



SCIENCE COUNCIL  
**CGIAR**

Report of the  
Sixth External Program  
and Management Review  
(EPMR) of the International  
Institute of Tropical  
Agriculture  
(IITA)

February 2008



SCIENCE COUNCIL

---

CGIAR

Report of the  
Sixth External Program and  
Management Review (EPMR) of  
the International Institute of  
Tropical Agriculture  
(IITA)

Review Panel: Cyrus Ndiritu(Chair)  
Gebisa Ejeta  
Greg Edmeades  
Pammi Sachdeva  
Robert Tripp  
Mary Ncube (Consultant)  
Geoff Norton (Consultant)

JANUARY 2008

The Science Council of the CGIAR encourages fair use of this material provided proper citation is made.

Correct citation: CGIAR Science Council (2008) *Report of the 6<sup>th</sup> External Program and Management Review of the International Institute of Tropical Agriculture (IITA)*. Rome, Italy: Science Council Secretariat

**THIS DOCUMENT CONTAINS:**

- Extracts from the Summary Record of Proceedings of the Annual General Meeting 2007 (AGM07)
- Science Council Commentary
- IITA Response to the Sixth EPMR
- Transmittal letter and Report of the Panel on the Sixth IITA EPMR





## **Consultative Group on International Agricultural Research (CGIAR)**

---

CGIAR Annual General Meeting, 2007 (AGM07)<sup>1</sup>

### **Agenda Item 11. Evaluation (cont'd)**

#### **11.a IITA EPMR**

K. Sierra invited IITA EPMR Panel Chair Cyrus Ndiritu (who participated through videoconference) to make brief remarks. Unfortunately, technical problems resulting in videoconference disconnection prevented him from participating further in the discussion.

R. Wang presented the ExCo13 recommendations.

#### **Decision:**

- Members were pleased with the review panel's assessment that IITA is in good institutional and financial health.
- SC Chair R. Rabbinge remarked that IITA's research for development model/approach has unique features that should be shared with other Centers.
- EIARD expressed support for the panel's recommendations with regard to enhancing partnerships between IITA and CIAT, ILRI, and in particular, FARA.
- They also emphasized the important role of IITA in the regional MTPs.
- IITA Board Chair Brian Harvey assured Members that efforts are being made to resolve the cassava research issue with CIAT.

#### ***Conclusion and Decisions:***

*The CGIAR endorsed the ExCo recommendations on the 6th IITA EPMR.*

---

<sup>1</sup> Extract from the Summary record of Proceedings of Annual General Meeting, 6-7 December 2006



**Science Council Commentary**  
**on the Sixth External Program and Management Review of the**  
**International Institute for Tropical Agriculture (IITA)**

*September 2007*

The Council considered the Report of the Sixth External Program and Management Review of IITA, and the Center's response, at the Science Council's eighth Meeting at Bioversity International, Maccaresse, Italy on the 28th of August 2007. The principle findings and recommendations of the EPMR Panel were presented by the Panel Chair, Dr Cyrus Ndiritu. Responses on behalf of the Center were made by Professor Bryan Harvey, IITA Board Chair and by IITA Director General Hartmann.

**Overview**

The SC notes that the Panel had treated IITA's paradigm for R4D (Research for Development) as an important experiment, including as it did an increased focus on the production to market chain and value addition. The Panel's major recommendations were therefore for the Center to develop an overall strategy to contribute to R4D and to strengthen the alignment between such a Strategy and the Center's MTP Projects and individual grant projects. In addition there was a strong recommendation for IITA to focus more effectively on the management of its science. The SC is pleased to note that the quality of IITA's science is not considered a constraint at the present time but that additional skills and areas for development have been identified so that IITA can match its project research and services to its ambitions for African agricultural development.

The SC strongly supports the need for IITA to complete the development of a new strategic plan to help describe and ensure the longer term focus for its research and show how it contributes to the System Priorities and to the regional alignment. It also supports the Panel's observation that the drawing together of experiences (the synthesis of results in different areas, and evaluation of long- and short-term science) and a thoughtful approach to partnership development (see below) are important inputs into effective strategic planning. A well focused strategic plan linked directly to a business plan for guiding the financing of the strategy is required in order to maintain focus in the R4D approach. The Science Council therefore will, as part of the follow up process to this EPMR, review and comment on the new draft of IITA's strategic plan as soon as it is available, and before SC09.

In the new plan, the SC expects IITA to lay out its definition of the R4D approach (which may also help the development of a CGIAR-wide definition of this term) and the IPG research within that approach. The approach encompasses research on commodity value addition and agribusiness. In this context the Panel advises that IITA's role cannot be to develop and deploy new producer organizations, seed enterprises or agribusiness ventures, but rather to assess which approaches and methods are most effective and to ensure that partners at the national level are able to act on this information. For example, because of the lack of a seed industry in West Africa, there are a number of instances where IITA projects feature community (or other local-level) seed multiplication schemes. Although such schemes may be useful for diffusing new varieties, there is no evidence from IITA that they lead to any sustainable seed production capacity. In addition, the investment in such schemes may dampen incentives for the development of private seed production capacity. It would be appropriate for IITA to address

this dilemma in a more organized way, as it seriously affects the capacities for widespread diffusion of its products. A review and synthesis of its experiences in this field would be in order (for instance with other CGIAR Centers in the implementation of System Priorities or the regional plan). The Science Council supports the Panel's advice for IITA to look more at input markets relevant to its own research products rather than involve itself in research on output markets. The distinction between investing research resources to engage in pilot activities in order to learn lessons from specific experiences, and assuming coordination responsibility for development projects conceived by external donors or national government production campaigns, needs to be made clear in IITA's policy and strategic vision.

### **Research relevance**

The Council is pleased to note that the Panel finds large impacts on cassava production based on IITA's cassava varieties and biocontrol agents, and the Panel commends IITA scientists for communicating these results through a very good publication record. The Panel found that IITA's approaches to crop improvement and plant protection research continue to hold out major opportunities for impact, although in contrast to cassava, there is little published work or impact documented on cowpeas.

The SC agrees with the Panel that research on NRM including soil fertility remains a key issue in Africa and IITA must define its strategy and research in this area in relation to recent developments in fertilizer use such as the Abuja declaration. It would be wise to capitalize on the experiences of IFDC and others in this field. In addition, there is a need to re-energize the plant health related IPM and biocontrol research at IITA. These approaches need to be made explicit in a new IITA strategy.

The SC confirms the Panel's recommendations to strengthen specific areas of science, namely: the consolidation of biotechnology research (to maximize IITA's contributions to this important area of crop improvement research), the need for business plans and the involvement of relevant NARS early on in transgenic breeding programs (as highlighted in the Report of the Biosafety Panel to the CGIAR Science Council on Biosafety Policy and Practices of the CGIAR Centers, Published in May 2007), acquiring biometrics expertise, to raise the profile of cryopreservation and support to germplasm health and transfer systems, to document soil fertility research and advocate more efficient use and input supply systems, to reassess the strategic direction of the Opportunities and Threats project and to strengthen the national agri-business consultative platform and ensure risk assessment and management for IITA.

The SC agrees with the panel that donors need more clarity and guidance in the use of performance indicators such as 3a on the quality and extent of impact assessment work in the Centers. However it does not agree that such indicators have "dubious value". The SC also would not agree that the impact indicators have: "...penalized (Centers) inappropriately and diverted (them) from practical, comprehensive studies of adoption and impact" (p.43) and that "...the requirements of journal publication are often inimical to practical adoption analysis as part of an on-going program of research" (p.78). Quality in the conduct of impact assessments is vital if the results from them are to be regarded as credible, rather than public relations exercises.

### **IPGs and the organization of IITA's science**

The SC finds that it would have been useful if the Panel had been more analytical on the pros and cons of IITA organizing research around the commodity value chain versus the ecosystem approach in terms of generating IPG research. Historically, IITA has oscillated between

structuring its research on ecoregional or crop-based systems. The most recent change of paradigm by IITA, to a more agri-business centered approach to new research based on demand-pull, and commodity value chains, has led to a decline in the use of benchmark sites, previously a mainstay of IITA strategy on NRM research and means of extrapolating results. Ecosystems are no longer seen by IITA as the prime determinant for technology generation. The SC notes that this change might make it more difficult to ensure that IITA results would be turned into IPGs and would maintain that the two approaches are complements, not substitutes. The commodity value chain approach requires analysis to ensure that international spillovers can be generated and that the benefits of gains beyond the farm gate accrue sufficiently to the poor. It is notable that WARDA is being encouraged by its EPMP Panel to better target its research activities using a stratification of its biophysical and socioeconomic environments, which at first sight would seem to be the opposite of IITA's move away from an ecosystem approach. Such alternative approaches would not be conducive to improved programmatic alignment among Centers, which is being encouraged by the CGIAR. Thus, the SC encourages IITA to make its expected modus operandi to produce IPGs clear in its strategy document, and points to examples, such as the "outcome line" approach (described in the recent EPMP Report of CIAT), as potentially useful means of structuring such strategic discussions.

### **Approach to partnerships**

IITA has numerous listed and practical partnerships with national programs and the Panel noted that IITA has expanded partnerships to include the private sector, CSO, ARIs, opportunities from NEPAD, FARA, and science partnerships with other CGIAR Centers and the BeCA facility. However, in engaging with new agri-business initiatives the immediate (and local) focus of IITA has switched to relationships with small and medium-sized enterprises (SMEs) and universities. The Science Council supports the Panel's perceptive assessment of the possible danger for the Center in its long-term relationships with traditional national partners, with a need to re-assess partnerships in relation to new activities and likely Center impacts. The Panel has encouraged a more active and broader engagement with NARS to maintain the traditional links that the Center had built up and to ensure the sustainability of IITA's research interventions in Africa. Capacity building remains a key point of interaction with NARS partners and a contribution to IITA goals. IITA's choice to reduce its direct involvement in training courses in favor of program-associated training is understandable but may have to be executed with some sensitivity to avoid the feeling of dissociation from the work of IITA expressed by some NARS. The Panel has indicated the need for IITA to engage NARS in all aspects of its agri-business and value addition research to enhance collaboration and mutual learning. The Science Council supports this approach.

### **Inter-Center interactions**

Given the major responsibility that IITA has for cassava in Africa, the continuing disagreement between CIAT and IITA over this commodity is detrimental to the CGIAR and its work. The Science Council understands that the major point of dispute is the entry point and phytosanitary control for improved cassava germplasm into Africa. It is imperative that only certified clean germplasm be imported and that African farmers have the opportunity to benefit from a broad selection of improved germplasm. In agreement with the EPMP Panel reports of both IITA and CIAT, the Science Council urges a swift resolution of this issue. It is encouraged by promises from both Board Chairs that steps are being taken to this end and the Science Council will follow progress closely. On the other hand, the SC was very pleased to see the positive statement about the relationship between IITA and Bioversity and between IITA and CIMMYT for the very long standing partnership on maize research in Africa. Given the broad mandate of IITA and its

relative weakness in staple and horticultural crop pest management, IITA would gain from a strategic alliance with AVRDC and ICIPE.

Both the EPMR of IITA, and the simultaneous EPMR Report on WARDA, comment favorably on the steps being taken to align aspects of the corporate services function of the two Centers at the Benin station. WARDA's programmatic linkages are more expressly with Centers having rice research programs (i.e. with IRRI and CIAT as consolidated in a recent agreement). However, the SC notes that both IITA and WARDA EPMR Reports make recommendations for new staff positions (and a Scientific Advisory Panel at WARDA) and this may provide opportunities for the Centers to consider joint appointments or other arrangements (e.g. in the areas of biometrics) to meet the needs of both Centers. Any such arrangements should seek to enhance the role of the IITA staff group and facilities concerned with IPM at the Biocontrol Center for Africa (the Benin station) and not to reduce them.

The SC notes that whilst the Panel records that IITA spent very substantial staff time in contributing to regional planning since the undertaking was agreed in mid 2004, it does not report on the value-added for research from the alignment, or savings to IITA from the possible devolution of activities. There has been similarly slow progress in the initiation of the SSA-CP at the West African site. IITA has been very successful in initiating full cost recovery as part of its financial growth, and yet overhead issues remain contentious in developing IITA partnership relations with CGIAR and associated partners. The Science Council believes that the Alliance Executive has an opportunity to play a more effective role in mediating and galvanizing some of the latent research relationships in West Africa. Drawn out debates can also lead to the disillusionment of partners contributing to collaborative research and consortia, which IITA must guard against.

### **Governance-Board processes and financial management**

The SC is pleased to note the growth and comparative health of IITA's financial resources over the period of the review, suggesting strong support by key donors for its R4D approach and good financial management. It further notes therefore that the Panel's major recommendations in this area are on improving the management of science and science-support functions. The changing research project structure over the period of the review, the incomplete strategic planning, the long term experimentation with the R4D council (just recently made into an advisory body) may all be seen as having delayed IITA's progress and some of the fault lies in the slow implementation of the recommendations of the 5<sup>th</sup> EPMR by the Center. This particularly applies to oversight of the program of science. The SC notes that some of the recommendations in terms of science management in this EPMR are similar to those in the previous one. Thus the SC asks that a detailed report on the progress of implementing the current Panel's recommendations should accompany the submission of the MTP in the next two years. The SC expects to follow developments closely, particularly relating to the science leaders (DDG-R and the Deputy Directors), to ensure that all senior positions are filled and to ensure that they have appropriate and feasible responsibilities to allow for the planning and management of IITA science. There is a concomitant need to strengthen the support to research by enhancing the HR unit to become proactive in recruitment, and strengthen the procurement function.

### **In summary**

The SC offers its thanks to the 6<sup>th</sup> EPMR Panel for its Report. The SC, whilst finding the EPMR Report quite long and somewhat guarded in tone, believes that it is a helpful report for the Center, and for the System, and accepts the Report and its recommendations. The Science Council

believes that the development of a new strategic plan by IITA is essential in order to address the Report's recommendations and to articulate better its research plan for the future. The SC looks forward to reviewing and commenting on a cohesive draft IITA strategic plan and design of the future projects as soon as it is available. The SC asks that the R4D paradigm is clearly defined. The role and pursuit of partnerships needs to be developed and the approach to capacity building is an important component for IITA to articulate too. Soil fertility remains a key issue in Africa, and IITA should define its strategy and research in this area, as well as its stance in relation to recent developments in fertilizer use such as the Abuja declaration.

The Council remains concerned about the IITA-CIAT cassava relationship and looks forward to a timetable for resolution of the issue as a matter of importance for the System.

The Council notes the Panel's cautions about possible mis-interpretation by donors of some indicators of the Performance Measurement System, and these will be kept under constant review. The Council urges IITA to take up the recommendations to which it has agreed in a prompt manner. Delays in responding to the 5<sup>th</sup> EPMR had had an opportunity cost to IITA in terms of strategy development, the priority setting process at program level, and the management of science. Thus the SC asks that specific updates, reporting the steps made towards implementation of the agreed recommendations, be provided as part of the submission of the MTP for the next two years.



## RESPONSE OF IITA BOARD AND MANAGEMENT TO THE 6<sup>TH</sup> EPMR REPORT OF IITA

### A. GENERAL

IITA welcomes the EPMR report. We are in agreement with its findings and recommendations. It will also contribute to the development of our next Ten-Year Strategy. The IITA Board of Trustees' meeting on this strategy was scheduled to benefit from the Panel's input.

We applaud the Panel for touching on some complex developmental themes such as what it takes to contribute to development in the context of the Continent's evolving needs. As per its terms of reference, the Panel focused on what IITA needs to strengthen or pay attention to. It arrived at those recommendations after also noting the strengths of the Institute, such as effective governance and management, and stable finances<sup>2</sup> that allowed IITA to focus on delivery and qualitative aspects of research<sup>3</sup>, protection of its core competences<sup>4</sup>, and the relevant R4D model<sup>5</sup> to impact hunger and poverty in Sub-Saharan Africa.

At the crux of the matter is IITA's R4D model. Like the Panel, IITA is convinced that the traditional approach of conducting research and waiting and hoping for someone to use its results, is *not* adequate. The needs of the poor are simply too great and too pressing for such a 'wait and hope' approach. A "beyond research" approach was needed. IITA initiated programs that help excite, demonstrate, stimulate, and encourage adoption of relevant technologies in addition to its research programs that are trying to address the productivity and profitability of the SSA's food system. The highest levels of government and agribusinesses were engaged to enhance the receptivity and probability of adoption and positive impact. Effective links were forged with advanced research institutions because of the need for basic research and rapid development. The Institute broadened the partnership-base to embrace the government, private sector, universities and others on the delivery end to leverage the "specialization of labor." IITA packaged these elements into a cohesive R4D approach, complete with exit strategies, and tested it out in several countries. This model is expected to deliver spillover effects that "may pay significant dividends for several nations beyond those with which IITA is currently directly engaged"<sup>6</sup>. The approach promotes the focus of agricultural research on addressing major development problems in Africa rather than simply contributing to the body of scientific knowledge. The topic is relevant to this

---

<sup>2</sup> EPMR Report sections – section 5.9.2 (Governance), section 5.7 and 5.8 (Finances)

<sup>3</sup> Ibid, section 3.1. B

<sup>4</sup> Ibid, section on Summary and Recommendations, also 3.1 Summary

<sup>5</sup> Ibid, section 2.4.2

<sup>6</sup> Ibid

EPMR because there were doubts in some quarters about IITA taking this path. The exciting results achieved in Nigeria, touching millions, have already been heard by other governments in Africa and the Institute has been requested to replicate the approach in their countries. Today, four years later, the impact outcomes, investor support<sup>7</sup>, and the conclusions of the Panel give us confidence that we are on the right track. Beyond acknowledging the value of this approach, the Panel identifies areas in staffing and specialization that IITA needs to strengthen if this approach is to reach its full potential. Looking beyond IITA, the Panel challenges the Institute to seek ways to engage its traditional NARS partners in ways that they too gain from its R4D model “in moving through the spectrum of discovery to delivery and along the value chain.”<sup>8</sup> IITA commits to take up this challenge.

In summary, the Institute is appreciative of the helpful analysis that the Panel has generated and in identifying the areas that need attention. We will tackle these with diligence. Any differences in tactics, sequence, and in approaches on how to effectively strengthen the areas identified will be explored and the best options adopted. Both, the Panel and IITA are united in their recognition that the challenges we face in Sub-Saharan Africa are sad, huge and complex and that there is no time or place for complacency within and without IITA. We are encouraged by some positive winds of change on the African Continent.

---

<sup>7</sup> Ibid, section 4.8

<sup>8</sup> EPMR Recommendation 10

## B. RESPONSES TO RECOMMENDATIONS

### EPMR PANEL RECOMMENDATIONS AND IITA RESPONSE

	RECOMMENDATION
1	The Panel encourages IITA proceed to complete its Future Strategy document considering some of the suggestions provided in this report. The Panel <b>recommends</b> that the Center should seek greater congruence between the overall Center strategy, MTP Project planning and the restricted project grants in order to articulate the high priority research and line up the direction of growth with the intentions of R4D. The Panel further <b>recommends</b> that the relationships should be clearly documented as a nested set. The Panel notes that the drawing together of experiences (the synthesis of results in different areas, and evaluation of long- and short-term science) is an important input into the continuing evolution of effective strategic planning.
IITA	<b>Agree</b>
2	The Panel <b>recommends</b> that IITA does not expand biotechnology facilities further into other locations, but instead strengthen the facilities at the two existing hubs to serve the needs of NARS as well as the IITA scientists more adequately.
IITA	<b>(also 4 and 10) Partially Agree:</b> The distinction between research functions and capacity building and service functions involving NARS, as per 2 and 10, is useful. Tissue culture facilities in different countries are required for safe movement of breeding lines of clonally propagated crops. DNA extraction in countries outside the two hubs is necessary as DNA is far easier to transport than plant/pathogen materials. PCR for diagnostics is essential in countries for rapid diagnosis of diseases. Such activities undertaken in the satellite stations with national partners are a powerful capacity building tool in addition to meeting our research needs. This recommendation has cost and efficiency implications that need to be explored very carefully.
3	The Panel further <b>recommends</b> that in order to improve coordination and communication between its biotechnology hubs at Ibadan and Nairobi, IITA should consider appointing a biotechnology coordinator to facilitate the functions of these hubs and enhance effectiveness of the Center's biotechnology thrust.
IITA	<b>Agree</b>
4	IITA is entirely correct in emphasizing the important role of markets in agricultural development in Africa but the Panel <b>recommends</b> the institute to pay more attention to building and strengthening national agri-business capacities for marketing the inputs (such as seed, clonally propagated materials and biocontrol agents) that embody the institute's own technologies, and draw lessons from this experience.
	<b>(also 10) Agree:</b> In implementing the sustainability of programs underscored by this recommendation, also linked to part of 2 and 10, we will examine development fundamentals that impact sustainability against the developments in Africa. The R4D model and our emphasis on the role of markets, that the EPMR Panel also endorsed, include approaches that contribute to this sustainability challenge.
5	Cryopreservation of tissue has the potential to eliminate effects of somaclonal variation and the need for regular field and tissue regeneration of conserved, clonally-propagated germplasm. The Panel <b>recommends</b> that IITA seek support for collaboration with an appropriate ARI to establish dependable cryopreservation protocols.
IITA	<b>Agree:</b> We also concur with the Panel's recognition that the science is still at the level of "exploring" the potential of Cryopreservation. Its potential to reduce conservation costs is an impetus to research this subject as is the potential for higher risk of material loss.
6	The Panel <b>recommends</b> that IITA enhance capacity to provide intellectual and material support to germplasm health and transfer in Africa. This includes appropriate tissue culture protocols, transboundary material passports and indexing capacity and foundation vegetative propagation

	materials. The intention of this recommendation is to further enhance IITA capacity so that this critical expertise can be shared.
IITA	<b>Agree:</b> We have initiated dialogue with the African Union to enhance continental capacity in this domain in addition to enhancing our own capacity.
7	The panel <b>recommends</b> that the goals of the Opportunities and Threats project should focus on commodity-specific as well as multi- or supra-commodity analyses that are linked to a well-defined priority setting and strategic planning process at the project and institute levels.
IITA	<b>Agree:</b> This is an interesting and complex recommendation but the Institute agrees to examine this project. This recommendation seems to suggest that the Opportunities and Threats Project should provide analytical underpinnings for all of IITA’s work at several levels: commodities, supra-commodity level, SSA’s agricultural sector, etc. We will also consider the merits of moving such analytical work outside the MTP group of undertakings.
8	The Panel is concerned that IITA-led strategies for promoting an upward trend in yields, fertilizer use, and soil fertility in the savannas will not adequately meet future food demands. The Panel <b>recommends</b> that IITA prepares a comprehensive summary of its past soil fertility research; that it monitor nutrient flows in its farming systems research and exploit possible genotype x fertility level interactions in its germplasm; and that it enhances advocacy for efficient fertilizer use and supply systems.
IITA	<b>Agree:</b> The recommendation is consistent with our views on the very critical constraint of soil fertility. IITA is also trying to engage others that might be better equipped to handle the subject. These include the 200 strong African Association of Soil Scientists, African universities, and international groups in Africa like TSBF, which specializes on soils, and the newly formed Alliance for a Green Revolution for Africa, which is going to invest very significant sums on the topic of soils and fertilizers. The latter is also consistent with the Panel’s recommendations, 2, 4, and 10.
9	The Panel notes that the IRS vacancy resulting from the departure of the senior statistician has not been filled, and is concerned that the Center is not gaining the full benefit of newer techniques in spatial adjustment of data, in genotype x environment interaction analysis, and in the analysis of molecular information. This concern has also been voiced by several scientists during discussions. The Panel <b>recommends</b> that the position of senior statistician be filled as soon as possible.
IITA	<b>Agree</b>
10	The Panel <b>recommends</b> that IITA recognize its broader responsibility for building capacity towards bringing about lasting and sustainable solutions against hunger and poverty. This requires that IITA engage its NARS partners more actively and more broadly in its R for D, so that all partners gain experience in moving through the spectrum of discovery to delivery and along the value chain.
IITA	<b>(also 2 and 4) Agree:</b> A) The NARS, are our largest partners (see Figure 1, EPMP report) but the engagement of other national partners, including agribusinesses, universities, SROs, pan-African organizations, NGOs, decision makers, governments, and other influential groups, are also essential to addressing the food and agricultural needs of a country. The Panel acknowledges this (see sections 4.5., 4.6., and recommendations 4, 8, and 10). We thus do not differ in view from the panel but rather need to better clarify our perspective, definitions and interpretation of roles. The Institute is also sensitive not to “crowd out” capable NARS. As their strength grows, IITA retracts to other disciplines or countries that need help. It is recognition of the strength of the respective NARS. B) ILRI and FARA’s request to subsidize their operations, via reduced overhead charges, is not something IITA can afford. IITA hosts eight CG supported centers, subsidizing them is beyond its means. IITA also considers that the arbitrary application of overhead rates is not good management.
11	Since an effective Program Committee can greatly facilitate the work of the Board (as well as of Management, if the PC is able to do its work properly), and the issue has been of continuing concern to the IITA Board for some time, the Panel <b>recommends</b> that the Program Committee focus

	on strategic program issues; ensure that it, and its members, do not micromanage scientific activities; and that the Committee receive high-quality analytical papers and other relevant information from Management in a timely manner to enable it to properly undertake its program guidance and oversight responsibilities.
IITA	<b>Agree:</b> The new Chair of the Program Committee has already begun to orientate the Committee in this direction.
12	The Panel <b>recommends</b> that IITA’s research management structure and accountability be strengthened by: a) clearly specifying the responsibility, authority, and lines of reporting for the DDG (R4D), Deputy Directors, and scientists; b) utilizing the Research Development Council (RDC) primarily as an advisory body to the DDG, as per its new Board-approved terms of reference; and c) strengthening the research management function, by appointing Project Managers reporting to the Deputy Directors, for managing the MTP projects included in the research portfolio.
IITA	<b>Agree:</b> We concur with the need to strengthen our research management. 12 a) and 12 b) are already underway. On item 12 c) we will explore its implications. The Institute’s bottom up research management structure may not be easily apparent and we will elaborate it better. There is quite a bit of management below the Directors. The beauty of the current system is that it is a flat structure keeping scientists closer to the decision makers, which leads to more informed and comprehensive decision making. The system has specialized management at MTP project level immediately downstream of the R4D Directorate, which works with project managers, program managers, and senior scientists to manage research. Two examples illustrate the point. The MTP Project “Banana and Plantain Systems” has a number of research managers below the Directors, including two senior breeders (East/Southern and West/Central), heading the respective breeding programs in the region, as well as IPM specialists, and agronomists. The MTP project “Opportunities and Threats” has an impact group, led by a senior scientist, a GIS group led by its unit head, and senior scientists leading the biotic/abiotic stresses section.
13	The Panel <b>recommends</b> that the HR management Unit at IITA become more proactive in establishing effective systems for recruitment, performance management, career advancement, and retention of both IRS and NRS; and in ensuring that the approved HR processes and procedures are consistently followed by managers and staff throughout the organization.
IITA	<b>Agree:</b> We concur on the need for improvement. Our recruitment process (takes too long) and performance measurement for national staff is not where it should be. For example, performance measurement is not fully deployed in Nigeria due to resistance from the workers’ association. The plan for addressing this subject was launched in 2006 and is scheduled for completion in 2009.
14	The Panel <b>recommends</b> that suitable follow-up action for strengthening the procurement function be taken by Management in the coming months, along the lines proposed by the external procurement experts.
IITA	<b>Agree:</b> An external review was completed early in 2007. Implementation begins in September 2007 and will be completed in 24 months.
15	The Panel <b>recommends</b> that the staff and DDG-S (IITA) and ADG (WARDA): a) continue a very collaborative approach to ensuring that the transfer/alignment of corporate services proceeds smoothly; b) closely monitor on a regular basis the progress made by the various Transition Task Forces and the Local Implementation Committees at Cotonou and other sites covered by the MoA; and c) seek to benefit from the experience of other Centers that are aligning corporate services.
IITA	<b>Agree</b>



June 29, 2007

Rudy Rabbinge,  
Chair, Science Council  
Consultative Group on International Agricultural Research  
Wageningen Graduate Schools  
Bode 99, Postbus 102  
6700 AC Wageningen  
The Netherlands

Ren Wang, Director,  
Consultative Group on International Agricultural Research  
The World Bank  
1818 H Street NW  
Washington, DC 20433 USA

Dear Drs. Rabbinge and Wang,

On behalf of the Panel, I am pleased to transmit to you the report of the sixth External Program and Management Review (EPMR) of the International Institute of Tropical Agriculture (IITA). The Panel has reviewed IITA's performance in the four broad areas of: i) mission; strategy and priorities, ii) quality and relevance of the science; iii) effectiveness and efficiency of management (including governance and finance); and iv) accomplishments and impacts. We have also endeavored to address the list of strategic issues raised by the Science Council.

The Panel finds IITA has maintained its commitment to science for an effective and sustainable research for development program with strong regional and political partnerships in sub-Saharan Africa. The Center has strong support for its approach from its principle investors. The Panel has made fifteen major recommendations and a number of suggestions aimed at improving the quality of planning and management by the Center. For example, the Panel recommends that the Center should seek greater congruence between the overall Center strategy and other project planning activities and to bring these into line with the restricted grant projects that it is pursuing. Furthermore the Panel recommends that IITA's research management structure be strengthened, particularly at the project management level and with due attention to work loads and regional research responsibilities. The Center is also encouraged to give greater attention in developing its new partnerships as the R4D activities are further entered into so that both traditional and new partners are suitably involved, and can benefit from the commodity and value chain

approaches that are being undertaken. Programmatically, we see opportunities for IITA to do more in natural resources management to underpin the commodity and product focus and to provide leadership to the continent in aspects of plant health.

The Panel notes that due to the effective reforms and management shown by the Director General and Board at the beginning of the review period, the Center overcame a possible financial crisis and has shown strong growth since. Given this solid base and the generally sound practices of the Board, the Panel has focused attention on means to raise the effective participation of the Program Committee in providing strategic guidance to the Center. The Center is now moving to fill the senior management posts and the Panel confirms the need to continue to develop sound scientific management in support of the overall R4D strategy.

The Panel would like to express its thanks to the IITA Board, management and staff, who cooperated with us in every way and provided us with all the information and facilities we required.

Finally, the Panel members join me in expressing our appreciation for the assistance provided by Peter Gardiner, the SC Secretariat representative and Panel Secretary. We are also very grateful for the opportunity to participate in the challenging task of conducting this review. We hope that the Report will be useful to IITA and its partners, as well as to the CGIAR.

Yours sincerely,

A handwritten signature in black ink, appearing to read 'C. Ndiritu', written in a cursive style.

Cyrus G. Ndiritu  
Panel Chair,  
Sixth External Program and Management Review, IITA

CONSULTATIVE GROUP ON INTERNATIONAL AGRICULTURAL RESEARCH  
SCIENCE COUNCIL AND CGIAR SECRETARIAT

**Report of the  
Sixth External Program and Management Review (EPMR)  
of the International Institute of Tropical Agriculture (IITA)**

Review Panel: Cyrus Ndiritu (Chair)  
Gebisa Ejeta  
Greg Edmeades  
Pammi Sachdeva  
Robert Tripp  
Mary Ncube (Consultant)  
Geoff Norton (Consultant)

SCIENCE COUNCIL SECRETARIAT

JULY 2007



## CONTENTS

SCIENCE COUNCIL COMMENTARY .....	vii
SUMMARY AND RECOMMENDATIONS .....	1
1 INTRODUCTION, BACKGROUND AND CONTEXT .....	9
1.1 Introduction: Background to IITA's Mandate - The African Challenge .....	9
1.2 The Current and Future Challenges for African Agriculture and IITA .....	9
1.3 IITA's Historical Approach up to the Last EPMR.....	11
1.4 Present and Future Challenges for IITA's Mandate Crops and Agroecological Regions .....	11
1.5 The Evolution of IITA's Current Focus and Themes .....	12
1.6 The EPMR .....	15
1.7 Response of IITA to the 5 <sup>TH</sup> EPMR Recommendations .....	15
1.8 Recent Center Commissioned External Reviews .....	17
1.9 Scope and Method of Evaluation.....	18
2 STRATEGY, PRIORITIES AND PROGRAM.....	21
2.1 IITA Vision, Mission and Goals.....	21
2.2 Mandate and Geographic Scope.....	21
2.3 Strategic Plans .....	22
2.4 Positioning of IITA in the R4D Continuum .....	24
2.5 Setting Priorities.....	26
2.6 Components of IITA's Approach.....	30
3 QUALITY, RELEVANCE AND IMPACTS OF SCIENCE .....	39
3.1 Quality of Science at IITA .....	39
3.2 Current Research Agenda and Scope.....	45
3.3 Assessment of the MTP Projects .....	45
3.4 Cross Cutting Issues .....	72
3.5 Research Locations .....	83
3.6 Science Support Units .....	84
3.7 Capacity Building .....	85
4 STAKEHOLDER RELATIONSHIPS: ASSESSMENT OF PARTNERSHIPS, PROGRAMS AND CENTER IMPACTS .....	87
4.1 IITA's Attitude to Partnership .....	87
4.2 Inter-Center Relations .....	89
4.3 Relations with NARS.....	91
4.4 Advanced Research Institutes and African Universities.....	94
4.5 Private Enterprise .....	95
4.6 Non-Governmental Organizations.....	95
4.7 Sub-Regional Organizations.....	96
4.8 Investor Relations .....	96
4.9 Policy and Advocacy with Governments.....	96

5	GOVERNANCE AND MANAGEMENT .....	99
5.1	Introduction.....	99
5.2	Record of Reforms .....	100
5.3	Pace of Implementation .....	101
5.4	Governance.....	102
5.5	Management.....	110
6	IITA TODAY AND IN THE FUTURE.....	129
6.1	IITA Today.....	129
6.2	Continuing Challenges.....	130
6.3	Where can IITA be in Five Years?.....	131
6.4	How Would it Have Got There?.....	132

## TABLES

---

1.1	Crop statistics and trends for IITA's mandated crops (FAOSTAT, 2007) .....	12
1.2	Implementation of the 5 <sup>th</sup> EPMR Recommendations .....	16
1.3	List of Center-Commissioned External Reviews and a donor-review of a Project conducted since the last EPMR.....	17
2.1	IITA's "Development Dialogue" 2004-2006.....	24
3.1	Germplasm collections held in IITA's Genebank (March, 2007) .....	46
3.2	Production, area planted, and yield of cassava and yams in Eastern and Southern Africa and in West and Central Africa (Source: FAOSTAT, 2007). .....	50
5.1	Board Composition .....	105
5.2	Income and Expenditures based on Audited Results 2001-2006 (UD\$'000) .....	114
5.3	IITA's Top Donors 2001-2006 (US'000).....	115

## FIGURES

---

4.1	Distribution of IITA partners and organizations by geographical regions.....	88
5.1	IITA Organizational Chart.....	111
5.2	IITA's Research for Development Council and Research Management Structure .....	113

## ANNEXES

---

1	General and Specific Terms of Reference for the Conduct of the 6th External Program and Management Review of IITA .....	A-1
2	Recent Center Commissioned External Reviews of IITA and its Projects and Programs.....	A-3
3	IITA Third EPMR Panel Composition and Biodata .....	A-53
4	List of Panel visits and Persons Met During the Conduct of the Review. ....	A-58
5	Geographical Spread of IITA.....	A-65
6	Indicators of Science Quality .....	A-66
7	Global Importance of Bananas and Plantains .....	A-67
8	Recommendations of the CCER of the Systemwide Program on Integrated Pest Management (Conducted May 2007) .....	A-69
9	Description of the Thrust and Achievement of the Crop Breeding Program at IITA, 2001-2006.....	A-72
10	Geographical Foci of the Breeding Programs.....	A-83

11	Natural Resource Management (NRM) Research at IITA over the Past Decade .....	A-84
12	IITA's Guiding Principles for Development and Deployment of Genetically Engineered Organisms .....	A-97
13	Number and Categorization of IITA's Partners.....	A-98
14	Acronyms .....	A-99



## SUMMARY AND RECOMMENDATIONS

The International Institute for Tropical Agriculture (IITA) is one of the longest established Centers of the CGIAR and currently is the largest in terms of budget. IITA's target is the improvement of African development through research on agriculture. The Sixth External Program and Management Review of the Center took place between March and June 2007.

The review was conducted at a time when the context of agricultural research in Africa is changing; there is both the stark reality of current poverty levels and population growth still to be accommodated (an anticipated increase of 80-100 million more people by 2012) and a sense of renewed purpose. The Millennium Development Goal of halving the proportion of poor people is still within reach at the worldwide level, but many individual countries in Sub-Saharan Africa will most likely not reach this goal and, in some, average poverty rates remain above 40 percent. The Africa Union's NEPAD Comprehensive African Agricultural Development Program (CAADP) helps provide a framework for harmonized and responsive action into which research efforts can fit.

IITA's historical approach has been to focus on the genetic improvement of its mandate crops (cassava, yams, cowpeas, plantain, banana, and maize) and on the sustainable intensification of the farming systems in which they are found in Sub-Saharan Africa (SSA). Major advances have been made in the past in the introduction of disease resistance into its target crops and IITA was a past leader in integrated pest management approaches. It continues to place emphasis on management of major disease threats (e.g. cassava brown streak disease, banana wilt), post harvest contaminants (fungi producing mycotoxins on maize) and pests such as the parasitic weed *Striga*. The Center augments this approach by conservation of targeted species for agriculture. It worked formerly through an approach focused on agroecologically-defined sub-regions.

The Center's new draft Strategy document offers a number of modifications. IITA continues to do research on resource and crop management and plant health, but these no longer form the basis for organizing the research program. Instead, its MTP Projects are organized by commodity-based systems (roots and tubers, banana and plantain, cereals and legumes, high value crops), cross cutting projects (agrobiodiversity, agriculture and health, the System-wide program on IPM), and one which could address long term planning. There is general agreement between these areas and the new CGIAR System Priorities for Research focused on diversification, high value crops and nutritional quality and food safety. Although an ecoregional orientation remains, agroecological zones are no longer seen as the prime determinant for technology generation. IITA has a more explicit commitment to Africa-wide bodies in areas such as phytosanitary control, regional research, agricultural trade, and food health. This commitment is illustrated by growing attention to regional research organizations and political bodies, particularly the African Union and its NEPAD program. Although IITA has considered broadening its mandate to the whole of Africa, the Panel concurs with the Center's assessment not to extend the geographical mandate of IITA to North Africa and to remain focused on SSA.

In the period covered by the review, (essentially 2001 to early 2007) the Center has promoted the concept of "Research for Development" (R4D). The adoption of the Research for Development paradigm encompasses different trajectories and points of application for research. Firstly, there is the improvement of crops to enhance yields and ensure food security in the face of increasing human population pressure and the stress of crop diseases and pests. Secondly there is the

possibility of creating local income from the diversification of farming systems (to include higher value commodities such as fruit and vegetables, as encouraged by the new CGIAR System Priorities for Research). Thirdly, and as proposed in the new IITA draft strategy document, is the possibility of developing agri-industrial approaches for commodities (such as cassava) that have alternative products and outlets. This is a vision of agricultural research that seeks to address major development problems in Africa by paying attention to the “demand-pull”, principally by ensuring that market development provides adequate incentives for farmers (to complement the “supply-push” of new technology) to diversify and intensify their production. The Center has argued that this will have more impact not only in enhancing agricultural production but also in strengthening the wider value chain. R4D requires attention to a wide range of issues that traditionally have been beyond the immediate interests of most agricultural research institutes; IITA’s current involvement in areas such as the rehabilitation of the West African cocoa industry and the expansion of industrial demand for cassava are examples of this new paradigm. The Panel believes that IITA will require new expertise to accomplish the agri-business approach. While there has been some apprehension in some quarters, several of IITA’s major donors are supportive of this approach. The success of R4D, and the destiny of IITA’s mission and goal, is going to be tied to the Center’s continued commitment to science. This includes the long term-research that has brought IITA to its present position, and to the future framing of investigation and research. The Report places emphasis on the need for planning and managing that science.

Internally, IITA has experimented with a Research for Development Council (RDC), with Members elected by staff rather than a traditional line management through a Deputy-Director General of Research as suggested by the 5<sup>th</sup> EPMR. The RDC, with Board approval, will revert to a more advisory role to the Center’s Management, which the Panel believes to be appropriate. However, the experimental nature of the arrangement and the slow implementation of the recommendations of the last EPMR have come at some opportunity cost for the Center. This is evidenced by the large number of changes in the arrangement and targeting of Projects (a process which is still incomplete). In the period between EPMRs, IITA conducted 7 Center Commissioned External Reviews (CCERs) and there was an independent review of an earlier Project conducted by a donor. The Panel found that there was a tendency for the CCER Reports to address process and Project structural issues rather than science quality. This may in part arise from a) inadequate terms of reference, and, b) inadequate preparation on behalf of the Center, and the Panel makes suggestions for improvement of the performance of the CCERs. For these reasons, the present Report considers the future of the Projects and cross cutting issues for IITA in some detail.

However, the Panel does not consider that the quality of science at IITA is a serious constraint to achieving the mission of the Center at this time, though it also recognizes that good science begins by asking the right questions and building appropriate research skill sets to address those research issues. Since the last EPMR, IITA has made strides to strengthen its capacity in socioeconomics and has materially improved its impact assessment approaches. The Panel would like to see these capacities marshaled more effectively to help IITA learn lessons from its wide experience that can then be applied to the further development of Center projects (as reflected in Recommendations 4 and 7 below). Good quality science will only lead to practical outcomes if research programs allow the opportunity for a comprehensive and long-term effort, a goal that may be threatened by reliance on multiple projects with varying mandates. In relation to long-term impacts the panel would like to encourage IITA to document its experiences carefully especially because it has a responsibility to dialogue with those who apply the impact instruments in the CGIAR. However, there is much more that IITA needs to do to foster an effective impact culture and to focus impact research on relevant objectives.

