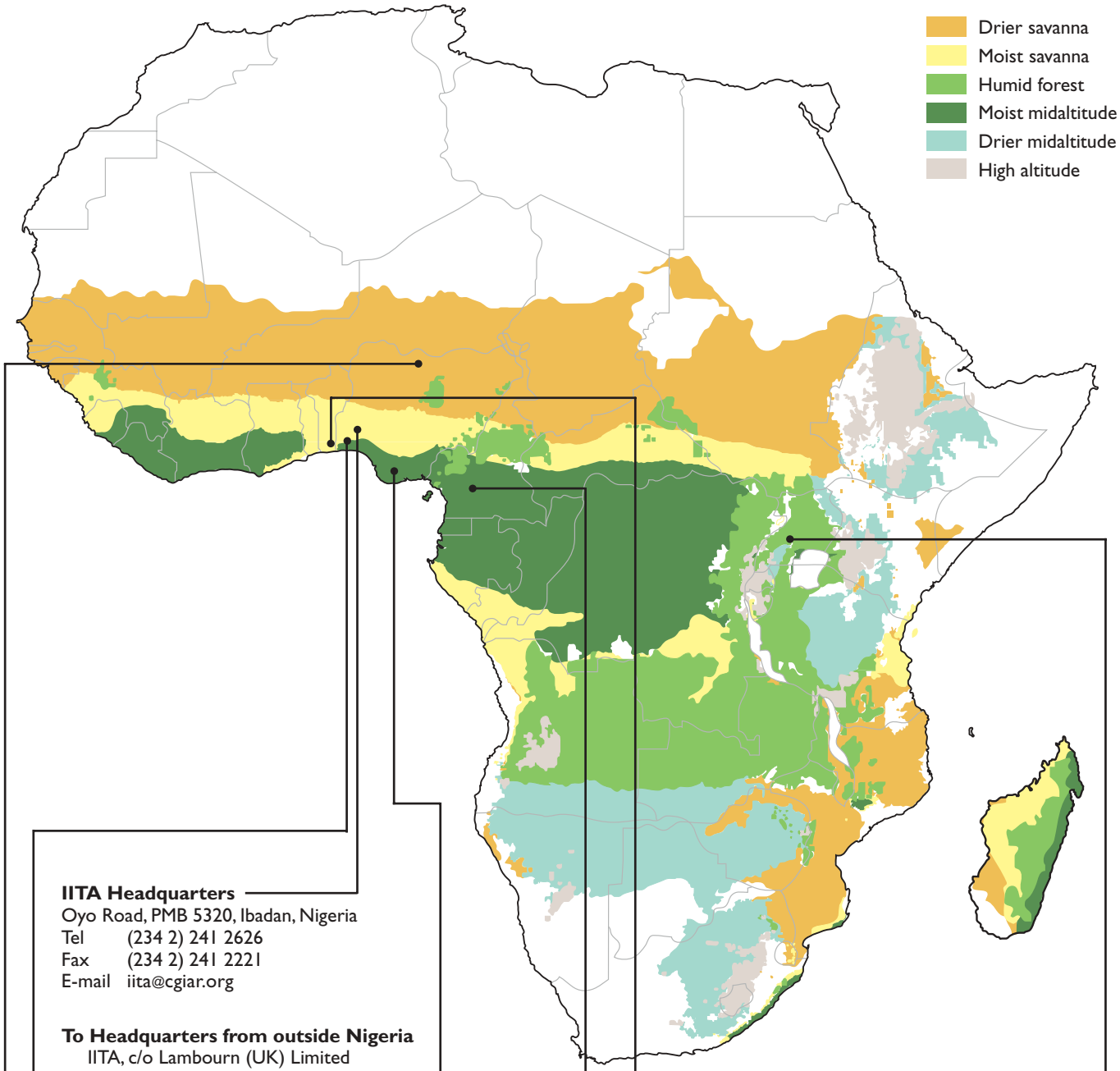
S.A. Adetunji, PhD, soil scientist, a/director, *Ibadan*
P. Watts, BSc, director, *Ibadan***
Budget and Finance
E. Estoque, CA, chief financial officer, *Ibadan*
B.A. Adeola, FCIS, accountant, *Ibadan*
J.E. Bolarinwa, MBA, payroll accountant, *Ibadan*
S. Ogunade, treasury manager, *Ibadan*
K.O. Olatifede, ACA, special projects accountant, *Ibadan*
O. Sholola, ACA, corporate accounting manager, *Ibadan*
Computer Services
J. Scott, MSc, manager, computer services, *Ibadan*
Human Resources/Personnel
C.F. McDonald, MSc, manager, human resources (irs), *Ibadan*
O.I. Osotimehin, BSc, DDA, personnel manager (nrs), *Ibadan*
J.B. Adenuga, AMIPM, employee services manager, *Ibadan*
A. Ohanwusi, MBA, planning/training manager, *Ibadan*
Management Information Systems
R. Lafond, CA, oracle implementation manager, *Ibadan***
I. Neish, HCIMA, head, *Ibadan*
N.N. Eguzozie, BSc, financial information systems (FIS) manager, *Ibadan*
L.O. Afemikhe, MSc, senior technical analyst (FIS), Ibadan
J. Ukpong, ACA, FIS senior analyst, *Ibadan*
Materials Logistics
B. Draper, materials logistics manager, *Ibadan*
Medical Unit
F.O.A. Ajose, MD, head, IITA clinic, *Ibadan*
E.O. Lawani, MD, physician, *Ibadan*