The Center's policy of protecting its core competencies appears to be working effectively in the crop improvement programs, but has faltered somewhat in natural resource management. Crop improvement and plant protection research continue to hold out major opportunities for impact. It is important therefore that IITA maintain its core biotechnology capability, so that it seizes the opportunity to use molecular breeding techniques whenever their cost effectiveness can be demonstrated in an African context. The Center in general has appropriate policies and processes, e.g. for biosafety, management of research data etc and communications have improved. The Panel views the agri-business approaches being developed by IITA as important experiments, and urges the Center to ensure that these are science-based, well planned and supported by the necessary expertise. It will be necessary to continually identify the research questions that are being addressed at the various points in the production and value chains and to effectively share these experiences with a wide array of partners to ensure learning and spillovers.

The Panel's Report, therefore, puts emphasis on the need for IITA to strengthen the alignment and relationship of Center and individual Project Strategies and in the Management of science and provides 15 Recommendations:

### **On Center Strategy**

**Recommendation 1:** The Panel encourages IITA to proceed to complete its Future Strategy document considering some of the suggestions provided in this report. The Panel *recommends* that the Center should seek greater congruence between the overall Center strategy, MTP Project planning and the restricted project grants in order to articulate the high priority research and line up the direction of growth with the intentions of R4D. The Panel further recommends that the relationships should be clearly documented as a nested set. The Panel notes that the drawing together of experiences (the synthesis of results in different areas, and evaluation of long- and short-term science) is an important input into the continuing evolution of effective strategic planning.

### **Cross-cutting approaches supporting research**

Noting the tendency for IITA to respond to local needs or to be drawn into the development of facilities for biotechnology at many of the sites it works, particular when sharing facilities with NARS, the Panel makes two recommendations into the focus of biotechnology at IITA (through Ibadan and the BECA facility in Nairobi) and its management.

**Recommendation 2:** The Panel *recommends* that IITA does not expand biotechnology facilities further into other locations, but instead strengthens the facilities at the two existing hubs to serve the needs of NARS as well as the IITA scientists more adequately.

**Recommendation 3:** The Panel further *recommends* that in order to improve coordination and communication between its biotechnology hubs at Ibadan and Nairobi, IITA should consider appointing a biotechnology coordinator to facilitate the functions of these hubs and enhance effectiveness of the Center's biotechnology thrust.

## **Cross cutting approaches - Focusing research on markets**

**Recommendation 4:** IITA is entirely correct in emphasizing the important role of markets in agricultural development in Africa but the Panel *recommends* the institute to pay more attention to building and strengthening national agri-business capacities for marketing the inputs (such as seed, clonally propagated materials and biocontrol agents) that embody the institute's own technologies, and draw lessons from this experience.

### **In relation to Programs**

Underpinning the critically important conservation work that IITA does are considerations of cost, insurance against unforeseen events and genetic stability. As the conservation efforts underpin all of IITA's improvement programs for the region it serves, and sharing improved germplasm both by IITA and amongst partners carries with it concerns for plant health across the continent, the Panel makes two recommendations in relation to partnerships in cryopreservation technology and extending IITA's plant health facilities.

**Recommendation 5:** Cryopreservation of tissue has the potential to eliminate effects of somaclonal variation and the need for regular field and tissue regeneration of conserved, clonally-propagated germplasm. The Panel *recommends* that IITA seek support for collaboration with an appropriate ARI to establish dependable cryopreservation protocols.

**Recommendation 6:** The Panel *recommends* that IITA enhance capacity to provide intellectual and material support to germplasm health and transfer in Africa. This includes appropriate tissue culture protocols, transboundary material passports and indexing capacity and foundation vegetative propagation materials. The intention of this recommendation is to further enhance IITA capacity so that this critical expertise can be shared.

IITA is developing three cross cutting programs, one of which has the capacity when properly planned and focused to support the research priority setting goals of the Center. For this reason the Panel places particular emphasis on the appropriate planning for the "Opportunities and Threats" MTP Project.

**Recommendation 7:** The panel *recommends* that the goals of the Opportunities and Threats project should focus on commodity-specific as well as multi- or supra-commodity analyses that are linked to a well-defined priority setting and strategic planning process at the project and institute levels.

The Panel carefully considered the role and current capacity of Natural Resources Management research at IITA, given the production and product focus of much of the developing portfolio. Whilst IITA has published some of its earlier results in this area, the Panel is concerned that here, as in some other areas, the Center is not utilizing its available information in a way to identify gaps and to comprehensively inform the overall strategic direction for Natural Resource Management particularly in relation to soil recapitalization. The Panel, therefore, makes the following recommendation:

**Recommendation 8:** The Panel is concerned that IITA-led strategies for promoting an upward trend in yields, fertilizer use, and soil fertility in the savannas will not adequately meet future

food demands. The Panel *recommends* that IITA prepares a comprehensive summary of its past soil fertility research; that it monitor nutrient flows in its farming systems research and exploit possible genotype x fertility level interactions in its germplasm; and that it enhances advocacy for efficient fertilizer use and supply systems.

To underpin good agricultural science, the Panel is convinced that IITA needs to pay more attention to backstopping its own science and that of partners with statistical support and makes the following recommendation:

**Recommendation 9:** The Panel notes that the IRS vacancy resulting from the departure of the senior statistician has not been filled, and is concerned that the Center is not gaining the full benefit of newer techniques in spatial adjustment of data, in genotype x environment interaction analysis, and in the analysis of molecular information. This concern has also been voiced by several scientists during discussions. The Panel *recommends* that the position of senior statistician be filled as soon as possible.

Although IITA reports a large number of different partnerships, in reviewing IITA's draft strategy, and in meeting some of IITA's research partners in the field, the Panel is concerned that the traditional strength and emphasis on partnership with the NARS is waning in some cases. Elements of this are to do with reduction in formal capacity building for NARS participants for which the Center finds it harder to command funds and so has developed a more programmatic means of engagement starting in 2002. However, the Panel is most concerned that in a redefinition of NARS by the Center and a selective focus on universities and SMEs as partners in agroindustrial projects, that the Center is in danger of by-passing the source of sustainability for such initiatives beyond IITA's involvement. The Panel puts particular emphasis on the following Recommendation if IITA is to fulfill its espoused strategy:

**Recommendation 10:** The Panel *recommends* that IITA recognize its broader responsibility for building capacity towards bringing about lasting and sustainable solutions against hunger and poverty. This requires that IITA engage its NARS partners more actively and more broadly in its R for D, so that all partners gain experience in moving through the spectrum of discovery to delivery and along the value chain.

IITA has generally had good relationships with other CGIAR Centers and associated partners. However, there are still concerns that relationships with CIAT (over the introduction of cassava germplasm) and ILRI and FARA (which in part concern overhead rates) are not yet resolved and the Panel urges IITA and its partners to address these, noting the role that the Alliance might play in mediating such concerns. Whilst the Panel has sympathy for IITA's positions in these discussions, drawn out debates can also lead to the disillusionment of partners contributing to collaborative research and consortia which IITA must guard against (particularly, for example, in the Kano site for the SSA-CP and in the collaborative development of the regional action plan for WCA).

In considering the Governance and Management of IITA, the Panel commends the manner in which the DG and Board have handled earlier financial difficulties and managed the growth of the Center in the review period. The Center has enjoyed particularly cordial relationships with its host government and has been singled out to join in commodity improvement projects which are likely, if successful, to have wider spillovers. The Panel's recommendations therefore focus on the management and support of the scientific program.

## **On the Program Committee of the Board**

**Recommendation 11 :** Since an effective Program Committee can greatly facilitate the work of the Board (as well as of Management, if the PC is able to do its work properly), and the issue has been of continuing concern to the IITA Board for some time, the Panel *recommends* that the Program Committee focus on strategic program issues; ensure that it, and its members, do not micromanage scientific activities; and that the Committee receive high-quality analytical papers and other relevant information from Management in a timely manner to enable it to properly undertake its program guidance and oversight responsibilities.

## **On research management**

**Recommendation 12:** The Panel *recommends* that IITA's research management structure and accountability be strengthened by: a) clearly specifying the responsibility, authority, and lines of reporting for the DDG (R4D), Deputy Directors, and scientists; b) utilizing the Research Development Council (RDC) primarily as an advisory body to the DDG, as per its new Board-approved terms of reference; and c) strengthening the research management function, by appointing Project Managers reporting to the Deputy Directors, for managing the MTP projects included in the research portfolio.

## **On human resources management**

**Recommendation 13:** The Panel *recommends* that the HR management Unit at IITA become more proactive in establishing effective systems for recruitment, performance management, career advancement, and retention of both IRS and NRS; and in ensuring that the approved HR processes and procedures are consistently followed by managers and staff throughout the organization.

## **On the procurement function**

**Recommendation 14:** The Panel *recommends* that suitable follow-up action for strengthening the procurement function be taken by Management in the coming months, along the lines proposed by the external procurement experts.

## **On the relationship and alignment with WARDA**

The Panel notes the good working relationships at a) Cotonou, Benin, where WARDA staff are temporarily housed and where the two Centers share facilities, b) Ibadan, where some rice research is conducted by WARDA scientists using plots on the Ibadan site. However, WARDA's natural programmatic linkages are with IRRI and CIAT and IITA does not intend to take on more rice research. The major forms of alignment therefore are through shared Board members of these West Africa- based Centers, and through the planned rationalization of corporate services functions. The Panel makes the following recommendation.

**Recommendation 15:** The Panel *recommends* that the staff and DDG-S (IITA) and ADG (WARDA): a) continue a very collaborative approach to ensuring that the transfer/alignment of corporate services proceeds smoothly; b) closely monitor on a regular basis the progress made by the various Transition Task Forces and the Local Implementation Committees at Cotonou and

other sites covered by the MoA; and c) seek to benefit from the experience of other Centers that are aligning corporate services.

In conclusion: The 5<sup>th</sup> EPMR had suggested that IITA should seek to improve the quality of its science. This Panel is happy to report that the Center has indeed started down the road towards that goal and is making good progress. An effective and sustainable R4D program will work towards ensuring that development is truly driven by science. However, good quality science will only lead to practical outcomes if research programs allow the opportunity for a comprehensive and long-term effort, a goal that may be threatened by reliance on multiple projects with varying mandates. The Center's policy of protecting its core competencies appears to be working effectively in the crop improvement programs, but continuing attention to natural resource management issues are required. The Panel believes that the Center now has a good opportunity to adjust its strategic plan and to align internal planning with its espoused vision. To put science at the core of its approach, IITA needs to enhance the planning and management of its Projects and the balance of sub-regional efforts in alignment with the new strategy. It is important that IITA maintain its core biotechnology capability, so that it seizes the opportunity to use molecular breeding techniques whenever their cost effectiveness can be demonstrated in an African context.

The Panel is concerned about the relationships between IITA and its traditional NARS partners. IITA needs to make adjustments in the nature and level of national engagement as its portfolio of activities unfolds, and it often does. Unfortunately, the direction of IITA's new modality for evolving partnerships has stirred misgivings in some countries. The expectations of collaborating NARS is that partnerships will evolve where some responsibility is shifted to NARS, and IITA scientists will move to focus in areas where the NARS have not yet achieved sufficient strength. The R4D agenda provides many new frontier areas, as this Report discusses, and long term partnerships are the key to the sustainability of activities currently being planned. Where relations have soured, partners fear that they are shunned because of their demand for a greater role in joint R&D efforts and their request for greater share of research grant support for their higher level of engagement. IITA's future approach to partnerships within the R4D paradigm needs to be a carefully thought through part of the new strategy development to avoid losing the major gains it has made historically in relationships with NARS partners.

The Panel is cognizant that IITA has had a momentous five year period in which many major adjustments in research for development approach were initiated and continue to be implemented. While the Panel believes that the new R4D approach is an exciting experiment, it would at the same time wish to encourage the Center to proceed with cautious optimism. IITA should ensure that the right monitoring and evaluation mechanisms are put in place in order to provide the basis for long term impacts, while at the same time providing a means of capturing the lessons learnt for purposes of scaling-up and for making internal programmatic adjustments with time. It is against such a background that the Panel made a series of specific recommendations and suggestions believing that they will be helpful to the Center in the further development of its strategy and its espoused approach. It is the hope of the Panel that once the recommendations are agreed upon, IITA will expedite their implementation.



## **1 INTRODUCTION, BACKGROUND AND CONTEXT**

### **1.1 Introduction: Background to IITA's mandate - The African Challenge**

By the time of the founding of the International Institute for Tropical Agriculture (IITA) in 1967, the symptoms of deterioration in African agriculture were apparent. An earlier assessment<sup>9</sup> observed that between 1965 and 1973, agricultural production in Africa was growing at a paltry annual average rate of 2.4 percent, while the population was increasing at 2.6 percent. Between 1973 and 1980, the annual rate of agricultural production fell drastically to 0.3 percent, while the population rate increased to 2.8 percent. Then between 1980 and 1987, though a slight improvement in agricultural growth could be observed, production performance was still depressed in a period when population increase was accelerating to reach an annual rate of over 3.0 percent.

According to the 1989 World Bank indicators for Africa and other parts of the world, nowhere else had the situation evolved so negatively and so rapidly (World Bank, 1989). This grim assessment was also confirmed by FAO statistics of the time which showed that, among all continents, only the African index of agricultural production per capita had been negative since 1965 (FAO, 1987). The consequence of this situation was that Africa was fast becoming unable to feed its population, and its economic situation sharply deteriorated simply because agriculture continues to represent over 33 percent of gross domestic product (GDP) in sub-Saharan countries, and for some countries up to 76 percent of the GDP.

It is against such a grim situation that the nascent IITA started its work in Ibadan, Nigeria, in July 1968, with a preliminary mandate of working on important African crops and cropping systems pioneered by cowpea and other grain legumes as well sweet potato and yam. IITA was expected to collaborate with IRRI on rice, CIMMYT on maize and CIAT on cassava. As time went on, IITA expanded its mandate to include banana and plantain. Even at this very early stage some in the founding fraternity were not convinced as to the wisdom of one Center being mandated to handle such a large array of crops and cropping systems in a region as vast and as diverse as Africa.<sup>10</sup> It was however argued convincingly to the sponsors that a diversified IITA program would provide immense benefits to the developing national research systems that required information in a multiplicity of crops and cropping system approaches.

### **1.2 The Current and Future Challenges for African Agriculture and IITA**

Hunger affects more than 840 million people worldwide. More than 300 million of these people are in Africa. According to the World Bank Development Indicators (WDI) for 2007, the number of people living on less than a dollar a day in the world reduced by 260 million in the period 1990-2004. However, in Sub-Saharan Africa (SSA) the number rose by over 60 million<sup>11</sup>, indicating the rampant and ever increasing poverty in Africa compared with the rest of the world. The Millennium Development Goal of halving the proportion of poor people is still within reach at the worldwide level, with a projected decline from 29 percent to 10 percent between 1990 and 2015. But many individual countries will most likely not reach it, particularly those in Sub-Saharan Africa, where average poverty rates remain above 40 percent, raising concerns of widening inequalities between regions. Poverty is often partnered by severe food insecurity

---

<sup>9</sup> Paraphrasing Jacques Diouf's assessment of the situation during the 1989 Sir John Crawford Memorial Lecture

<sup>10</sup> R.F. Chandler

<sup>11</sup> World Development Indicators for 2007

which in turn leads to malnutrition. The overall picture for Africa is one in which the total human health and wealth is severely challenged under the current developmental strategies.

For Africa, more than anywhere else, agriculture is a key contributor to the overall development portfolio<sup>12</sup>. This fact has been recognized for a long time and many documents “parrot” the importance of African agriculture to development but so far no real solution has been found to work. Recently, the Africa Union’s NEPAD has developed a strategy for catalyzing agricultural growth under its Comprehensive African Agricultural Development Program (CAADP)<sup>13</sup> with the hope that this will help revitalize African agriculture. The program has been endorsed by African leaders and aims to provide a framework for harmonized and responsive action through four key thrusts:

- Extending the area under sustainable land management and reliable water control systems;
- Improving rural infrastructure and trade related capacities for market accesses;
- Increasing food supply, reduce hunger, and improve responses to food emergency crises;
- Improving agriculture research, technology dissemination and adoption.

The NEPAD goal for the sector is agriculture–led development that eliminates hunger, reduces poverty and food insecurity while at the same time opening the way for enhanced agricultural export trade. The NEPAD-CAADP vision for agriculture is not very different from some of the Millennium Development Goals (MDG) and neither is it far removed from the CGIAR core priorities, but the CAADP envisages that the continent should, by the year 2015:

- Improve the productivity of agriculture to attain an average annual growth rate of 6 percent, with particular attention to small-scale farmers, especially focusing on women;
- Have dynamic agricultural markets within countries and between regions;
- Have integrated farmers into the market economy and have improved access to markets to become a net exporter of agriculture products;
- Achieved a more equitable distribution of wealth;
- Be a strategic player in agricultural science and technology development
- Practice environmentally sound production methods and have a culture of sustainable management of the natural resource base.

According to the NEPAD secretariat, the challenge that is now facing the CAADP process is to move beyond and build upon the political commitment to prepare bankable projects and programs as well as mobilize funding and expertise to implement these projects and programs. Now more than ever before IITA has a script from which to read and craft its programs for an even more meaningful contribution to agricultural development which is concomitant with the priorities of the African governments and consequently the African people, and hopefully the future yardstick for the IITA’s performance will be reflective of these aspirations.

It is clear though, that in the past, and particularly the period under review by this EPMR panel, IITA has made substantial efforts to understand the impediments of growth to African agriculture and also articulate its contribution towards resolving these hurdles. Detailed analysis of IITA’s interpretation of its role in African agriculture is presented in the Center’s Medium Term Plan (MTP) covering the period 2007-2009 (current at the time of the 6<sup>th</sup> EPMR). In the MTP, IITA has re-evaluated its resources and its ability to apply new technologies and describes a

---

<sup>12</sup> Marsha Felecia Benjamin (2006) The Contribution of Agriculture to Development

<sup>13</sup> Implementing the Comprehensive Africa Agricultural Development Program and Restoring Food Security in Africa- The Road Map

revamping of its Project structure and its partnerships with NARS, other CGIAR Centers and the ARIs. The Panel's detailed analysis of the MTP Projects is presented in Chapter 3. Importantly for this EPMR is that, in the MTP, IITA responded to the specific recommendations of the preceding, 5<sup>th</sup> EPMR which should have guided the actions taken by the Center over the last five years or so.

### 1.3 IITA's Historical Approach up to the Last EPMR

IITA's historical approach has been to focus on the genetic improvement of its mandate crops and on the sustainable intensification of the farming systems in which they are found in SSA. Germplasm improvement research introducing disease resistance into its target crops has had large agricultural and economic impacts in Africa – notably in combating cassava mosaic disease. IITA was a past leader in integrated pest management approaches, and the control of cassava mealy bug has illustrated the large return to research investments from this approach<sup>14</sup>. It continues to place emphasis on management of major disease threats (e.g. cassava brown streak disease, banana wilt), post harvest contaminants (fungi producing mycotoxins on maize) and pests such as the parasitic weed *Striga*. The Center augments this approach by conservation of targeted species for agriculture; for instance, in 2006, IITA held 6500 germplasm accessions of yam, cassava and banana/plantain. Formerly, the Center adopted an agroecological zone (AEZ) approach to SSA, defining its researchable problems in relation to the intensification of agriculture in the dry and moist savannas, the mid-altitude zone and environmentally appropriate exploitation of tree crops in the humid forest zone. This included collaborative interactions with livestock research provided by others. Increasing emphasis has been placed on the diversification of income-generating activities. IITA engaged in substantial capacity building of national partner scientists and organizations in SSA, holding large numbers of individual and group training courses until the latter were phased out in 2002.

### 1.4 Present and Future Challenges for IITA's Mandate Crops and Agroecological Regions

IITA's traditionally mandated crops are cassava, yams, cowpeas, plantain, banana, and maize. The human population in SSA is estimated to be growing at 2.5% per annum, and it is of interest to compare rates of change in productivity gains of IITA's crops against this rate. Estimates of gain for production, planted area or yield fell below 2.5% /yr in 4 of the 7 crops, 5/7 and 6/7 crops, respectively, in east and southern Africa (ESA) from 1990-2005. Similar figures for West and Central Africa (WCA) for production, area and yield showed gains of less than 2.5%.yr in 3/7, 5/7 and 6/7 crops, respectively. Relaxing the standard to a 1% annual increase in production, area and yield shows that this was not met in 2/7, 2/7 and 5/7 crops in ESA, and in 1/7, 3/7 and 5/7 crops, respectively, in WCA. Thus yield increases failed to reach the performance criterion more frequently than did gains in crop area. Recent data (2000-2005) show some improvement in gain in yields, especially for cassava, cowpeas, plantain, banana, and maize in WCA, and for plantain, banana, maize and yams for ESA. It is clear that sustained and increasing yields, in response to the need for intensification, will remain a major challenge for IITA's scientists in coming years.

(For the table below, the Panel recognizes the limitations of FAOSTAT data for this purpose, and notes that bean data are included with cowpea data. It recognizes that most of the data for ESA is generated by beans, and that for WCA is a mixture of the two crops. It is, however, unaware of better data sources at this time.)

---

<sup>14</sup> see Nature 432: 801-802, 2004

**Table 1.1 Crop statistics and trends for IITA's mandated crops (FAOSTAT, 2007)**

	Eastern and Southern Africa			Western and Central Africa		
	Production m ton	Area m ha	Yield t/ha	Production m ton	Area m ha	Yield t/ha
<b>Cassava</b>						
Current <sup>a</sup>	22.16	2.57	8.62	83.90	8.61	9.75
Slope 90-05	0.62**	0.02**	0.18**	1.87**	0.14**	0.08**
Percent/yr	3.35	1.00	2.35	2.68	1.83	0.85
<b>Yams</b>						
Current <sup>a</sup>	0.23	0.03	7.14	44.58	4.60	9.72
Slope 90-05	-0.003ns	-0.002*	0.16**	1.40**	0.12**	0.06ns
Percent/yr	-1.12	-3.05	3.45	4.01	3.24	0.69
<b>Beans &amp; cowpea</b>						
Current <sup>a</sup>	2.19	3.65	0.60	4.35	13.02	0.33
Slope 90-05	0.02ns	0.08**	-0.01**	0.15**	0.51**	-0.003ns
Percent/yr <sup>b</sup>	1.17	2.59	-1.51	4.58	4.89	-0.91
<b>Soybean</b>						
Current <sup>a</sup>	0.49	0.39	1.27	0.57	0.65	0.88
Slope 90-05	0.02**	0.02**	0.003ns	0.03**	0.001ns	0.05**
Percent/yr <sup>b</sup>	5.66	5.48	0.22	7.76	0.20	7.35
<b>Plantain</b>						
Current <sup>a</sup>	13.39	2.41	5.56	9.95	1.83	5.43
Slope 90-05	0.13**	0.02**	0.01ns	0.17**	0.03**	0.02*
Percent/yr <sup>b</sup>	0.98	0.88	0.11	1.93	1.54	0.39
<b>Banana</b>						
Current <sup>a</sup>	3.57	0.61	5.86	2.14	0.28	7.59
Slope 90-05	0.04**	0.01**	0.01ns	0.003ns	0.002*	-0.05ns
Percent/yr <sup>b</sup>	1.36	1.19	0.22	0.14	0.73	-0.68
<b>Maize</b>						
Current <sup>a</sup>	24.08	13.65	1.76	13.37	9.70	1.38
Slope 90-05	0.57**	0.24**	0.02ns	0.17**	-0.09ns	0.03**
Percent/yr <sup>b</sup>	2.65	1.81	0.94	1.45	-0.94	2.35

<sup>a</sup> Current level is the mean of 2003, 2004 and 2005 data. Zambia data not included.

<sup>b</sup> Percent of mean production level 1990-2005

\*, \*\*, ns: slope significantly different from zero at P<0.05, P<0.01, and P>0.05.

## 1.5 The Evolution of IITA's Current Focus and Themes

In response to the EPMR of 2001, IITA held a meeting of its then Research Program and Executive Committee (RPEC) to review the compartmentalization and arrangements of the IITA research agenda and the structure needed to manage the projects and the stations. This was driven by the feedback of the EPMR, the need to strengthen the agro-ecological zone approach in the 2001-2010 Strategy, to simplify structure, and reduce involvement of scientists in administration and management task. This was suggested for approval by the Board and for elaboration in November 2001.

## **IITA's MTP Projects between 2002-2004**

- Improving Yam based systems (A<sup>15</sup>, E)
- Improving cassava based systems (A, D, E)
- Development of integrated annual and perennial cropping systems (E)
- Biological control and functional biodiversity (B)
- Integrated management of cassava pest (B)
- Impact, policy, and system analysis (C)
- Improving maize-grain legume systems in WCA (A, F)
- Conservation and use of biodiversity (A)
- Improvement of high intensity food and forage crop systems (F)
- Improving cowpea-cereal systems in the dry savannah (A, F)
- Improving plantain and banana based systems (A, D, E)
- Protection and enhancement of vulnerable cropping systems (D)
- Integrated management of legume pests<sup>16</sup> (B, F)
- Integrated management of maize pests (B, F)

and the SP-IPM (B) and the Ecoregional program for the humid and sub-humid tropics of SSA (EPHTA) (E).

The 14 projects were subsequently reorganized into 3 disciplinary projects and three agro-ecological projects. The RPEC reaffirmed the research agenda should be driven by the needs of the agro-ecologies. The support stations were assigned to the three agro-ecological projects. The new projects were put forward in the 2003-2005 MTP. This reorganization was planned by scientists, the RPEC and the DG at the Work Planning Week (WPW) in 2001. The RDC used WPW 2002 to further refine the MTP projects from goal to activities and for streamlining activity list and milestones.

## **Revision of IITA's MTP Projects between 2003-2005**

- A: Preserving and enhancing germplasm
- B: Developing biological control options
- C: Impact, policy and systems analysis
- D: Starchy and grain staples in ESA
- E: Diverse agricultural systems in the humid zones of WCA
- F: Grain-based systems in the WA savannah

In 2005, the projects were designated as programs because of the diverse nature of research included in them. In March 2005, new Guidelines were sent to the Centers for the development of MTPs. These guidelines had many changes in the definition and required reporting of projects. In order to accommodate these, the six programs were retained but IITA identified Project entities based on the milestones and activities given in the previous MTP. This was considered an interim step since in the short timeframe the RDC and PCs had very little time to consult scientists. The Center also had very little time to reconsider the financial reporting on the basis of new projects.

---

<sup>15</sup> Reference to new projects into which the activities were subsequently incorporated

<sup>16</sup> The Integrated management of legume pests was combined from two other Projects

## **IITA's MTP Programs and Projects in 2006-2008**

### *Program A. Preserving and enhancing germplasm and agrobiodiversity with conventional and biotechnology tools*

Project A-1 Sustaining biodiversity of staple crops for current and future generations

Project A-2 Producing more food at lower cost through genetic improvements of staple crops

Project A-3 Biotechnology tools (e.g. molecular markers, gene identification, transformation) developed and applied for germplasm management and crop improvement

Project A-4 Biofortification of staple food crops

### *Program B. Plant health management program*

Project B-1 Identifying and characterizing pest problems and assessing their interactions with the environment

Project B-2 Developing and implementing biological control options

Project B-3 Implementing host-plant resistance and habitat management options

Project B-4 Developing safe crop protection products and practices

### *Program C. Supporting innovation processes*

Project C-1 Socio-economic technology assessment on micro-level

Project C-2 Recommendations for policies, institutions, and legal frameworks supportive of generated innovations and the innovation process

Project C-3 Improvement of efficiency in research and dissemination of research results

### *Program D. Eastern and southern Africa agri-food systems*

Project D-1 Eastern and Southern Africa banana-based cropping systems

Project D-2 Eastern and Southern Africa roots and tubers systems

### *Program E. Enhancing livelihoods in the humid and sub-humid zones of West and Central Africa*

Project E-1 Productive plantain systems

Project E-2 Profitable root and tuber systems

Project E-3 Market-oriented peri-urban crop and crop-livestock systems

Project E-4 Multi-product perennial food and cash crop systems

### *Project F. Improving and intensifying cereal-legume-livestock systems in the savannas of West and Central Africa*

#### *Systemwide program on integrated pest management*

The SC's Commentary on the 2006-2008 MTP was very critical of the lack of science outputs and output targets in the Agroecological zone projects. They concluded that the discipline-based projects were strong in science while the agroecological projects were more focused on development activities. This was also evident in the lack of integration between the projects. Scientists continued to focus efforts in discipline-based projects, rather as they had done under the previous Division structure. Strategic planning at the annual work planning week in 2005 considered alternative approaches to project formulation that would enhance integration of science along the R4D continuum and more in line with the Center's stated approach. This resulted in the realignment of the 6 programs to 7 "MTP projects". Originally, this rearrangement was more conceptual than practical, but the Projects are in the process of further refinement, beginning with the Center's Strategic Planning for 2006.

**IITA's MTP Projects in 2007-2009** (letters in brackets indicate the former distribution of work now collected under the new headings)

- Agriculture and Health (A-4, B-4, C-1)
- Agrobiodiversity (A-1, A-3)
- Banana and Plantain systems (A-2, A-3, B-3, C-1, D-1, E-1)
- Cereal and Legume Systems (A-2, A-3, B-3, C-1, F)
- High-Value Products (B-1, B-4, E-3, E-4 )
- Opportunities and Threats (B-1, B-4, C-1, C-2, C-3)
- Root and Tuber Systems (A-2, A-3, B-3, C-1, D-1, E-2)
- Systemwide Program on Integrated Pest Management

*In summary:* In the Review period, IITA has made extensive changes in its Project and program arrangement. Initially IITA tried to dissipate the competitive tensions which the new Management perceived had built up within the former Division-based structure. It also attempted to respond to reporting guidelines and the criticisms of the Science Council about the balance between research and development activities. It was conscious of the need to move towards a more effective research format to accomplish the R4D approach. The efficacy of the final formulation of four commodity-oriented projects linked by three more cross-cutting projects and the SP-IPM is considered in Chapter 3. However, much of the alteration, although time-consuming, seems in fact to have been a realignment of IITA's existing competencies and grant funded research. At the time of the EPMR, planning for the new functions of the Projects has only been undertaken for four Projects and the cross-cutting Projects, in particular, await appropriate development to meet the needs of the R4D approach.

## **1.6 The EPMR**

IITA is one of the longest established Centers of the CGIAR. The current EPMR is the 6<sup>th</sup> such review of the Center. Since the 5<sup>th</sup> EPMR in 2001, the CGIAR has approved (June 2005) policy document guidelines for the Monitoring and Evaluation System for the CGIAR Centers. The new components of the monitoring and evaluation (M&E) system include annual performance measurement (PM), Center-Board Commissioned External Reviews (CCERs) and streamlined EPMRs commissioned by the Science Council on behalf of the Group and organized jointly by the SC and the CGIAR Secretariat. The EPMRs, conducted at roughly five-year intervals complement the annual Science Council (SC) assessment of Center's Medium Term Plans (MTPs). The specific and general terms of reference for the 6<sup>th</sup> EPMR of IITA can be found in Annex 1.

## **1.7 Response of IITA to the 5<sup>TH</sup> EPMR Recommendations**

The fifth EPMR of IITA made an aggregate of 17 recommendations, which can be grouped as shown below (Table 1.2) which indicates the action taken. The details of the Center's implementation process are captured in the 2007-2009 MTP. It would appear that although the IITA was slow in starting to respond to the implementation of recommendations of the 5<sup>th</sup> EPMR, the process gained momentum as the current EPMR approached. Approximately 50% of the recommendations have been fully implemented while the other half is being addressed only now. In the area of the Governance and management, the Fifth EPMR panel had made five substantive recommendations four of which have been fully implemented even though not as urgently as would have been expected.

**Table 1.2 Implementation of the 5<sup>th</sup> EPMR Recommendations**

<b>PROGRAM RELATED</b>	<b>PARTNERSHIP RELATED</b>	<b>GOVERNANCE/MANAGEMENT RELATED</b>
<b>1. Prioritization Process +</b>	4. Regional Scientists forum particularly for GMO research +	<b>2. Appointment of DDG-Research ++</b>
<b>3. Yam ideotype breeding to reduce labor demands +</b>	11. Enhance NARS capacity through training +	<b>14. Program of BOM reforms ++</b>
<b>5. Appropriate &amp; targeted crop improvement research +</b>		<b>15. Streamlining the HR management ++</b>
<b>6. Review Plant Health Management Division (PHMD) declining output +</b>		<b>16. Revamp the Internal Audit capacity ++</b>
<b>7. Resource and Crop Management division (RCMD) business plan ++</b>		<b>17. Upgrade status of External Liaison Office --</b>
<b>8. RCMD-AEZs ++</b>		
<b>9. Strengthen Socio-economics +</b>		
<b>10. Emphasis on Geo-spatial analysis +</b>		
<b>12. Implementation of IPR new policy +</b>		
<b>13. Close collaboration with policy institutes +</b>		

\*Action taken expressed as; Implemented ++ Partially Implemented + No clear response-

The lag in implementing these recommendations certainly reduced IITA’s capacity to achieve some of its obligations. As an example, the delay in hiring the DDG-R had serious implications in the capacity of IITA to address adequately the priority setting process at program level. One recommendation on the strengthening of the External Liaison Office was addressed through a completely different mechanism - that of dropping the post completely. This particular office was traditionally responsible for NARS and other stakeholder linkages, a responsibility that is now embedded in the programs under the ambit of the scientists - a process the Center terms ‘active engagement’. There are also plans for a new Deputy Director post (in Project Development and Management) to take on the administrative functions of relationships. At the time of the current EPMR, this post had not yet been filled. During the field visits, the Panel held a number of discussions with NARS representatives in which NARS implied that there has been erosion in the IITA-NARS partnerships especially in training and collaborative priority setting engagements. It is not possible to state whether this is directly attributable to the closure of the ELO but it is important to note that at least some NARS are less happy with the current arrangements.

The fifth EPMR also made two partnership-related recommendations, one specifically in training and one in the creation of an SRO forum particularly for the GMO issues. Both of these recommendations imply a capacity building effort. IITA responded that deliberate engagement with NARS has helped to build capacity in the specific area of the formulation of biosafety regulations, citing the cases of Nigeria and other countries in Africa. Following more recent planning, training will be largely re-organized and IITA is about to experiment with the outsourcing of training to NARS and other relevant organizations. This is an effort to build capacity

in the traditional NARS but focuses more on regional universities. In its new training approach, IITA admits that there are reduced resources for training and IITA has therefore structured a training format that is more program-based. The details of this new training format are given in Chapter 3. While the Panel recognizes the constraints in training support it is the considered view of the Panel that IITA should put more effort in program –related training if the NARS are to be enabled to play their rightful role in the research and development continuum.

The remaining ten recommendations were largely related to program issues and, in general, there has been an effort to comply with the recommendations. The recommendations related to Resource and Crop Management Division (RCMD) have been completed while the others are in various stages of being met. It is hoped that as the adjustment to a new research management structure is finally made, IITA will in the future be able to respond quicker to advice and agreed recommendations.

### 1.8 Recent Center Commissioned External Reviews

A major instrument of monitoring and evaluation in the CGIAR is the commissioning of Center Commissioned External Reviews, in the period between CGIAR Reviews, of aspects of the main research, priority setting or governance components of the Center. The outcomes of such reviews, if effectively undertaken, serve as guides to any mid-course corrections required by Center Board or management. CCER Reports can assist the EPMR Panel in its overall reviewing function by providing intermediate snapshots of the progress of the Center and recommendations against which Center progress can be judged. IITA conducted 6 CCERs before the 6<sup>th</sup> EPMR panel convened (see Table 1.3) and one, although planned earlier, was conducted of the Systemwide Program on Integrated Pest Management between the two phases of the EPMR. The EPMR Panel considered all of these results and the results of an independent review of the earlier Project A conducted by a donor (Table 1.3).

**Table 1.3 List of Center-Commissioned External Reviews and a donor-review of a Project conducted since the last EPMR**

---

1.	CCER: Systemwide Program on Integrated Pest Management (April 2007)
2.	CCER: Governance and Management (June 2005)
3.	CCER: Project B: Developing Biologically Based Plant Health Management Options and Conserving Biodiversity of Sustainable Agriculture (November 2004)
4.	CCER: Project D: Research for Development Enabling Environment (October 2004)
5.	CCER: Project E: Enhancing Livelihoods in the Humid and sub-Humid Zones of West and Central Africa through Profitable and Sustainable Intensification of Diverse Agricultural Systems (May 2004)
6.	CCER: Project C: Assessing Impact, Formulating Policy Options and Systems Analysis (January 2004)
7.	CCER: Project F: Improving and Intensifying Cereal-Legume Systems in the Moist and Dry Savannas (October 2003)

---

A Donor-commissioned Review of Project A: Preserving and Enhancing Germplasm and Agro-Biodiversity with Conventional and Biotechnology Tools (conducted between November 2004 – January 2005)

The collected recommendations of these CCERs and donor review can be found in Annex 2. Additional comments in relation to the findings of the CCERs can be found in Chapter 3 and the specific program or project subject matter under review.

The Panel found that there was a tendency for the CCER Reports to address process and Project structural issues rather than science quality. This may in part arise from a) inadequate terms of reference, and, b) inadequate preparation on behalf of the Center, particularly of materials that would allow reviewers to prepare substantive advice in short time-frames. Despite IITA's long research history, the new research management structure at IITA may have been unaccustomed to such reviews, and may have underestimated their potential utility. In general, the Panel suggests that CCERs should be conducted by panels of 2-3 people to obtain specific advice over the broad research and research-associated areas contained within specific IITA projects. The reviewers should be properly external to the work of the Center. These concerns notwithstanding, the Panel found the CCERs of Governance and Management (see Chapter 5), of Project F and of the SW-IPM, to be valuable inputs into the conduct of the current EPMR. The review of Project A (conducted at the request of the EU) was professionally conducted over a longer time-frame than allowed to the CCERs. However, those reviewers also drew attention to the difficulty in providing comprehensive analysis of the science encompassed in the large projects (Programs) as then formulated.

## **1.9 Scope and Method of Evaluation**

### ***1.9.1 EPMR Panel, terms of reference, mode of operation and acknowledgments***

The Panel for the 6<sup>th</sup> External Program and Management Review of IITA was convened under the Chairmanship of Dr Cyrus Ndiritu. The composition of the panel, the background of panel members and the schedule for the conduct of the review are given in Annexes III and IV. The Panel first assembled at IITA's headquarters in Ibadan, Nigeria for the first phase of the review on the 5<sup>th</sup> of March 2007. The Panel Chair and members met with the Director General, Dr. Peter Hartmann and senior members of the administrative and scientific staff, including some from research locations sites. The Panel participated in presentations of the MTP Project activities, the Systemwide Program on Integrated Pest Management (SW-IPM) and the scientific support units and was able to interact with staff in plenary and in small group meetings (including with the Research for Development Council, RDC). Where necessary Panel members or groups of Panel Members held separate meetings with individual scientists or cross program discipline groups. Both the Director General and the Deputy-Director General-R4D kindly responded to requests for additional meetings or provided additional information on the evolution of the Programs and site activities. Panel members visited laboratories, field trials and exhibits as well as the support units at the Ibadan campus. The Governance Panel member and Finance consultant met with Administrative and Finance staff, the Auditors (in Lagos) and members of the Audit Committee of the Board. IITA held its Annual Board Meeting in the following week, the 14-17 May. The Panel Chair and Governance expert met with the Board Chair and held separate discussions with Trustees. They also monitored the conduct of the Board Meeting and its Committees.

The Panel members were able to consult Center policies, plans, strategic documents and other publications placed on a special website or provided to the panel in hard copy on request.

Prior to the main phase, the Panel secretariat administered three surveys a) a survey of staff *curricula vitae* and publications as part of the evaluation of science quality, b) a stakeholder survey to gain insights into the perceptions of IITA's scientific and regional collaborators and

fundings, and, c) a survey of staff satisfaction (covering the scientific staff and senior unit managers). The latter two surveys were conducted anonymously through an on-line survey monkey format.

Members of the Panel visited selected outreach sites and contacted regional collaborators in the run up to the main phase of the review between the 17<sup>th</sup> to the 27<sup>th</sup> of May, as detailed in Annex 4 (the visit to Kano was conducted during the main phase; between the 1<sup>st</sup> to the 3<sup>rd</sup> of June). The purpose of the field visits was to validate the information obtained from documents and discussions with implementing partners. To facilitate wide field coverage the EPMPR team partitioned itself into three groups:

- one group made visits to eastern African countries covering Kenya, Uganda and Tanzania;
- the second group covered southern African countries including Mozambique and Malawi;
- the third group was responsible for western African countries and made visits to Benin, Ghana and the host country Nigeria.

During the field visits, the evaluation team tried to obtain factual data and held focused group discussions with beneficiaries. The full list of persons met, institutions and associations visited are shown as Annex 4.

The Panel reconvened in Ibadan on the 27<sup>th</sup> of May and developed and wrote the Report, including the reports of the two consultants, between the 28<sup>th</sup> of May to the 8<sup>th</sup> of June, contacting staff on matters of clarification. During the main phase the Panel Chair conducted telephone interviews with (i) the current top ten donors to IITA to garner their perceptions on Center performance and challenges and (ii) with several Directors General of other major collaborating Centers in the CGIAR.

Draft chapters of the Report were shared with Center management (principally Dr Hartmann) for reviews of factual errors, and the Panel Chair presented the major recommendations and findings of the Panel verbally to Management and Staff on the 8<sup>th</sup> of June.

*Acknowledgements:* The Panel is pleased to acknowledge the substantial cooperation provided by IITA's Board, management and staff in the preparation and conduct of the review. The Panel is very grateful to all staff (including the Director General, scientific managerial and administrative staff, catering, transport, communications and liaison) that combined to make the Panel's stay as efficient and comfortable as possible during the period of the review. Thanks are also due to staff of the Center, particularly to the interim Deputy-Director General-Support, Dr Campbell Davidson, and the Director General's assistant, Ms Toyin Oke for taking care of the substantial logistical issues concerned with field visits, for organizing presentation schedules, and helping develop formal responses and material on behalf of the Center in response to requests for information.



## **2 STRATEGY, PRIORITIES AND PROGRAM**

### **2.1 IITA Vision, Mission and Goals**

IITA's current strategic plan was prepared in 2000 and covers the period 2001-2010. The mission statement of that plan states that:

*"IITA aims to enhance the food security, income and well-being of people in sub-Saharan Africa by conducting research and related activities to increase agricultural production, improve food systems, and manage natural resources in a sustainable manner, in partnership with national and international stakeholders."*

There have been significant changes at IITA since that plan was written, but according to a draft strategic plan for 2011-2020 the mission statement remains essentially unchanged. The draft plan also introduces a vision for IITA:

*"To be one of Africa's leading research partners in finding solutions for hunger and poverty"*

Despite the continuity in the Institute's mission, IITA's views on how it can fulfill its mission have changed and consequently its goals have been somewhat modified. Those changes, and the fact that in some sense the Institute is in transition, provide the basis of much of the discussion in this chapter on strategy, priorities and program.

### **2.2 Mandate and Geographic Scope**

IITA's research and geographical mandates are described in the current Strategy (2001-2010): *"IITA conducts research, germplasm conservation, training and information exchange activities in partnership with regional bodies and national programs including universities, NGOs and the private sector. The research agenda addresses crop improvement, plant health, and resource and crop management within a food systems framework and targeted at the identified needs of four major agroecological zones: the dry savanna, the moist savanna, the mid-altitude zone, and the humid forest. Research focuses on small- and medium-scale farmers and on all production systems to fulfill the ecoregional mandate with special emphasis on the following food crops: cassava, cowpea, maize, plantain and banana, soybean and yam."*

The Institute's current thinking (as illustrated in the new draft Strategy document) offers a number of modifications. In terms of research agenda, although IITA continues to do research on resource and crop management and plant health, these no longer form the basis for organizing the research program. Instead, its MTP Projects are organized by commodity-based systems (roots and tubers, banana and plantain, cereals and legumes, high value crops), cross cutting projects (agrobiodiversity, agriculture and health, the System-wide program on IPM), and one which could address long term planning (Opportunities and Threats). Although an ecoregional orientation remains, agroecological zones are no longer seen as the prime determinant for technology generation.

In December 2005, the CGIAR endorsed new System Priorities for research (SPs) to guide and focus collaborative research across the system. There are 20 such priorities divided amongst five Priority Areas (roughly, 1. Germplasm conservation and characterization; 2. Germplasm improvement – including research on both biotic and abiotic stresses; 3. The identification and

exploitation of high value agricultural products for income for the poor; 4. Natural resources management; 5. Policy and institutional research, including producer organizations and markets). It is intended that the CGIAR Centers and donors will commit the bulk of research activities and funds to these areas. IITA's traditional strengths and the emerging focus on market-led agricultural production would seem to provide an appropriate match. The Science Council criteria for such choices include a focus on research, the comparative and competitive advantage of CGIAR Centers to undertake the research compared with other players, and the need for publicly funded research to produce international public goods i.e. that the research outputs should be applicable freely across the widest possible recommendation domains, preferably across several countries. Whilst the same strategic criteria are espoused by IITA, as noted in Chapter 1, they also raise important practical considerations in the design and implementation of the Center's research, particularly in the formation of public private partnerships and holding open the doors to equitable sharing and benefits. Among the most important examples of IITA's reorientation, in line with these new criteria, are its focus on diversification, high value crops and nutritional quality and food safety.

IITA's view of the African continent has changed as well. Although its research remains focused on SSA, IITA has a more explicit commitment to Africa-wide bodies in areas such as phytosanitary control, regional research, agricultural trade, and food health. This commitment is illustrated by growing attention to sub-regional and regional research organizations, but also to regional economic and trade organizations and to political bodies, particularly the African Union and its NEPAD program.

Although IITA has considered broadening its mandate to the whole of Africa, a paper commissioned by the Board and management concluded that a) IITA has a world mandate on cowpeas and yams and b) because of the limited use of its mandate crops in North Africa, and because of the possible perception by donors, partners and other stakeholders of a loss of focus on SSA, an Africa-wide mandate, including North Africa, was not recommended. The Panel concurs with this assessment not to extend the geographical mandate of IITA to North Africa.

### **2.3 Strategic Plans**

IITA's current Strategic Plan covers the period 2001 to 2010 and was prepared under the former Center management. Its analysis was necessarily based on data and institutional arrangements from the late 1990's. It focused its analysis on the agricultural systems and agricultural research requirements of agroecological zones (AEZs). It identified common development challenges and proposed the strategy of addressing research through a number of benchmark sites. It provided rationale for three research programs or Divisions (Crop Improvement, Resource and Crop Management and Plant Health Management) which were in existence at the time of the last IITA EPMR.

In 2004, Hartmann, the current Director General, published "An Approach to Hunger and Poverty Reduction for Sub-Saharan Africa." which laid out IITA's approach to poverty reduction. This would be focused on means to a) encourage local production, b) create wealth, and c) reduce risk for farmers and both the rural and urban poor. This was more of a "think piece" than an endorsed strategy at the time, but it started to alter the way IITA addressed its research mission.

IITA has shared with the Panel a discussion draft of its new Strategic Plan, tentatively called "Contributing to African agricultural development: Strategic Plan 2011-2020". This draft has

been developed subsequent to some major political and institutional changes affecting African agriculture (the formation of the African Union, the New Partnership for Africa's Development (NEPAD) and the Comprehensive Africa Agriculture Development Program, or CAADP). The draft plan adopts the same poverty reduction strategy as the 2004 paper, promotes a Research for Development (R4D) process which has implications for internal organization, and proposes emphasis on the most populous countries in sub-Saharan Africa which would be served through four regional hubs (one for each of the four major areas of sub-Saharan Africa – see Annex 5). In setting its future research agenda the Center would consider:

- Significantly increased agricultural productivity with emphasis on improved food quality and commercial competitiveness.
- Effective use of new technologies, particularly in high population countries, with the aim of achieving greater impact
- Poverty reduction by strengthening efforts on wealth creation and a broader range of crops, post harvest technologies, marketing and food quality.

It is instructive to compare the two Plans. Although the current (2001-2010) Strategic Plan lists enhancing commercialization opportunities as one of its principal objectives, the guiding principles in the new draft Strategy indicate significant differences. For instance, additional emphasis is placed on processors and agroindustries. While the current Strategic Plan lists “help strengthen national and regional research capacities” as one of its principal objectives, the draft Plan indicates that the traditional focus on NARS is inadequate. In terms of research strategies, the current Strategic Plan envisions “the effective management and conservation of natural resources for sustainable agriculture, and for adaptation to environmental changes” as a principal objective, while the draft Plan places more emphasis on “preventative approaches to deal with biological threats to crops and post-harvest losses.”

These changes in emphasis have significant implications for IITA's strategies and priorities:

- The Institute's emphasis on Africa's most populous countries at first glance may appear to put it at odds with the CGIAR mandate of developing IPGs, but it may be argued that the number of people reached by a technology rather than the number of political borders that the technology crosses should determine its value. In addition, regional research and trade networks increasingly allow technologies to spill over from larger countries to their neighbors.
- The change in strategies has had contradictory implications for some of IITA's crop management disciplines. On the one hand, the reduction in emphasis on natural resource management and the environment in the draft Plan is notable and has implications for the type of science carried out by the Institute and its ability to address long-term issues such as soil fertility management. On the other hand, the increased emphasis on risk mitigation corresponds to IITA strengths in deploying disease or pest-resistant crop varieties and participating in large-scale biocontrol efforts; it also links to current interest in themes such as climate change.
- The increased emphasis on market chains implies a logical expansion in the range of organizations that IITA might work with as partners, but the current strategy may neglect to give sufficient attention to the potential of IITA's traditional partners, the NARS, for following its lead and expanding their capacities to promote a market-led approach.

The move towards a market-based approach requires IITA to get involved at the field level in development projects that it might not otherwise consider. The argument that participation in pilot projects is required in order to gain an understanding of these new areas is valid, but there

is the danger that such participation can lead IITA into heavy involvement in downstream project management. IITA's draft strategic plan includes consideration of an exit strategy for such projects which recognizes partners' roles in implementation. However, this conception of an exit strategy may place too much faith in the capacity of short-term projects to establish all the necessary links in a commodity value chain in order to leave behind an agro-industrial model that can be imitated by others. This may occur in some cases, but a more comprehensive vision would place emphasis on: lesson learning (even failed pilots can provide valuable experience); monitoring progress in a sector and providing key, targeted research-based inputs; and synthesizing experiences to provide widely applicable principles and guidance.

## 2.4 Positioning of IITA in the R4D Continuum

Two of the major features of IITA's new strategy and priorities are a proactive engagement with those involved in African agricultural development and the articulation of a Research for Development approach.

### 2.4.1 IITA'S Development Dialogue

**Table 2.1 IITA's "Development Dialogue" 2004-2006**

Year	Country	Audience	Topic
2004	DR Congo	Vice President Minister of Science & Technology	Approaches to Hunger and Poverty Reduction
2005	Ethiopia	AU Commissioner Rural Economy and Agriculture	Phytosanitary barriers to trade
2004	Japan	(former) Prime Minister Mori Select Members of Parliament	Approaches to Hunger and Poverty Reduction in SSA
2005	Liberia <sup>17</sup>	President	Development of agriculture
2004	Libya	AU	Pre-Heads of State preparations
2003	Malawi	Vice President	Emergency to Development
2004	Mozambique	Vice Minister of Agriculture (visited IITA - Nigeria)	Cassava Brown Streak threat
2005		Government and donors	Roundtable on food and agriculture
2005	Niger	AU and National Government FARA	Famine concerns
2004	Nigeria	President	Agricultural Initiative
2005		Ministers of Agriculture and Commerce	Commercialization of Cassava
2006		Senior Presidential Advisor	Plans for commercialization of banana
2003	Nigeria	Mr. L. Båge, President IFAD	General Development Strategies
2006		Mr & Mrs. Gates, Gates Foundation	Commercialization of cassava
2003	Sierra Leone	Vice President Parliament Minister of Agriculture	(designed) National food security strategy. Later invited to present it to Parliament.
2004	South Africa	NEPAD	Pan African Cassava Initiative
2006	Tanzania	Government officials Prime Minister Deputy Minister of Agriculture Permanent Secretary	Poverty reduction approaches

Since the arrival of the new DG, IITA has placed particular emphasis on ensuring that it is attuned to the major agricultural policy initiatives in Africa (at both the national and regional

<sup>17</sup> DG represented by Dr. S. David of IITA

level) and to broader development issues such as the achievement of the Millennium Development Goals. This effort is described as IITA's participation in the development dialog of Africa. Since the inception of this effort, the Institute has received invitations to important events and the DG has had audiences with a number of key decision makers (see Table 2.1). In addition, the DG has had a number of public speaking engagements, including presentations to banks, industry leaders and interviews for TV and newspapers in Botswana, DRC, Nigeria, and Tanzania.

#### **2.4.2 *Research for Development***

IITA promotes its mission and programs through the concept of "Research for Development" (R4D). This is a vision of agricultural research that addresses major development problems in Africa rather than simply contributing to the body of scientific knowledge. R4D can be another reminder that the "supply-push" of technology is an inadequate strategy and that equal attention must be given to "demand-pull", principally by ensuring that market development provides adequate incentives for farmers to take advantage of new technology to diversify and intensify their production. R4D thus requires attention to a wide range of issues that traditionally have been beyond the immediate interests of most agricultural research institutes; these include innovative extension techniques, the organization of input markets and delivery systems, and the strengthening and diversification of output markets. IITA's current involvement in areas such as the rehabilitation of the West African cocoa industry and the expansion of industrial demand for cassava are examples of this new paradigm.

The R4D concept is an effective way to articulate the challenges facing agricultural research and to motivate scientists to focus on practical outcomes. At the same time, R4D offers some difficult challenges for an organization like IITA. The major questions include: the division of labor between IITA and partners; the role of the NARS (IITA's traditional partners); the degree to which IITA should play a leadership role in broad-based, location specific development initiatives; and the opportunity costs of the approach.

R4D traverses the research continuum from the discovery to the delivery of agricultural technology. This is a broad range of responsibilities that no single agency can be expected to cover. IITA's role in much of the discovery stage is unquestioned, although IITA's traditional strengths are not at either extreme of the spectrum. It is difficult to provide general guidance to determine where IITA should take major responsibilities for activities closer to the delivery end of the spectrum (often by developing or expanding its own analytical skills) where it should rely on other organizations and be able to identify appropriate partners.

There are certainly a number of areas where the R4D model can contribute to expanding the skills of IITA scientists and re-orienting the priorities of the institution. The crop varieties that IITA develops must have qualities that meet market requirements; IITA has always put emphasis on the assessment of consumer qualities and it is now addressing industrial processing requirements for crops like cassava and cowpea. Top-down extension messages are inappropriate for delivering many of the technologies developed by IITA, and the institute is acquiring experience with innovative extension techniques such as farmer field schools. The delivery of seed and planting material is crucial to IITA's success, and it has a very wide range of experience with alternative delivery mechanisms (although it needs more involvement and experience working with private seed and input producers). Producer organizations are an effective means of not only testing and developing technology but also marketing output, and IITA is learning how to exploit these synergies.

However, IITA's role cannot be to develop and deploy new producer organizations, seed enterprises or agribusiness ventures, but rather to assess which approaches and methods are most effective and to ensure that partners at the national level are able to act on this information. The distinction between investing research resources to engage in pilot activities in order to learn lessons from specific experiences, and assuming coordination responsibility for development projects conceived by external donors or national government production campaigns, needs to be made clear in IITA's policy and strategic vision.

The role of NARS (IITA's traditional partners) in R4D is a particularly important issue. Although IITA correctly emphasizes the need to cast the partnership net much more widely than before, the draft strategic plan indicates that IITA will be more selective in its collaboration with NARS in R4D, favoring those NARS classified as "strong". This would imply a significant shift in partnership strategies and is examined in more detail in Chapter 4.

A further dilemma in operationalizing the R4D strategy is the balance between involvement in location-specific activities and the derivation of broad principles and guidelines for multi-institutional participation in agricultural development. In particular, IITA increasingly assumes leadership roles in broad-based projects which may feature a relatively small research component. However, IITA believes that the impact assessment of such efforts will provide guiding principles for the replication that will then be the responsibility of other entities.

Finally, the R4D paradigm raises questions about opportunity costs that must be addressed in IITA's planning process. The participation in technology transfer projects implies substantial effort by senior scientists at IITA who provide key technical support and leadership, but at the same time have primary responsibilities in long term research. This additional demand on senior scientists could compromise their ongoing research and their capacity to generate more research results and technology, and IITA's planning and priority setting must acknowledge this trade-off.

## **2.5 Setting Priorities**

This section examines issues related to the mechanisms that IITA uses to set priorities for its research. It includes a discussion of the Research for Development Council and the Research for Development Directorate; the institute's approach to planning the sites and activities for its outreach activities; the process for planning its MTP Projects; and the implications of the significant increase in the institute's budget for priority setting.

### ***2.5.1 The Research for Development Council***

The RDC was established in 2002 after a consultative process with scientists by the DG. The RDC was described as a 'think tank' for strategic planning. Membership initially consisted of the Director/R4D, one appointment by the DG, and three elected councilors. Many of the TORs recommended for the RDC in 2002 were more related to decision making rather than strategy so in 2005 the RDC reconsidered the TORs for itself (and for institute management positions). These were also shared with the Board in 2005. In 2006, the Management and Governance CCER recommended changes in the TORs of the RDC. Subsequent RDC modifications were further adjusted by the Board, and were once again considered in March 2007. Although the new TORs establish a more strategic role for the RDC and are in line with its original role as a 'think tank' for strategic planning, it is clear that the debates and reorganizations of the past few years have not allowed the RDC to play a significant role in strategic planning or priority setting. The Panel

believes that the recent additions of DDG-R and DD positions (which were recommended by the RDC itself), along with other changes in the management of the MTP Projects, will provide more clear-cut responsibilities for strategic planning and will allow the RDC to play a useful advisory role.

### ***2.5.2 Project Development in the R4D Directorate***

The development of individual projects is done by scientists but is managed by the relevant DD and DDG-R. The Contract and Grants Office also participates to inform management of the opportunities for proposal submission and serve as a focal point for the management of input from scientists and oversight from administration. Opportunities to submit proposals are also a result of resource mobilization activities of the DG, DDG-R, and individual scientists. RDC gives strategic input into the identification of specific initiatives or targets for proposal development. The identification of specific proposal development is a decision of the DDG-R with input from the DD. The approval for submission of proposals is from the DD and then the DDG-R. R4D management and scientists identify specific opportunities, develop concept notes or proposals, and implement approved proposals.

Whilst some advances have been made in tools and approaches for individual aspects of impact assessment, there is currently no overall scheme that defines the relationships between the Center's strategic planning, the planning of MTP Projects, and the development of individual grant projects. The RDC is not an effective or appropriate entity to oversee these relationships. The Institute's senior management needs to define this planning cycle (with input from the RDC). Such a cycle would also define the roles and expectations for annual planning meetings and for the "country strategies" that are currently developed without a standard format or clear role in the planning process. An effective planning process will also establish IITA's "impact culture" in such a way that more careful planning, monitoring and evaluation is every bit as important as the identification of particular "impact" stories. In addition, the institute needs to continue to develop more agile and useful ways to obtain input from SROs (beyond mechanically derived lists of priorities) and from other outsiders who could contribute to a more productive and transparent planning process.

### ***2.5.3 Approaches to Regional planning and the geographical mandate***

IITA has not expanded the number of sites where its staff is based in recent years, but there have been some significant readjustments in staff strength at various sites. The Institute currently has staff stationed at five sites in Nigeria (Ibadan, Abuja, Kano, Maiduguri, and Onne) and maintains offices and facilities in Benin, Cameroon, Ghana, Kenya, Malawi, Mozambique, Tanzania, and Uganda. Separately from site selection for research, there were initial plans to identify four support hubs (or administrative hubs) for the West, East, Central and Southern regions of Africa. To date, only West (Ibadan) and East (Tanzania) hubs have been formally selected by IITA, although there are aspirations to establish an additional support hub for Central Africa (potentially in DRC). According to Management, the selection of research locations, and the allocation of research staff is considered on other criteria, such as the subject to be addressed, status and facilities of partners, scientist preferences and aspects of critical mass. The Deputy Directors (DDs) have responsibilities which cut across agroecological or geographical boundaries (e.g. the DD in Mozambique also has responsibility for the West African savanna and the DD in Tanzania is responsible for Cameroon).

Because of the large number of dimensions (regional research presence, regional administration, research focus, Project research management and recent shifts in the relative importance of

particular sites; e.g. Tanzania versus Cameroun) the Panel could not discern a transparent strategy that defines the changes that are in train. IITA has had a long presence in Uganda (originally established in response to the threat provided by cassava mosaic virus, CMV) and it is currently the largest location outside Ibadan. However, cassava expertise had been reduced and so, in response to the appearance of brown streak virus in cassava (which originally appeared on the East African coast, but is now recognized to be much more widespread) IITA has chosen to build up expertise at the Tanzania office. It is not clear why the work on BSV could not have been coordinated from Uganda so that office could serve the region as formerly.

The Panel strongly suggests that the Institute consider several points:

- A clear set of guidelines is required for the establishment of regional support hubs. Response to emergencies such as a disease outbreak or to the establishment of a large development project is unlikely to foster the type of long-term institutional development at national level contemplated by R4D.
- Deputy Directors' responsibilities should be defined by geographical rather than agroecological boundaries which match with their expertise and their oversight should be confined to management issues and relations with partners. The new DD for Project Development position under recruitment can provide additional support to relations with partners and MTP Project supervisory posts (see Chapter 5) can complement the DDG-R in managing the conduct and assessment of research.
- The IITA office in Cotonou faces particular challenges because of the arrival of WARDA (see Chapter 5) and because the recent reorganization of research at IITA has reduced the independence of the plant health specialists who have traditionally been based at Cotonou. Deploying plant health specialists more widely in Africa surely makes sense, and it is almost certainly a good thing that the new MTP Project organization integrates these scientists into broader research objectives, where their particular skills can contribute to, but also be measured against, other crop management innovations. Nevertheless, there may be some danger in overlooking the need for some critical mass (as long as IITA continues to invest in biocontrol and related activities). Other factors include the strong relations that have developed in Benin that allow the efficient movement of the highly regulated and perishable biological materials needed for the work, and it remains an important link with Francophone Africa.

#### *2.5.4 Planning the MTP Projects*

As explained in Chapter 1, the current MTP Projects were established relatively recently, in 2006, partly in response to the Science Council's overall concerns about the previous round of medium-term planning. It is therefore understandable that they are, to a certain extent, "works in progress". They represent a logical and defensible ordering of IITA research and interests, although each one of them deserves more attention. Observations on individual MTP Projects are found in Chapter 3; this section is confined to a few general observations on the Projects and the way in which they are planned.

The MTP Projects are described in IITA's 2007-2009 Medium Term Plan. The individual Project descriptions follow Science Council guidelines for presentation and feature rationale, objectives, impact pathways, identification of IPGs, partner roles, and logframe. Although the presentation may fulfill the requirements that allow summary and comparison across Centers they do not provide enough detail on actual research or evidence of strategic

planning for the individual Projects. Such evidence does not necessarily have to be presented in the overall MTP, but the Panel finds that there is currently insufficient information or documentation about past or contemplated planning processes for the MTP Projects.

It would appear that some work is still required to transform the MTP Projects from an adequate way of summarizing and describing the totality of the Institute's work to an important tool for strategic planning and research management. Further work on refining the components of the Projects (such as limiting the extent to which individual restricted core projects are divided among several different MTP Projects) is required. It is also necessary to define more carefully the Project objectives so that the rationale for inclusion of a particular activity is clear; for instance, it is important that Project objectives begin to drive the design of restricted core projects, rather than the other way around. Perhaps most importantly, although DDs have been assigned administrative duties related to the MTP Projects, these major building blocks of IITA research require more management and oversight specifically related to their research content, a point that is made in Chapter 5.

At the time of the Review, two of the Projects (Banana and Plantain and Roots and Tubers) had gone through a strategic planning process, but the Panel is not aware of formal documentation. It is important that further elaboration of the Projects distinguishes between planning and brainstorming. At this point, the MTP Projects require more precise delineation and articulation of their activities, their strategies to measure progress, and where specific products fall in the planning-impact assessment cycle. The language of a logframe is not adequate for such a task.

#### *Regional Planning with Partners*

An issue related to IITA's regional deployment and planning is the Center's participation in regional planning exercises with other IARCs, in particular related to the Regional MTPs taken by the Centers through the Alliance (previously the Center Directors' Committee or CDC). IITA has joined in the collaborative CGIAR Center, SRO and NARS planning process to develop a regional MTP for West and Central Africa. Formally, WARDA is the Lead Agency appointed by the Alliance Executive to convene this planning process, but IITA estimates it has spent very substantial staff time in contributing to the planning since the undertaking was agreed in mid 2004. The first regional MTP (delivered in mid 2006) identifies seven areas for research and collaboration, but the drawn out process has dampened enthusiasm at IITA for further efforts which are not project-led.

IITA has also provided strategic inputs into other regional and African planning processes. IITA utilized its GIS capacity, regional farming systems knowledge and experience of benchmark site research to support the inception phase of the Challenge Program (CP) for Sub-Saharan Africa and to assist in the identification of the pilot learning sites (PLS) for the first research phase of the CP. Research is planned at the KKM PLS (in northern Nigeria and southern Niger) where IITA has had a long-term presence, and more work is being planned in the ZMM PLS in southern Africa. However, the research process has not been initiated because of a protracted administrative negotiation amongst partners. The Panel is assured that the impasse has recently been overcome, but progress towards initiation of work at this site should be kept under review.

### 2.5.5 *Managing growth*

The budget of IITA has grown substantially over the review period (the proposed figure of USD 50.6 million for 2007 is 40% higher than it was in 2001). It is important to ask if this new donor investment has enhanced or detracted from the accomplishment of IITA's research outputs. What have been the long term effects of this growth in budgetary resources in relation to the sustainability of IITA's undertakings and the Center's impact?

In an era of generally declining support to agricultural research, IITA's success in reversing its previous budgetary decline and generating new sources of support is to be applauded. The precise value of the additional income to IITA is difficult to judge, because a significant proportion of the funds, while managed by IITA, flow to partner organizations. This is often an effective use of the funds; for instance, an ARI partner provides advanced technology to complement IITA's research, or an NGO facilitates the delivery of IITA's technologies. In addition, the overheads allow some stability for essential research, or the availability of project funding may allow the Institute to continue employing a scientist in an administrative position until more research funds are identified. And of course access to development projects provides IITA with needed experience in R4D in order to generate the information and principles that will lead to broader impact.

However, there are dangers in pursuing development projects simply as a source of funding. Scientists who work as project managers will find their capabilities and access to their discipline declining (and may look for opportunities elsewhere). If a significant proportion of the Institute's funds are derived from development projects, there may be a relative decline in the support services (publications, biometrics) offered to the remaining researchers. Most importantly, the Institute may find itself a victim of its own success. Donors and governments will increasingly come to it for the management of development projects and its reputation will change. It will be less able to attract or retain researchers or even to muster the resources required to monitor, evaluate and synthesize the projects in which it is working in order to derive the principles that would allow donors and governments to gradually abandon the project mode in favor of more sustainable policies and institutions that serve as engines for agricultural development.

*In Summary:* the Panel encourages IITA proceed to complete its Future Strategy document considering some of the suggestions provided in this report. **The Panel recommends that the Center should seek greater congruence between the overall Center strategy, MTP Project planning and the restricted project grants in order to articulate the high priority research and line up the direction of growth with the intentions of R4D. The Panel further recommends that the relationships should be clearly documented as a nested set.** The Panel notes that the drawing together of experiences (the synthesis of results in different areas, and evaluation of long- and short-term science) is an important input into the continuing evolution of effective strategic planning.

## 2.6 COMPONENTS OF IITA'S APPROACH

IITA's approach to its strategy and priority setting has implications for a number of areas of research management. Four elements are examined in the following discussion: the benchmark area approach (which was a key feature of IITA's earlier research design); biotechnology (which is assuming growing importance in the institute); product delivery (which is relevant to IITA's

focus on market development); and diversification (a key element in the Institute's market-led strategy).

### **2.6.1 *The Benchmark Area Approach: History and Current Situation in 2007***

The Benchmark Area approach was developed as the conceptual framework of the Ecoregional Program for the Humid and sub-Humid Tropics of sub-Saharan Africa (EPHTA). It was envisaged that interdisciplinary teams would be located at each benchmark site, backstopped from headquarters in each of their disciplines. The concept depended on the identification of research sites representative of large agroecological zones with fairly uniform socioeconomic features. Strategic research on those sites thus would maximize the extrapolation of research information. Two locations were initially identified, one in Cameroon in the Yaounde-Ebolowa area in the humid forest margins, and a second in Nigeria in the Kano-Zaria area of the northern Guinea savanna. A project proposal supporting the establishment of six benchmark areas was submitted to EU but not funded. Five benchmark sites were partially or completely characterized, but only the Kano and Cameroonian locations have continued to serve as research sites over the past 12 years.

Strengths of the approach: Identification of production constraints that are region-wide generates strategic research addressing important issues of variety, farming systems and soil fertility. This in turn leads to creation of IPGs addressing major production constraints that are widely transferable, giving maximum return to research dollars. Links with local partners ensure that relevant technologies are delivered to farming communities who would scale these out to the diverse communities across the benchmark area.

Assessment of progress: The Guinea savanna and humid forest margin sites have delivered a number of useful methodologies around selection of sites and representative study villages, and the diagnosis and description of local farming systems. The basic rationale behind the development and operation of benchmark areas is sound. To a fair degree IITA has achieved its initial goals in the two fully developed areas. Each is recognized as generating an array of research technologies applicable to farmers operating over a broad east-west belt from Guinea to northern Nigeria. However, characterization, development and maintenance of these sites has proved resource intensive at a time when the core funding needed to underpin long term development has been diminishing. When donors terminated support for a benchmark area the national programs had neither the resources nor the interest to maintain ecoregion-wide research. Some sites simply became irrelevant and were closed. Communication with partners and NARS, if ignored, rendered sites islands rather than nuclei for research. And where BAs were located in relatively remote areas, stable IR staffing became a problem. Sites succeeded where staff completed characterization and identified key constraints promptly, then moved quickly to establish a collaborative research agenda with partners and stakeholders. Staff needed to scale out as quickly as possible. Trim and nimble steering committees, and an appreciation of local culture and the evolving nature of cropping systems were also elements determining success.

The value of the benchmark concept was questioned by the 5<sup>th</sup> EPMR because of its tendency to compartmentalize resources. IITA has therefore de-emphasized this approach in recent years. A more flexible research investment strategy was needed in the face of major disease threats (e.g. brown streak virus of cassava) - something not possible if a large proportion of core research resources was committed to benchmark area-based research.

Current status: IITA now favors a commodity chain approach as a more efficient means of organizing good science. Factors determining the location of research programs are more heavily weighted towards population concentration and country size (e.g. Nigeria, parts of DRC, Kenya, Uganda, Ghana) or where specific challenges must be met (e.g. cassava brown streak virus in eastern Africa). The benchmark area approach has now become one of several factors determining location of research sites, some others being the regional nature and scope of problems, expertise, strength of NARS partners, availability of funding, and ease of staffing.

Panel assessment: The Panel recognizes the logic and the limitations of the benchmark area approach, and endorses the intelligent and selective use of this approach by IITA. However, the placement of research centers in East Africa, at first blush, does not appear to be very systematic. For example, long term commitments to research centers in Uganda and Tanzania appear difficult to justify on an agroecological zone or a genotype x environment basis. While the concept in ESA of “research stations without walls” provides flexibility in research and fast response to emerging crises, the Panel notes that short term staff deployments are hard on staff and families, and are not conducive to good strategic research. It is noted, however, that when IITA establishes a research location it is committed to providing full institutional support to that location no matter how short the funding horizon. Nonetheless, long-term natural resource issues that seriously threaten African agriculture must not be ignored. These include a decline in the base level of soil fertility, and the build up of problem weeds such as *Striga* and *Imperata*. If these are not addressed by IARCs (either individually or as part of cross-cutting programs) it is difficult to see who will tackle them at a regional level. There appears to be the need to establish at least one additional long-term benchmark area located in the mid-elevation ecology of ESA. The Panel would welcome a greater level of core support for such a step as costs elsewhere are brought under control.

### **2.6.2 Biotechnology at IITA**

IITA has made a major commitment to establish biotechnology facilities at two major centers (hubs) and a network of smaller facilities (nodes) at several locations. Considering that several of the staple crop commodities of Africa under the IITA mandate, namely cassava, yam, cooking banana, plantain, and cowpeas, receive little attention from the larger global biotechnology community, these investments at IITA seem well justified. The Center has clear and deliberate strategy for using its biotechnology facilities for building regional capacity and to serve as a bridge by linking its NARS partners with advanced research institutions around the world to apply emerging biotechnological tools to African crops.

The IITA biotechnology facilities are placed at several locations spreading scarce resources rather thinly. The oldest of these facilities, and still the largest, is the one located at the Ibadan headquarters. This facility undertakes biotechnology R&D in the areas of tissue culture, plant transformation, and the development of molecular markers for diagnostics, diversity analysis, and potential use in breeding. It is supported by good support facilities such as greenhouses and managed by active, hands-on scientists.

The second IITA biotechnology hub is located in Nairobi and is somewhat integrated into an existing ILRI laboratory platform as a joint IITA and ICRISAT sub-platform. This facility is also envisaged to serve as part of a network of bioscience research for eastern and southern Africa (BECA) under the New Partnership for Africa’s Development (NEPAD). The government of Canada (CIDA) provided much of the funding for construction and refurbishment of laboratory facilities, equipment for both genotyping and bioinformatics. The IITA-BECA facility specializes

in high throughput marker technology and in serving collaborative research efforts with IITA and NARS partners in eastern and southern Africa. No tissue culture or transformation activities are undertaken at this facility. A Facility Manager is assigned to each of these hubs with total oversight responsibilities.

In addition to the two major hubs, IITA also conducts biotechnology activities at Benin, Cameroon, Kano, Uganda, and Tanzania. Plans seem underway to expand these activities to Malawi and Mozambique. Biotechnology activities at these research locations are conducted in facilities put together primarily by IITA or in joint effort with partner NARS. Some like the excellent facility in Uganda for both transformation and marker work are primarily run as a national facility that receives minimal support and oversight from IITA. In Uganda, IITA's biotechnology research appears fully integrated with those of NARO.

The following observations have been made about the strategic plans, management, and overall conduct and vision of biotechnology research at IITA:

1. While there appears a good division of labor and fully complementary programs between the larger hubs at Ibadan and Nairobi, relations appear cold. A strategy paper presented to the team stated:

*“There is currently limited interaction and information flow between Nairobi based scientists and IITA scientists based in western Africa (particularly Ibadan) and IITA's Administrative center in Ibadan. There is a tendency for scientists from eastern Africa to be seen as competitive to those in western Africa, and vice-versa, a culture that is counterproductive to teamwork and IITA's research agenda”.*

The Panel agrees, and it is wise to intervene quickly and delineate the proper division of labor and accentuate the complementary nature of the efforts at these two facilities. Both facilities can easily be enriched by the other excellent R&D efforts that IITA and partner scientists conduct in each of these two regions. We suggest that IITA assess whether the DDG for Research or a designated IITA Biotechnology Officer be designated for this and similar Center-wide coordination of biotechnology research at IITA.

2. There is currently no ASARECA-commissioned regional biotechnology project conducted as a *bona fide* BECA project. Nevertheless, the laboratory is well utilized with projects funded through grants that IITA scientists and partners have developed. We are, therefore, cautiously optimistic, that when current construction efforts are completed, there is likely to be sufficient bench space to accommodate the research needs of IITA and ICRISAT “core” projects as well as the expected NARS demands through the NEPAD/ ASARECA initiative.
3. Research in biotechnology is expensive; there are significant overhead costs and the consumables for wet-laboratories are very costly. We suggest that IITA not continue to expand biotechnology facilities at several centers but focus on strengthening the two hubs for truly regional capacity building, research service, and backstopping.
4. In connection with the above, and where the NARS offer modest facilities, IITA should not invest to equip and run a separate and parallel program but instead strengthen NARS efforts by linkage to IITA's regional biotechnology (hubs) facilities. Placing biotechnology equipment and personnel at several facilities may deny IITA the focus and concentration that its biotechnology program will need to have the needed impact.

*The Panel recommends that IITA does not expand biotechnology facilities further into other locations, but instead strengthen the facilities at the two existing hubs to serve the needs of NARS as well as the IITA scientists more adequately.*

*The Panel further recommends that in order to improve coordination and communication between its biotechnology hubs at Ibadan and Nairobi, IITA should consider appointing a biotechnology coordinator to facilitate the functions of these hubs and enhance effectiveness of the Center's biotechnology thrust.*

### **2.6.3 Product Delivery**

IITA develops a number of different types of research products. This discussion focuses on the delivery of tangible products (including crop germplasm, varieties, biocontrol agents and biological pesticides) and does not include the delivery of information products such as crop management recommendations or policy advice.

*Germplasm:* IITA has managed germplasm development and testing networks for many years. IITA is the host for WECAMAN, a network for maize breeding research in West and Central Africa and coordinates or participates in networks for its other mandate commodities. NARS report that they are able to request trials from IITA although recent funding problems have meant that the number of regional trials sent to NARS for some crops such as cassava has diminished. There are two brief IITA Impact Studies published in 2000 on cassava and maize, showing the significant (and growing) contribution of IITA germplasm to varieties released by national programs. An on-going study in West Africa aims to update information on maize varieties and the use of IITA germplasm. IITA believes that it has contributed to the release of 23 varieties of cowpea, 57 of cassava, 8 of yams, and 17 of soybean", although the retirement of the soybean breeder has been responsible for a lapse in the capacity to track this crop. Maintaining networks for germplasm testing is therefore important, so that IITA can place high priority in the more strategic research of developing new traits and new source populations that NARS partners can exploit at their specific environments. This makes for a proper division of labor.

*Crop varieties:* NARS are responsible for the final development and release of crop varieties based on IITA germplasm, although in cases where NARS do not have plant breeding capacity these are direct selections from IITA lines. In most countries variety release procedures for grain and legume varieties are fairly well established (although not necessarily efficient), but less so for root and tuber crops and bananas. It is not clear if IITA invests enough effort to help make these variety release processes more agile. It may be worth IITA reviewing national variety release procedures for its crops, especially in the context of renewed interest in the reform and harmonization of seed regulations in all regions of Africa.

The release of crop varieties must be accompanied by a strategy for seed production and provision, and this is an important deficiency for most of IITA's crops. In Nigeria, the private seed industry interacts with IITA to identify suitable maize hybrids and the companies then collaborate with IAR to secure release of the variety. Although Nigeria is West Africa's leading producer of commercial seed, its total production is pitifully small. There are almost no other examples of private seed enterprises for food grains and legumes in West Africa. A donor funded project established a West Africa Seed Network (WASNET); when the project terminated, IITA agreed to run the network, but has recently turned the operation over to its members. The membership is based on national government organizations such as certification agencies, although some national seed producer organizations are also members. The network activities

largely concentrate on issues such as harmonization, variety lists, and interactions with NGO or community seed projects. These are useful activities, but the network does not appear to be an appropriate mechanism to promote commercial seed development in the region. IITA is currently reviewing the status of seed provision for maize in West Africa and soybean in southern Africa. IITA should ensure that it is able to take advantage of, and make contributions to, the several large donor-led initiatives that support seed enterprise development in Africa.

Because of the lack of a seed industry in West Africa, there are a number of instances where IITA projects feature community (or other local-level) seed multiplication schemes. Although such schemes may be useful for diffusing new varieties, there is no evidence from IITA that they lead to any sustainable seed production capacity. In addition, the investment in such schemes may undermine any incentive for the development of private seed production capacity. It would be appropriate for IITA to address this dilemma in a more organized way, as it seriously affects the capacities for diffusion of its products. A review and synthesis of its experiences in this field would be in order.

The challenge is even greater for vegetatively propagated crops. IITA has considerable technical experience in this area. Virtually all of the diffusion of new varieties of these crops is done through special projects that organize multiplication and (often free) distribution. These may be in the context of emergency programs to combat the spread of crop disease or as part of general agricultural development projects. IITA has been involved in so many of these efforts that the Institute should be able to synthesize this experience and work towards promoting more sustainable strategies for the diffusion of these crops. The analysis would also consider where conventional multiplication is the most appropriate route and where innovations such as mini-sets (for yams) or tissue culture techniques are to be promoted.

*Transgenic crops:* IITA is developing transgenic cowpea and banana varieties. The African Agricultural Technology Foundation (AATF) is assisting with the cowpea work (*Maruca*-resistant Bt cowpea) and the banana work on transgenes for resistance to bacterial wilt. AATF promotes the concept of developing business plans for its projects but IITA's role in the business planning is not clear, although IITA has recently been commissioned to do a study on demand for Bt cowpea in West Africa. IITA has also been contracted by AATF to do baseline studies related to the development of *Striga*-resistant (imidazolinone-tolerant) maize varieties in several countries, although the actual technology is being developed by CIMMYT and others. It would be useful if IITA played a more active role in business planning for its transgenic crops (whether or not their development is facilitated by AATF).

The development and deployment of transgenic crops depends on the establishment of national biosafety regulations, a process that is proceeding very slowly in much of SSA. IITA has taken the lead on a donor project related to biosafety in Nigeria. Although the establishment of biosafety frameworks is an essential prerequisite for the delivery of any of IITA's transgenic crops, it is difficult to see what IITA's comparative advantage in this area might be, and there are a number of other players in this field. IITA can play a useful supporting role in this area, particularly in collaboration with SROs, but it should not be seen as an institution that would take the lead on the development of national biosafety frameworks.

*Bio-pesticides and biological control products:* IITA has had considerable success in several biological control innovations (e.g. for cassava mealy bug and green mite control); the deployment of these natural enemies depended on agreements from national governments and publicly funded

dispersal efforts. A more recent example is experience with the development of the bio-pesticide “Green Muscle” for the control of locusts. Although this product is now produced commercially, its deployment is also handled through publicly funded application over fairly wide areas of a country. An on-going effort to identify and produce benign species of fungus to compete with those responsible for aflatoxin in grain may also lead to products that will be deployed by public efforts, at least initially, but if successful would be expected to be available through commercial channels. IITA hopes to develop and deploy other bio-pesticides that will be used by individual farmers and will certainly require commercial production and distribution. The nurturing of local enterprises to produce and market such products is a significant challenge; IITA needs to devote more effort to identifying how such enterprises can be developed and what its role, in collaboration with other partners, should be in this development. There has been much talk in IITA and other CGIAR Centers about “innovation systems”, but there is little practical experience for ensuring that the appropriate entrepreneurs and end-users interact with scientists during product development. In addition, national regulatory systems currently make the commercial release of such bio-pesticides difficult or impossible. IITA can achieve a certain “demonstration effect” by limited field experiences (as is apparently the case for *Beauveria bassiana* fungus for the control of the diamondback moth in vegetables in Benin employed by an NGO), but it will not have significant impact until the regulatory issues are addressed. This is not a task for IITA alone, but it needs to formulate a clear strategy to contribute to efforts at regulatory reform.

**IITA is entirely correct in emphasizing the important role of markets in agricultural development in Africa but the Panel recommends the institute to pay more attention to building and strengthening national agri-business capacities for marketing the inputs (such as seed, clonally propagated materials and biocontrol agents) that embody the institute’s own technologies, and draw lessons from this experience.**

#### **2.6.4 Role of IITA in Diversification and High Value Crops**

A focus on diversification and high value crops is consistent with the CGIAR System Priority 3. There are various roles for IITA in this area. First, it is important to emphasize that IITA research that allows greater productivity for traditional food staples can contribute to providing farmers with greater food security and thereby open opportunities for diversifying into other crops. Second, the development of a wider range of demand for traditional staples, with new industrial uses and higher grades and standards, can also provide additional income through participation in agricultural markets, and IITA is pursuing several such opportunities. Third, crop research can enhance the productivity of livestock systems (as recent work on dual-purpose cowpea has illustrated). Fourth, this priority offers IITA the possibility of establishing research expertise in new crops and cropping systems.