F. O'Dwyer, BSc, nurse/practitioner, *Ibadan***
P.O. Ojo, MSc, medical laboratory services officer, *Ibadan*
Physical Plant Services
A. Bhatnagar, BSc, head, physical plant services, *Ibadan*
R. Bishop, site maintenance services officer, *Ibadan*
S.W. Quader, BSc, electronic services officer, *Ibadan*
E.O. Akintokun, research vehicle services officer, *Ibadan*
F.K. Alude, HND, heavy equipment and fabrication services manager, *Ibadan*
P.T. Lamuren, BSc, telecommunication services officer, *Ibadan*
M.A. Oyedeji, C&G (FTC), electrical services officer, *Ibadan*
O.O. Taiwo, HND, assistant services officer, *Ibadan*
Auxiliary Services
H. Cameron, manager, hotel and catering services, *Ibadan*
D. Errington, MSc, specialist science teacher, *Ibadan*
D. Hurst, BEd, head, international school of IITA, *Ibadan*
K. Hurst, Dipl. Ed, teacher, international school of IITA, *Ibadan*
C. Inniss-Palmer, MA, specialist english teacher and deputy head, international school of IITA, *Ibadan*
D.J. Sewell, manager, aircraft operations, *Ibadan*
W. Ekpo, ACIS, security manager, *Ibadan*
C.A. Enahoro, HND, head, travel services, *Lagos***
A. Ndakotsu, MBA, assistant head, travel services, *Lagos***
M.O. Olanrewaju, HND, assistant manager, hotel and catering services, *Ibadan*