It is this fourth area that is most challenging. IITA has always had an agro-ecological mandate and has conducted research on quite a wide range of crop staples. The possibility of taking on research responsibilities for additional, non-staple crops is thus a logical option. However, it is important that IITA carefully define its particular areas of expertise and its strategy for collaboration with other partners.

The current support for the various tree crop projects and the application of IITA’s experience in IPM to horticultural crops provides an opportunity for building up a reputation and set of expertise over the next several years that could allow IITA to offer a well-defined set of skills, contacts and priorities for contributing to agricultural development through high-value products.

The first priority should be to clearly identify IITA's specific technical contributions. For tree crops, IITA has long experience in crop management and socioeconomic analysis in forest (and forest margin) systems. For vegetables, IITA's biological pest management experience is the principal entry point. However, there are many areas where IITA must rely on the technical expertise of other institutions; the design of the farmer field schools for cocoa, for instance, necessarily relies on the experience of institutions such as CABI and national cocoa research organizations. Similarly, IITA has limited experience in crop management for vegetables, its pest control expertise is limited to biological options, and the potential range of horticultural crops demands some prioritization and focus. IITA has little to offer in terms of germplasm for any high-value crop and thus must identify and collaborate with appropriate partners; even its research on molecular mapping of cocoa must be turned over to someone else in order to make use of it.

Because much of what IITA is being asked to do in terms of technology development for high value crops involves crop management (rather than plant breeding), there are particularly acute challenges for designing adequate delivery systems. The crop management changes recommended for cocoa (e.g. for disease control) require significant farmer learning. The current strategy of investing in the extension technique of farmer field schools (FFS) is logical, but the variable track record of FFS for various crops around the world, and the concern about the technique's cost effectiveness, implies that much investment will be needed in monitoring progress and in searching for the most efficient means of delivering crop management advice. The challenge is exacerbated by the moribund state of most national extension systems; there is considerable hope that civil society organizations can fill much of this gap, but that is so far based on faith rather than accomplishment. The concern about FFS is equally applicable to interests in pest control for vegetables, and the paucity of successful examples of the introduction of IPM to resource-poor farmers argues for careful monitoring and evaluation. These are areas where a combination of IITA expertise and the synthesis of wider experience could make a significant contribution to the policy arena, consistent with IITA's mandate. IITA should move away from concentration on developing particular extension strategies or designing specific configurations for farmer organizations and instead provide objective syntheses of experience to guide others in these areas of technology delivery.

An important crop management option for high value products for which IITA is particularly well placed is that of bio-pesticides. (Bio-pesticides can of course be used on a wide range of crops, but their costs, specificity and management requirements indicate that they are likely to make their first impact on commercial crops.) These currently have little use in Africa (besides the delivery of "Green Muscle" for locust control by public programs and a few examples in export horticulture). Two major impediments are business development and regulatory frameworks. Bio-pesticides have a short shelf-life and lend themselves to small enterprise models but there is little such development in SSA. In addition, there is significant potential for improving national pesticide policies to make them more consistent with safer and more effective pest control strategies, and in particular to make regulatory frameworks accommodate bio-pesticides. Current national regulations and costs essentially preclude the introduction of most bio-pesticides. Until enterprise development and regulatory reform are addressed, there is little hope that any IITA innovation in this area will find its way into farmers' fields on a significant scale. It is essential that IITA identify organizations that can push forward on these two issues and define its own contributions.

It may be argued that some of the problems of encouraging crop management improvement will be resolved when more efficient output markets provide better incentives for investments from farmers. This is a position that is explicit in the conception of the various cocoa projects. For many high value products final demand is well established but intermediate points in the marketing chain are deficient. The argument is undoubtedly valid, but who should take responsibility for improving these output markets? In the current cocoa projects, donors rely on IITA to coordinate much of this work, although they call in other organizations (such as the Canadian cooperative organization, SOCODEVI) to improve marketing efficiency. While temporarily accepting responsibility for helping coordinate others in the development of producer cooperatives, farmer groups and certification systems and organizing market information systems, IITA should not seek to enter directly in these activities. These have been the features of many donor projects (in various crops, in Africa and elsewhere) for several decades, with variable success. Building the local institutions that can support an industry such as cocoa production is a very difficult challenge. IITA should concentrate on identifying the most competent organizations that perform this role and confine its input in this area to synthesizing experiences in those areas where it has competence. One example might be the area of farmer organizations and their interactions with the marketing process (especially where there are interactions with production options and technology use), but even here IITA needs to demonstrate that it has the expertise (and a critical mass of research and analysis) to allow it to make a useful contribution to a field of research where many others are already involved.

Similar arguments can be made about IITA involvement in sectoral policy for high value crops. The CCER for Project C has recommended that IITA limit its contributions in sectoral policy analysis and this advice should be considered for high value crops. IITA socio-economists are capable of describing and modeling commodity sectors, but the significant investment of time in such work would only be justified if they address clear policy outcomes that contribute to practical interventions related to technology generation and provision. Such possibilities should be clearly articulated before engaging in such work.

The growing realization that high-value crops can make a significant contribution to agricultural growth for many resource-poor farmers, the current commitment of donors to fund IITA work in this area, and IITA's relevant technical experience offer the hope that this is an area where IITA can make an important contribution. But the Panel urges IITA to use the next few years to better define its comparative advantage so as to be able to act with more authority in its negotiations with donors and their widely varied interests and objectives in agricultural diversification.

*Summary Assessment.* The Panel's major concerns about the Center's planning and priority setting relate to the basis for, and process by which MTP projects seem to be conceived. Some of the current uncertainty in this process is related to the changing guidelines and short deadlines for the written plans required by the Science Council, but it is also related to the unclear connections between the Center's strategic plans and its annual planning process. It also appears to the Panel that the Center needs to make a clearer distinction between the research leadership expected of senior managers (especially DDs) and the proposed project management responsibilities of other scientists (Chapter 5). The RDC should be seen as a think tank, while the Deputy Directors should devote themselves to planning, priority setting, and monitoring performance.

### 3 QUALITY, RELEVANCE AND IMPACTS OF SCIENCE

#### 3.1 Quality of science at IITA

The heart of IITA's mission is to conduct research that addresses key issues of agricultural development in sub-Saharan Africa. The quality of that research affects the impact of the Center, both in the short and long terms. In seeking to address this issue the Panel recognizes that although its mandate is to review the previous 5 years research, a great deal of IITA's strategic research on germplasm improvement and natural resource management may take 10-15 years before its efficacy and impact can be properly assessed. It is today's research that determines IITA's capacity to respond to the needs that arise in a few years. The Panel is also aware that IITA has enthusiastically embarked on a program of R4D, and this has the potential to move research activities downstream on the discovery to delivery scale. As well, a significant proportion of the development research tends to be nationally focused and may generate results that are by nature country-specific, rather than being international public goods applicable to a whole region. These and other issues, therefore, were considered by the Panel.

##### *3.1.1 Steps taken by IITA to address quality of science issues*

IITA conducts strategic, applied and adaptive research, as well as engaging in advocacy and capacity building. IITA interprets support from the donor community and the SSA-CP as an expression of confidence in their R4D research strategy and an endorsement of the quality of its science, and in general the Panel concurs. Quality of science has been widely discussed by the RDC. As a result IITA research managers have focused on science quality assurance through leadership, mentoring, the effective use of core funds to support and protect core science competencies needed to ensure gains in long-term research endeavors (such as breeding), and support for new science. The RDC has also outlined a strategy for technology acquisition through stronger links with ARIs. Some examples would be the close relationships that have been forged with the University of Copenhagen during the development of acyanogenic cassava and a cassava-specific DNA micro-array; and strong collaboration with the John Innes Center in UK during the development of genetic linkage maps in yam that has resulted in significant technology transfer to IITA.

Several mechanisms are used by IITA management to ensure and enhance the quality of science:

- Appointment of link persons from the Program Committee of the Board to specific projects, to increase their input to the strategic research agenda of the Center, and assist the Deputy Directors who lead these projects.
- CCERs conducted on five of the major projects described in the 2003-5 MTP, and recently a CCER of the SP-IPM program. There has been a donor commissioned review of Project A. These have produced useful recommendations on the direction and conduct of science. Future CCERs are planned at the rate of one per year.
- The annual work and strategic planning meeting where project outputs are set and quarterly milestones agreed upon.
- Individual scientists set workplans with Deputy Directors (DDs) to help ensure adequate research standards. The DDs monitor the quality of work as it progresses. Annual performance appraisal of scientists awards at least 15% of the overall assessment to quality of science, judged by publications, presentations, paper reviews, proposals prepared and funded, and quality of research outputs.
- Field monitoring tours at Project level are held at all IITA locations to observe field execution, and staff seminars are open to all.

- Competitive grant opportunities for travel to conferences, and training courses that may incubate new science.
- Review of research contribution of staff, who must present a research seminar every three years as part of the contract renewal process.
- In-service training in topics such as statistical analysis, writing skills etc.
- Internal review of manuscripts before submission for publication, managed through the office of the DDG-R4D.

### ***3.1.2 Assessment of science quality at IITA by the EPMR***

Quality of science at IITA is not easily defined, since it must always be tempered with relevance of research goals in the R4D continuum and expected return on research investment, as well as the more traditional measures of quality. In assessing the quality of science the Panel relied on the following sources.

1. Reports, articles, presentations and planning documents supplied by IITA, and supported by personal observations during field visits and discussion with research managers at the Center.
2. 20 research publications selected by IITA at the request of the EPMR to represent the breadth and depth of science over the past 5 years.
3. The Reports of the five previous CCERs and one donor commissioned review.
4. Science quality assessment carried out for the IITA EPMR (April/May 2007), which includes an analysis of publication records.
5. Results from the CGIAR Performance Measurement System: IITA results for 2006.
6. Results of a Stakeholder survey carried out for the EPMR (April/May 2007). There were 37 responses from institutes in 15 countries. Institutes from 12 countries in SSA responded (including institutes in the host country, Nigeria)
7. The CGIAR's 2006 Stakeholder survey: The IITA stakeholders (N=52) were a mixture of knowledgeable partners and CGIAR Members, with about 50% from ARIs and 33% from national or regional organizations.

The following indicators have been considered by the Panel (criteria are expanded further in Annex 6.)

#### *A: Relevance of science to SSA:*

IITA's stakeholders provide an important source of opinion on IITA's research programs and their relevance. In the 2007 survey all respondents were familiar with IITA, and 56% of respondents rated IITA as excellent in roots and tubers research, while 35% of respondents rated IITA excellent in plant health research. More than 50% of respondents rated IITA as either excellent or good in all research categories except in natural resources management research, where 50% of respondents categorized IITA's research as poor. The attitudes of respondents to IITA's work on high value products and agro-industrial initiatives was more evenly spread over response categories, suggesting that IITA has not yet established a reputation for its research and related activities in these fields. Around 50% were familiar with IITA's R4D approach and felt that this had had a positive effect on the Center's achievement. Half of the respondents (nine of these are institutions from countries in which IITA has sites or projects) indicated they could not contribute at all to priority setting. These results were broadly consistent with those from the 2006 survey, when IITA scored better than average on perceptions relating to its research attributes, e.g. research addressing most current and relevant agricultural challenges, or innovative research.

Research papers submitted to the Panel ranged in relevance to Center research goals from highly relevant (sustainable cropping systems in the savanna; a major review of the severe CMD epidemic) through to irrelevant (sulphur dynamics on temperate soil under ryegrass in pots). And while papers that identify molecular markers associated with major diseases of mandate crops make for good science, their relevance to IITA's mission is reduced when there is little evidence that marker assisted selection has not been routinely applied for the traits in question. The Panel notes that current molecular marker research on diversity analysis tends to be somewhat repetitive. The Panel was informed that staff with the necessary expertise in MAS has recently been hired, and the Panel would welcome a sustained and carefully planned initiative in MAS on one or more of IITA's mandate crops.

The Panel considers that the relevance of the MTP projects to meet Africa's needs is generally high. It is also tempered by the responsibilities the CGIAR itself places on the Center, both in terms of mandated crops and of system wide goals. The projects that focus around crop improvement goals and management systems for those crops are well focused and remain highly relevant to IITA's mandate. Agrobiodiversity is responsible for conserving the genetic variability that drives genetic gains in the commodity programs into the foreseeable future. Opportunities and Threats, inasmuch as it enhances and protects those gains through biotic, abiotic and socioeconomic elements also is close to the heart of the Center's mission in science. IITA's mandate in Agriculture and Health is a departure from traditional concerns but is congruent with new CGIAR goals; whether the production and delivery of cryptic traits whose identity is difficult to preserve is an effective means of addressing these problems remains to be demonstrated. High Value Crops, with its focus on crops such as cocoa and peri-urban vegetable production represents a departure from the Center's historic focus on mandated staples, but there is little doubt that these types of crop represent important income sources for many African farm families. The protection of gains in staples through biocontrol measures provides a direct link to African small-holder needs. The Panel finds however that there are relevant areas that have a long-term horizon, similar to that for crop improvement, that do not appear to be adequately addressed during the period under review. An obvious example would be the sustainable management of the natural resource base of SSA.

*B: Rigor of science:*

In general the Panel finds that the rigor of science at the core of each of the MTP Projects to be acceptable. This is especially true for those crop improvement projects that represent mature science and that have been in existence for several decades. However, for new areas, such as the High Value Crops Project little traditional research is being conducted. The rigor of the disciplinary science that supports crop improvement is generally adequate, but there is some variability. One concern is in the area of soil fertility where the panel feels the appropriate questions are not being asked. For example, what are the nutrient requirements and the nutrient balances of the major cropping systems in key food producing areas of SSA, and are these sustainable? Are trials being conducted at enough locations to generate confidence in region-wide recommendations? Are indirect indicators of nutrient deficiency such as DRIS being followed up with appropriate field trials to confirm nutrient responses in appropriately adapted germplasm? In the area of socioeconomics, research focus (and perhaps rigor) appears to be threatened by overload and lack of critical mass in addressing priority themes. Management at IITA asserts that all projects proposed and accepted by IITA contain a significant science component. Are line scientists engaged in developing these research components? The Panel strongly encourages IITA to be more assertive in developing researchable hypotheses and

research strategies in each of its major restricted core projects so that technology generation becomes a clearly identified component of the development effort.

The Panel has already noted the tension that exists between the need to conduct relevant research to support development and the need to meet scientific standards of major journals. This is particularly challenging in SSA, where scientific staff are expected to fulfill many roles “to get the job done”. Nevertheless, publications are an important measure of scientific quality and provide assurance of that standard to staff and managers alike. A good publication record also helps ensure that researchers will move between IITA and peer research institutions with little difficulty. In the following discussion we make a distinction between “ISI journal” and “All peer reviewed journals” (the latter category is more encompassing, since it includes ISI journal articles as well as many types of articles subject to different forms of peer review).

The publication record of IITA’s scientific staff is generally good. It is however uneven, in that 22% of IRS staff published no ISI journal peer-reviewed articles over the past five years, and 16 % published no peer review articles of any sort. The average rate of publication was 0.9 publications per year in ISI journals, and the average for only the staff who published was 1.5 publications per year. Two scientists published 6 ISI journal papers each in 2006. Almost half of the papers published were co-authored with national program partners. Comparisons with other CGIAR Centers are always difficult, but the mean publication rate in ISI journals in six other Centers is 1.7 per year (range 0.8 – 3.0), and the percent staff who failed to publish any articles over a 5 year period was 17% (range 8 - 22%). Clearly the proportion of IRS who did not publish at all in the past 5 years should be of some concern. Forty-seven percent of all IRS joined the Center in the period under review and some may still be establishing their scientific programs. Nonetheless the numbers of students supervised per staff member over the past 5 years (6.4) is high by CGIAR standards, and this usually results in journal publications. IITA staff are, however, widely recognized for their contributions, with 42% being asked to review journal papers in that same period.

Research papers submitted to the Panel ranged considerably in the rigor of the scientific approach employed. For example, the Panel hoped to find in the evaluation of farming systems for the savannas some long term estimates of treatment effects (from modeling or experimentation) on nutrient balances and yields that support assertions of sustainability, but were disappointed. This is an example of where rigor and depth can be added to the R4D approach to provide a quantitative underpinning to its research. Other highlighted research contained in overviews was excellent but sometimes old. The journals chosen for publication varied from average to excellent.

*C: Enabling high quality science:*

IITA’s internationally recruited staff (IRS) is reasonably balanced for gender (22% female), well qualified (>80% with PhDs), and represents a wide array of disciplines. In terms of primary disciplinary expertise the largest group are those trained in crop improvement (approximately 25%), followed by staff trained in plant health, entomology and pest management research (23%) and socioeconomics (23%). Agronomy and soils professionals comprise 21% of staff, and nutrition and food safety professionals 8%. There are a number of specialized skills represented among staff such as GIS, nematology and insect taxonomy. In general it is a well balanced research team, but with some obvious gaps. For example, there is no IRS-level biometrician, and the Center’s weed control specialist and its only senior yam breeder have both recently been appointed to positions with more than 75% time allocation to administration. As well, IITA’s staff

is aging. The age distribution of the total IRS complement shows 65% in the range 45 to 59, with only 3% of IRS in the “young scientist” age bracket of 30-34. The Panel understands that there has been a concerted attempt to hire Post Doctoral staff to support core competencies burdened by administrative responsibilities. The Panel urges IITA to accelerate that program and augment it by an aggressive hiring of competent scientists in the 30-40 year age bracket.

There have been shifts in the balance of skills in IITA since 2002, with the strengthening of the socioeconomics group. Stakeholders surveyed in 2007 encouraged IITA to continue to provide research activities in all relevant areas, rather than further increasing the emphasis on development, socioeconomics or policy advocacy. In other words, they felt the changes in balance over the past 5 years had gone far enough. On the other hand, more than half of the respondents rated IITA’s training and capacity building programs as average, and several noted the decline in these activities in recent years.

Research papers submitted to the Panel painted a mixed picture of staff strength. In a number of cases the senior author was not an IITA employee, and several papers described research that was done prior to the author joining IITA. Most illustrated a healthy research team work ethic, and there was a lot of evidence of good research partnerships among co-authors in ARIs. However, in a few cases IITA scientists’ input appeared to be limited to the supply of the genetic materials.

The Panel wishes to compliment IITA on the strength and dedication of its research team. It has however noted some areas of weakness in disciplinary balance of that team. The most obvious is the absence of an IRS-level statistician. Soil fertility is another apparent area of weakness, and needs leadership at the senior scientist level. At a less important level, the absence of simulation capability in the crop and soil areas impedes the capacity of the Center to address long term research issues, especially those associated with time trends.

The Panel has also noted that IITA has been slow to fill senior scientific positions and still may not have the appropriate arrangement for research planning and management (and supporting services like procurement which affect the rate of science). The Panel suggests that IITA has paid a price in the fashioning and refashioning of new projects (a process still in train) without overall direction to reorient its research towards the Research for Development approach.

*D: Maintaining science quality:*

The successful hiring and retention of high quality staff is a critical component of continuity to long term research programs. Plant breeding frequently depends on a deep familiarity with germplasm, genetic variation and environments and their idiosyncrasies. In agronomy and socioeconomics it is an in-depth understanding and appreciation of the environment – whether it is crop, soil, cropping system, household or policy – in which agriculture operates. However, the 2006 stakeholders survey asked respondents to rate the Centers’ abilities to hire and retain high quality staff. IITA scored 11 points below the average Center score for this attribute.

The Panel recognizes the special features of IITA’s situation, especially the challenges of attracting staff to Ibadan. IITA has done a remarkable job of providing a safe and comfortable working environment on campus, and reliable access to internet and cell phone services has greatly improved communications with the outside world. However, the Center may have to consider a more deliberate approach to enhancement of family and professional life at headquarters, and the deliberate strengthening of research locations outside Ibadan so they become viable and

recognized hubs of research excellence. The Panel also commends and encourages the steps taken by research management to monitor and mentor research by individual scientists, and to maintain their research skills.

*E: Output and impacts of science:*

Historically there have been very large returns to IITA's research in areas such as biocontrol and breeding for resistance or tolerance to plant viral diseases. In the assessment of the Medium Term Outputs, as part of the CGIAR's Performance Measurement system, 95% of IITA's 75 declared Outputs were considered met in 2006 - a high rate of accomplishment. IITA identified five outcomes from their work which varied in character: determination and use of cassava standards in Nigeria, Uganda and elsewhere; reduction of child labor in cocoa plantations; adoption of nutrient management systems in northern Nigeria; selection of improved cassava genotypes in Sierra Leone, Benin and Nigeria; and dissemination of improved cassava planting materials in Southern Sudan. It is noteworthy that these 3 out of 5 of these outcomes are in cassava production and utilization.

Stakeholders also have perceptions of IITA's major impacts. The 2007 survey for the EPMR revealed that more than 50% of respondents considered IITA's major contributions to research were in cereal legume systems and in root and tuber systems, and the majority of respondents found IITA's germplasm conservation program highly relevant to their own programs.

Several of the 20 research papers submitted to the Panel showed convincing effects of impact, though as formal studies of impact *per se*, they were rather variable in quality. IITA's role in managing the EACMV epidemic in east and central Africa, the impacts of biocontrol, and the positive benefits of legume-cereal cropping systems in the savannas paint an impressive picture of the impacts of research. Others, such as the mapping of key traits, are expected to provide impact in the future.

Through its Performance Measurement (PM) system the CGIAR has assessed the Centers' impact by two indicators:- a review of 12 papers providing some measure of impact of IITA technologies and published in 2006, plus an evaluation of current 'impact culture' (influenced by the recent increase in socioeconomics staff). The *studies* of impact that IITA submitted and which were evaluated by the CGIAR's PM assessment in 2005 (such impacts are assessed triennially) were found to be of relatively poor quality. However, this does not mean that IITA is without impact (as assumed by one IITA investor who may have misinterpreted this indicator), but rather that the quality of the technical approach of the submitted studies was deficient.

In preparation for the Review IITA prepared a document bringing together methods and experience in the conduct of ex-ante and ex-post impact assessment and farm-level adoption studies since the time of the last review. The review clearly shows a considerable body of research on these topics, reflecting increasing investment by IITA in this area. However, there is much more that IITA needs to do to foster an effective impact culture and to focus impact research on relevant objectives rather than just submitting studies to meet the PM criteria. The Panel notes the somewhat dubious value of CGIAR indicators of performance which can become ends in themselves. Publications may be developed simply to meet performance measures. The opportunity cost to the conduct of research by this type of activity can be high. It is unfortunate that CGIAR stakeholders may misinterpret the real value of indicators and the Panel urges the CGIAR to ensure that information (and investor education if necessary) is made available to

ensure that Centers are not penalized inappropriately nor diverted from practical, comprehensive studies of adoption and impact.

The 5<sup>th</sup> EPMR suggested that IITA should seek to improve the quality of its science. This Panel is happy to report that the Center has indeed started down the road towards that goal and is making good progress. An effective and sustainable R4D program will work towards ensuring that development is truly driven by science.

Summary: IITA deserves praise for the quality of its scientific team and the core science activities in which it engages. The Panel does not consider that the quality of science is a serious constraint to achieving the mission of the Center at this time, though it also recognizes that good science begins by asking the right questions and building appropriate research skill sets to address those research issues. However good quality science will only lead to practical outcomes if research programs allow the opportunity for a comprehensive and long-term effort, a goal that may be threatened by reliance on multiple projects with varying mandates. The Center's policy of protecting its core competencies appears to be working effectively in the crop improvement programs, but has faltered somewhat in natural resource management. It is important also that IITA maintain its core biotechnology capability, so that it seizes the opportunity to use molecular breeding techniques whenever their cost effectiveness can be demonstrated in an African context.

### **3.2 Current Research Agenda and Scope**

Research lies at the heart of the mission and mandate of IITA, and is the anchor of the Center's R4D strategy. IITA has an ecoregional mandate for sub-Saharan Africa, and a set of mandated crops with which it works. These are staples that nourish Africa – yams, cassava, bananas and plantain, cowpea, maize and soybean, while other sister CGIAR Centers have responsibility for complementary species such as sorghum and groundnut. In the 1980s and 90s the Center's responsibility was to engage in genetic improvement of mandated crops, and develop crop management practices that would exploit these improvements to provide increased production, while conserving the natural resource base. Under those priorities, IITA conducted long term research that had significant impacts on food production in SSA. In 2005 the Science Council adopted an expanded set of priorities for CGIAR Centers that includes enhanced nutritional quality and safety, the genetic enhancement of selected high value species, and the goals of increasing income from fruit and vegetables and from forests and trees. These have been embraced by IITA and together with the more traditional priorities form the basis of the 2007-2009 Medium Term Plan.

### **3.3 Assessment of the MTP Projects**

IITA's research agenda described in the MTP includes seven projects plus the System-Wide IPM Program. These differ considerably in size and scope. When ranked by the proportion of Center budget, the largest is Roots and Tuber Systems (30%), followed by Cereal and Legume Systems (21%), High Value Products (19%), Banana and Plantain Systems (12%), Agrobiodiversity (7%), Agriculture and Health (5%), Opportunities and Threats (5%) and the System Wide IPM Program (2%). Each of these is considered in turn.

### 3.3.1 Agrobiodiversity

IITA has as one of its major responsibilities the collection and conservation of genetic resources in a form that will be useful to crop improvement programs in IITA, in national programs, and by researchers throughout the world. IITA's Genebank collection represents a unique insurance strategy against future biotic and abiotic challenges on the continent. Collections are of the mandated crops, though some species of regional importance (mainly bambara groundnut and African yam bean) are also conserved. A small microbial collection is maintained in IITA-Cotonou. The Genebank also houses temporarily the African Rice Center collection. A multipurpose tree collection (118 *spps*) is maintained in the IITA arboretum for observation.

**Table 3.1 Germplasm collections held in IITA's Genebank (March, 2007)**

Common name	Latin name	Total	Seed bank	Field bank	<i>In vitro</i> bank	Designated
Cassava	<i>Manihot esculenta</i>	3,144	0	3,144	1,547	2078
	<i>Manihot</i> spps (12)	125	33	92		
Yam	<i>Dioscorea</i> spps (10)	3,333	133	3,200	1,286	3200
Banana/plantain	<i>Musa</i> spps	293			293	293
Cowpea	<i>Vigna unguiculata</i>	15,001	15,001			15,001
Bambara groundnut	<i>Vigna subterranean</i>	2,030	2,030			2,030
	<i>Vigna</i> spps (56)	1,632	1,632			1,632
Soybean	<i>Glycine max</i>	1,909	1,909			1,909
African yam bean	<i>Sphenostylis stenocarpa</i>	139	139			
Misc. legumes	(12 spps)	430	430			
Maize	<i>Zea mays</i>	767	767			
<b>Total</b>		<b>28,803</b>	<b>22,074</b>	<b>6,436</b>	<b>3,126</b>	<b>26,143</b>

Of the genotypes under storage, 77% are stored as seed and 22% vegetatively propagated in the field. Of those vegetatively propagated, 49% are duplicated in the *in vitro* bank. Of the total collection, 91 are designated (distribution to other programs takes place on request, but intellectual property on these varieties cannot be claimed by them or IITA). Long-term seed storage is held at -20°C, while the working collection is maintained at +5°C. Seed stored at -20°C is expected to store in good condition for 50+ years, while at +5°C expected life is ~10 yrs.

The Genebank has been in existence since the inception of the Center, and collections have been steadily accumulated over time. At present it is managed by a Germplasm Scientist supported by a committee of scientists with a direct interest in its utilization and function. From 2002-2006 the Genebank and biodiversity functions were part of Project A, and in 2006 the present stand-alone project was formed. It contributes to CGIAR System Priorities 1A, 1B and 5A.

#### *The Agrobiodiversity Project*

There are four project outputs. The first two are the collection, preservation, documentation and distribution of accessions of 1) clonally propagated species (35%) and 2) seed crop species (30%); 3) Description of the genetic diversity of conserved germplasm (25%); and 4) Breeding populations targeting transfer of traits from wild species/unadapted germplasm (10%). The Panel agrees with the nature of these outputs and the balance of effort among them.

Staffing consists of eight scientist years from 23 scientists representing appropriately diverse disciplines. In 2007 the budget for the project was US\$3.35 m, a 56% increase over 2006, and comprised of 58% restricted core and 42% unrestricted core. It makes up 7% of Center research expenditure in 2007, up from 4.6 % in 2006.

Collections include cassava landraces from West Africa (the majority), DR Congo, Malawi, Tanzania and Zambia. Some cassava introductions from Latin America are included (most Latin American introductions came as crosses on IITA germplasm since they had no CMD resistance); and cultivated materials from Asia and Africa; a yam (*D. rotundata*) collection from WCA; a collection of *D. alata* from Asia; a collection of yellow fleshed yam (*D. cayenensis*) originating in West Africa. Modest collections of wild relatives of most mandated crops are also housed in the bank, including a *Vigna* collection from Africa. No wild relatives are held for banana. As improved cultivars are released, they also become accessions in the Genebank for later evaluation of genetic gain, though is no clear policy on this. There is a small program of *in situ* conservation on yams at Ibadan in which several sites in the IITA forest are monitored for native populations. There seems little reason to expand this activity at this time.

Seed collections are regenerated every 15-20 years, based on protocols developed at IITA. Between 2001 and 2006 1442 of 1700 bambara groundnut accessions stored for the past 20 years at +5°C and -20°C were successfully regenerated, documented and stored in the long-term vault at -20°C. Germplasm of vegetatively propagated crops is maintained as living collections in the field or as tubers, roots, cuttings or bulbils. For these, field planting each year (yam) or alternate years (cassava) is the main method of regeneration - a costly procedure. IITA has therefore taken a leading role in *in vitro* reduced crop cycle storage. After several rounds of tissue culture, plantlets may lose vigor and exhibit morphological changes because of somaclonally-induced lesions. This merits further study to understand and minimize changes in the genetic integrity of accessions.

Core collections are in the process of being identified. They consist of approximately 10% of the accessions, chosen to represent ~95% of the genetic variation in the collection, and identified by clustering morphological or molecular characteristics. In the past 5 years core collections of yam (380 accessions) and cowpea (2078 accessions) have been identified. A smaller core collection of cowpea (N=374) has been identified using molecular markers. Identification of a core collection based on morphological traits has recently been completed in cassava.

Conservation without characterization and evaluation limits the usefulness of any collection. Various subsets of the cassava collection have been characterized for starch type, CBSD, anthracnose and root knot nematode. The whole collection is scored during growouts and has provided sources of resistance to CMD<sub>Ug</sub> and cassava bacterial blight. All cowpea accessions have been screened in Kano for *Maruca*, *Striga* and mosaic resistance. The yam collection has been evaluated for resistance to yam mosaic virus, anthracnose and leaf spot, and subsets for nematode infestation. Soybean accessions have been screened against rust, and all are susceptible. Under the HarvestPlus Challenge Program subsets of cassava and yams have been characterized for micronutrients (Zn, Fe, beta carotene).

A number of diversity studies have been conducted in mandated species. SSR markers were used to estimate genetic diversity in 209 collections of cassava from Africa and Latin America, and showed a high level of within-region diversity, being greatest in Brazilian and Colombian collections. A total of 2575 cassava accessions were evaluated for diversity with 14 SSR markers

in 2004 under the Generation Challenge Program. In a study of West African cocoa relatively little genetic diversity was observed, suggesting vulnerability to future challenges from diseases and global climate change.

Phytosanitary issues are especially important. Seed and clonally propagated materials are indexed for viruses, and seed shipped from the Genebank outside Nigeria must be accompanied by a Germplasm Health Statement issued by the semi-autonomous Germplasm Health Unit in IITA, as well as a phytosanitary certificate issued by the Nigerian Plant Quarantine Service that is under the Nigerian Ministry of Agriculture. The Panel is satisfied the due care is being taken to avoid the dissemination of diseases through shipments originating in Ibadan. However, since these facilities do not exist at other locations, it urges IITA to establish a similar standard of security at other research locations.

Within IITA linkages are strongest with the crop improvement programs. Externally the Project partners with a wide range of institutions ranging from national genebanks, research Centers and plant protection agencies, and the genetic resources Centers of the sub-regional organizations. The Inter-African Phytosanitary Council works with IITA to provide a framework for safe movement of germplasm within Africa. The University of Nottingham has phenotyped bambara groundnut collections, and CIRAD continues to provide SSR markers for yam. Within the CGIAR, IITA is a partner in the SGRP (System-wide Genetic Resource Program) and SINGER. These ensure standard crop preservation protocols, descriptors and information exchange, and consistent operation under the International Treaty on Plant Genetic Resources for Food and Agriculture (in force since 2004). IITA also collaborates with genebanks in CIAT, CIMMYT, and Bioversity (for *Musa*).

Management of risk is an important consideration. Regeneration of vegetatively propagated material occurs at two separate locations to avoid losses from weather, and duplicate copies of tissue cultured accessions are kept in IITA-Benin. In the future seed will be periodically sent to the International Seed Vault. The Genebank has its own backup generator capable of maintaining essential functions. The panel is satisfied that all reasonable steps are being taken to avoid the loss of genetic materials from accident and misadventure.

Achievements for the project over the past 5 years, in addition to those noted, include the successful maintenance of > 6000 clonally propagated materials in the field; the generation of 2900 field-based accessions in the *in vitro*-genebank with a duplicate copy of 87% of these in Benin for security; the certification of 53 accessions of *Dioscorea*, 1790 of cowpea and 287 of cassava as virus free; and regeneration of 7000 cowpea collections. A total of 3019 accessions in the genebank were distributed to 10 countries during 2003; 3886 accessions in 2004; 3534 in 2005; and 2388 accessions during 2006. The economic value of Genebank activities is currently being assessed.

*Assessment:* This is a unified and cohesive project that is a protected core IITA activity. The Genebank is functioning securely and efficiently, is well-respected, works with an appropriate range of partners, and is used as source of useful agrobiodiversity throughout SSA. IITA is commended for maintaining these activities in a difficult working environment, and IITA staff have easy access to Genebank data. It is less clear if molecular characterization follows a well defined plan, or how priorities are set among competing activities such as diversity studies in cocoa vs. cowpea and the conservation and regeneration of "orphan" vs. mandated crops.

*The future:* Cryopreservation of tissue has the potential to eliminate effects of somaclonal variation and the need for regular field and tissue regeneration of conserved, clonally-propagated germplasm. *The Panel recommends that IITA seek support for collaboration with an appropriate ARI to establish dependable cryopreservation protocols.*

As breeding populations improve, the difference in performance between them and landraces will widen, and a greater investment in prebreeding within core collections will become justified. Prebreeding activities should be broadened and extended to crops other than maize. A plan for the systematic evaluation of the structure of genetic diversity in core collections is needed, using SSR or SNP markers. The Panel suggests that prebreeding activities based on such studies be extended to cowpea, cassava and yam, with a focus on abiotic stress tolerance. Such activities should be jointly designed and managed by scientists from this project and from the major crop improvement programs.

Security and integrity of the collection is of continuing concern. The panel suggests that IITA review the adequacy and distribution of its duplicate storage sites in case of civil unrest, and ensure that a fail-safe bar-coding system for identification of samples throughout the regeneration process is implemented.

Additional collections appear justified. The panel suggests that in light of the challenges to landraces posed by global climate change, additional funds be sought to complete the collection of *Dioscorea* species. The successful crossing of cassava and castor suggests that the maintenance of a collection of *Ricinus* spp. in the genebank is now justified.

*Designated germplasm:* Under the terms of the International Treaty on Plant Genetic Resources, IITA supplies designated germplasm under the Standard Material Transfer Agreement (SMTA), a lengthy document that accompanies each seed shipment. IITA admits some confusion and concern over the use of the SMTA for distribution of material under development. The panel shares IITA's concern and encourages the Center to continue to share its experiences in the implementation of the SMTA with Bioversity and other Centers of the CGIAR.

Although IITA considers its insect collection formally under the Opportunities and Threats Project, the Agrobiodiversity title might be expected to represent the Center's collections more broadly. Certainly, the Panel notes an absence of any cross-reference to the insect biodiversity collection held at IITA-Cotonou. Its collection of 6,000 African insect species and 250,000 specimens is unique, and information and taxonomic skills embedded in this collection should be utilized more widely in IITA. At the same time, there is the need for long-term and stable financial support for this unique African asset. We encourage IITA to address these two issues in the near future, while maintaining the utility of the collection to the biocontrol program in Cotonou.

### 3.3.2 Roots and Tuber systems

Roots and tubers have a major role in the nutrition and well-being of Africans living in the humid and sub-humid ecologies of the continent. Cassava provides good famine insurance, is quite drought tolerant, ranks 6<sup>th</sup> among major staples globally and is second only to maize in Africa. It provides over 50% of calories for over 200 million people in SSA. Yam is estimated to provide 60 million people in SSA with 200 kcal/day in West Africa. Both are vegetatively propagated crops, so transmission of viruses and bacteria in planting materials is a challenging problem. Data on current production, area and yield of cassava and yams, and trends from 2000-2005 (Table 3.2) indicate that both crops are predominantly found in WCA.

**Table 3.2 Production, area planted, and yield of cassava and yams in Eastern and Southern Africa and in West and Central Africa (Source: FAOSTAT, 2007).**

	Eastern and Southern Africa			Western and Central Africa		
	Production m ton	Area m ha	Yield t/ha	Production M ton	Area m ha	Yield t/ha
<b>Cassava</b>						
Current <sup>a</sup>	22.2	2.57	8.62	83.9	8.61	9.75
2000-05: Slope	-0.066ns	0.011ns	-0.070ns	3.37**	0.195**	0.183**
2000-05: %/yr	-0.29	0.43	-0.79	4.28	2.34	1.94
<b>Yams</b>						
Current <sup>a</sup>	0.23	0.03	7.14	44.58	4.60	9.72
2000-05: Slope	-0.023*	-0.0114*	0.74*	1.954**	0.233**	-0.071ns
2000-05: %/yr	-8.54	-21.04	13.16	4.70	5.48	-0.72

<sup>a</sup> Current level is the mean of 2003, 2004 and 2005 data. Zambia data not included.

\*, \*\*, ns: slope significantly different from zero at P<0.05, P<0.01, and P>0.05.

M=million

Only 21% of SSA's cassava production comes from ESA. In WCA, cassava production is dominated by Nigeria (46%). From 2000-2005 production has grown at a faster annual rate in WCA (4.3%) than in ESA (no change). In both regions, growth in area during this period has been greater than growth in yield. More than 99% of SSA's yam production occurs in WCA, where the main producers are Nigeria (71%), Cote d'Ivoire (11%), Ghana (9%), and Benin (5%). From 2000-2005 the 4.7%/yr increase in production was entirely due to an increase in planted area. Industrialization of cassava is occurring across the continent, following the pattern of development of the crop in Thailand and Brazil where it serves as an important source of industrial starch and animal feed. It is likely that the new opportunity of bio-fuels production from cassava will have an impact on cassava production and utilization dynamics. IITA has the sole mandate for conservation and improvement of yams, while the mandate for cassava is shared with CIAT.

*History:* Yam and cassava breeding at IITA dates from the early 1970s. Prior to 2002 cassava and yam were part of at least four projects (numbers 5, 6, 13 and 14). In the reorganization of research in 2002, roots and tuber research activities were distributed mainly in three of six projects (B; D; E). In 2006, a further reorganization formed the present Roots and Tuber Systems Project. The Panel welcomes the uniting of these two major crops under one project and one head.

Roots and Tuber Systems Project: Crops include cassava (*Manihot esculenta*), yams (*Dioscorea* spp., mainly *D. rotundata* and *D. alata*), with sporadic research on taro (*Colocasia* spp.) and cocoyam (*Colocasia* and *Xanthosoma* spp.). Both cassava and yams flower, and can be relatively easily crossed. From F1 onwards each is clonally propagated, and takes about 5 years from initial crossing to the first replicated yield test, and a further 4-5 years to release and large scale multiplication. Cassava has multiple uses (fresh roots, gari, chips for animal feed, leaves as vegetable or forage; starch, glue, ethanol, etc) while yams are considered a luxury staple used for human consumption. Nigeria has legislated that 10% of all bread shall be non-wheat flour, and this component is often cassava.

The project has six major outputs: 1) Prioritization of policy, input/output markets, post harvest and production constraints (17%); 2) Description of biotic and abiotic processes and interactions (24%); 3) Improved root and tuber germplasm (22%); 4) Integration of improved component technologies (18%); 5) Assessment of the commercial viability of agro-enterprises (7%); 6) Strategies for enhancing technology adoption potential (12%): Impact is expected to be through increased productivity and informed agroenterprise investment.

Root and Tuber Systems is the largest of IITA's projects, utilizing 28 scientist years (56 scientists in total), of which 74% are located in WCA. The budget (2007) is US\$14.3M (68% restricted core, 32% unrestricted core), and represents 30% of IITA's research budget, down from 37% in 2006. Major donors are USAID and Government of Nigeria for cassava, and IFAD for yams.

Variety development: A major goal of the central breeding program in both crops is to create a reservoir of useful genetic variation in an improved genetic background. Genetic variation is first collected and preserved in the Genebank. Sources of resistance are identified and delivered when a biotic challenge to the crop arises on the continent. This population is improved through recurrent selection. Breeding objectives in cassava reflect its diverse uses as food, feed (cassava leaves; chips) and industrial applications (mainly starch). Germplasm divides by adaptation into lowland and mid altitude. Four satellite breeding populations have been formed for biofortification, mealiness (cyanogenic glucoside levels are low), industrial requirements, and ploidy manipulation. Extending shelf life after harvest is desirable, though not as important as stable pest resistance. Selection in yams includes yield, pest resistance, upright unsupported top morphology to reduce labor, and tuber shape. There is no active selection for fertility responsiveness, though increasingly cassava progeny trials are being evaluated under low and high fertility. The main breeding program is at Ibadan, but breeding is also conducted in Uganda, Tanzania (east Africa) and Malawi (southern Africa). The crop is widely adapted as it is grown under a wide range of environmental conditions. The genotype x environment structure of the cassava germplasm within Africa does not appear well defined. Potential for breeding cassava appears prospective as African and Latin American germplasm pools are considered heterotic. Yam breeding populations are divided by species (*rotundata* and *alata*) and across end uses (e.g. fresh or for flour) and earliness to bulk.

For both crops the main immediate challenges are diseases. The most urgent of these are viruses, namely severe CMD (cassava mosaic disease), formed from a viral hybrid and showing aggressive resurgence in Uganda (EACMV<sub>UG</sub>), and cassava brown streak disease (CBSD), found on the East African coast, and spreading. By screening accessions from the Genebank in disease "hotspots", sources of resistance have been identified. Some of these are linked closely with an SSR marker, and robust ELISA tests have been developed for use by NARS to type variants of both diseases. IITA scientists have introduced resistance against CBSD into farmer-grown

cassava varieties and have optimized plant regeneration protocols for farmer-grown cassava varieties to prevent virus transmission in seed materials. Genetic transformation experiments using a reporter gene construct are in progress for CMD resistance, and resistance to cassava bacterial blight has been found by screening ~1200 clones from the Genebank. Yam mosaic virus (YMV) is the most important yam disease. Resistant sources are available, including a QTL identified for resistance in *D. rotundata*. Reliable methods of accurately identifying YMV and its variants by ELISA or PCR-based tests are available for use by NARS. QTL and RAPD markers for yam anthracnose resistance have been found in *D. alata*, which is severely affected by the disease. To be useful these should be converted to a PCR-based marker system.

Insects and nematodes are also a major challenge, though IPM through biocontrol has had a history of remarkable successes in cassava. Cassava green mite is widespread but is being adequately controlled by a predator mite, *T. aripo*. Selection for hairy (vs. glabrous) apices on cassava improves the effectiveness of *T. aripo*, and provides a useful trait during selection. African root and tuber scale is a challenging disease to both crops in specific locations, and little resistance has been identified. Nematodes are a problem in both crops, but treatment of planting materials with nematocides improves performance, and some genetic resistance in cassava has recently been identified. Applications of fertilizer may suppress nematode reproduction in yam tubers.

Testing and distribution of improved germplasm is challenging. Multi-location testing and distribution in ESA has been through the networks EARRNET and SARRNET (though EARRNET may be discontinued by ASARECA). Similar work on yams in WCA has been supported by project funding. In WCA distribution of both crops was sometimes facilitated by WASNET, but this function has been handed back to the NARS. A major effort is needed throughout SSA to provide clean root and tuber propagation materials, either as stalks, tubers or as tissue-cultured plantlets. There are currently project-related activities which allow for the distribution of planting materials and harmonization of rules for seed production. However, no formal seed system is in place for the multiplication/distribution of clean planting material.

In general, breeding programs for both crops appear ready to meet short-term challenges from pests and diseases. The Panel is satisfied that sources of resistance to key threats have been identified, and tools for accurate virus identification are available to scientists and to a lesser extent IITA's partners. However, the programs appear less well prepared to meet the challenges of intensification that will surely occur in the next decade. The Panel commends IITA as the global leader in vegetative propagation of field crops, and strongly suggests that the Center, with appropriate partners, actively encourage large scale efficient tissue culture and field propagation methods, backed by cutting edge virus detection methods, and executed by the private sector wherever possible.

Research in agronomy, nutrition and processing: While cassava yields are increasing in WCA, yields of cassava in ESA and yams in WCA are declining, in part because of declining soil fertility. Specific nutrient requirements for cassava and yam are not well defined, nor indeed is the value of chemical fertilizer to these crops. The role of arbuscular mycorrhizal fungi in yam nutrition is also somewhat obscure, but under investigation. Under the guise of the HarvestPlus Challenge Project variation for beta carotene, iron and zinc have been assayed in African landraces, and genetic gains can be made for these traits. However, the relationship between nutrient content and yield has not been clearly defined. The Panel strongly encourages IITA to

determine the general response of both crops to chemical fertilizer in terms of yield and suitability of roots or tubers for pounding and storage.

Processing and storage research focuses on industrial demand, and on traits like suitability for mechanical peeling of cassava roots; mechanical systems for mechanization; convenience for packed food; starch and glue - all in partnership with NARES, the industrial sector and ARIs. IITA should examine its comparative advantage in pursuing industrial applications of cassava and seek to transfer gradually most of its industrial applications research to suitable partners.

*Partners and roles:* These reflect an appropriate choice of NARES, regional and subregional organizations, international Centers (ILRI and especially CIAT) and ARIs that can provide an array of industrial and laboratory technologies and information. Several partners are developing molecular tools in both crops and some are experimenting with transgenic events in cassava. The new BiocassavaPlus project links many upstream partners to generate an experimental multi-gene transgenic cassava with high nutritional value and disease resistance. The Panel finds the mix of partners and their roles to be appropriate, but specifically urges IITA to develop stronger links in germplasm exchange with CIAT.

*Impacts:* The period under review builds on an era of extensive adoption of IITA cassava germplasm. It is estimated that by 1998, 22% of the 9 million ha of cassava grown in 20 SSA countries was IITA derived, giving on average a 49% yield increase. A total of 48 IITA-derived cassava varieties were released in SSA 2002-2006. The cassava green mite biocontrol campaign has resulted in continent-wide success, largely through the distribution of *T. aripo*, which is now established in at least 20 countries in sub-Saharan Africa. A total of 8 yam varieties have been released in Nigeria and Ghana over the past 5 years. The first linkage maps for *D. rotundata* and *D. alata* based on AFLPs have been published, and a large number of ESTs are available for each crop. The group has produced a total of 204 publications as well as a significant number of postgraduate theses. The Panel wishes to congratulate IITA scientists for the remarkable impact on cassava production of IITA's cassava varieties and biocontrol agents, and commend them for communicating these results through a very good publication record.

*The future:* The strengths of this project are its multi-disciplinary team, partnerships with ARIs and NARS, and its cross links with other projects such as Agrobiodiversity, Agriculture and Health, and Cereal and Legume systems. The project has good internal coherence, and a unifying central theme based around root and tuber crops. Provided it can maintain a product focus, it should serve African farmers and IITA well in the next decade.

Genetic gains will need to be protected by ensuring that ample genetic variation for pest resistance is present in the breeding programs. A continuing program of evaluation of the cassava and yam collections from the Genebank, grown under disease pressure, provides the basis for this. Cassava is easily crossed with its wild relatives, and recently has been crossed with castor bean (*Ricinus communis*). For yams, the ideotype developed after the 5<sup>th</sup> EPMR provides a useful breeding guideline that should result in high yield and lower labor costs during production. Crosses between *D. alata* and *D. rotundata* have not been successful thus far, but the Panel agrees that this is an important crossing barrier to be overcome because of the wide adaptation of *D. alata* and generally better tuber quality and anthracnose resistance of *D. rotundata*. The panel strongly encourages IITA to continue research on carefully selected wide crosses in both crops, and to retain its focus on reducing labor costs associated with growing both crops.

New breeding methods may also improve the chances of using seed rather than vegetative materials when exchanging germplasm. There are several possibilities. The most interesting is hybrid production in cassava, using male sterility, doubled haploids, and followed by pedigree breeding approaches. The identification of heterotic groups and the development of inbred materials that set seed reliably would allow germplasm exchange through sexually produced seed, with little/no virus transfer. Backcrossing would be facilitated, something presently quite difficult in cassava. A second, already underway, is ploidy manipulation to facilitate wide crosses. The Panel strongly suggests that an experimental breeding program in cassava, oriented mainly towards hybrid production, be started as a special output within Root and Tuber Systems.

The panel strongly suggests that breeding procedures be modified to ensure that fertilizer responsiveness is determined at the progeny level during selection by routine evaluation under at least two diverse fertility regimes, following an assessment of historic data for the presence of genotype x fertility level interactions. This will permit the identification of genotypes that do well under both, and prepare the program for intensification that will inevitably occur in these crops. The Panel notes that there is a need for a senior root and tuber agronomist based at Ibadan to work closely with breeders. Leads on improved management practices for cassava will likely come from Thailand and Brazil.

Molecular breeding is largely an untapped resource in this project. A recent donor review found little or no evidence of use of molecular information in breeding programs at IITA. The overarching strategy in molecular breeding of roots and tubers is not clear to the Panel. It strongly encourages the development of such a strategy. IITA has been active in hiring staff with skills in this field. The Panel encourages IITA to undertake a proof of concept marker-assisted selection experiment using PCR-based markers or SNPs identified in partnership with ARIs, refined as needed by the experiences at CIAT in this area.

While the new Project structure should work well for varietal improvement, it is less clear if this grouping will result in integrated sustainable farming systems in which both crops play important parts. This research is allocated to Output 4: integration of improved component technologies, where it attracts one activity. To the Panel this appears to be an inadequate attempt to exploit the characteristics of new improved germplasm through better crop management, and strongly encourages further agronomic research in these two crops. Furthermore, innovative yam-based systems may be required to build interest in the crop in 1-2 countries in ESA. If this proves insurmountable, IITA should consider abandoning plans for improving yam production in this sub-region.

The Panel endorses the thrust towards increased involvement of the private sector particularly leading to the commercialization of post-harvest product processing in a number of project activities. These initiatives will trigger primary needs for systems that provide clean seed, diagnostic kits for disease detection at the farm level, and industry that absorbs additional production through processing plants. IITA has done an exemplary job in fostering private sector involvement in processing. The Center can step back from cassava processing, storage issues and food technology options, promote them with the private sector, and thus release resources to develop a program on "seed" systems for clonally propagated species. It is strongly suggested that IITA consider establishing a commercialization group advised by successful businessmen to provide guidance and linkages in the business community across a wide array of technologies with potential for commercialization.

### 3.3.3 *Banana and Plantain Systems*

Bananas and plantains are perennial crops that grow quickly and can be harvested all year round. In 2000, there were some 9 million hectares of bananas and plantain globally, with world production estimated at 99 million tonnes in 2001. Figures are approximate because around 85% of banana production comes from small plots and backyard gardens, and most is consumed locally. Around 10% of production comes from large plantations and enters world trade.

Banana and plantain, however, are staple food crops for millions of people in developing countries<sup>18</sup>. In parts of sub-Saharan Africa, Latin America and the Caribbean, average per capita consumption is 0.15-0.30 kg per day. In Uganda, Rwanda, Gabon and Cameroon, bananas account for between 12 percent and 27 percent of daily calorie intake of their populations. In export, it ranks fourth among all agricultural commodities, and is the most significant traded fruit, with world trade totaling over US\$ 4.7 billion annually<sup>19</sup> (and see Annex 7.)

Diseases are among the most important factors in banana production worldwide. They remain the primary focus of all current breeding programs. Recently, diseases have also become principal targets of biotechnological efforts to improve this crop. The main challenges to research include breeding for resistance to Black Sigatoka disease, Fusarium Wilt (Panama disease), Bunchy Top Virus and banana weevil, alongside the development of improved production systems.

The importance of banana and plantain in Africa is underscored by the priority rating these crops have been given by the sub-regional organizations, particularly so in the ECA countries where banana and plantain are in the top four commodity and factor research priorities. The IITA program therefore has a strong justification for its focus on these crops. In the ECA the strongest banana proponent is Uganda, and both IITA and NARO have strong commitments to the program. IITA has been in Uganda for over 14 years where it has definitely contributed to the strengthening of the banana and plantain research profiles of NARO.

IITA strategies for banana research: Tetraploid bananas have been introduced from IITA/Uganda in 2004 and 2006 for establishment of nurseries, experiments and setting up of demonstrations in Mozambique, Malawi, Zambia and Angola.

In the project "Production of transgenic bananas resistant to *Xanthomonas* wilt disease in Eastern Africa", efforts are underway to develop improved varieties of banana resistant to *Xanthomonas* wilt using the *pflp* and *hrap* genes isolated from sweet pepper (*Capsicum annuum*). These genes are owned by the Academia Sinica, Taiwan, and are accessed by IITA through AATF. The transgenic crops expressing these genes have shown to be resistant to experimental bacterial disease and fungal disease challenge. This project will be implemented by ensuring that farmer preferred banana varieties are transformed and regenerated using the protocol established at IITA. Plants expressing transgene (*pflp* or *hrap*) will be tested in a proof of concept experiment by artificial inoculation (*in vitro* screening) to evaluate for BXW resistance, in controlled laboratory conditions and containment facilities. IITA and other organizations are also involved in researching and promoting crop management interventions for the control of BXW. In this case (and in all instances in which IITA is pursuing genetic transformation) an important part of IITA's business

---

<sup>18</sup> The world banana economy 1988-2002 FAOSTAT

<sup>19</sup> UNCTAD-INFOCOM, 2004, Market information in the commodities area

planning for technology deployment should include periodic assessment of the costs and benefits of competing or complementary technologies.

Other pest management options, such as the use of clean planting material as a strategy against nematode and weevil attack, have been developed (including hot water treatment to sanitize planting material). Some of these technologies on testing have provided benefits to farmers. Introduction into farmers' fields on a larger scale is needed, together with pre- and post-harvest handling techniques that enhance the suitability of the produce for trade. Efficient partnerships with both national public and private networks of extension agencies, and various segments of the private sector, will be required. In agronomy, research efforts are being made to identify soil-pest interactions, soil degradation effects, and drought stress responses. A number of factors affecting yield have been identified, and technologies are being developed to improve agronomic practices. This is done in close collaboration with research on germplasm improvement, in particular in the fields of IPM and drought stress research.

*Dissemination process for bananas and plantains: West Africa:* In West Africa, the "Strategic *Musa* Improvement Project" (SMIP) aims to develop disease resistant plantain and banana hybrids. The IITA hybrids combine disease resistance with high quality fruit and yield up to three times the levels of traditional varieties<sup>20</sup>. New varieties have been distributed to NARS in West Africa, through conventional multi-locational evaluation trials.

In Nigeria, some 15 banana or plantain hybrids have been delivered, with clear geographical x socio-cultural differentiation. In Ghana, where testing has been in effect since 1998, three hybrids (two plantain, one cooking banana) were identified as meeting the requirements of producers and consumers. IITA is currently setting up performance trials requested by the National Variety Release Committee (NVRC) prior to official release. In Cameroon, adaptive work with four hybrids was initiated in 2002. Farmers are better able to control the hybrid delivery process and to promote capacity in seedling production and post harvest processing. Awareness of improved hybrids in Cameroon has also increased with on-farm tests at nodal sites across the country.

*East Africa:* The overarching challenge has been to develop diploids and tetraploids having both disease and pest resistance and improved agronomic qualities with '*matoke*' characteristics and identify fertile triploids for use as seed parents.

Breeding achievements:

- Eight Sigatoka resistant East Africa Highland Banana (EAHB)-derived secondary diploid hybrids have been developed and are now being used for developing triploid hybrids.
- Forty-eight Sigatoka resistant EAHB-derived secondary triploid hybrids have been developed and are being evaluated. So far, four triploid hybrids have been evaluated by farmers for disease and pest resistance and yield. These rated above the EAHB and are being further evaluated in different parts of Uganda.
- Hybrids with improved resistance to black Sigatoka are being used in varietal mixture trials with farmers' varieties. Such experiments have shown that by reducing the inoculum load of black Sigatoka, the hybrids enable the landraces to perform better.
- Resistance against the most important nematode has been identified and is being used in the breeding program.

---

<sup>20</sup> In 1994 IITA was awarded the King Baudouin Award for outstanding scientific merit on the basis of this research.

Dissemination of five IITA bred hybrids has been undertaken in Uganda, where IITA collaborates with a private company, AGT, to produce endophyte-enhanced tissue culture material for bananas for dissemination at large scale. Hybrids BITA-2 and BITA-3 were also included in the largest scale hybrid distribution scheme ever undertaken in eastern Africa, culminating in the distribution of nearly 2.5 million seedlings of improved varieties since 1997 in northern Tanzania. New donor support has boosted the dissemination scheme in Mozambique<sup>21</sup>. In the Crop Crisis Control Project (C3P), management practices to contain BXW are disseminated through NARS and NGOs in six countries (Uganda, Rwanda, Burundi, Eastern DRC, Tanzania, and Kenya). Deployment of transformed, adapted and farmer-preferred banana varieties in East African target countries will be commissioned in conformity with biosafety, risk assessment and management, seed registration and release procedures, public perceptions and consumer acceptability.

*Southern Africa:* A range of improved hybrids which incorporate genes for resistance to several important pests and diseases (including black Sigatoka), together with other with desirable agronomic characteristics (high yield etc.) have been developed. Some of these varieties have been introduced into NARS research systems in the Tanzania, Mozambique, Malawi and Angola. Plans include wider dissemination in the future in Mozambique and Zambia.

Expected overall impact of banana and plantain research: An earlier ex-ante study<sup>22</sup> on the impact of tissue culture of improved germplasm in Western Kenya (although not done by or for IITA), estimated welfare gains at US\$ 60M. An ex-ante assessment by IITA of the impact of BXW on economic welfare estimated the average annual economic losses over a decade from BXW in Uganda at US\$200M. A large number of farm and household surveys in Rwanda, Burundi and DRC have been done, which will allow an analysis of the economic viability of “on the shelf” technologies, as well as an impact analysis for the project. IITA intends to make impact assessment system-based instead of commodity based, and to cover economic, social and other aspects such as health and nutrition. A joint project between Bioversity and IITA, on assessing effects of diversified *Musa* genetic resources on poverty reduction, environmental sustainability and gender equality in rural communities began in early 2007.

*Future Continental and Regional Needs:* The Panel recognizes that banana and plantain are critical crops in the African food equation. Noting the development of emphasis on impact assessment, the Panel encourages IITA to ensure that such assessments are built into individual projects. However, according to available information at the continental level, banana and plantain productivity increases are not dramatic. Compared to other crops, increases in production have generally not kept pace with population growth from 1990-2005. Since 2000 increases in area have been minimal, and yield has increased only by about 2% in that period. The challenge will be to continue the increase in yields given some of the challenging disease issues faced by the crop and the general population increase.

It would appear that one of the main limitations to the improvement of the banana and plantain is the availability, access and affordability of clean and certified planting materials. This matter has attracted the attention of ASARECA in the ECA region. While the key players appreciate the fact that the production of planting materials should be handled by the private sector, the teams also recognize that tissue culture technology still needs support from a partner like IITA in

---

<sup>21</sup> [http://www.agr.kuleuven.ac.be/DTP/TRO/\\_data/onfarmactivities.htm#Tanzania](http://www.agr.kuleuven.ac.be/DTP/TRO/_data/onfarmactivities.htm#Tanzania)

<sup>22</sup> Qaim (1999), not by IITA

relation to the development of appropriate protocols, indexing capacity services, provision of transboundary material passports, and to serve as a trusted source of foundation vegetative propagation materials<sup>23</sup>. The panel would therefore encourage IITA to consider taking a lead in partnering with other interested parties like USAID/East Africa, the Tissue Culture Business Network (TCBN), CIAT, ISAAA, AATF, ASARECA and NARIs to launch and invest in a support platform for an African wide tissue culture initiative. Whilst this is important for banana and plantain, the Panel believes that this capacity should be thought of more broadly.

*The Panel recommends that IITA enhance capacity to provide intellectual and material support to germplasm health and transfer in Africa. This includes appropriate tissue culture protocols, transboundary material passports and indexing capacity and foundation, vegetative propagation materials. The intention of this recommendation is to further enhance IITA capacity so that this critical expertise can be shared.*

### 3.3.4 Agriculture and Health

IITA's mission oriented approach to agricultural research is designed to produce outputs that meet health as well as "market" needs. This project currently focuses on two particular elements:

- Malnutrition caused by a lack of micronutrients, such as vitamins, zinc, and iron, that affects vulnerable groups such as women and children.
- Poor food quality and safety, caused by mycotoxins, which endanger health and lives of consumers in Africa but also impose barriers to trade between African countries and important export markets such as the EU and USA.

There is also a small part of this project focusing on the impact of diseases, such as HIV/AIDS and malaria, on the availability of labor and agricultural productivity, and the consequent effect this has on food security and livelihoods.

IITA scientists involved in this project include breeders, economists and post harvest scientists, amounting to a total of 3.75 Full Time Equivalents (FTEs) across 12 scientists. Resources are allocated to specific projects in the following manner:

- Characterization of staple crops for vitamins and minerals (28%)
- Biofortification strategies to enhance the diets of nutritionally disadvantaged populations (28%)
- Improved food safety (36%)
- Options to mitigate human disease (HIV/AIDS, malaria) effects on agricultural productivity (8%)

Research highlights include:

- The development of aflatoxin biocontrol agents for maize and methods for inoculum production
- The identification of micronutrient-dense yellow-fleshed cassava clones (iron and zinc, and provitamin-A)
- The development of drought-tolerant and Striga-resistant high protein maize varieties
- Studies on nutrient retention of traditionally processed food products of cassava

---

<sup>23</sup> Proceedings Of The Asareca/ Ecabio Workshop on Plant Tissue Culture Held at Novotel Hotel, Bujumbura, Burundi from 29 November to 1<sup>st</sup> December 2006

- Studies on options for aflatoxin management (cropping systems, post harvest and storage) and the impact of aflatoxin on children's' growth.
- The conduct and analysis of a national dietary survey in Nigeria in order to inform priorities for crop-based nutritional improvement.

The nutritional enhancement work is based on the premise that despite the fact that increasing incomes and improving education about the benefits of a balanced diet are effective in dealing with malnutrition in the longer term, improving the nutritional quality of staple foods can play a role in reducing malnutrition in the short and medium term among the chronically poor. Most of this work is supported by restricted funds, including those provided through the CGIAR Harvest Plus Challenge Program. There is good evidence that IITA's plant breeders have made considerable progress in identifying useful sources for micronutrient improvement and have incorporated these in productive breeding programs, particularly in cassava and maize. It is less clear if IITA (or other institutions involved in these efforts) have thought as carefully about the targeting and delivery of nutritionally-enhanced varieties. IITA's involvement in the national nutrition survey in Nigeria provided useful experience on the distribution of micronutrient deficiencies, but there is little experience in providing guidance on what populations (defined by geographical or agroecological zone, rural/urban residence, or economic status) should be priority targets for such varieties, nor how these varieties would be promoted and delivered. For instance, an implicit assumption of much of this work is that these will be crops grown by farmers for home consumption, although rural laborers or the urban poor may often be at risk from malnutrition. The targeting and delivery issues need to be addressed in a wider context than IITA's own research, but an institute such as IITA that is particularly concerned with the role of markets in delivering innovations could provide a lead in this area.

While crop breeding has a role to play in improving nutrition, the assumption that this is a significant way to achieve improved food quality needs to be confirmed by an analysis of the food chain. This includes an evaluation of the nutritional value of current (and potential) varieties as well as an examination of how the nutritional value of the food product is affected by harvest, storage and processing. This type of analysis determines the points at which interventions might be required to increase nutrients or reduce their destruction, and the comparative cost effectiveness of each. IITA has an experienced food technology capacity that is already involved in relevant research. As most of IITA's mandate crops are potential candidates for this type of breeding investment, it is important that clear priorities and areas of intervention are identified. Given that the selection for micronutrient content involves significant opportunity costs (e.g. in foregoing additional yield or yield stability) it is particularly important that the work is carefully monitored.

The work on aflatoxin control involves both the development of atoxigenic strains of *Aspergillus flavus* that can compete with toxigenic strains and research on crop management and post-harvest conditions that can minimize the presence of aflatoxin. The impact on trade is the major economic incentive for adoption of control measures and instances where farmers are penalized economically for the presence of aflatoxin may be the logical place to start promoting technology change. For broader uptake of such technology, considerable farmer education will be necessary, and IITA will have to rely on suitable partners and policy makers. IITA's role should center on assessing the distribution of the toxic organisms and developing suitable technologies, while others will take the lead in making the case for policy intervention. The delivery of the atoxigenic agent shares many challenges with those of biopesticides, and these challenges - particularly in the absence of clear policy support and public health campaigns - should not be underestimated.

Although crop breeding for micronutrient content and the development of management options for aflatoxin control have little in common technically, they share an important reliance on health and nutritional data as a guide for agricultural research priorities and for targeting delivery. It thus makes sense that they fall under the same project so they can share the cost of monitoring the latest thinking and literature in these areas that fall, for the most part, outside of IITA's expertise. They also share the priority of identifying how products (new varieties or crop management options) that have health benefits that consumers will have difficulty recognizing or appreciating, can be delivered. Current plans are for analysis of the implications of HIV/AIDS or malaria for agricultural production, although this seems more appropriate for Opportunities and Threats. IITA should resist the temptation to include work that addresses general food security concerns in this project, unless it relies heavily on nutritional or medical data to provide a rationale for research decision-making.

*In summary:* A strategic plan for this project will be developed in the near future. The Panel strongly suggests that the planning process pay particular attention to defining those characteristics that qualify a research activity for this project, including the reliance on medical or nutritional criteria (as opposed to broader food security). It further suggests that the project contemplate mechanisms for periodic review of the rationale for pursuing specific health-related goals, including a review of alternative means of addressing these problems and analysis of opportunity costs for pursuing the research. IITA should devote an increasing proportion of its attention in this project to developing strategies for targeting these innovations and delivering them to specific populations in need.

### **3.3.5 Opportunities and Threats**

This is the most dispersed of IITA's seven projects, with a large number of staff contributing, on average, less than 0.3 person-years of time to its activities. The project's major output at present (with 42% of resources utilized) concerns diagnoses of biotic and abiotic stress. Although several of the contributing scientists are currently supported by core funds, and the project is presently relatively small in size, its scope and sustainability are threatened by the fact that more than 90% of the current budget derives from activities that terminate by September 2007. Thus there is a need to rethink the nature of this project.

The project emphasizes broad-based analysis of constraints and priorities; but as recent IITA documents on the "impact culture" have shown, priority setting must be seen as part of a system that includes farm-level monitoring, adoption studies, and impact assessment. It is not the best use of resources to envision a major project focused solely on identification of constraints. An alternative goal of the project would be to provide relevant information and analysis to the other projects (and to the institute as a whole) for the purposes of strategic planning, priority setting and monitoring of research results.

The project is described as taking responsibility for assessments that go beyond commodity-specific projects. There are certainly some important examples of this nature (e.g. climate change, input markets) that the project can address. But much of the work that IITA will do on priority setting and impact assessment is necessarily commodity-based, and confining the project to supra-commodity assignments would considerably limit its activities and its benefits. In addition, IITA must always consider its comparative advantage in devoting its scarce resources to long-term, cross-commodity issues rather than to issues of more direct importance to the institute.

Furthermore, the current list of constituent projects (biotechnology policy, mycotoxin control, livestock markets, knowledge support systems, climate change) is so broad that it is difficult to understand the “glue” that holds the current set of activities together. There is the danger that this project might simply become a repository for any activity that does not have a clear commodity focus. Instead, the project’s activities should be defined by their contribution to the ability to identify constraints and priorities for IITA’s work.

A reformulated project could contribute more directly to the planning and impact activities of the four cropping system projects (each one of which lists constraint analysis and impact assessment among its own objectives), and could explore contributions to the Agriculture and Health and Agrobiodiversity projects, which would presumably also profit from assessment of constraints and priorities. The project also offers opportunities for sharing data and analysis across commodities, and could assist the institute to develop more robust methods and impact assessments.

A reformed and more focused project could help address the challenge faced by IITA of ensuring that individual adoption and impact studies (often done in response to donor or other external pressure) do not remain as isolated analyses but contribute to the broader monitoring, evaluation and planning of the institute’s work. The project could also take the lead on the synthesis of individual, pilot-level experiences (in commercial markets for crops, input delivery, or innovations in technology transfer) that would provide the type of broad guidance expected from a research institute such as IITA.

In addition, the project could promote an approach to market development based on an action research model (or using the innovation systems paradigm that IITA has promoted in the past), involving key stakeholders in information gathering, reflection and planning phases of commodity based projects. This would provide the project more immediate involvement with IITA’s active work, rather than being confined to developing future scenarios. Providing a rigorous means of involving relevant stakeholders in the strategic planning process would be particularly relevant for IITA’s R4D philosophy.

A minor (but important) issue is the name of the project. The current name is unattractive and fails to convey the services that the project can offer. It is understood that “threats” was adopted to refer to the analysis of biotic and abiotic stresses, which are an important element of IITA’s priority setting environment, but a more attractive term that conveys rather clearer meaning should be sought for the project, such as “Strategic Analysis and Planning”.

Finally, it appears that if this project is broadened to include planning or impact activities that are linked to other projects but are not separately funded themselves, it would have difficulty in assembling a sufficient critical mass of staff. Many of these activities would be managed by socioeconomists; but the project should not be seen as a way to reconstitute a separate socioeconomics unit. Instead, it should encourage a healthy mix of disciplines that provide a broad perspective on the progress and potential for other projects, as well as provide syntheses and cross-project analysis for IITA.

*The panel recommends that the goals of the Opportunities and Threats project should focus on commodity-specific as well as multi- or supra-commodity analyses that are linked to a well-defined priority setting and strategic planning process at the project and institute levels.*

### 3.3.6 Cereals and Legume Systems

The IITA Cereal and Legume Systems project targets the promotion and adoption of improved best-bet cropping practices in collaboration with multiple stakeholders. The project has a goal of enhancing food security, improving livelihood, reducing poverty, and improving human nutrition in the savannas of West and Central Africa. The major constraints to agricultural production in the savannas with intensified cropping systems are: soil erosion, poor soil fertility, low soil organic matter, insect pests and diseases of cereals and legumes and other crops (e.g. cotton), weed infestation such as *Striga hermonthica*, drought, overgrazing and lack of feed resources. These all contribute to low crop and forage yields or poor livestock growth. Ecologically, the savannas of West and Central Africa are characterized by elevations below 800 m, a growing period of sufficient length for cereal and grain legume crops, and a relatively high production potential. Soil erosion and nutrient depletion have gradually increased and have become serious threats to food production. With increasing demand for food and feed catalyzed by steadily rising population, farming systems in the savanna may intensify further. This may lead to a reduction in traditional fallow periods, increased grazing demands, and may exacerbate current problems unless sound interventions are put in place.

Past research at IITA has demonstrated that an integrated crop (cereal and legume) and livestock system that promotes judicious use of fertilizers (organic and non-organic) and management of crop residues is a good prescription for enhancing soil fertility, increasing organic matter content, and reducing pest and disease population. IITA's comparative advantage lies in its capacity to generate and deliver technology options to improve food systems that can be directed to the benefit of the rural poor. While not losing sight of the value of improving the key food crops, IITA should maintain its primary focus on studies of enhancing the efficiency of the total farming systems prevailing in different agro-ecologies, including the role of cash crops. With an increasing focus on poverty alleviation and reduction, IITA should interject supplemental programs on market analysis. These should have a food system approach that promotes responsiveness to changing demands from the rural, urban, and commercial sectors, as well as its more traditional targets in the community. Hence, in addition to the disciplinary research targeting crop improvement, a research agenda should be emphasized that looks into the specific needs of the variety of production and sustainable natural resource management options without disregard for diversification and increased commercialization and profitability of the farming enterprise.

The following list of planned interventions to address key constraints in the production-to-consumption chain of the cereal and legume systems in the savannas are sound, but require disciplined prioritization for implementation:

- More rational use of nutrients (strategic fertilizer use).
- Greater recycling of nutrients, appropriate replenishment of soil organic matter through the use of dual-purpose legumes and manure.
- Better use of biological resources to raise and maintain yields of crops and livestock, such as rotation or relay cropping systems.
- More effective measures for soil and water conservation.
- Integrated pest management through the integration of varieties resistant to insects and diseases with rotation, trap crops, optimum pesticide use, and better agronomic practices.
- Use of high yielding cultivars adapted to the production environment.
- Introduction of labor saving devices for production and post-harvest processing, and reduction of post-harvest losses through appropriate storage technologies.
- Employment of more effective input and output marketing strategies.

- Effective ways of technology transfer.

The research agenda is also properly rationalized both in its planned implementation approach as well as its implications on longer term adoption and use. Agronomy and resource management research is often best conducted locally in the area of intended use to increase chances for adoption of the ensuing technologies. IITA scientists link with their NARS partners to conduct research that evaluate interactions between newly developed crop cultivars with novel traits (best variety) and efficient natural resource management (NRM) practices (agronomic technology) in intensifying food and forage crop-livestock systems. These tests are conducted in consultation with stakeholders to ensure the likelihood of effective delivery and adoption. Also recognized are the value of production to the consumption value chain, and the value of appropriate farming technologies resulting from well designed agronomic research in facilitating adoption and sustainable use of appropriate technological packages. The long term sustainability of science-based new farm practices can only be assured if local institutions and/or agents of change are empowered, and efficient market access and commercialization support is put in place. Access to inputs is often a critical constraint to improved productivity, as is the promotion of value-added processing and storage to improve rural income and investment in crop-livestock production related activities.

The Cereal and Legume Systems project is subdivided into the following six major output groups, each with generalized priority thematic areas and more specific and defined research activities:

*Output 1: Researchable issues in response to stakeholders' needs formulated, targeted, and prioritized through identification of key drivers of intensification.* This is the social science component of the Cereal and Legume System project. Priority thematic areas in this output are: (1) characterization studies for prioritizing constraints and opportunities, (2) developing and testing methodologies for scaling-up/out technologies, (3) *ex-ante* impact assessment of seed and non-seed technologies, (4) monitoring the spread and impact of improved technologies, and (5) commercialization opportunities for maize, soybean, cowpea, and other important crops in the savanna.

Specific activities in this output include conducting diagnostic surveys to prioritize constraints and opportunities, commodity market surveys, bio-physical characterization of soils, assessing prevalence and severity of pests, diseases, and weeds, monitoring impact and spread of new technologies, economic evaluation of best-bet crop-based livestock systems, and assessment of commercialization opportunities for emerging IITA-derived technologies.

*Output 2: Management practices for the optimization and stabilization of intensified production systems developed through enhanced understanding of soil processes weed and crop interactions.* This is the Agronomy and Soil Science component with priority thematic areas of research organized as follows: (1) Strategic research on soil processes and crop and weed interactions, (2) Weeds and their interaction with crops, soil, and field management, (3) The benefits of legumes in cereal-legume rotation with regard to BNF, soil microbiota, weed control and others, (4) Understanding and utilizing the beneficial interaction between organic and inorganic fertilizers in crop production systems, (5) Understanding and utilizing interactions between planting patterns, plant densities, and crop combinations to enhance resource-use efficiency, and (6) Identifying appropriate soil conservation technologies to sustain crop and soil productivity.

Research project activities in Output 2 include strategic research on soil processes and crop and weed interactions such as rhizosphere processes that enhance P acquisition, identification of legume genotypes that utilize P from sparingly soluble sources, P distribution and desorption characteristics and residue characteristics vs. P availability. Output 2 also includes assessing soil conservation technologies, benefit of cereal-legume rotation on BNF and soil microbes, weed interactions with crops and field management, and assessing effect of planting densities and patterns on crop yield and yield components.

*Output 3. System and end-user constraints and opportunities addressed through the development of high yielding maize hybrids and open-pollinated varieties, dual-purpose soybean breeding lines, cowpea breeding lines, and promotion of improved varieties of other important crops in savanna systems.* Output 3 is primarily a plant breeding component addressing the crop improvement task for sets of traits and against constraints on cereal and grain legumes deemed important by stakeholders. Priority thematic areas of research in this output are as follows: (1) Developing and testing improved varieties with high and stable yields in different agro ecological zones; (2) Developing and evaluating crop varieties that are resistant/tolerant to biotic and abiotic stresses and with ability to stimulate suicidal germination of *Striga* and *Alectra* seeds; (3) Developing and evaluating crop varieties with higher nutritional value; (4) Developing and evaluating crop varieties with efficient use of nutrients; (5) Tailoring varieties to fit different cropping systems; (6) Developing and evaluating crop varieties with increased crop residue of high feed value.

Major crop improvement activities include developing and testing of new crop varieties and hybrids, genotypic evaluation of crops against biotic and abiotic stresses, breeding for *Striga* resistance, breeding dual-purpose legumes for grain and forage, breeding maize for enhanced nutritional value and micronutrient content, and developing cereal and legume crops for nitrogen use efficiency and for higher N-fixation.

*Output 4: Improved post-harvest technologies, production and processing equipment for expanded utilization and commercialization in the food, feed, and industrial sectors developed:* Priority thematic areas of research in this output are as follows: (1) Develop and test production, harvesting, and processing machinery to improve labor use efficiency, add value to productivity, and reduce storage and handling losses in major crops; (2) Develop, evaluate, and promote new products and processing methods to diversify utilization of maize, cowpea, and soybean for income generation and improved nutritional status; (3) Improve storage technologies; and (4) Improve nutritional status of vulnerable groups.

Activities in Output 4 include evaluation of post-harvest equipment for field operations, assessing influence of infestation of storage structures on infestation of pests of stored cereals and legumes, and evaluation of new food products for improved nutrition and income.

*Output 5: Integrating farmer acceptable cereal-legume and livestock systems that are developed, validated, and promoted through participatory, income-generating crop, resource management, and IPM based best-bet strategies.* This is the integrative component project. In this project IITA and its NARS partners focus on the interaction between new crop germplasm (best variety) and more efficient natural resource management (NRM) system (crop and soil management techniques) in intensifying food and forage crop–livestock systems. Such a combination would consist of the best variety for a given environment grown using improved crop and soil management technologies. Both the technology and the desired outcomes would be appropriate to the farmers to whom they must be delivered effectively.

Priority thematic areas of research in this output are: (1) Develop integrated soil fertility management systems, (2) Develop integrated pest management systems; (3) Develop improved legume–cereal cropping systems suitable for different niches; (4) Develop options for enhanced crop–livestock systems, (5) Develop options for mechanization and post harvest systems; and (6) Integrate best-bet options identified in themes 1–5 into synergistic systems (or systems that address all key constraints).

The major research conducted in this project is the farmer participatory testing of integrated crop–livestock systems. Others are more mundane participatory evaluation of newly improved cereal and legume crop cultivars and participatory seed production, evaluation of cowpea relay cropped into maize plots, and on-farm trials of improved crop livestock system.

*Output 6: Enhancement of NARES and other stakeholders' capacity to adopt, generate and transfer technologies:* This is the “Technology Transfer” component of the Cereal and Legume Systems project. Priority thematic areas of research in this output are as follows: (1) Participatory technology development and transfer; (2) Sustainable seed systems for major crops in the savanna developed; (3) Networks and partnerships encouraged; and (4) Institutional and human capacity building.

Project activities range from educational components (ranging from farmer field days to degree training), organizing international trials, scaling up mature technologies, organizing community seed multiplication efforts, involvement in organized regional networks, encouraging private sector initiatives, and training workshops for farmers, extension personnel, contract sprayers, and agrochemical companies.

#### *Integrated Nutrient Management in Crop-Livestock Systems in the Savanna*

This is the major research effort in Cereal-Legume Systems conducted as a fully integrated activity. In this project IITA and its NARS partners focus on the interaction between new crop germplasm (best variety) and more efficient natural resource management (NRM) system (crop and soil management techniques) in intensifying food and forage crop–livestock systems. Such a combination would consist of the best variety for a given environment grown using improved crop and soil management technologies.

Results from process-level research in Output 2 (Breeding) and Output 3 (Natural Resource Management) led to component technology development. These components were used to design “best-bet” technologies that had potential to improve the productivity of legume-cereal production systems. Promising technologies included a) maize varieties tolerant to low nitrogen, *Striga*, and drought, b) dual purpose soybean and cowpea varieties that fix high quantities of nitrogen and produce biomass under low phosphorous conditions, and with resistance to *Striga gesnerioides* or cause suicidal germination of *Striga hermonthica*; and, c) improved crop and soil management practices such as cereal-legume rotations, appropriate planting dates, and densities, judicious use of organic and inorganic fertilizers, and the application of environmentally-friendly pesticides.

Best-bet technologies and impacts: Various permutations of these technologies were deployed and tested in farmers' fields in collaboration with extension agencies. The participation of farmers provided the opportunity to select technologies that best suited their circumstances and environments. Monitoring and evaluation of on-farm trials was conducted periodically and this

allowed participating farmers to share experiences with non-participating farmers as well as providing feedback to researchers. In addition, policy makers at several levels of government (traditional, local, state or federal) participated in the monitoring and evaluation activities.

One of the best-bets identified is “Balanced Nutrient Management System, BNMS”, a practice in which half of the recommended fertilizer quantity is replaced by animal manure or a soybean-maize rotation with reduced fertilizer rate to the maize (BNMS package). The BNMS package was compared to a fertilizer practice recommended by SG2000 (136 kg N, 20kg P, and 37 kg K ha<sup>-1</sup>) and farmer practice (no or little use of external inputs). Whereas the two improved packages provided higher maize yield than the farmer practice, the BNMS package was more appreciated by farmers for its lower fertilizer N requirement for maize, the higher price of soybean, the high quality crop residue for livestock, and the low input costs.

The development of the BNMS technology also brought together collaboration from IITA and its partners. The Katholieke Universiteit of Leuven provided support in upstream research in isotopes and ICP measurements. National programs in several countries (IAR in Nigeria, INRAB in Benin, and ITRA in Togo) participated in oversight of the on-farm technology testing and validation in different environments. Extension organizations (Sasakawa Global 2000 and Institut de Conseil et d’Appui Technique) promoted technology diffusion through organized extension programs of field days and farmer visits, and provided feedback to researchers.

Summary: This is an exemplary research project in its science quality, its interdisciplinary integrative approaches, and the steady courting and nurturing of policy advocacy via invitations extended to state and local officials to farmer field days and topical workshops. It has been under repeated testing in northern Nigeria for several years. However, this experience has now been shared with collaborators in several states in Nigeria. Similar on-farm tests are planned to be conducted with leadership by national scientists in nine states with limited involvement of IITA. A project is under discussion to extend a similar approach to Mozambique. There is need to have multiple integrative projects designed to address the natural resource management issues that no-doubt will increase with the intensification of the cropping systems. It is also important that tested best-bet options are scaled up and out to larger communities sooner for greater impact, their imperfections notwithstanding.