Italics are used for *country* of work location other than for Nigeria when *location* within Nigeria is given.

* Passed away in 2001
** Left in 2001

Abbreviations used in this report

AFLP	amplified fragment length polymorphism
BDBV	banana die-back virus
BSV	banana streak virus
BCP	Biological Control Products (South Africa)
BMZ	*Bundesministerium für Wirtschaftliche Zusammenarbeit und Entwicklung* (Germany)
CGM	cassava green mite
CIAT	*Centro Internacional de Agricultura Tropical*
CIEPCA	*Centre d'information et d'exchanges sur les plantes de converture en Afrique*
CIFOR	Center for International Forestry Research
CILSS	*Comité inter-Etats de lutte contre la sécheresse dans le Sahel*
CIMMYT	*Centro Internacional de Mejoramiento de Maíz y Trigo*
CIRAD	*Centre de coopération internationale en recherche agronomique pour le développement (France)*
CGM	cassava green mite
CMD	cassava mosaic disease
CSIR	Council for Scientific and Industrial Research
CTA	Technical Center for Agricultural and Rural Cooperation (EEC)
DFID	Department for International Development (UK)
DNA	deoxyribonucleic acid
DREAM	Dynamic Research Evaluation for Management (an impact model)
DS	derived savanna
EACMV	East African cassava mosaic virus
EAHB	East African highland banana
EARRNET	East Africa Root Crops Research Network
EPHTA	Ecoregional Program for the Humid and Subhumid Tropics of Sub-Saharan Africa
ESARC	Eastern and Southern Africa Regional Center
ESA	East and Southern Africa
FIS	Financial Information System
FFS	farmer field schools
FMB	forest margins benchmark area
FOODNET	Postharvest and Marketing Research Network for Eastern and Central Africa
FPR	farmer participatory research
GBDI	Global Biodiversity Institute
GCF	Gatsby Charitable Foundation
GIS	geographic information system
GPS	geo-positioning system
GTZ	*Gesellschaft für Technische Zusammenarbeit (Germany)*
HFC	Humid Forest Ecoregional Center
IARC	international agricultural research center
ICLARM	International Center for Living Aquatic Resources Management
ICRISAT	International Crops Research Institute for the Semi-Arid Tropics
IFAD	International Fund for Agricultural Development
IFPRI	International Food Policy Research Institute
ILRI	International Livestock Research Institute
IPM	integrated pest management
ISNAR	International Service for National Agricultural Research
LUBILOSA	*Lutte biologique contre les locustes et sauteriaux*
NARES	national agricultural research and extension system(s)
NGO	nongovernmental organization
NGS	northern Guinea savanna
NRI	Natural Resources Institute (UK)
PEDUNE	*Project écologiquement durable du niébé*
PL	participatory learning
PRONAF	*Projet niébé pour l'Afrique*
RAPD	random amplified polymorphic DNA
RNA	ribonucleic acid
RUSEP	Rural Sector Enhancement Project
SARRNET	Southern Africa Root Crops Research Network
SP-IPM	Systemwide Program on Integrated Pest Management
STCP	Sustainable Tree Crops Program
USAID	United States Agency for International Development
USDA	United States Department of Agriculture
VPI	Virginia Polytechnic Institute
WAFRINET	West African Network for Taxonomy
WCA	West and Central Africa
WECAMAN	West and Central Africa Maize Network (SAFGRAD)
WECARD	West and Central African Council for Research and Development



IITA Headquarters
Oyo Road, PMB 5320, Ibadan, Nigeria
Tel (234 2) 241 2626
Fax (234 2) 241 2221
E-mail iita@cgiar.org

To Headquarters from outside Nigeria
IITA, c/o Lambourn (UK) Limited
Carolyn House
26 Dingwall Road
Croydon CR9 3EE
United Kingdom

Lagos/Ikeja Office
Plots 531 & 532 WEMPCO Road, Ogba Estate
PO Box 145, Ikeja, Nigeria
Tel (0803) 4023913

IITA Kano Station
Sabo Bakin Zuwo Road
PMB 3112, Kano, Nigeria
Tel (234 64) 645350/645351/645353/624046
Fax (234 64) 645352
E-mail iita-kano@cgiar.org

IITA High Rainfall Station, Onne
PMB 008, Nchia-Eleme
Port Harcourt, Rivers State, Nigeria
Tel (871) 682341880/761841076
Fax (871) 682341882
E-mail iita-onne@cgiar.org

République du Bénin
IITA Biological Control Center for Africa
BP 08 0932 Cotonou, Bénin
Tel (229) 350188
Fax (229) 350556
E-mail iita-benin@cgiar.org

Cameroon
IITA Humid Forest Ecoregional Center
BP 2008 (Messa)
Yaoundé, Cameroon
Tel (237) 2237434
Fax (237) 2237437
E-mail iita-humid@cgiar.org

Uganda
Eastern and Southern Africa Regional Center (IITA-ESARC)
Namulonge, PO Box 7878
Kampala, Uganda
Tel (256 41) 223460
Fax (256 41) 220217
E-mail iita-uganda@cgiar.org

International Institute of Tropical Agriculture
a Future Harvest Center supported by the
Consultative Group on International Agricultural Research

ISSN 0331 4340