### **3.3.7 High Value Products**

The current MTP, 2007-2009 indicates that the main objectives of this project are to:

- Develop and facilitate dissemination of natural resource management technologies that increase the productivity of high value cropping systems in a sustainable manner.
- Facilitate the development of post-harvest technologies and market systems that increase the availability of high quality agricultural products.
- Generate knowledge to facilitate effective management of ecosystems.
- Facilitate development of local agroenterprises for cost-effective seed systems and biological plant health management products.
- Explore and develop innovative institutional arrangements to facilitate the dissemination of research processes, methods, and emerging International Public Goods (IPGs) in selected value chains.
- Advise upstream decision-makers on a conducive institutional and policy environment for vibrant high value production systems that are environmentally sound and socially acceptable.

Many of the activities in the High Value Products (HVP) Project can trace their origins to earlier IITA investment in two areas:

- (i) Work of the former Resource and Crop Management Division in forest and forest margin environments (and the later "Project D" on Livelihoods in Humid and Semi-Humid Zones) which addressed crop diversity and incentives for intensification. One of the principal reasons for IITA's central role in the STCP is the impact its analysis of cocoa systems in Cameroon made on a workshop on cocoa industry development sponsored by USAID and the cocoa industry in 1998.
- (ii) IITA's work on biocontrol and IPM, based in Benin, that has traditionally focused on IITA mandate crops such as cassava but whose experience is now being applied to a wider range of crops.

The HVP Project, as currently constituted, is based in large part (78%) on restricted core funds. The project is dominated by restricted grants that address the rehabilitation and development of the cocoa industry in several West African countries. Most of the rest of the project is concerned with pest control in vegetables, funded in large part by restricted grants. There are a few other activities supported by restricted grants, such as a project on biological control of coconut mite, based on earlier IITA experience with cassava green mite, and interest in cashew in West and southern Africa.

The HVP Project is the most concentrated of IITA's projects; most of the staff in this project work full-time on HVP activities. Such concentration offers a number of advantages. First, there is a geographical focus; virtually all current activities are centered on West Africa and most project staff are based in Ghana and Benin. Second, there is a crop concentration, featuring tree crops (almost exclusively cocoa at this point) and vegetables. Third, there is solid IITA technical expertise in biological pest control that can be applied to vegetable crops and the socioeconomics of forest systems that has informed the early years of the tree crop research.

However, such concentration may present some disadvantages as well. The project depends heavily on current donor interest in the cocoa sector; if that interest wanes it is not clear where IITA would turn. In addition, there is the potential danger that the project might be isolated from the rest of IITA's work, responding mostly to the particular interests of restricted grants, and not contributing as much as it should to IITA's wider mandate. Addressing these potential disadvantages will require a clearer definition of IITA's niche in the area of high value products and attention to project coordination and developing synergisms among the various project activities.

The best-documented experience of this project is the set of activities, funded by several donors (including the cocoa industry), promoting cocoa sector development in West Africa. The Sustainable Tree Crops Project (STCP) was initiated in late 2002 and the first four years of work involved activities in five areas: strengthening community groups; technology dissemination and research; policy change and implementation; market information systems; and labor and social systems. IITA serves as the "host" for the project, which includes a number of partner organizations and activities in Cameroon, Cote d'Ivoire, Ghana, Guinea and Nigeria (with current work expanding into Liberia). IITA provided coordination for this wide range of activities, although much of the work was done by partner organizations.

An external review was conducted in 2005 and this led to a second phase of the project, with the goal of establishing a sustainable multi-institutional forum that would promote cocoa sector

development by passing most responsibilities to local government and civil society organizations. While the review acknowledged that there were problems with national-level commitment, the management of a multi-institutional endeavor, and the role of the project in policy change, it found enough positive outcomes to recommend further investment. It singled out the work on farmer field schools (FFS) for particular praise, which was one of IITA's principal responsibilities in the project. IITA developed curricula for cocoa FFS (drawing on the technical expertise of local and Northern research organizations with experience in cocoa), trained facilitators, and organized the conduct of a large number of FFS in four countries. A manual on the organization of FFS has been produced and IITA has done comprehensive evaluation surveys in each of the countries.

In the next phase of the STCP IITA needs to think carefully about its role and comparative advantage. Many of the expectations for the project clearly fall outside IITA's mandate and will be left to partners. IITA has made an excellent contribution to technology generation and diffusion in the context of the FFS, and there is the expectation that this method will be widely used by partner organizations in the coming years. On the one hand, the IITA studies have shown that FFS participants apparently achieved higher production and often lowered input costs, but the uptake of technical recommendations was variable, and the link between participation and production increases is not always clear. Worldwide experience with FFS indicates that this method can be quite effective on a small scale, but expanding it to cover a greater proportion of farmers involves significant organizational and financial challenges. There is an expectation that IITA will help devise methods for cost sharing for FFS (e.g. involving the combination of public funds and farmer contributions). There may be some scope for investigation in this area, but now that IITA has established a model for FFS organization and monitoring, it should shift its research emphasis to synthesizing results of evaluation studies and to documenting the costs and benefits of a range of technology transfer techniques, so that national partners have guidance on options available outside the context of external project funding. (This type of research would certainly benefit from collaboration with other IITA activities in technology transfer in areas such as IPM so that comprehensive guidance is available.)

The external review of STCP points to the need for more emphasis on soil fertility management, and some participatory research with FFS graduates is underway in this area; it would seem that this is a theme where IITA should be able to make significant contributions. IITA is also organizing participatory research on diversification, featuring the planting of timber species in cocoa farms; IITA's experience in socio-economic analysis can be applied here, although it is an area that requires input from other research organizations as well. The next phase of the STCP project also includes work on marketing and policy issues, and it is less clear what IITA might contribute. There are plans for analyzing the efficiency of different types of producer cooperative (e.g. in Cameroon); the results of such an analysis would be most useful if they provided clear guidance on feasible interventions to help develop producer organizations. Similarly, IITA is developing econometric models of agricultural production for cocoa-growing regions that can be used and modified by national partners; such work will benefit from prior identification of specific, practical choices that can be informed by reference to such models. In all cases, IITA needs to think about how its socioeconomic work in STCP contributes to IITA interests and mandate.

The other major element in the HVP Project is interest in vegetable production, particularly in West Africa (although IITA is also backstopping a value chain analysis for vegetables in southern

Africa). The technical part of this work draws on IITA's long experience with biological pesticides and natural pest control products and principally addresses peri-urban vegetable production. The challenge has been to develop alternative pest control techniques that will help lower dependence on chemical pesticides. Several promising innovations have been tested (and in one case a biopesticide provided by IITA is being used on a small scale by a local NGO that trains farmers) but there is no immediate prospect for the delivery of these products because of a lack of commercial production capacity and by a lack of national regulatory frameworks that would permit the deployment of such products. A second project is examining the prospects (and farmers' willingness to pay) for safer pesticides for vegetable production in four West African countries.

The current vegetable work draws on recognized IITA expertise in the development of biological pest control measures and socioeconomic analysis; these are two important areas, but only a small part of the skills required for vegetable sector development. If IITA hopes to continue working on vegetables it will have to decide how to strengthen these skills with others that may exist in the institute (e.g. crop management) and combine them with those of other organizations that work on germplasm, management, sectoral development to establish a well-defined niche.

The current mix of IITA partnerships for the research and promotion of high value agricultural products is deliberately broad, as it seeks to integrate comparative skills available in various platforms and has a justified emphasis on technical resources. However it should be recognized that the very definition of the high value crops implies that the crops or their products generate income for the target farmers. It is therefore important that the project also makes a deliberate attempt to guide partnerships that will create the possibility of a whole value chain approach. Clearly there is need to link the current programs to other players who can contribute to the considerations of business development profiles, otherwise the project risks falling into the trap of developing technologies that may not find favor with potential adopters. These partnerships can be explored elsewhere in the continent where IITA is already active and where experience in market oriented production research for either tree crops and/or vegetables already exists. The case of Kenya's horticultural development program could provide valuable insights and also provide an avenue for the Kenyan NARS to become a contributor to IITA's high value crops program. There are too few examples where south-south co-operation is truly beneficial, and this is one opportunity awaiting exploitation.

Summary: The HVP Project is a logical way of presenting and managing current restricted grants in two somewhat disparate areas (tree crops and vegetables). The two major activities to date have been well managed and productive. The two areas share some themes in common, and the Project management should seek as many synergies as possible in the coming years (but without forcing collaboration where there is little rationale to do so). The long-term existence of the HVP Project will depend on identifying sufficient synergies (and contributions to IITA's wider work); the identification of a clear set of IITA contributions; and continued donor interest in these commodities. It is not clear that all these conditions will be met, but in the short-term the HVP Project appears to be a reasonable approach to organizing this research.

### **3.3.8 System-wide IPM Program**

*Background:* The System-wide Program on Integrated Pest Management (SP-IPM) was established in 1995 in response to Agenda 21, the main aim being to encourage system-wide activities to facilitate IPM as an important component of sustainable agricultural development. It has a Steering Committee of 12 made up of representatives of CGIAR Centers, the interim chair is

currently the DDG-R4D of IITA, and it is led by a Coordinator who is an IITA staff member. The goal of SP-IPM is to increase the quality and usefulness of IPM research and capacity strengthening to increase productivity, improve human health, and decrease environmental degradation.

While there has been continuing enthusiasm by many of the staff involved in this program over its 12 year history, in practice, the whitefly collaborative project appears to be the only significant success story, most of the other initiatives having had short term or limited success, or had limited support from participating institutes. Since 2005, the activity of SP-IPM has been at a low level, associated with administrative difficulties and conflicts. However, despite this chequered past, there still appears to be interest from CGIAR Centers and from donors in continuing the SP-IPM. At a meeting in Nairobi in February 2007, a fresh approach to SP-IPM was proposed.<sup>24</sup>

The main proposal of the Nairobi meeting was that ... *“SP-IPM should break away from its traditional quest for pest-oriented inter-Center project interests and instead strengthen inter-Center research on understanding and utilizing agrobiodiversity to mitigate food/fibre losses due to pests, and endeavor to design R4D within the context of climate change effects on biodiversity, that is, the bases of agriculture, human and environmental health. Soil health; effect of climate change on key global pathogens, insect pests and weeds; functional agrobiodiversity use and monitoring; food safety (and biosafety); educational tools for capacity building; and vegetative seed production systems were agreed upon as the emerging themes around which the MTP 2008-2010 for SP-IPM will be structured”*.

Subsequent to the initial meeting of the EPMP team, a CCER of the SP-IPM was conducted in Ibadan in March, 2007. The main objective of this CCER was to provide recommendations on: the validity of the program; responsibilities and mechanisms for governance, management and implementation of SP-IPM; the role of IITA in this regard; options (with pros/cons); and a sequence of actions.

The report of the CCER (March 2007), notes that the SP-IPM has made a valuable contribution to cross cutting issues associated with removing bottlenecks to IPM implementation. There are two ways in which this has been attempted – through activities focused on collaborative research involving staff from various Centers (and possibly outside the CGIAR system) and activities to communicate knowledge and information to NARES and other agencies involved in IPM implementation. The CCER opted for continuing the SP-IPM based on the MTP 2007-2009, and provided 15 recommendations, all of which have been subsequently agreed to by the IITA Board (for further details see Annex 8.)

The main recommendations include the following:

- A restructured administration of SP-IPM with a smaller Steering Committee, an independent Chair and a transparent procedure for funding SP-IPM activities
- The focus of SP-IPM projects to be on no more than three priority themes
- An internal monitoring and evaluation system to be developed and impact assessments made on pilot sites
- A facilitated workshop to be held in 2007 to plan for future SP-IPM activities

While the Panel generally agrees with the analysis and recommendations of the CCER, the future of SP-IPM clearly needs to be carefully considered, given the problems previously encountered

---

<sup>24</sup> See minutes of the Steering Committee Meeting, Nairobi, Kenya 25 – 27, February 2007

by this system-wide program. In the past, the SP-IPM has been top heavy with administration. What is now required is a lighter, more streamlined administrative structure – which will provide the encouragement, resources and flexibility to enable interested parties within and outside the CGIAR to collaborate on specific IPM projects. A smaller steering group and the appointment of a full-time Chair and Coordinator of SP-IPM are certainly steps in the right direction.

The shift in emphasis recommended by the CCER to focus on just two or three IPM themes is also to be commended. It is suggested that resources previously allocated to overall SP-IPM administration would be better used to free up champions in these two or three focus areas.

*Collaborative SP-IPM research* on pests common across Centers could potentially provide valuable economies of scale - as with the whitefly program. Future possibilities include stem borers, certain diseases and weeds but the potential for adding value is not clear. Perhaps it would be better to focus on common pest management issues – such as improved pesticide use in the context of IPM, including improved pesticide application techniques for chemical pesticides as well as bio-pesticides. IPM related policy is another topic that has been suggested in the past but one which has not been taken up.

This raises the important issue of the involvement of other, non-CGIAR agencies in SP-IPM. The effectiveness and impact of SP-IPM activities are likely to be much greater if key IPM expertise outside the CGIAR is included. For instance, input from external partners is likely to be required on improved pesticide use, such as pesticide application techniques, mentioned above.

The extent to which SP-IPM research and development activities should include practical IPM implementation is another issue that needs to be discussed. Since best practice in IPM is generally site specific, successful IPM strategies need to be designed and adapted to local agro-ecological systems, current cropping practices, and socioeconomic, marketing and political situations. Therefore, local NARES have a crucial role to play to support the design, implementation and sustainability of IPM on farms in their locality. However, approaches and techniques for facilitating NARES and other stakeholder involvement in specific SP-IPM projects is certainly a topic that would be appropriate for SP-IPM involvement.

In its report, the CCER team suggested that SP-IPM can add value by addressing constraints to IPM implementation, such as facilitating the development of regulatory processes for bio-pesticide registration, promoting skills and documenting evidence that demonstrates the benefits of IPM research. Approaches and methods for determining these constraints, focusing on common issues and devising means of reducing them is another possible generic activity the SP-IPM could perform, involving the participation of socioeconomic expertise from such programs as IITA's "Opportunities and Threats" program.

*SP-IPM Communication activities* have been viewed favorably in the past. Feedback from some of the original participants in SP-IPM indicated that the networking and information dissemination functions of the project were seen as very valuable – with SP-IPM playing the role of an objective, honest broker. In this context, the SP-IPM web site could play a much more important role – in terms of internal and external communication. However, as well as providing information about the different programs, publications and meetings of the SP-IPM, consideration should be given to developing a portal on the site designed for CGIAR and other visitors who wish to find out about specific IPM topics. The current section on educational tools is a case in point, although

there is currently only one manual (on nematology) in this section. The potential for the SP-IPM to engage in training courses as part of this activity should also be considered. Another aspect of communication that the SP-IPM might consider is to re-explore is the idea of an African PestNet – based on the very successful PestNet model being used in the Asia-Pacific region for linking practitioners and experts via a list server.

*In summary:* The Panel concurs with the recent CCER and supports the continuation of the SP-IPM focused on one or a small number of themes. The Panel offers some suggestions but is not prescriptive, urging the partners to address areas that, firstly, clearly add value to individual Center programs (including the proper meshing with IITA plant/health and commodity approaches) and, secondly, which share information to advance approaches and the enabling environment across the wider community of practice in IPM.

### **3.4 Cross Cutting Issues**

#### **3.4.1 Plant Breeding**

*Introduction:* IITA conducts crop breeding in each of its mandate crops, i.e. banana and plantains, cassava, yam, cowpeas, soybeans and maize. Crop breeding efforts at IITA fall into two major groups based on the mode of propagation of the crops, namely seed or clonal material. Several of the crop breeding programs at IITA have enjoyed sustained long term support and have developed into seasoned crop improvement programs. Today, they are able to respond to emerging disease crises as well as new commercial opportunities for growth. The cassava program at IITA has been particularly notable in successfully responding to the outbreak in cassava mosaic disease in eastern Africa in the late 1990s. More recently, it has responded to the Nigerian Presidential Initiative, a pilot project that is currently under deployment to promote cassava as a commercial food, feed, and industrial crop in Nigeria. Continuity and sustained support are crucial for any plant breeding program, but are more critical for some of the IITA mandate crops such as cassava, banana and plantains, that take several years to establish as crop plants. These crops are vegetatively propagated, and opportunities for continual exploitation of segregating populations are limited. On the other hand, crops such as cowpea have almost no input from other major breeding programs outside of IITA. As a result, IITA has been a primary source of knowledge and germplasm for cowpea breeding internationally. IITA has also been the sole source of tropical Africa's soybean germplasm, although its breeding program has been interrupted. Maize breeding at the Center is mandated to improve the crop for the lowlands of sub-Saharan Africa focusing on the major traits of drought tolerance, resistance to major diseases (maize streak virus, ear rots, and leaf blight) and the parasitic weed, *Striga*. Each of these breeding programs has shown a good record of accomplishments as measured by germplasm developed and distributed, cultivars released and/or registered, and more recently with an increased emphasis and effort in generating journal publications (see Annex 9).

*Program Focus:* Perhaps not by design, but through demands generated over time, the IITA crop improvement programs have had to respond to germplasm needs of institutions all over Africa. The geographical foci of the breeding programs in the mandated IITA crops are shown in Annex 10. Crop breeding at IITA focuses on improvement for productivity, resistance to biotic and abiotic stresses, nutritional quality, as well as new traits needed for industrial processing. But the most important challenges for clonal crops are diseases; fungal, bacterial and particularly viruses. Significant progress had been made in several diseases, but currently cassava mosaic virus (CMV) and cassava brown streak viruses (CBSV), yam mosaic virus (YMV), and banana

wilt (BXW) are the major diseases that threaten these crops. Insects and nematodes are also major problems in these crops. Response to moisture stress, parasitic weeds, and productivity under marginal environment with limited inputs are the primary targets of improvement for these crops.

*Breeding Approaches:* The breeding methods used vary, naturally, from crop to crop based on mode of propagation (asexual or sexual), and pollination (allogamous, autogamous). The complexities of the breeding scheme employed also range among the diverse species included in the mandate crops. The simplest methods are used in the clonally propagated species as a result of restrictions imposed in undertaking more elaborate crossing and evaluation of these species. The self-pollinated legume species, cowpeas and soybeans, generally employ “pedigree breeding, back-cross breeding” and these are generally sufficient to generate the range of variation needed, to introgress desired traits, and to allow successive manipulation and exploitation of the variation generated. In maize, a cross-pollinating species, IITA maize breeders have adopted efficient means for use of these approaches without encumbering the flow of genetic material and getting into costly and elaborate testing schemes. Methods such as intra- and inter-population improvement schemes, pedigree breeding, backcross breeding and use of selection indices have been practiced to improve the more complex agronomic traits of grain yield, agronomic fitness and adaptation, drought tolerance, nitrogen use efficiency.

Generally, the breeding methods currently employed by IITA breeders across all crops do not impose restrictions to success. The list of crop cultivars released and distributed by IITA during the last five years is shown in Annex 10. The plant breeders at IITA have also been open to exploring new approaches to move beyond the “natural” restrictions of the species. Even in the clonal species, certain innovations such as searching for genes for male sterility, pushing the limits and integrity of the genome via ploidy manipulation and interspecific hybridizations, as well as induced mutagenesis have been carried out. IITA breeders have also wisely linked with ARIs to undertake basic studies in crop biology or complex traits.

The Panel applauds the response capacity to emergencies and new initiatives demonstrated by the crop improvement programs at IITA, such as the cassava program (primarily) and the banana and plantain team as well. However while these responses were readily met at this time where the current productivity levels are low and variants were readily available, future competition will be much greater as new releases compete with improved clones and varieties from previous releases. Past releases have benefited from access to “abundant” genetic variation and the broad adaptation inherently associated with clonally propagated heterozygous species. Future responses may continue to rely on these built-in benefits, but will also require more deliberate creation of genetic variation and selection beyond that found in nature. The Panel judges that the programs should evaluate the potential heterosis across and within species towards a more systematic exploitation of hybrid vigor. At the time of the Review there is evidence that IITA is developing new staffing to address MAS. In general effort should be given to the more cutting-edge sciences of genetic transformation (cowpea, banana, and cassava) and molecular diagnostics, as well as expanding the molecular marker development and genomics work in a more organized fashion. This should be done in collaboration with appropriate ARIs and other partners. Current DNA marker efforts aimed at genomic diversity studies appear scattered and unfocused, but still provide a service for capacity building among IITA staff and the students training under them.

*Testing Environments:* The field crop team has sets of testing environments managed by IITA staff as well as a network of locations available for their use through their collaborators. Data collected from these sites are summarized annually to determine selection and advancement, as well as accumulating performance data for use in cultivar release. The facilities visited by the Panel at Ibadan, as well as in the field stations in other countries, were excellent or adequate for the conduct of reliable experiments, the only limitation perhaps being inadequate irrigation facilities in several of the other locations. Laboratory and support facilities for plant pathology and disease diagnostics, food chemistry, and entomological services for plant breeding are generally good, and staff support seems very adequate. The tissue culture facilities at Ibadan and Kawanda, Uganda, are excellent, and both can conduct genetic transformation on site. Facilities needed to conduct molecular breeding and MAS are available at Ibadan and Nairobi (BECA) facilities.

*Relations with NARS:* IITA breeding teams have developed a network of collaborators in selected countries to whom breeding materials are sent for testing on a regular basis. The field crop breeding effort, particularly maize breeding, also services regional networks such as WECAMAN and uses these for getting breeding germplasm tested regionally. Funding for conducting such a coordinated effort is paid for by the regional network.

*Seed Dissemination:* The field crop breeding teams use existing setups for seed dissemination. Many of these are semi-organized and ad-hoc facilities put up mostly by a local plant breeder. Even in Nigeria, most true seed multiplication of improved IITA-derived cultivars is handled by community-based seed multiplication programs. These programs may serve to promote the diffusion of crop varieties, but are never good substitutes for an organized and reliable seed delivery mechanism such as through the private seed industry. The IITA maize breeding team has initiated some activity with local small and medium enterprises (SMEs) to encourage seed industry development.

*Private Sector Involvement:* IITA scientists work with the private sector particularly to promote end product utilization and encourage commercialization of IITA-derived technology (or products derived from these technologies). However, there is much less effort directed towards developing in-house capacity to deal with the development of a private sector seed industry for both seed based crops as well as clonally propagated commercial crops. We encourage the modest efforts of the maize team working with private SMEs and hope that this effort is expanded. The Panel also suggests that greater attention is paid by IITA management to establishing an in-house expertise in “seed” issues both for sexually and asexually propagated species. This represents a good opportunity for IITA and would provide an essential service to the stakeholders in promoting commercialization of newly derived genetic technologies.

*Capacity Building Efforts:* Each of the crop breeding programs lists capacity building as a major function of their efforts. The teams work directly with breeders at collaborating NARS, and enter into a mentoring role and share resources via regional networks. IITA scientists are increasingly engaged in graduate education of young African scientists through supervisory roles for MSc and PhD research dissertations. They are commended for this function which takes a significant portion of their time, but is an extremely valuable and satisfying function both for both parties. Capacity building at any level is a long lasting contribution, but graduate education in support of struggling Universities in Africa is a very worthwhile service to render. This also allows IITA scientists to undertake research that requires extensive data collection and analysis, and provides answers to critical research questions as well as publications.

### 3.4.2 *Plant health*

The Plant Health scientists at IITA have a strong record of accomplishment through the activities of the biocontrol group in Cotonou, and in the diagnosis of major diseases and the management of insect pests. Although not a formal group, they have played a full part in crop improvement teams that have successfully developed host-plant resistance, and continue to participate in the development of nematode resistance in yams. Plant Health scientists include entomologists, plant pathologists, virologists and a nematologist. Despite changes in the reporting structure within which they have operated in the last several years (Plant Health Division, Agro-ecological zones, the current project structure), the specialists still operate as a plant health group.

The demand for plant health specialists within IITA exceeds supply. This shortfall is sometimes resolved by involving available and appropriate NARS expertise in specific projects. Collaborative links exist with other centers of expertise – for example on fruit flies and stem borers with ICIPE. Although small projects may be seen as detracting from the “mega-project” strategy, the specialists feel they serve a valuable purpose. For example, IITA plant health specialists provide a range of back-stopping services for NARS and other regional groups. These make important contributions to research, provide valuable feedback from different locations, and help develop capacity in NARS. Training courses for the region are provided by plant health specialists (e.g. two training courses in The Gambia in 2007 for quarantine officers). In some cases, project proposals are developed by NARS scientists who then bring the projects into IITA.

A number of management issues were raised in relation to Plant Health. While deliverables are set on an annual basis, progress is monitored on a 3-monthly basis. This is felt to be too short a reporting period and an inefficient use of staff and management’s time. Mentoring within disciplines can be achieved in various ways. For instance, a young plant pathologist has been placed at Ibadan rather than at some other site (at least initially) so he can benefit from working closely with an experienced pathologist. In the past, the plant health specialists organized an annual seminar series, where they would make presentations on their projects. Continuation of this practice would help the mentoring and quality control process within the disciplines.

The need for a number of additional appointments in plant health disciplines (or at least access to these disciplines) was expressed – including weed science, pesticide residue research (this would require analytical equipment), and pesticide application techniques (for chemical as well as bio-pesticides).

Cotonou has served the entomologists well as a location for their research. The site is close to an international airport, and the quarantine services of Benin have been very cooperative in allowing the import and export of biocontrol agents. Access to the Insect Biodiversity collection held at the station is an additional benefit. There is also an excellent cadre of trained NRS serving as support staff in Benin. The Panel notes that this unit has had a strong record of successes at this site, and suggests that provided they can be fully integrated into crop improvements programs in Ibadan, they may maintain their current advantages and have better transportation access to research programs in ESA than if they were located in Ibadan. Recognizing the critical role the Plant Health group has played in the past, the Panel strongly suggests that IITA continue to maintain its relative strength, given the history of major insect and disease outbreaks on staple crops that have threatened food security of the entire region.

### 3.4.3 *Natural Resources Management*<sup>25</sup>

The agricultural environment in sub-Saharan Africa is characterized by declining soil fertility status, under-exploited water resources and aggressive weeds that are difficult to manage. Population increase is averaging 2.2% annually, but annual yield increases of IITA's mandated crops are almost all less than this. Because the 5<sup>th</sup> EPMR had felt this area was weak, the Panel undertook to consider the nature and impact of IITA's research on natural resources over the last decade.

A brief history of NRM research at IITA: NRM research has been focused around benchmark sites that were reference areas characteristic of major target areas. Ten years ago scientists in NRM and Agronomy were part of the RCMD and were divided into two groups (humid forest and savanna systems) with several disciplines represented in each. The forest group studied primarily soil acidity and nutrient response, while the focus of the savanna group was animal-plant interactions, biological N fixation, P interactions, and Striga. There was little or no emphasis on fertilizers. Agroforestry (maize-Leucaena) systems were developed, but were generally not adopted, and were followed by development of herbaceous legume systems (N fixation and forage). A CCER conducted in 2001 recommended that external inputs again be considered, so fertilizers and pesticides were combined with the best technologies of the previous years. The Humid Forest NRM team has since been disbanded, and the system-wide program, Alternatives to Slash and Burn has lost momentum in Africa. The Savanna NRM team, based in Kano, is now an integral part of the Cereals and Legumes System Project.

The 5<sup>th</sup> EPMR noted (p50) that "continued investment by IITA on leguminous cover crop trials, animal manures and crop residues would appear to be a case of diminishing returns", and suggested a shift in emphasis from experimentation to collation of "best bet" technologies based on existing data. The Panel therefore is interested in assessing if this suggestion has resulted in change.

#### *A: NRM issues in the savannas, derived savannas and forest transition zone*

In the next decade it seems likely that much of the savannas of WCA will be largely under continuous cultivation, so managing erosion, problem weeds, declines in soil organic matter (SOM) and nutrients, insect pests and diseases of cereals and legumes are keys to sustained and increased production. Opportunities for expanding crop area will be fewer.

Soil fertility and fertilizers: The striking feature of SSA is the lack of fertilizer usage on the continent, where average annual application rates over the cropped area are 8 kg/ha. This compares with 96 kg/ha in E & SE Asia, 101 kg/ha in south Asia, and 78 kg/ha in Latin America. In 2000 average cereal yields in SSA, E & SE Asia, S Asia and Latin America were 1.0, 3.4, 2.4 and 2.9 t/ha with a negative growth rate in yield in SSA 1980-2000. Nutrient mining exceeds 30 kg nutrients/ha/yr, for a net loss of at least 4 million tons of nutrients annually in SSA. The 5<sup>th</sup> EPMR noted that low input systems without fertilizer have failed to provide adequate productivity gains in much of SSA.

Key factors affecting low usage of fertilizer in SSA are its high farm gate price, untimely supply, and risk of uneconomic returns, but not a low biological response by cereals<sup>26</sup>. Other traditional

---

<sup>25</sup> A more complete discussion of this section on Natural Resource Management is contained in Annex 10I

<sup>26</sup> Morris, M., V.A. Kelly, R.J. Kopicki and D. Byerlee. 2007. Fertilizer Use in African Agriculture: Lessons Learned and Good Practice Guidelines. World Bank, 144pp.

crops such as cassava, yams, and banana do not have a long selection history at high fertility levels, and show only modest responses to applied N. IITA's research on soil fertility over the past 10 years has been well documented in peer reviewed journals, and can be classified as a mature research area. Over 20 journal articles have been published on factors governing N and P availability over the past 5 years, with a larger emphasis on the role of P. The limitation of low organic matter levels (perhaps the major source of soil nutrients) has been recognized. Important and useful research has been conducted on improvements to biological N fixation, through identification of improved strains of *Bradyrhizobium*. However, the use of NPK fertilizers such as 20-20-20 or 15-15-15 continues in SSA, despite limited responses to K. Zinc and sulfur deficiencies have been reported in the Guinea savanna, but not systematically evaluated across large areas. Cover crops such as *Mucuna* and *Puereria* that boost cereal yield have been identified, but offer no edible by-product in return for the land and water they use during growth. Research data from the first 25 years of research were summarized as scholarly publications in a special issue of the Soil Science Society of America in 2001,<sup>27</sup> but the Panel notes that this is not in a form that the fertilizer industry or policy makers could easily use, nor is the summary by nutrient and crop.

The Panel is concerned that IITA-led strategies for promoting an upward trend in yields, fertilizer use, and soil fertility in the savannas will not adequately meet future food demands. *The Panel recommends that IITA prepares a comprehensive summary of its past soil fertility research; that it monitor nutrient flows in its farming systems research and exploit possible genotype x fertility level interactions in its germplasm; and that it enhances advocacy for efficient fertilizer use and supply systems.*

Soil water: Global climate change will likely increase variability of rainfall events, and perhaps reduce crop available water. The Panel endorses and encourages research on improved drought tolerance by IITA's crop breeders in collaboration with CIMMYT for maize. However, the panel sees little reference to research on strategies that increase water use efficiency on target crops under rainfed or irrigated conditions. Modest research investments on irrigation management and water use efficiency by crop within common cropping systems appear justified.

Weed management: During the last decade IITA scientists have made significant progress in non-herbicide control options for major weeds, though herbicide options remain the most effective for *Imperata*, and are generally favored by farmers. IITA research has shown that integrating tillage, herbicide, optimum plant density, intercropping and cover cropping has given good control of *Imperata*. The Panel notes that in the majority of weed control studies undertaken by IITA scientists the target crop has been maize, and occasionally cassava. Little or no mention was made of research targeting weed control in cowpea, soybean, yam and *Musa*. Weed control in these crops adds greatly to the labor burden, and merits further efforts. The Panel is also concerned that the leading weed scientist in IITA has moved to a largely administrative position, further weakening this important area.

Cropping Systems: Despite (or perhaps because of) the wide diversity of cropping systems, a commodity chain approach is now widely used by IITA. Alley cropping, a major research theme and cropping system developed by IITA in the 80s, has largely been abandoned because of poor adoption. Current research emphasis has been on cereal-legume systems in the natural and

---

<sup>27</sup> Sustaining Soil Fertility in West Africa. 2001. G. Tian, F. Ishida, D. Keatinge (eds). Soil Science Society of America Special Publication #58, Wisconsin.

derived savanna zones. Much of IITA's recent research has focused on the control of *Striga*, since about two thirds of fields in the savanna zone are infested.

In the last decade *Striga* research at IITA has focused on developing tolerant varieties, improving soil fertility and utilizing trap crops in rotation. Key "best-bet" methods are rotations of maize and promiscuous soybean, and millet-dual purpose cowpea intercropping, both of which result in a reduction in *Striga* plant density and in the *Striga* seed bank. Both have been responsible for a 50-70% increase in gross incomes of adopting farmers and have fuelled a major increase in soybean area. Research is currently refining these systems. The Panel congratulates IITA on the excellent work done in *Striga*. It notes however that it focuses heavily on the savannas of West Africa. It urges IITA to evaluate the effectiveness of these technologies in ESA also, and to assess the suitability of imazapyr resistance in germplasm adapted to the SSA lowlands. The Panel also encourages the rapid field evaluation of *Striga* resistance in IITA's own selections from *Zea diploperennis*.

*B: Humid and sub-humid forest zones*

This is a mature research area for IITA. Because farmers in the humid forest have shown an unwillingness to invest in soil fertility directly, emphasis has changed to nutrient use efficiency by crops *per se* where germplasm is being screened under farmers' field conditions. IITA's research has shown that an early planted, vigorously growing crop is the best intervention to capture nutrients by reducing leaching and runoff. Choice of species planted during fallows (where these are still practiced) has been shown to have a large effect on the natural resource base. For crops such as plantain, the use of small amounts of fertilizer plus control of nematodes significantly increases yields, thereby reducing the need to clear further forest. Green manure crops have been shown to be twice as effective as a natural fallow in restoring soil properties, and can reduce the labor costs of clearing forest after a fallow. The Panel notes that little reference has been made to perennial issues such as soil acidity, soil organic matter and general nutrient status, and their long term trends in the humid tropical zone. These require monitoring and modeling over time

Gaps and future needs in NRM: IITA has indicated that high priority areas for future research in NRM will be: the role of P in biological N fixation; the extent and severity of micronutrient deficiencies; sustainability of best bet technologies that include improved varieties, fertilizers, pesticides and cropping systems; and the role of conservation tillage. The Panel endorses these priorities provided they are focused on a broader range of crops, and encourages IITA to invest in fertility management and weed control research in ESA. We strongly suggest that IITA hire a roots and tubers agronomist who will work closely with NARS partners to address management and sustainability issues in these crops. The Panel also expresses concern that soil fertility research and fertilizer advocacy seems to have gone on the back burner, despite a steady decline in soil nutrients status with time. There is a need for a network in the savannas, perhaps similar to the SoilFertNet established in southern Africa, where "best bet" technologies for stabilizing and increasing fertility status of soils under constraints faced by small-scale farmers are developed, promoted and documented. The panel also urges IITA to evaluate the case for herbicide use and conservation tillage as viable resource-conserving systems in areas where *Imperata* and *Striga* predominate, and to lead research on ways to improve the efficiency of African fertilizer markets. The Panel see little mention of livestock and their use of crop residues in the savannas, yet they are an important component of the farming system. It is clear that in the past IITA has worked closely with ILRI in developing best-bet practices for integrating and optimizing crop and livestock output, especially through dual purpose cowpeas. However, the

Panel notes that the absence of an active ILRI presence at key savanna research sites currently jeopardizes further developments of this sort. The Panel strongly suggests the development of a policy on the maintenance, use and continued relevance of long-term NRM sites at Ibadan and Zaria since these are a major research asset. Finally, we note the need for access to state of the art laboratory facilities in soil fertility, and a strategy for training national program partners in NRM.

#### **3.4.4 Socioeconomics**

The 2001 EPMR and the 2003 CCER of Project C recommended that more attention be devoted to socioeconomics. They both pointed to the importance of priority setting and impact assessment, and recommended that the project contribute to understanding processes of agricultural intensification and strengthen collaboration with biophysical science in technology generation. IITA has taken these recommendations seriously, and has strengthened its capacity in socioeconomic analysis in recent years.

There are currently 11 socioeconomists at IITA, six of whom joined since the last EPMR. These staff are no longer housed in a single unit or project but are dispersed across a range of projects. This has some advantages, but there is a risk of insufficient disciplinary leadership and coherence. The Institute's socioeconomists indicate that they have adequate opportunity to interact with each other (and the number of co-authored publications is a positive sign), but attention should be given to ensuring that this interaction is structured and directed. The 2001 EPMR recommended the appointment of a senior economist to a disciplinary leadership/coordination role. The Panel suggests that IITA consider this suggestion seriously.

Impact assessment is of course a high priority throughout the CGIAR, and in the past few years IITA has devoted increasing resources to this subject. A recent document (*A framework for conceptualizing impact assessment and promoting impact culture in agricultural research*) outlines how the concept of an impact culture should inform all of IITA's activities. This culture comprises a broad platform that includes ex-ante assessment, on-farm evaluation, adoption studies and impact assessment. IITA economists have a good grasp of the literature and methods in this field and have made contributions in each of the areas.

Two of the staff are currently designated as "impact economists". IITA publishes an Impact Series (launched in 1999), which currently includes 11 studies, and a number of other institute publications document adoption and/or impact. Two documents in particular outline a framework for impact assessment and summarize the recent IITA work in this area. To some extent IITA must structure its impact analysis to suit the tastes of its donors, but it should ensure that any analysis provides as much useful information as possible to feed back into the planning cycle. In addition, priorities for impact assessment need to be carefully identified; there are many cases where competent and successful technology generation can lead to useful changes in production practices without necessarily providing sufficient evidence of statistically measurable "impact", especially as defined in some of the more ambitious impact assessment schemes.

A review document (*Achievements in Impact Assessment of Agricultural research: IITA experience, 2001-2006*) demonstrates a very wide range of relevant studies done by IITA socio-economists in the past six years, but the variety of products is in large part a function of the many different projects in which IITA has been involved and the shifts in research strategies it has employed. There is a need to ensure that IITA moves toward a more coherent set of objectives in which planning and assessment play a clearer role in establishing research priorities and attracting research funds. The four elements of the impact cycle/framework need to be linked to IITA's

management procedures rather than being a series of isolated analyses of different endeavors at various stages of the research process.

For ex-ante impact assessment, it is important that analyses are conducted at a level and scope that offer fairly immediate guidance to IITA's technical research agenda. (For instance, a criticism of the previous FOODNET project was that its market analyses had little immediate relevance for IITA research.) Current work includes the use of models for commodity sectors, production systems and research priority setting. For this work to be useful, other IITA scientists or partners should be able to interrogate such models to obtain relevant information for practical decision-making.

Adoption studies are an important element in the impact framework. These studies are important for demonstrating progress, providing feedback to biophysical scientists, and indicating where changes in strategy may be required. IITA socioeconomists have conducted a considerable number of adoption studies, although they have not always been structured and analyzed in a way that provides the optimum amount of feedback and guidance for research decision makers. Many are confined to the immediate areas of a development project's activity and often treat adoption as a yes/no variable rather than examining the detail of farmer adaptation. The unfortunate reality is that the requirements of journal publications are often inimical to practical adoption analysis as part of an on-going program of research.

In addition to the contributions of the socio-economists in planning, impact assessment and policy discussed above, there are several other areas of socioeconomic research that also deserve attention.

One potential contribution of the socioeconomists is in synthesizing the experiences of IITA's "pilot" projects. IITA needs to demonstrate that these projects provide robust and broadly applicable guidance for research organization or policy that would qualify as IPGs. A potential candidate for this kind of synthesis is the experience in promoting cassava and its industrial utilization. There seems to be a significantly broad set of examples, where (for instance) industrial promotion led to production increases (Malawi), ran into production constraints (Uganda), or did not elicit adequate commercialization strategies (Ghana). There is a constellation of issues that could be examined, including: appropriate varietal and crop management technology, marketing mechanisms, the balance between local and large-scale processing, and the degree to which subsistence and cash-crop production are synergistic or deserve separate treatment. A comprehensive synthesis could draw principles that development projects or national governments could use to better plan their activities for cassava promotion.

A second candidate for more socio-economics attention includes crop management issues, particularly fertilizer use. IITA was a key player in the recent Fertilizer Summit in Nigeria; and it should take advantage of this momentum and experience to synthesize the implications of IITA's considerable knowledge of soil fertility and fertilizer response in its mandate crops to provide clear guidance on fertilizer requirements, constraints and policies. The best place to start would be Nigeria itself, where IITA's involvement in several national crop production efforts provides an entry point for discussion of appropriate fertilizer policy; this might be done in collaboration with IFDC.

A third possible contribution of the socioeconomists would be to push forward IITA's interests in market development for its own products. It is somewhat paradoxical that IITA's interest in

market development seems to be focused more on output markets rather than input supply. The delivery of IITA products (seed, planting material, biocontrol products) has more direct links with the technical interests and expertise of the institute, and yet the involvement of IITA in these business areas seems to be minimal. There are current plans to examine the status of maize seed production and delivery in West Africa (including IITA's considerable experience with local-level seed production initiatives) and this is encouraging. Similar work is planned on soybean and cowpea seed in SSA. IITA has an immense amount of experience on the production and delivery of planting material of vegetatively-propagated crops, yet most development projects for these crops seem to develop their own ad-hoc schemes without reference to past experience. IITA could synthesize its observations and help move forward current debates on the relative importance of state, civil society and private sector roles in providing sustainable planting material supply for these crops.

A fourth possible area for socioeconomic analysis is the analysis of the delivery of crop management advice. The High Value Products project in particular is investing considerable resources in methods such as farmer field schools (FFS) and it may be an appropriate time for IITA to synthesize its experience with these crops to provide useful information on costs, benefits and alternatives for the efficient delivery of crop management information.

In summary: the Panel commends the recent increase in the number of socioeconomists at IITA, and welcomes their distribution among research sites. The socioeconomists have been involved in a wide range of tasks and are producing an increasing number of publications. But it is sometimes difficult to see how these analyses are contributing to substantive priority setting at IITA or helping synthesize IITA's recent experiences in technology generation. Part of the problem is a lack of research leadership, and a better mechanism for coordinating and prioritizing the activities of the socioeconomists. The re-establishment of the working paper series would contribute to disciplinary communication and help define priorities. IITA's economists need to develop a clear set of priority themes on which to build a reputation; and they need to contribute to the institute's planning and assessment of major investments in technology generation.

#### **3.4.5 Other research-related cross-cutting groups**

##### *Biotechnology*

Issues relating to this unit are addressed in Chapter 2.

##### *Germplasm Health Unit*

This unit has a very heavy responsibility – that of checking all seed and clonally propagated material coming and going from IITA, and sometimes for other institutions. It has service, research and compliance functions. Diagnosis and treatment (if necessary) of seed samples and viral indexing for clonally propagated materials are carried out. The Unit issues a Germplasm Health Statement, and ensures that germplasm consignments for export from, or imported to IITA are not infested or infected by pests, particularly of quarantine importance. The Unit can grow material under containment in Nigeria but is costly. The Panel was impressed by the purpose, enthusiasm and discipline of staff engaged in this Unit, and by its leader.

##### *Geographical information systems (GIS)*

IITA has a Geospatial Laboratory staffed by one core-supported IRS and national staff. The appointment of an APO to lead GIS activities in Tanzania is expected, but a second IRS position

remains unfilled and contingent on project funding. Most current GIS activities are covered under the Opportunities and Threats Project, and address issues such as mapping CMV or banana wilt incidence and spread, or the predicted effects of climate change. The unit has played an important part in helping identify representative pilot sites for the SSA Challenge Project using soils and climate information, and socioeconomic data such as population and distance from markets and roads. In WCA GIS services have been used to map socioeconomic data under the SAKSS project, and the distribution of geo-referenced collections of cowpea so similar environments can be investigated in order to fill gaps in collections. Remote sensing data accurate to 30-50 million resolution (Landsat 7) and biophysical data are readily available. Partners include GIS units in other CGIAR Centers, and data are freely shared among IARCs. Current limiting factors to output and application are not equipment but the time of the manager, who gets little time to initiate research. GIS capacity is provided also by NRS at headquarters and several outreach locations. Capacity building among IITA staff and NARS staff is largely in the use of GPS units to geo-reference experimental data. The Panel commends IITA on strengthening its geospatial capacity and its efforts to further augment IRS-level staffing under project financing.

#### *Biometrics and statistics*

Biometrics advisory services comprised of qualified NRS staff are available to scientists at headquarters and at several outreach locations. Common software packages (SAS; GENSTAT; SPSS) are available to scientists for data analysis by HQ and outreach staff. The Panel notes that the IRS vacancy resulting from the departure of the senior statistician has not been filled, and is concerned that the Center is not gaining the full benefit of newer techniques in spatial adjustment of data, in genotype x environment interaction analysis, and in the analysis of molecular information. This concern has also been voiced by several scientists during discussions. ***The Panel recommends that the position of senior statistician be filled as soon as possible.***

#### *Research data management*

Geo-referenced data from experiments and breeding plots are routinely entered into the IITA Data Management System (DMS), a server-based database maintained at Ibadan. Historical data from mandated crops for the past ~20 years is available on the DMS, which is fully compatible with the ICIS platform that has been widely adopted by other CGIAR centers. At present data from IITA's laboratory information management system is not a part of the DMS. The internet provides access to the DMS database from outreach locations, though access is restricted by password and areas of interest. Data enter the database through Excel files submitted by scientists to the Ibadan NRS database manager who is responsible for maintaining consistent definitions of variables and database integrity.

#### *Crop and soil modeling*

This is often used to test hypotheses, synthesize understanding about crop responses, and to predict effects of weather variability, climate change, or long term soil fertility trends on crop performance. It appears that IITA currently has no capability in crop and soil modeling. The Panel suggests that IITA place emphasis on developing this capacity in at least one key crop or in soils when hiring future APOs or project staff for natural resource management-related projects.

#### *Biosafety*

IITA has an institutional biosafety committee (IBC) constituted in line with Nigeria's National Biosafety Guidelines. The committee has five members, two from outside IITA. It is chaired by an IITA Deputy Director and one IITA staff member as secretary and biosafety officer. IITA has

adopted guiding principles for development and deployment of genetically engineered organisms (see Annex 12). IITA has worked closely with the Nigeria's Federal Ministry of Environment, providing inputs into the preparation of the national biosafety bill. IITA is also assisting Uganda, Tanzania and Malawi in the development of their biosafety bills based on this experience in Nigeria. The practical conduct of research at the BECA site is conducted under the aegis of ILRI's biosafety regulations.

### **3.5 Research Locations**

The Team visited IITA offices and/or facilities in Ghana, Benin, Kano (Nigeria) Kenya, Uganda, Mozambique, Tanzania, as well as headquarters at Ibadan.

In general the quality of offices and office support was quite adequate. It exemplified IITA's policy of establishing full corporate support of outreach locations once the decision had been taken to post staff to the location. The quality of field facilities that staff relied upon for research did not limit their abilities to conduct relatively downstream components of R4D. Relatively small investments in laboratory facilities can significantly improve the depth of science and contribute to retention of high quality staff. The Panel was heartened to see excellent field and laboratory facilities at the majority of these locations where R4D is being actively practiced. In some cases IITA could advertise their presence in the country to greater effect. For example, in IITA's Ghana office there was no obvious sign or identifying mark indicating they were linked with IITA (or even STCP) on an office shared with Technoserve. In addition, research staff of Crop Research Institute (a leading NARS) were unfamiliar with IITA's staff or program in Ghana, and were requesting the appointment of a part-time IITA liaison officer from among their ranks. Cotonou as a research location continues to contribute uniquely to IITA's research portfolio, and has a critical mass of scientists working on biocontrol, and excellent physical facilities supporting such research. The loss of an agronomist from this location was noted, and the Panel asks that IITA consider ways in which this location can contribute more broadly to its research agenda in the derived savanna ecology. Mozambique was noted as a challenging working environment, but one where conditions were improving.

The more difficult question, however, is the balance between number of locations, critical mass of scientists at each location, and the possible dilution of research and research management resources at key centers such as Ibadan as further expansion in SSA takes place. Does expansion to ESA threaten strategic research activities of the center? Effective management of staff at outreach locations is easier today than 10 years ago, largely because of vastly improved telecommunications. Where staff are fully integrated with a progressive NARS organization, issues of critical scientific mass become less apparent because NARS partners provide the needed disciplinary mix, and Mozambique may be a good example of this principle. There was some evidence that expansion to ESA has diminished research capacity in WCA, and the Panel is concerned that similar effects may result from moving staff from one country to the next in quick succession. Key scientists have taken roles as Deputy Directors, and the travel to locations for research supervision inevitably is onerous, and has an opportunity cost to their research programs. Staff in other disciplines represented by only one or few IRS are stretched, and the resulting multi-tasking can result in a loss of depth in strategic research. The report has already alluded to strained relationships that can occur over distances, perhaps because of communication issues and competition for resources. On the other hand, representation in areas where major languages are spoken (French and Portuguese) also has some advantages in terms of technology transfer and inclusiveness.

The Panel suggests that research effectiveness and efficiency would be increased by having most scientists in one or two regional centers of excellence outside Ibadan. National research issues would then be handled through partnerships and extended visits. Exceptions to this principle should only be when crises develop that are country-specific but potentially regional in nature.

### **3.6 Science Support units**

#### **3.6.1 *Computing services in Ibadan***

The IITA computer system has evolved from a mainframe based system 12 years ago to a dispersed system of 16 servers on the Ibadan campus and two servers at most the main outreach location. Inventory is about 450 computers at Ibadan, 900 for IITA as a whole. The main factor causing breakdowns is the stop/start electricity supply. IITA Ibadan imports PCs as components from Taiwan and assembles them according to specific needs of the user. This reduces unit cost to about US\$500, and servicing and repairs are done on site. Renting computers sometimes aids in overhead recovery on special projects, but there seems little opportunity for savings by this means at present.

Backbone wiring on campus is fiber optic, and the rest is 12 year-old cabling. At present the group are experimenting with one large central radio transmitter for internet access that will reach most campus locations. Computing services are led by an IRS, supported by trained NRS. The computer group responds to requests from programs for computers; there is no direct charge back to the programs. Operational databases (financial, procurement, assets, project management (ProMIS), and some H/R functions) are all handled on Oracle, but it is slow to access from outreach locations. In order to improve security, IITA is considering contracting backup storage at a location external to Nigeria.

Bandwidth is expensive in Nigeria, and IITA pays US\$25,000 per month for its connection. Doubling the bandwidth available would make video conferencing and Netmeetings a real possibility – an important consideration with a geographically dispersed staff. An institutional policy on bandwidth is under development, as are plans for upgrading the computer system.

The Panel commends the computing services group for the standard of computer service offered at the Center, and for the bulk purchase of computers as components. IITA needs to continue to invest in adequate bandwidth. This would improve internal operating efficiency by improving response times, would increase the quality of teleconferencing, and may result in a reduced need for staff to travel.

#### **3.6.2 *Communications and Information Services***

This unit is headed by one IRS and supported by NRS. In a recent reorganization 14 NRS positions were discontinued and seven new positions created, at a higher level. However, many of these positions, such as web editor, creative designer, and corporate communications manager are yet to be filled. The head of the unit currently spends 80% of his time on strategic issues, concerned primarily with the development of the IITA corporate image and internal communication. The remainder of his time is mainly spent on producing corporate publications.

Staff of the Unit have been involved in the development of software that facilitates internal communication – such as the development of online travel approval systems. Currently, the web

site is focused on providing access to information relevant to staff within IITA and in other CGIAR Centers. The Panel learned that only 4% of the hits on the IITA site were of African origin when IITA staff were excluded. In the future, the strategy is to provide information in response to client demand rather than providing IITA-generated information without regard for what is truly useful. The implementation of this strategy will depend on the appointment of staff to fill vacant positions.

The 5<sup>th</sup> EPMR proposed the development of a specific strategy for information dissemination and training (also echoed by the CCER of Project B), especially training for mid-career NARS staff. The Panel expresses concern that this Unit appears so strongly focused on IITA's corporate needs while materials needed for supporting training programs for NARS remain on hold. It urges IITA to fill the remaining IRS vacancies so the needs of NARS are more fully met.

### **3.6.3 *Ibadan Research Farm***

IITA has a large research farm at Ibadan that provides essential facilities for field experimentation. The efficiency of field experiments is a direct reflection of the within-replicate uniformity and general vigor of plant growth. The Panel was informed that support for the conduct of the field research program (irrigation; application of pesticides; land preparation, etc) was timely and of an acceptable standard. The farm has however been under cultivation for at least 35 years, and a number of fields are depleted. The Panel suggests that management of the farm embark on a program of systematic rehabilitation of these fields, using judicious combinations of green manure, chicken manure and synthetic fertilizers to stabilize and increase soil organic matter, and restore soil uniformity and productivity.

### **3.6.4 *Laboratory facilities and screen houses in Ibadan***

IITA has a considerable amount of laboratory space. There are a number of laboratories included in this group. These include biotechnology, soils and fertilizers, food quality, microbiology, pathology, entomology and viral indexing. The physical facility in most cases is now more than 30 years old, and equipment, while adequate for most of the requirements of the research program, is in some cases rather dated. There are some notable exceptions (Biotechnology; Plant Health and Microbiology), but the Panel raises the question of whether these facilities are generally of a standard to attract cutting edge scientists in fields such as soil science and soil chemistry, and urges IITA to consider outsourcing non-strategic laboratory services whenever a supplier can be identified in Nigeria and when quality can be assured.

## **3.7 Capacity Building**

During the discourse with the EPMR Panel it was clear that IITA recognizes the training needs that accompany its research activities. From its inception, IITA has supported both formal and non-formal training activities from its core budget as part of its strategy to improve food security and reduce poverty in Africa. IITA training activities have been guided by the overall goal to strengthen the capability of scientists and technicians of national agricultural research systems (NARS) to conduct the research and training necessary for agricultural development in their own countries. Further, IITA training activities facilitate research collaboration between IITA and NARS. IITA's comprehensive strategy for training comprises graduate research, individual attachments, and development and distribution of group training course materials.

The present realities of declining research and training budgets calls for the reassessment of the present approach to training. Future training must be service-oriented and must provide the

opportunity for skill-based professional capacity development and enhancement for NARS employees and for graduate students of agriculture to develop their professional skills. Training at IITA has undergone major transformation, moving away from the traditional IITA based training format to a decentralized and more field based training. IITA has adopted three key approaches as a means of ensuring that it continues to contribute to the pool of effective NARS researchers. The new plan will be effected through the Professional Capacity Advancement Program, Graduate Research Program and Short Term Courses.

*The Professional Capacity Advancement Program (PCAP):* targets professionals from partner national research institutions and universities. A Visiting Fellows (VFs) program will target BSc or MSc degree holders with several years of experience and fresh PhD degree holders who will be assisted to conduct research in areas similar to those of IITA scientists. The VFs will work as part of a team. The Training Unit, together with the IITA host scientist, will ensure quality management of the learning process. Appointments will range from 6 to 18 months, depending on the availability of funds and the type of research project.

*Graduate Research Program (GRP):* The long-term goal is for the IITA-trained researchers to take up positions in research institutions in their home countries. Areas of study provided by IITA scientists will be an integral part of a continuing IITA projects and will be widely advertised.

*Short-term Course (STC):* Scientists identifying a critical need for training of research collaborators may propose courses that will be packaged and advertised by the Training Unit.

IITA will continue to explore with relevant institutions (universities, development agencies, NGOs, CBOs, NARS) partnership ventures with donor support for training materials production and adaptation, and development of on-line resources, CD-ROMs, interactive tutorials, and the joint organization of courses, workshops, and conferences. An example is IITA's Social Sciences Laboratory in Cotonou, which provides computer access to trainees who are learning analytical techniques. IITA is in the process of developing a series of 10 5-day training modules on various subjects that can be offered to national scientists; major effort to date has been on the development and delivery of a module on impact assessment.

During the course of this EPMR, Panel members interacted with various NARS at country locations where the issue of training was repeatedly raised by the NARS members. In general there was recognition of the active role that IITA has played in training but at the same time the NARS decried the currently diminished training opportunities. From the perspective of the NARS they linked training to both program and institutional sustainability and the need to avoid erosion in both areas.

*Summary:* The Panel notes the general reduction in funds which support traditional training. Nevertheless, the Panel would like to encourage IITA to continue the dialogue and engagement with donors and national governments, as well as NARS, in relation to the identification of innovative training support, and to ensure that it considers the type of training activities that will allow NARS to acquire the new skills that are required for the R4D approach.

## 4 STAKEHOLDER RELATIONSHIPS: ASSESSMENT OF PARTNERSHIPS, PROGRAMS AND CENTER IMPACTS

### 4.1 IITA's Attitude to Partnership

IITA's engagement protocol is to link with a wide array of partners including advanced overseas research institutes (ARIs), regional and Africa-based international organizations; national agricultural research services (NARS), universities, and non-governmental organizations to aid in technology generation, deployment and diffusion towards its goal of alleviating hunger and reducing poverty. The primary partners for IITA's R4D mission have been the NARS of collaborating nations. IITA is increasingly looking towards ARIs and African universities for the more upstream research for greater complementarity and synergy and to increase likelihood of generating science-based impact. The Center has also aggressively sought out partnerships with the small and medium enterprises (SMEs) and other for-profit entities as partners in advancing its objective of creating a demand pull. It links increasingly to the different expressions of the private sector in its agri-business approaches and as part of its agricultural research for development paradigm. The Center is also cognizant of the value of a sustained relationship with sister CGIAR Centers, creating complementary programs and sharing resources more efficiently. IITA appears to pay due attention to maintaining closer alliance with national governments and governmental organizations as well as with sub-regional, regional, and Africa-wide organizations in search of policy advocacy for itself and collaborating partners. Relations have also been created with non-governmental and civil society organizations. The way in which the various partners contribute to project research is well described in IITA's MTP for 2007-2009. The observations of the EPMR on the state of these partnerships are described in later sections of this chapter.

Currently (in 2006), IITA has established formal partnerships with over 160 organizations in more than 50 countries.<sup>28</sup> The list reflects IITA's engagement with funding agencies, research organizations, universities, private organizations, and NGOs reflecting the wide spectrum of alliances that a Center such as IITA partners with, to generate resource support and to mobilize and disburse research results for impact. It is a long list, but both the number and range of partners are perhaps on par with those of other Centers. Since 2003, IITA has adopted a new policy on inter-institutional agreements that requires that all fund transfers above US\$2000 require agreements. In 2006, IITA had 361 active agreements which include 146 agreements, 101 sub-agreements, and 114 MOUs. In 2006, approximately 24% of IITA funds were transferred to partners.

Working with partners is a necessary part of the R4D strategy. IITA documentation places particular emphasis on listing partnerships but perhaps in an insufficiently rigorous fashion. A partner organization should be one that shares risks and investments in an endeavor, rather than simply being an ad-hoc participant briefly consulted or contracted for a short-term project. IITA should critically review and assess partner organizations for their contribution to long-term development goals. The measure of R4D's effectiveness in developing relationship to non-research organizations should be in the accrued sustainability of skills and partnerships.

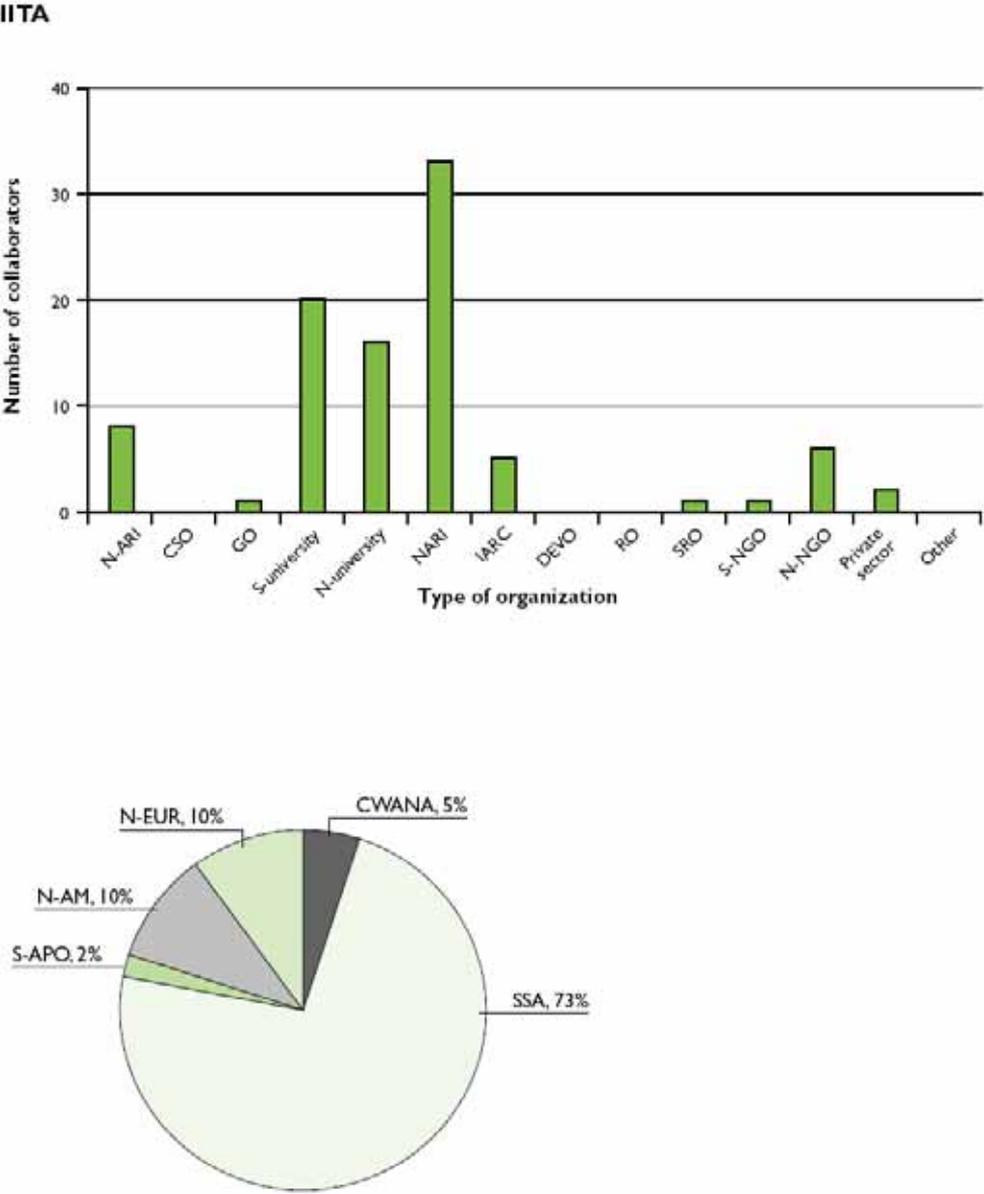
IITA suggests that with the increasing scientific capacities of some NARS and Southern Universities, IITA will be able to focus more on regional and pan-African bodies in the future.

---

<sup>28</sup> See Annex 11: In some cases the partnerships are limited to persons in institutions

The intent is to move to a position where NARS/Southern Universities and IITA will then complement each other in upstream research and the joint implementation of R4D programs. Collaboration with NGOs and the Private Sector will also be further expanded and intensified especially in the area of adoption and commercialization of agricultural products, although it is not clear if IITA acknowledges the important role of NARS in downstream adaptive research and links with the private sector. Informal partnerships will remain important and IITA is designing systems to better capture and capitalize on these partnerships. Figure 1, shows the distribution of IITA partners and organizations in different geographical regions of the world.

Figure 4.1 Distribution of IITA partners and organizations by geographical regions



In the highly competitive world of international agricultural R&D, many institutions have difficulty in keeping a proper balance in their relationships with institutions and programs that they partner with and/or serve. Collaborating institutions often fail to recognize their comparative advantages and the particular place and niche that they need to fill to avoid duplication and overlap with the functions and responsibilities of their respective partners. In some cases, the problem arises from harmless temptations to jump at opportunities for generating results with impact, attracting grant funds, and drawing attention to one's program and self. In others, it may be the result of ill-conceived and improperly rationalized adjustments to the mandates of one's institution. In yet other situations, it almost appears to arise from disregard for the aspirations and strength of partner institutions.

Inter-institutional engagements deserve serious attention and need to be approached with care and touch for the purpose of attaining success and impact. If not handled with care, great opportunities for synergy and complementarities are missed, and likelihoods for achieving significant results and impact towards the greater common goal are unduly compromised. Although in the past, IITA has done a good job of seeking out appropriate partners and leading and sustaining that partnership towards advancing the cause of science in development, concerns are emerging from its current relationships with NARS. The nature and extent of these issues and the Panel's observations about these relationships are described below.

## **4.2 Inter-Center Relations**

IITA enters into a number of partnership arrangements with other CGIAR Centers through contributions to Challenge Programs (identified in Chapter 3) and the planning for these and other regional planning in Africa (see section 2.5). The following focuses therefore largely on the key bilateral relationships between IITA and other Centers.

### **4.2.1 CIAT**

The basis of collaboration between CIAT and IITA is a detailed MOU signed by the respective DGs in June 1984. The framework of the MOU recognizes the comparative advantages of each Center. CIAT, being located in the region where cassava originated, was recognized as having an advantage in developing and maintaining a global germplasm bank; understanding the epidemiological profiles of cassava diseases; and, where applicable, the source of natural bio-control agents. Additionally CIAT was recognized as being strong in the area of cassava processing for various industrial applications, and was expected to take a lead role in this aspect. IITA on the other hand was recognized as a Center responsible for breeding and dissemination of cassava in the African continent, as well as logically being the gateway for cassava germplasm destined for Africa.

This MOU seems to have steered the collaborative work between the two institutions quite smoothly until about five years ago when the relationships became strained, primarily on the issue of introducing germplasm to Africa in a manner that does not seem to safeguard against the inadvertent introduction of cassava diseases from South America. The Panel sought and obtained a communication paper detailing the IITA position on the challenges and expectations in handling the introduction of materials into Africa. The following is an excerpt from this document:

"International and regional exchange of cassava germplasm, as for other crops, is an essential component of crop improvement. The movement of germplasm across borders of countries and

regions involves risks of inadvertent introduction of foreign pests and pathogens of quarantine importance to new areas. Pathogens have even been intercepted from tissue culture materials. Phytosanitary regulations/measures have been established to reduce the risk of such introductions. These are in recognition of the fact that some pests and pathogens may have mild impact in their areas of origin but can become highly virulent or destructive once introduced to a new environment. For instance the Inter-African Plant Quarantine and Phytosanitary Guidelines and Regulations Vol. 11 of December 1999 page 58, crop no.39 stipulates: "Vegetative material importation is strictly PROHIBITED into the Continent". Unfortunately, the established phytosanitary measures are being compromised. "In as far as cassava is concerned, there have been introductions of pests from South America to Africa in the past, which could not be eradicated. These include the cassava green spider mite (*Mononychellus tanajoa*), and the cassava mealy bug, (*Phenacoccus manihoti*). *P. herreni* is currently confined to Brazil, Bolivia, Colombia and Venezuela but remains a potential threat."

IITA's submission also gave details of several cassava diseases that were not yet known to occur in Africa, but which would be devastating if introduced. To guard against this possibility, and to protect African farmers from more disasters, CIAT and IITA signed an MOU whereby introductions from South America to Africa would be processed by IITA, (cleaned and certified) before release to the NARS which lack adequate physical, human and financial capacity to do so. The Panel commends this approach, and believes the MOU provides a useful basis on which to proceed, particularly since some NARS in Africa are still in the early stages of development.

The Panel understands that CIAT in some cases apparently wishes to move its material directly to NARS in Africa. To the extent that they are dealing with strong NARS (e.g. South Africa), this would be in accordance with the MOU; but the Panel is concerned that often it is not the technical capability, but the rigor needed to receive, contain, test, grow and observe the materials that is weak in some NARS. To address this issue in a productive way, IITA, IAPSC and CIAT have called a meeting on the movement of vegetative material; and others dealing with this material (e.g. CIP, ASARECA, FARA, CORAF, etc.) have also been invited. This meeting was scheduled for 2007 but coincided with the EPMRs of both Centers, and has now been postponed to 2008.

Since both Centers have expressed their willingness to move beyond this apparent stand off, the Panel urges that the matter be discussed urgently between the two Centers and concerned parties, and be resolved with assistance from the Chair of the Alliance Board if needed.

#### **4.2.2 *Bioversity International (formerly IPGRI)***

IITA and Bioversity have a long history of collaboration in the area of banana and plantain (BP) research. The Panel is pleased to learn that the earlier tension between the two Centers has now been resolved; and IITA and Bioversity have identified a number of specific areas for collaboration. These include: preparation and implementation of joint proposals to a donor for program support in Burundi, Rwanda and D.R. Congo, and for a German post-doc to conduct impact assessment on bananas and plantains (BP) in East Africa; joint work through the consortium of IITA-TSBF-Bioversity in relation to BP research; preparation of a joint proposal for work on introducing BP endophytes in Uganda; integration of the BP breeding and testing program; and refinement of the Material Transfer Agreement protocols.

#### **4.2.3 CIMMYT**

The linkage with CIMMYT is solely related to the two Centers' work on maize. Here the two Centers have followed a time-honored division of labor-- CIMMYT handles maize needs in the mid- to high altitudes, and IITA focuses on lowlands (1000m or less). This has worked well; and the relationship between the Centers has markedly improved in recent years. Collaboration on the drought tolerant maize project is good. IITA has made good progress with its open pollinated maize in lowland areas in West Africa and south East Africa (Mozambique). Maize inbred lines developed by IITA have been contributed to hybrid maize programs in Zambia, Zimbabwe and South Africa. IITA maize varieties have also been requested and sent to Asia (India, China, and Korea). However, in the context of possible CGIAR reforms, if IITA moves closer to being primarily an (integrative) "eco-regional" rather than a commodity-focused Center, CIMMYT would look to contribute genetic and agronomic inputs to the eco-regional effort.

#### **4.2.4 WARDA**

IITA and WARDA have a long-standing collaboration on rice research, in the sense that in Ibadan, IITA hosts a number of research activities undertaken by WARDA staff, including rice research being conducted in partnership with IRRI and JIRCA scientists. This work has progressed productively and smoothly leading to the now Africa famous NERICA, and it is expected to continue with improvements and promotion. In addition, IITA scientists continue their own research at Cotonou (where WARDA's temporary headquarters is now located); but the Panel understands that IITA is currently not envisaging research by IITA scientists on rice. Thus, closer programmatic alignment between the two Centers is not anticipated at present, though the two Centers are moving ahead with alignment of governance and corporate services at their common facilities in Cotonou (Benin), as discussed later in this report (see Chapter 5).

#### **4.2.5 ILRI**

In general, relations between IITA and ILRI are good, but there are some issues that need to be addressed. The two Centers collaborate very well with regard to the BECA facility in Nairobi, in which the IITA has been a key contributor to human resource leadership. The BECA facility brings together, the abilities of AATF, ICRISAT, ILRI and other organizations, creating a center of bioscience excellence, but their collaboration in West Africa is not as good as it used to be a few years ago. ILRI staff turnover at Ibadan has been high; and it has not been easy to recruit new staff for that location, in part due to ILRI's stringent requirements for scientists who are equally able to work on both research and development aspects of its R4D strategy. Collaboration on projects has suffered in part because IITA charges its "standard" 23.5% overhead rate for all partners (including other CGIAR Centers). There are also tensions about the degree of consultation with partners before project proposal development. In addition, ILRI believes that IITA does not seem to be keen on working actively on the sub-regional MTPs even though it is the biggest Center and has an important mandate in the region. This may have delayed action by other Centers and FARA on these sub-regional initiatives.

### **4.3 Relations with NARS**

The longstanding principle for engagement for the CGIAR Centers has been to clearly designate the national agricultural service institutions of the many developing nations as their primary partners, and IITA has been no exception. IITA has a history of building strong and functional alliances with NARS in several countries in Africa. With each of these NARS, IITA developed relationships that built capacity, sharpened the research agenda of partner institutions, and empowered them sufficiently to create teams that responded to national and regional needs.

Early developments of IITA's alliance with NARS emphasized deliberate plans to strengthen national institutions through organized capacity building efforts that included degree and non-degree training, provision of infrastructural support, assistance in design and implementation of joint research agenda, and stocking up the growing NARS with valuable crop germplasm thereby laying out an essential foundation for success. This model has generally yielded strong NARS partnerships for IITA in both West Africa and eastern Africa and has paid dividends in research and impact generation. Early efforts concentrated in developing programs in West Africa, particularly in Benin and Cameroun where successful classical bio-control programs (Benin) and crop management options for forest farming systems (Cameroun) were developed. One of the most successful of IITA's NARS partners is NARO of Uganda, whose banana and cassava programs have been built with direct assistance of the IITA. This program has been truly exemplary with demonstrated capacity to national needs and emergencies, for instance during the sudden outbreak of a new virulent strain of cassava mosaic virus in that country in the late 1990s. NARO is deservedly proud of its accomplishments, but very forthright and effusive in its acknowledgment and gratitude to IITA in building capacity in both banana and cassava improvement in that country.

In one of its most recent engagements, IITA with donor support has embarked on a multi-institutional project in Mozambique with the national NARS (IIAM) as lead on the development and dissemination of cassava varieties with resistance to cassava mosaic virus and cassava brown streak virus. The project, though is still at an early stage, has generated great interest and response.

#### **4.3.1 *Balancing Relations with NARS***

Engaging NARS appropriately and with the view for long term sustainability of the program is a major responsibility of the Centers that should be taken seriously. Initiating partnerships is easier than sustaining these relationships over time. National programs in developing countries generally do not assert themselves as their stance is often weakened by lack or shortage of internal resource support for R&D, limited capacity and critical mass, or the perceived or real lack of voice in the decision making process. But more significantly, NARS remain reserved from making these assertions for fear of withdrawal of the support, however limited, that come to them from external institutions whose agenda may not always be in congruence with the NARS. This leaves the concerns of the NARS and the need to make sound and judicious judgment on programmatic inputs in the hands of the external partner organizations and the donors that sponsor the R&D efforts of these institutions in developing countries. Some program leaders and organizations are more effective at this than others.

The Panel observed, and learned from discussions with NARS and partner programs in eastern and southern Africa, that relations between IITA and its partners are souring. IITA is appearing less transparent in its activities and in the initiatives it rolls out in the region and the new cadre of IITA staff and leadership is distancing itself from NARS and their staff. Problems often arise from failure to carve out a proper division of labor, or inability to find a more equitable and properly rationalized sharing of resources. An appropriate division of labor among collaborating R&D institutions can be readily achieved by faithful recognition of each other's strength and place within the R&D continuum of "discovery to delivery". Limited overlaps may cause no harm, provided that there is the eventual recognition for the presence of other institutions that are better equipped or placed to address the issues further up or down the scale of the research development and delivery continuum. Problems that arise from lack of sharing of resources or lack of trust and/or respect among professionals are often more contentious and lead to

abrogation of relationships.

The longstanding legacy of its successful partnerships with NARS notwithstanding, there appears to be a major shift in IITA's paradigm for engagement with NARS and other collaborators. Director General Hartmann told the Panel that at IITA "we do not have a preconceived notion as to who our partners are; we will work with most anyone that helps us to get the job done".<sup>29</sup>

The Panel feels that this may be a good stance for expediency in getting a particular mission accomplished, but that it may not be an effective way to build a collaborative program, to develop sustained partnerships, or to build capacity for sustainable institutional interventions to address R&D concerns. There is a risk of "missing the forest for the trees". It does not reflect either a retrospective appreciation of the time and resources committed to building partnerships in the past (and the value of retaining them), nor a prospective outlook on the virtue of building local capacity and partnerships systematically for sustained long term impact. Instead, it suggests an abrogation (perhaps inadvertent) of the Centers' responsibility in capacity building and bringing about long term sustainable change. In particular, the one-dimensional classification of NARS as "strong" or "weak" presented in the IITA draft Strategic Plan, and the implication that only the former are suitable partners, is an indication that the Center may be misconceiving the institutional requirements for the successful implementation of R4D.

Most national research programs are "split images" of the international Centers in their objectives and aspirations, but often with less capacity and resources. As CGIAR Centers see the need for moving downstream on the research continuum to engage other partners to generate impact along the value chain, it can be assumed that NARS do too. If NARS partners are unable to see the opportunities for making these adjustments, they can be prompted to appreciate them. IITA's desire for looking to new partners to facilitate the downstream components of change to identify and exploit opportunities in processing, commercialization, input and output markets or outlets is clearly justified as NARS often do not have capabilities in these areas, but neither do most CGIAR Centers. As IITA looks for creative ways to achieve greater economic impact and gathers experiments to share, it needs to do what it can to bring the NARS into the fold, and not go around them. Bringing about substantive change in agricultural R&D requires deliberate engagement with key agents of change to build relationships and capacity so that the local partners are able to take over from IITA when sufficient strength is gained. It also requires the recognition that local partners have the same aspiration as IITA to effect real change in agriculture, but lack the capacity to get it accomplished and that IITA can help build or catalyze that capacity. There are signs that some collaborating NARS today have sufficiently stronger human and institutional capacity to address important research and development concerns in a fairly comprehensive manner.

IITA needs to make adjustments to the nature and level of national engagement as these developments unfold, and it does. Unfortunately, the new adjustments and modality for evolving partnerships by IITA have stirred some concern and misgivings in some countries. The expectations by collaborating NARS is that the partnership needs to evolve where some responsibility is shifted to NARS and IITA scientists move into research areas and focus where the NARS has not yet achieved sufficient strength. Where relations have soured, partners fear that they are shunned because of their demand for greater role of engagement in joint R&D

---

<sup>29</sup> personal communication

efforts and their request for greater share of research grant support for their higher level of engagement.

In eastern and southern Africa, IITA is shifting its programs and partnerships because of its regionalization rationale. This move has projected a sense of “abandonment” giving a semblance that the Center is conducting a parallel and competitive (and not complementary) research program. Such sentiments, of IITA conducting parallel research to those at NARS, were expressed to members of the EPMR in more than one country during the field visits. NARS also argue that their emerging strength should be an asset where the strong NARS could serve as partners in the new regional effort by sharing their knowledge and experience with neighboring NARS, but facilitated by IITA. This is an approach regional programs such as ASARECA and CORAF would support and endorse.

Furthermore, IITA’s expressed interest and practice for direct engagement with farmer groups, NGOs, and the private sector in host countries in eastern and southern Africa is meeting some resistance. On the part of IITA, engagement with the private sector is essential to encourage commercialization of products resulting from research as well as demand pull for technology generation. The NARS partners acknowledge the need for such engagement, but bemoan the fact that any initiative with local farmers, traders, and agribusiness interests that does not include meaningful host country counterpart engagement and perspective may be counterproductive. They fear that the absence of connection between end users or commercial entities and primary local sources of scientific expertise, the NARS, short changes the NARS’ desire to assert themselves and fails to create a more sustainable relationship between local scientific expertise and the emerging business interests.

*The Panel recommends that IITA recognize its broader responsibility for building capacity towards bringing about lasting and sustainable solutions against hunger and poverty. This requires that IITA engage its NARS partners more actively and more broadly in its R for D, so that all partners gain experience in moving through the spectrum of discovery to delivery and along the value chain.*

#### **4.4 Advanced Research Institutes and African Universities**

The Center has developed strong associations with a number of ARIs in several countries, in which, through proper division of labor, the ARIs provide links to upstream research within joint R4D efforts. Most of these complementary linkages, by design, are in basic molecular biology and genetic engineering. The results from many of these endeavors are at the early stage but with potential application on the horizon. One of the very early projects deals with the genetic engineering of resistance to stored pests (bruchid) in cowpea and has involved initially Purdue University and more recently a joint effort between Purdue and CSIRO in Australia for genetic transformation of cowpeas. In cassava, work is currently underway with the University of Copenhagen (KU) for the genetic transformation of acyanogenesis to produce cassava lines with very low (~1%) of cyanogenic glucosides in African cassava lines. An example in bananas deals with “managing micro-organisms to enhance plant health for sustainable banana production”. Other, representative examples of IITA-ARI collaborative engagements across the commodity crop mandates of IITA include studies of yam flowering and tuber dormancy with the University of Reading; The Danforth Center of Plant Science (Mo, USA) on cassava transformation for virus resistance; SRRC-USDA-ARC (Louisiana, USA) in development of diagnostic screening techniques for aflatoxin contamination in maize; and USDA-ARS to engage in the development

of rust resistance in soybeans. In general, the Panel feels that IITA is creating worthwhile partnerships in these areas, likely to create synergy and a cost-effective win-win relationship for itself and its partners.

#### **4.5 Private Enterprise**

One of the features of IITA's R4D model is the deliberate intent to move science towards technology development and find effective mechanism for its deployment. The concept also includes vision for creating a demand pull for technology generation by creating profitable market outlets via the commercialization of the emerging technologies. The IITA Ibadan-based Food Processing laboratory conducts research in local and convenient food products for commercial considerations. IITA has engaged with local small scale food processing industries in several countries including Nigeria and Tanzania in processing food products generated from new cassava, cowpea, and soybean varieties. In addition, the new IITA mega projects such as the Nigerian Presidential Cassava Initiative are based in promoting the processing of cassava for food, feed, and industrial use. IITA scientists have entered into new partnerships with large private companies in the implementation of this project. Another new initiative that potentially offers similar opportunities for IITA to develop new skills and accumulate expertise in public-private engagement is the Presidential Maize Initiative that promises the doubling of maize yields in two years. Unfortunately, this project does not have clear private linkage and is based on high fertilizer subsidy and production and distribution of seed of improved maize cultivars via a network of community-based seed multiplication programs. The Panel believes this to be unfortunate; this project could have prompted the creation at IITA of badly needed expertise in working with the input markets including support for the development of private seed industry. There is an acute need for such expertise in West Africa. IITA can choose to create such a knowledge base for working with private seed companies and particularly with an emerging industry in commercial multiplication and marketing of clonally propagated materials. While other Centers (ICRISAT, CIMMYT) have programs in seed industry development in East and Southern Africa, respectively, there is no base of expertise in Africa better suited for the function of assisting the private industry in clonally propagated material than the IITA. The Panel thinks this to be a good opportunity for IITA to serve the continent and catalyze a successful development of an industry that no doubt will grow rapidly.

#### **4.6 Non-Governmental Organizations**

Relations with NGOs do not feature prominently in IITA documents, but NGOs are listed and mentioned intermittently. The panel has also encountered several IITA-NGO engagements during its field visits in Nigeria and in other countries. In Ghana, a Canadian NGO, SOCODEVI works with farmer cooperatives in the IITA tree crop project (STCP) in promoting the marketing of cocoa by local farm cooperatives. In northern Nigeria, a local NGO, CRED assists farmer groups in the IITA led project (PROSAB) in the Mairunguri area. In Benin, the Panel visited a quite impressive local NGO called SONGHAI that is training farmers in entrepreneurial skills for agriculture. SONGHAI uses IITA technology in its educational program but is not formally linked to IITA. In Mozambique, a major IITA initiative is engaged, with donor support in promoting the development and dissemination of cassava varieties with resistance to the cassava mosaic virus (CMV) and cassava brown streak virus (CBSV). IITA is assisted in this nation-wide campaign by the national agricultural research service (IIAM) and several NGOs including CLUSA, World Vision, Save the Children, and TECHNOSERVE. The project was reported as a success to the visiting members of the Panel. The Panel is particularly pleased to learn of the close

partnership with the local NARS (IIAM) to catalyze longer term sustainability from the engagement.

#### **4.7 Sub-Regional Organizations**

IITA has built a good working relationship with several of the sub-regional organizations including CORAF and ASARECA, as well as with FARA, that has more continental responsibilities. The Panel interacted with the leadership of these regional programs both in person and via telephone interviews and received a generally positive report about their experiences with IITA. In the past, IITA has supported several of the networks that have been housed by the sub-regional organizations including WECAMAN, SARRNET, FOODNET, and EARRNET. IITA has also been party to some of the discussions and planning that led to the reorganization of the networks that is currently underway, and is expected to actively engage with these newly consolidated networks. The leadership of IITA network coordinators and the contributions of IITA scientists in responding to emerging needs in support of research and educational support in both eastern and West Africa has been well acknowledged.

FARA and IITA report cordial working relationships, and FARA, as an umbrella body of the sub-regional agricultural organizations in Africa, has to some degree been engaged in consultation with IITA's research programs. FARA continues to aspire to the greater alignment articulated at its formation in the Meeting of Minds meeting held at ILRI in 2002<sup>30</sup>. FARA is pleased that IITA is the lead center for the two pilot learning sites of the SSA-CP, and that IITA has been helpful in the preparation of the MTP. Subsequently, however, there have been disagreements on overhead rates to be charged and the Panel learned that IITA will support the FARA SSA-CP for only one year. The parties are in negotiation as to future arrangements.

#### **4.8 Investor Relations**

Key investors in IITA's research program interviewed by phone provided generally positive feedback regarding the Institute's R4D strategy, partnership approach, and results achieved. IITA is viewed as an effective voice for harnessing science for development in Africa, and its research program is seen to be demand-driven and responsive to the needs of the NARS, broadly defined, and the resource poor farmers they are expected to serve. Its major donors believe IITA's science remains strong, despite the Institute's recent emphasis on the development agenda; and this has justified the increased core funding that these donors have provided. They cited a number of activities undertaken by IITA - including its work in tackling diseases in cassava in a number of countries - as examples of its successful development-oriented research. The areas in which some donors would like greater emphasis in the future include linkages with sub-regional organizations, NGOs and the private sector. Evidence of increased effort in biotechnology was also noted by one investor, notwithstanding the considerable progress that the Center had made during the past five years.

#### **4.9 Policy and Advocacy with Governments**

IITA has done an exemplary job in cultivating relationships with local governments in Nigeria as well as several other countries in Africa. This is a credit to the Director General, Dr. Peter Hartmann and his commitment to lead a science-based development program through the R4D

---

<sup>30</sup> The transformation of SPAAR to FARA, 2002

initiative. Any development effort in Africa that does not receive due attention of local and national leaders stands little chance for success. Dr. Hartmann has made himself a recognizable face and name in the highest levels of African government organizations including the AU, NEPAD and the associated programs. As a result, he and IITA seem to have been singled out to be approached for initiating major R&D programs in several countries. IITA was requested by the Government of Nigeria to implement two nation-wide Presidential Initiatives on cassava and maize. IITA was also approached by the Governments of Mozambique and Uganda to lead similar programs in cassava and banana, respectively. However these initiatives were rationalized, it is indeed significant that these governments sought out science-based development interventions and singled out IITA for each of their targeted missions.

There appears to be a positive wind of change developing in Africa. IITA's contribution in policy advocacy for agricultural sciences is laudable as it may pay significant dividends for several nations beyond those with which IITA is currently directly engaged. When African leaders believe in the value of science, they are likely to flex their political muscles and help advance the cause of agricultural science in their nations. They may share their excitement with other leaders and inspire others similarly. This may also translate into greater support for agriculture and agricultural sciences and embolden respective national institutions in each of these countries. In general we believe that any time an international institute of IITA's repute is called upon by leadership of a developing country to bring its knowledge and experience to address an emergency (such as a crop disease) or to venture into a hitherto unexplored initiative, the cause of agricultural sciences is better served in fighting hunger and poverty problems.

*In summary:* The panel therefore applauds Hartmann's promotion of a can-do attitude in advancing the cause of agricultural development in Africa that is driven by science, and his deliberate courting of the leadership in Africa for a significant scaling out of this concept. For this experience to have lasting value, however, we encourage IITA to bring a seasoned scientific perspective to each of these initiatives, be deliberate about engaging local scientific expertise and experiences at all levels and, perhaps most importantly, approach these initiatives as experiments, the results and outcomes of which will be synthesized and shared with other governments and programs.



## 5 GOVERNANCE AND MANAGEMENT

### 5.1 Introduction

In November 2001, when the current Director General took office, the EPMR report had just been endorsed by the CGIAR. IITA was expected to speedily implement the report's recommendations, most of which had been accepted by the Board and outgoing Management. Unfortunately, during the same month, IITA was confronted with a significant and unexpected financial crisis. The Center was closing its annual accounts in the red, primarily because a major donor had drastically reduced its contribution by almost US\$2.1M. Notification of this funding cut had come in November, too late for IITA to adjust its expenditures for the year.

The Institute's leadership team was thus severely tested even before the new DG had settled into his new position. It had the option of implementing all or most of the EPMR recommendations despite the funding shortfall, or comprehensively rethinking the way forward and responding forcefully to the unexpected budgetary crisis. Recognizing its own leadership responsibilities, IITA Management, with support from the Board, opted to confront the unanticipated crisis boldly. It considered this approach both prudent and necessary; and was able to convert the funding challenge into an opportunity to undertake a major institution-wide reform effort.

Management launched a plan to address the financial deficit in 24 months, without cutting scientist positions. A decision was made to trim the corporate management infrastructure. Instead of recruiting a DDG(R), as recommended by the EPMR, it was decided to keep some positions vacant, and to reduce staff in corporate units or replace some internationally-recruited staff (IRS) with less-expensive nationally-recruited staff (NRS). In addition, Management sought to reduce administrative costs by outsourcing some services (such as security and grounds-maintenance), and seeking to make some other services (such as housing, food services, and conference facilities) revenue-earners by making them available to external clients on a fee-basis. Through well-attended "town hall" meetings, the Director General personally made the case for putting institutional interest above personal needs, and for deferring salary increases for all staff for two years, or until such time that the financial situation substantially improved.

Recognizing also that the reforms would not succeed without the support of scientists and their managers, the DG sought to develop a broad-based ownership of the proposed changes. He introduced the novel concept of placing all research activities under a newly-established Research for Development Council (RDC) which was to be comprised of three Councilors to be elected by the scientists themselves, and Chaired by the head of research at IITA. This democratization of the workplace, utilizing a participatory approach, fit the personality and management style of the new DG; and was considered by many staff as an improvement over the perceived top-down approach through which previous managers had apparently made decisions.

IITA also streamlined the research management structure, and the research portfolio. After intensive discussions with scientists, the number of projects included in the Medium Term Plan (MTP) was cut (re-grouped) from sixteen to six, thereby reducing the administrative load of research management. The three research Divisions, each headed by a Director who had operated rather independently, were combined into one Research Directorate, guided by the RDC. The six newly-elected Project Leaders were expected to draw their staff from a common

pool of scientists who were expected to devote most of their time to research or partnership activities in pursuit of the newly-announced Research for Development (R4D) strategy.

## **5.2 Record of Reforms**

These major reform efforts took time and effort to implement; but by 2003 had begun to take hold. Scientists lauded the DG's single-minded focus on R4D, his successful fund-raising efforts, and his leadership style; and he apparently earned a lot of goodwill among staff, donors, and partners. The financial situation improved dramatically. The year 2004 marked the beginning of a steady rise in donor contributions, to such an extent that by 2006, IITA's total annual income of over US\$45M made it the largest of the CGIAR-supported Centers. In 2007, with a proposed total funding of US\$ 50.6M, the Center is expected to achieve a 40% increase in funding over the 2001 level.

The Director General, his management team, and staff of the Center deserve full credit for this remarkable turnaround in IITA's financial fortunes, for this success was not easy to achieve. It required a strategic re-positioning of the Center--which the DG personally spearheaded, and continues to champion (as IITA's, by now well-known, "R4D" strategy, which seeks to "Nourish Africa")--as well as concerted efforts to increase restricted project funding, while at the same time tightly controlling operational costs. Almost all the growth has come from the funding of contracts or special projects; and Management gives credit to scientists who have "managed to double the research funding by including research activities in many of these special projects."

However, this hard-won success in implementing major reforms, while controlling costs, has come at a price. Some of the decisions made in 2002-03 had unforeseen consequences that in retrospect have negatively impacted the Center in unexpected ways. Some of these unintended consequences were noted by the Board in 2004, and by the CCER on governance and management in 2005; but corrective actions were not taken until much later. By 2007, therefore, at the time of the current EPMR, the results of implementing the major strategic and organizational reforms initiated after 2001 appear to the Panel to be substantial but somewhat mixed in the areas of research management and effective delivery of corporate services.

IITA Management firmly believes that it took the right steps at the right time; and that the funding shortfall in 2001 warranted cuts in positions or postponement of actions recommended by the EPMR. It also notes that most of the recommendations of the last EPMR have now been, or are soon to be, implemented. The Panel concurs with this last statement; and believes also that many of the reforms undertaken since 2001 were well intentioned and useful.

However, the Panel also believes that in some areas IITA seems to have persisted in utilizing management approaches that were proving to be less successful than originally expected. For example, delays in suitably modifying the TORs and mode of operation of the RDC have meant that this primarily "advisory" body has focused more on project-level issues and administrative matters than on providing clear strategic guidance to the research program, as originally intended; and delays in recruiting the needed complement of seasoned managers, for research as well as corporate services, have exacted a heavy toll. As a result, in the Panel's view, new investments in improved management systems and procedures (and possibly staff) are now overdue, in some areas.

The Panel discusses some of these areas below, and offers a few ideas for consideration. Its overall assessment of governance and management at IITA in 2007 is that the Center has made considerable headway since 2001, has made mid-course corrections during the past two years or so, and is moving in the right direction. If most of the actions planned by the Board and Management are undertaken as intended—and if the additional improvements recommended by the Panel are implemented as well—the Center could soon have an internal enabling environment that truly values good governance and effective and efficient management.

### **5.3 Pace of Implementation**

The Panel's guarded optimism about current plans and proposed recommendations is largely due to IITA's uneven record of implementing actions that the Board and Management had previously endorsed—even when such reforms would not have been costly, or could have been cost-effective. For example, in 2001 IITA had undertaken to carry out a program of Board reform that included such aspects as meeting twice a year, reducing the number of Trustees (including host country members), and commissioning a CCER on Board governance approximately one year after the new DG had taken up his appointment (i.e. in November 2002). In response, the Board did take all these steps—but most of them were taken only recently. The CCER on governance and management was done in 2005; and the EP MR recommendations on Board size and frequency of meetings were implemented during that year as well.

In the management area too, IITA has now implemented most of the 5th EP MR recommendations - but after a significant time lag, and in some instances only partially. For example, the recommendation that a single manager oversee the human resource function was not implemented for several years. The 2001 EP MR recommendations regarding financial management included strengthening the internal audit function, installing an Oracle-based management/financial information system, and engaging an overseas/project development officer. These too have been implemented; but serious action has been forthcoming only in the past few years.

The appointment of a DDG (R4D) is a recent development, even though it was recommended and accepted five years ago. The much-needed revision in the terms of reference of the Research for Development Council (RDC), restricting it to a primarily advisory rather than (also) a managerial role, took place only in March 2007, though it had been recommended by the CCER on governance and management in June 2005—and this recommendation had been accepted by the Board. The CCER recommendation that Program Leaders be selected by Management rather than being elected by scientists, had likewise been endorsed by the Board in 2005, but was implemented in mid-2006--when three Deputy Directors for Research were appointed by Management following an internal selection process, and the positions of the six Program Leaders were abolished. (The DDs are expected to allocate at least 80% of their time to research management).

The Panel is concerned about such delays not only because it is imperative that Board decisions and accepted EP MR and CCER recommendations be implemented by Management in a timely manner, but also because of the opportunity cost of not implementing a sensible decision or recommendation. Delays or inconsistent follow-up of needed actions inevitably results in some ineffective or inefficient practice continuing longer than necessary. The cost of not doing the right thing at the right time can be high, even though it may remain unnoticed for some time--as has happened at IITA in such areas as effective human resource management, and the

introduction of responsive research management arrangements and efficient systems and processes for managing some of the corporate services.

Accordingly, it is these “soft spots” that the Panel addresses below, starting with an assessment of how the Board functions and how its effectiveness could be improved. We then discuss how improvements in IITA’s management of research and resources—in particular, finance, people, materials, and information—could lead to gains in efficiency and effectiveness.

## 5.4 GOVERNANCE

The comments below are based on data obtained in a number of ways: perusal of minutes of Board meetings since 2001; review of the 2005 CCER on governance and management, and the Board’s response to it; review of documents presented by Management and staff in March 2007 to the Board and its Committees; interviews of individual Board members by the Chair and one member of the Panel; and direct observation of meetings of the Board and its Committees, following the Panel’s first visit to IITA’s headquarters in Ibadan, Nigeria.

### 5.4.1 *Board and Center Leadership*

During the past six years, IITA has been ably led by experienced Chairs of the Board and its Committees—Executive, Program, Audit, and Nominating—and by the Director General, who has recently been appointed to his second 5-year term. The Board Chair and members have brought to the Institute a broad strategic understanding of agricultural research and development, an abiding interest in capacity building and partnerships, and a deep commitment to Africa and to IITA’s R4D strategy. In the Panel’s view, the Board is led by a seasoned Chair who is respected by and supportive of Board members, encourages their active contribution to Committee and Board meetings, and has a close working relationship with the DG.

As expected, minutes of some Board and Committee meetings reveal that the Board and DG have not always been in full agreement on key issues, including questions of program strategy and research organization and management. At times, it appears that the Board may have deferred too much to the strong views and personality of the Director General, who is not at all hesitant to express his views on IITA and Africa and the CGIAR. There is a range of views on the Board regarding the support and guidance received from the CGIAR; with some Board members more keen than others to strengthen the collaboration with various components of the CGIAR, such as the Science Council, CGIAR Secretariat, and other Centers.

In terms of management style, the Panel understands from staff that the Director General took a very proactive approach to Center issues during the first few years of his tenure, and personally led the financial and institutional reform effort that is now recognized by many internal and external stakeholders as very successful. The DG’s vision, and the remarkable results it produced, is seen as a significant plus for the future of IITA. In addition, we understand that when the DG trusts someone, he delegates considerable authority to them. This enables him to engage fully with external partners in Africa.

In research management, the DG has introduced an innovative arrangement that encourages participation by scientists; and this approach is generally applauded by IITA staff. However, in recent years, once the immediate financial crisis was over and the Institute had returned to normal operations, the DG’s external-focus and his heavy reliance on a small inner circle of trusted colleagues has been interpreted by some staff as a desire to stay away from the routine of

managing a large and complex institution, and to (appropriately) distance himself from the politics of small groups that inevitably form in a campus community (about 50% of the staff are at Ibadan).

Other staff members at Ibadan perceive the DG as too busy with external engagements, many of which require frequent absence from headquarters, and believe that the time has come for all senior managers to participate more fully in institutional and campus life. The DDG for Research seems over-loaded, is relatively new to the position, and resides in Tanzania although she will be relocating to Ibadan in September 2007. The next DDG-S (responsible for Support Services) will be taking office in August 2007. Their presence at headquarters from August 2007 is expected to help strengthen Center leadership at the Ibadan campus. In addition, when they, and the Deputy Directors, become more firmly established, they would hopefully complement the DG's leadership of the Center with more independent voices, especially on crucial strategic, program, and management issues.

#### **5.4.2 Board Size and Composition**

The size of the IITA Board has been reduced from 18 in 2001, to 14 in 2003, and 13 currently (including the Director General). This has required a reduction of CGIAR- and host-country nominees, from 3 to 2 for each of these categories. The Board also includes two members who serve on the WARDA Board and two from the ILRI Board as "common" Board members, in accordance with the January 2006 agreement to align the governance of these two Centers. All these are commendable achievements.

The gender and geographical balance on the Board is reasonable. Besides the two members from Nigeria, there are two members from Africa, three from N. America (including the DG, who is ex officio), four from Europe, and one from Australia/N. Zealand. Four members (33%) are female; which too is noteworthy. The disciplinary composition is appropriate for a Center dealing with tropical agriculture; and includes several members with experience of governance and research management, as well as an expert in finance and administration (see Table).

#### **5.4.3 Board Committees**

The Board operates through Committees that generally follow CGIAR guidelines for Boards of Trustees, in terms of their functions, composition, and mode of operations. However, during the period under review, since 2001, minutes of meetings reveal that the Board and its Committees have not always been successful in ensuring that Management actually follows their advice in a timely manner. Several instances of this apparent lack of follow-up have been noted above. In addition, as the CCER noted in 2005, preparation of documents by staff for Board meetings has often been delayed or inadequate, with the result that Board discussions have not been as strategic as might otherwise have been the case. These deficiencies are now being gradually rectified, but it seems to the Panel that more effective involvement of the Board on strategic issues, especially by its Program Committee, would be beneficial, as discussed further below.

##### *Program Committee.*

From 2001-2006, the Program Committee (PC), chaired by an experienced science advisor with extensive knowledge of Africa and the CGIAR, has sought to maintain a distinction between program oversight by the Board and program responsibilities of Management. It has diligently undertaken its tasks; and has introduced guidelines for such matters as CCERs on the science undertaken by staff, participation of Board members in visits to IITA's field offices, and involvement of Board members (as link persons) in strategic planning for particular programs of

the Institute. It has also prepared or commissioned forward-looking think-pieces on topics of relevance to the program, such as the positioning of IITA as a sub-Saharan, or Africa-wide, or global research institution. All of these efforts have been very worthwhile, and are commended by the Panel.

The PC has also provided guidance on the structure of the Medium Term Plan, and the research arrangements for carrying it out. In 2001-02, the PC and Board supported the Institute's new R4D strategy, which helped improve the relevance of the research program and the Center's finances. However, the MTP-revision process did not proceed smoothly. Changes in strategy, program, and organization consumed a lot of energy and led to a period of uncertainty, as is common in any significant programmatic or operational change.

As was pointed out by the CCER on governance and management in 2005, the PC was not provided drafts of the MTP in a timely manner, the MTP was not ready for circulation even at the time the Board was in Ibadan, and neither the PC nor the Board were able to give adequate guidance. The process was probably not helped by the changes in guidelines and annual reporting requirements and the short deadlines of the CGIAR Science Council for MTP submissions. Information flow to the Committee may also have been hampered by the fact that the IITA Board Secretary is not a member of the senior management team at headquarters—which, at other CG Centers, greatly facilitates interactions between the Board and Management on an ongoing basis, and makes it easier for the PC to remain up-to-date with program issues.

The problem of insufficient opportunities for adequate program oversight remains unresolved. The February 2006 RDC meeting apparently took place around the time of the PC meeting, and the Board could not discuss in detail the proposed changes in program strategy and priorities until after they had been incorporated into the MTP. In an attempt to almost force-fit the existing research projects into the evolving CGIAR priorities and reporting templates, the Institute seems to have missed a vital opportunity to undertake a more systematic rethinking of research priorities and MTP-project strategies. Such a Board-led strategic thinking exercise is now planned for September 2007.

The PC has also had misgivings about the changing role of the RDC, from a primarily advisory body to one also dealing with research management and resource allocation for projects. The Council's return to its original advisory emphasis was finally achieved in March 2007, as noted earlier. What is still pending, however, is the introduction of a clearer structure of accountability for research leadership and decision-making at IITA; and improvements in the timely flow of relevant analytical information to the PC on proposed strategic options and their rationale and implications. Once these deficiencies are rectified, as is expected over the next few years, the strategic oversight provided by the PC could be much improved, as needed.

During the past year, the PC has also assigned responsibility to its members to serve as link-persons on program issues. Two Board members attended the Strategic Planning Week in November 2006 in which the strategic direction of two projects was discussed in a workshop/brainstorming mode. These members reported to the Board in March 2007 that this interaction with scientists had been positive, and mutually-beneficial. Over the next two years, this practice is planned to be extended to cover all seven MTP-projects, and the assigned link-members will have the opportunity to help shape the strategy and priorities of at least that part of the research program.

**Table 5.1 Board Composition**

Name	Nationality	Specialization	Gender	Nominated By	2001	2002	2003	2004	2005	2006	2007	Committee Membership	Start	End
Lukas Brader	Netherlands	Entomology	Male	DG-Ex-Officio	X							M-PC, M-EC	Dec-90	Dec-01
Kyoko Saio *	Japan	Nutrition	Female	Board	X							M-PC	Dec-94	May-01
Anastasio Leventis*	UK	Business	Male	Board	X							M-PC, M-AC, C-AC, M-EC	Dec-94	May-01
Guda Abdullahi (1)	Nigeria	Perm Secretary, Min of Agriculture	Male	Member Co	X							M-EC	May-01	Nov-01
Eraslas Gyang	Nigeria	Vice Chancellor, University of Agric, Makurdi	Male	Member Co	X							M-PC	May-01	Nov-01
Enrico Porceddu(2)	Italy	Genetics	Male	Board	X	X						M-PC, C-BOT, C-EC	Dec-94	May-02
Jorgen Jakobsen	Denmark	Plant Pathology	Male	CGIAR	X	X						M-PC, M-NC, C-PC	Dec-95	May-02
Limamoulaye Cisse	Senegal	Soil Science	Male	Board	X	X	X					M-PC, M-NC,	May-97	May-03
Eric Tollens	Belgium	Agric. Economics	Male	Board	X	X	X					M-PC, M-NC, C-NC	May-97	May-03
Joy Kwesiga	Uganda	Women in Development	Female	Board	X	X	X	X				M-PC, M-AC, C-AC	May-98	May-04
Geoffrey Mrema (3)	Tanzania	Agric. Engineering	Male	CGIAR	X							M-PC, M-AC	May-98	May-01
Abdoulaye Babale	Cameroon	Political Science	Male	CGIAR	X	X	X	X	X			M-PC, M-AC, C-AC	May-99	May-05
Assetou Kanoute	Mali	Biology	Female	Board	X	X						M-PC	May-99	May-03
Gry Synnevag	Norway	Plant Breeding	Female	Board	X	X	X	X	X	X		M-PC	May-00	Aug-06
Mortimer Neufville	USA	Animal Science, Biochemistry	Male	Board	X	X	X	X	X	X		M-PC, M-AC, C-BOT	May-00	Aug-06
Michael Collinson	UK	Agric. Economics	Male	Board	X	X	X	X	X	X		M-PC, M-NC, C-PC	May-00	Aug-06
Peter Hartmann	USA	Economics	Male	DG-Ex-Officio	X	X	X	X	X	X	X	M-PC, M-EC	Nov-01	Nov-11
B.D. Usman	Nigeria	Perm Secretary, Min of Environment	Male	Member Co	X	X						M-PC	May-01	May-03
Masaru Iwanaga(4)	Japan	Biotechnology	Male	Board		X						M-PC	Nov-01	May-02
Adama Traore	Mali	Animal Science	Male	CGIAR	X	X	X	X	X	X	X	M-PC, M-NC, C-NC	May-02	May-08
Maurice Izard (5)	France	Post Harvest	Male	Board		X	X	X	X			M-PC, M-AC	May-02	May-05
James Ayetse	Nigeria	Vice Chancellor, University of Agric. Makurdi	Male	Member Co		X						M-PC	May-03	May-05
Birger Moeller	Denmark	Biochemistry/Biotechnology	Male	Board			X	X	X	X	X	M-PC, M-NC	May-03	May-09
Cees Karszen	Netherlands	Plant Physiology	Male	CGIAR		X	X	X	X	X	X	M-PC, M-AC, VC-BOT	May-03	May-09
Akira Iriyama(6)	Japan	Administration/Law	Male	Board		X	X	X	X			M-PC, M-AC	May-03	May-05
A. Jairo	Nigeria	Perm Secretary, Min of Environment	Male	Board				X	X			M-PC	May-04	May-05
O.O.O. Ogunkwa	Nigeria	Perm Secretary, Min of Agriculture	Male	Member Co				X	X			M-EC	May-04	May-05
Oghomaysa Onwudike	Nigeria	V-C University of Agriculture, Umudike	Male	Member Co				X	X			M-PC	May-04	May-05
Bryan Harvey	Canada	Plant Breeding	Male	Board				X	X	X	X	M-PC, C-BOT, C-EC	May-04	May-10
Barbara Becker	Germany	Agronomy	Female	Board				X	X	X	X	M-PC, C-PC	May-04	May-10
Henri Marate	Belgium	Plant Protection	Male	CGIAR				X	X	X	X	M-PC, M-NC	May-04	May-10

Name	Nationality	Specialization	Gender	Nominated By	2001	2002	2003	2004	2005	2006	2007	Committee Membership	Start	End
Amal Pepple**	Nigeria	Perm Secretary, Ministry of Agriculture	Female	Member Co					X	X	X	M-EC	May-05	on-going
Dean Lewis	New Zealand	Finance and Administration	Male	Board					X	X	X	M-AC, C-AC, M-EC	Aug-05	Aug-08
Nthoana Tau-Mzamane	S. Africa	Agronomy	Female	Board					X	X	X	M-PC, M-AC, M-NC	May-05	May-08
Emmy Simmons	USA	Intl Development, Agric. Economics	Female	Board						X	X	M-PC, M-AC	Aug-06	Aug-09
Israel Adu**	Nigeria	Vice Chancellor, University of Agric. Abeokuta	Male	Member Co						X		M-PC	Aug-06	Aug-08
Ishola Adamson***	Nigeria	Vice Chancellor, University of Agri. Abeokuta	Male	Member co							X	M-PC	Mar-07	Dec-07
Paul Matuka	DRC	Faculty, University of Kinsasha	Male	Board							X	M-PC	Mar-07	Mar-10
Notes:														
*Served 6.5 years because of the change in the number of Board meetings from two to one meeting year.														
**Beginning 2XX5 the number of host-country members was reduced from three to two by amendment to the Decree (Permanent Secretary of the Ministry of Agriculture and Vice-Chancellors of Universities of Agriculture by rotation.														
***As Dr. Adamson replace Prof. Israel Adu, his term (officially two years) will expire in 2008)														
(1) Deceased														
(2) The Board extended the term of office of the Board Chair to maintain continuity in leadership at a time of change in Director General and in an EPMR year.														
(3) Resigned at the end of first term May 2XX1 to take up position at FAO														
(4) Resigned in mid 2002 to take up position as DG of CIMMYT; attended Nov 01 meeting as Trustee designate														
(5) Resigned at the end of first term May 2005														
(6) Resigned May 2005														

The Panel also notes that in March 2007 the PC discussed a number of strategic issues, including the evolving concept of regional hubs to serve as decentralized nodes for research partnerships and networks (different from the bricks-and-mortar approach of the Ibadan headquarters/station); the opportunities for and implications of seeking funding from private foundations; the benefits and costs of bidding for big, multi-year, restricted-funded projects; and the need for a well-defined research structure with clearer reporting lines. The PC discussion was, however, not very substantial, and these topics were only introduced at the meeting, with the expectation that they would be discussed at the proposed strategy workshop in September. As a result, almost all of the recommendations submitted by the PC to the full Board related to housekeeping matters or issues of process or information flow. This gives the impression of a PC desirous of, but as yet unable to, focus its attention to the more important strategic program issues facing the Institute.

Other issues that the PC raised, but did not discuss in any detail in March 2007, related to the research program structure (whether it should be based on a cropping-system or regional basis); whether IITA had moved too much to the development side of the R4D strategy, and now needed to re-focus more on world-class science; and the alignment of IITA's research program with other CG Centers, on a case-by-case basis as well as in the context of the CGIAR's evolving MTPs for the WCA and ESA sub-regions. For these and other strategic and policy issues that will need to be discussed at future PC meetings, advance preparation of suitable background materials by Institute staff would be essential. Appointment of a senior IITA scientist as Secretary to the PC would greatly facilitate this.

In this context, the Panel notes that the 2007 CGIAR Guidelines on Center Governance expect the Program Committee to "advise the Board on all aspects of the Center's research and research-related programs, focusing on formulating strategies and program plans and monitoring performance and impact. The key is to ensure that the Board provides broad strategic guidance and oversight but does not micromanage the scientific activities of the Center. Naming the whole Board to serve on the Program Committee, as a reflection of its focus on Center strategy, can blur the distinction between the whole Board and its committees; [and in this case] the preferred alternative may be not to have a Program Committee."

The Panel believes that there is much to be gained by retaining the Program Committee--which in IITA is not comprised of the full Board (the Board Chair and three other members are not listed as members of the PC). The CGIAR guidelines rightly emphasize the strategic guidance and oversight role of the Board on all program matters, and this governance responsibility can be discharged more effectively if there is a well-functioning Program Committee that focuses on strategic program and research-related (but not research management) issues. This role cannot be satisfactorily performed by simply relying on the CGIAR Science Council—which only provides general guidance on System and Center priorities, brief comments on the Center's Medium Term Plans, annual reports on Performance Measurement Indicators, and 5-yearly external program and management reviews (EPMRs, such as this report) on each Center.

Since an effective Program Committee can greatly facilitate the work of the Board (as well as of Management, if the PC is able to do its work properly), and the issue has been of continuing concern to the IITA Board for some time, *the Panel recommends that the Program Committee focus on strategic program issues; ensure that it, and its members, do not micromanage scientific activities; and that the Committee receive high-quality analytical papers and other relevant*

*information from Management in a timely manner to enable it to properly undertake its program guidance and oversight responsibilities.*

*Audit Committee.*

Besides providing Board oversight of the Center's annual financial audit, the Audit Committee (AC) is responsible for ensuring the adequacy of and compliance with internal financial controls and the truthful reporting of financial results. It is also responsible for monitoring the efficiency of operations and procedures, and monitoring of compliance with management policies.

The 2001 EPMR had noted a) the failure of the Audit Committee to monitor implementation of the Oracle System; b) the Institute's failure to appoint a Head of the Internal Audit department; and c) that the Director General attended and participated in Audit Committee meetings. In March 2007, however, the Panel observed considerable progress--a comprehensive report was presented to the AC by the external auditor covering the financial audit, internal control, and other related issues; and a summary report from the internal auditor was also presented, itemizing the coverage and results of audits undertaken during 2006. It also noted a few (smaller) items in which further improvements could be made, and these are detailed below.

The Panel noted that the minutes of some Audit Committee meetings do not contain decisions or recommendations reached during that meeting. The minutes of AC meetings on 17 May 2005 and 28 May 2004 are cases in point. However, Annexes to the Board meeting minutes on the relevant dates contained a list of recommendations from the AC. Furthermore, the Audit Committee's recommendation to the main Board for adoption of the audited financial statements and re-appointment of external auditors (where applicable) were not always minuted. It is important that whatever is decided and recommended to the full Board be recorded in the minutes of the AC meetings as well.

CGIAR guidelines on "Building Effective Board Committees" state that in order to assure objectivity the Director General should not be a member of the Audit Committee. The 5<sup>th</sup> EPMR had recommended that the DG should not attend the Audit Committee meetings; but the Panel notes that the DG has attended all Audit Committee meetings since the last EPMR (up to 2006). The Panel endorses the current practice that the DG attends Audit Committee meetings only at the invitation of the Committee to provide his direct inputs or clarification.

Some decisions on critical matters made by the Audit Committee and recommended to the Board have taken a long time to be implemented by Management. Examples include a) the recommendation to fill the position of Head of the Internal Audit Unit (from 2002-2006, Management and the AC sought to build the needed capacity by grooming the "interim" appointee, who was regularized in 2006 as the Head of internal audit); and b) the recommendation to establish a Procurement Committee to respond to weaknesses noted by the auditors relating to vendor selection and price determination.

In 2001, the Board recommended the appointment of the External Audit firm (which was to retire on conclusion of the external audit of the financial statements of the Institute for the year ended 31 December 2001), to provide internal audit services in tandem with the Institute's Internal Audit Unit. Their appointment was for a period up to May 2002. For the sake of objectivity and independence, particularly in instances where the auditors may have to report on internal controls and matters having an effect on periods on which they already passed a clean report, the

Panel discourages the appointment of retiring auditors as internal auditors immediately after their term as external auditors.

Overall, the Panel found that, at the time of the present EPMR, the Audit Committee is chaired by a very seasoned financial expert, and has well qualified members. It seems to perform its role and responsibilities diligently and effectively. The Committee receives reports from the finance manager and external and internal auditors on a regular basis, discusses them at length, and provides guidance and oversight as needed. The Management, in consultation with the AC, have also developed a “financial stability index” based on the ratio of unrestricted to contract (restricted) funds; and the Board’s Executive Committee and IITA Management use this and other indicators derived from the CGIAR Financial Guidelines to monitor the overall financial health of the Center. The Panel commends this systematic approach.

#### *Nominating Committee.*

The 2005 CCER on governance and management made several recommendations for strengthening the Nominating Committee (NC), including making the NC Chair a member of the Executive Committee, and the NC developing a list of governance competencies required on the Board and proposing how existing gaps could be filled. These and other recommendations have largely been implemented. The NC is more active now, and has developed (and uses) a profile of members annually, based on its gap analysis. As a result, as noted above, the gender, regional, and skills balance on the Board is now reasonable. The criteria for selection of common Board members (for IITA and WARDA) have also been established and followed, though there remains the issue of establishing adequate guidelines on possible conflict of interest when these common members attend either Board.

There are a few other pending items as well. These include finalization of the questionnaire used for self-evaluation of the Board, which is being revised in light of topics covered in the CGIAR Board orientation program; preparation of a questionnaire for evaluation of the Board Chair, along the lines of the one used for evaluating the DG in closed session (the DG then receives feedback from the Board Chair confidentially); follow-up by the Board of results of the 2006 staff survey conducted by Management, in which some items were red-flagged during Board discussion; and consideration of a proposal to establish an ad-hoc HR Committee of the Board, which was on the NC agenda for the March 2007 meeting, but was not discussed. It is expected that these items would be covered by the NC and the full Board at its next meeting.

#### *Executive Committee*

At IITA, the Executive Committee, which is empowered to act on behalf of the full Board as needed, is comprised of the Chairs of the Program and Audit Committees, the DG, a host country representative, a Vice Chair, and the Board Chair. It meets twice a year, just prior to the meeting of the full Board; but its members also interact by e-mail or phone at other times. The Panel believes the EC has undertaken its functions with diligence; and in recent years has also taken appropriate steps to “align” the governance of the IITA and WARDA Boards. This has required meetings of the two Board Chairs and DGs with other CGIAR stakeholders, such as the Secretariat and selected donors attending the AGM in Washington, as well as phone conferences of members of the Executive Committees of the two Boards on other occasions. These meetings have been productive; have led to the Memorandum of Agreement (MoA) on alignment of corporate services; have resulted in the formation of a joint committee for facilitating the selection of “common” Board members; and have given the CGIAR the assurance that IITA and WARDA are taking governance alignment seriously.

At its meeting in March 2007, the Executive Committee spent much of its time reviewing the Institute's detailed response to the CGIAR's 2006 stripe review on governance, and to the Science Council's lengthy questionnaire on Performance Indicators [which, the Panel notes, could have been done virtually, and signed off in plenary]. While this task was done in earnest, EC members also indicated to the Panel that this activity provided a good example of how "externally-driven" requirements took valuable time away from the more important business of the Center. It reinforced the Board's impression that the Rome- and Washington-based Secretariats are not sufficiently mindful of the limited time available to Board members for addressing strategic issues rather than dealing with seemingly-bureaucratic CGIAR requirements. In the Panel's view, there is clearly a need for more effective communication from the two Secretariats on the need for these periodic/annual questionnaires, and for a better understanding of the mutual benefits to Centers and the CGIAR from the Boards' willing participation in CGIAR-wide monitoring of Center governance and performance.

#### *Concluding Remarks on Governance*

It is clear that the Board has made substantial progress since 2001. The recommendations of the 2005 CCER on governance and management, which was undertaken by governance experts with experience of CGIAR Boards as well as EPMRs, has helped improve Board operations and performance. The improvements introduced by the NC and AC, including the appointment of finance and governance experts to the Board and its Audit Committee, and introduction of self-assessment instruments, has helped as well, as discussed above. The Board now consists of members with extensive experience of governance of large research institutions, both in the public and private sectors. They are fully cognizant of the need to distinguish their policy and strategic oversight role from the managerial functions of the Director General and his management team.

However, there remains a need to improve the information provided to the Board; and to ensure more effective follow-up of its decisions. This requires action by Management and a better recognition of the role and responsibilities of the Board. The effectiveness and efficiency of the Board could be enhanced by better utilization of the Board Secretary for preparing the agenda and documents for Board and Committee meetings, and for keeping track of follow-up actions by Management.

## **5.5 MANAGEMENT**

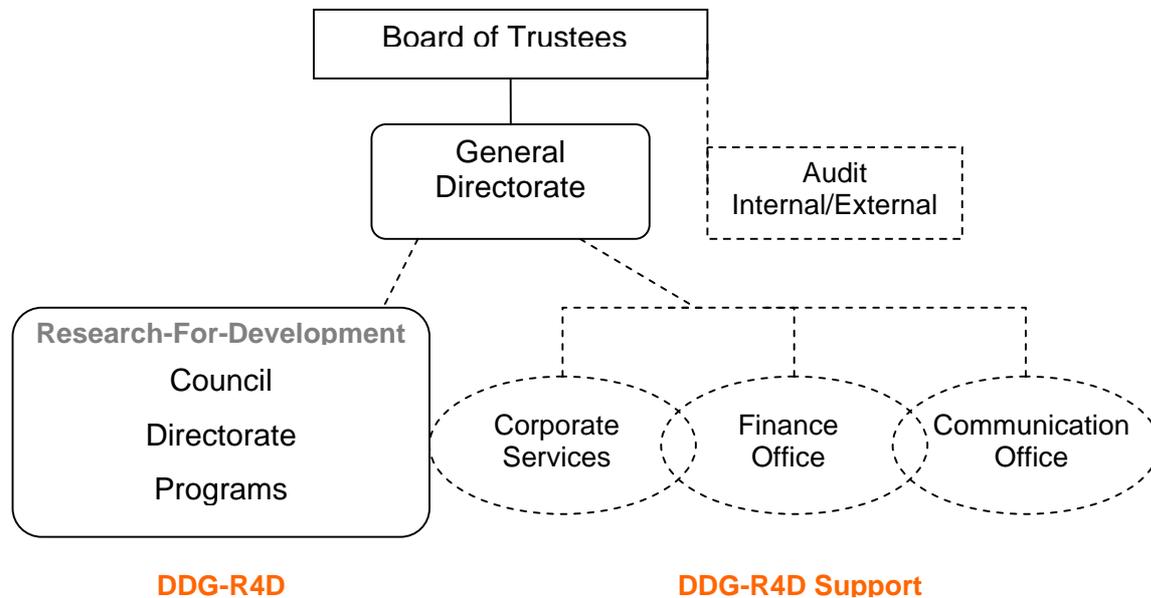
### *5.5.1 Research Management Arrangement*

IITA's organization chart (see Figure) has few of the boxes and reporting lines that would ordinarily indicate the locus of authority for decision making. It reflects Management's espoused preference for a non-hierarchical structure, in which teams come together, as needed, to address specific concerns. Though scientists report functionally to the Deputy Director(s) in charge of their projects, and administratively to the Deputy Director or Officer-in-Charge responsible for the research station where they work, they are encouraged to participate actively in decisions affecting them. The Panel commends this desire for openness, transparency, and involvement of staff at all levels.

The Research for Development Council (RDC), with three elected councilors responsible for providing strategic guidance to the DDG (R4D), is intended to demonstrate the functioning of a democratized and empowered workplace. Three scientists, elected by their peers through secret

ballot, serve as part-time Councilors. The RDC meets every quarter to discuss research-related matters of importance to the Institute; and its minutes are posted on the Center’s intranet and are circulated to staff and Board members. The DDG, as the head of research, chairs the RDC, and is expected to follow-up on the guidance received from the Council, and on its specific recommendations.

**Figure 5.1 IITA Organizational Chart**



The RDC is popular with IITA scientists, and serves a useful function for Management. Even though it does not include the three Deputy Directors of Research, who report directly to the DDG, the RDC is considered a key component of the research management arrangement. To ensure that the Council has access to the information it needs for its deliberations, the DDs are invited to all Council meetings (which they usually attend), and provide inputs on program- and strategic issues. However, they are not formally part of the RDC, and hence are not party to its recommendations. This arrangement has been in operation for the past four years; and is perceived by staff and managers as an innovation worth retaining.

The separation of functions between the RDC and the Research Directorate (comprised of the DDG and three DDs), allows the General Directorate to subsequently consider RDC recommendations, and to take suitable actions after consultation with the DG as needed. There has never been an instance when major recommendations of the RDC were not accepted by the DDG or DG. In part this is because the DDG (R4D) chairs both the RDC and the Research Directorate; and the DG reviews the agenda of the RDC, and when invited attends its meetings.

To the Panel this indicates that RDC discussions are taken seriously by both Management and staff; and that the scientists/Councilors understandably defer to the views of the DDG and DG—both of whom, by virtue of their wider responsibilities and access to information, are much more knowledgeable about strategic issues faced by IITA. This also allows the DG and DDG to perform their legitimate role in corporate-level strategic decision making. Hence the Panel, noting that the RDC has now returned to its original mandate as a primarily advisory body to the Research Directorate, supports the current role and terms of reference of the RDC, as approved

by the Board in March 2007. Politicization of the election process by which RDC members are elected is a very real risk, and the Panel urges Management to take all reasonable steps to prevent this from happening.

In IITA, as in other Centers, senior managers are accountable for all activities under their charge, including the establishment of new positions in the structure and filling them with suitable staff. Authority for decisions related to the research structure is expected to be matched with the responsibility for ensuring that adequate systems and procedures for recruitment and promotion are in place, and are consistently and transparently followed by everyone, including the DG and DDGs. Deviations from these institutional policies and processes can occasionally be justified--but only as exceptions, to avoid the perception of arbitrariness in decision making.

This principle of matching authority with responsibility and accountability should extend throughout the chain of command, including to levels below the DDG. The Deputy Directors too must have clear lines of (delegated) authority over both strategic and operational decisions relating to the research program for which they are (or should be) directly accountable. In addition, the professional expertise of Support Services staff (e.g. in human resources management) needs to be better utilized while appointing, evaluating, and promoting scientists and other research staff. If this were done, the current research management structure would become more decentralized, and potentially more effective.

Two important components of such a research arrangement are already in place--the RDC and the Research Directorate (see facing page<sup>31</sup>). In addition, the Panel believes there is a need to strengthen the research management arrangements and processes below the level of Deputy Directors. Prior to the appointment of the three DDs in mid-2006, the six research projects at IITA had been managed by elected Project Leaders--whose positions have now been abolished. The CCER on governance and management had noted the shortcomings of the research structure in 2005; and had recommended that research management be strengthened by selection (not election) of experienced scientists with demonstrated managerial talent. It had also recommended that these Project Managers be given opportunities for developing their management skills through training and mentoring.

The Deputy Directors are currently responsible for helping to undertake institution- and project level priority setting, planning, and strategy formulation; ensuring program and project performance; reporting research results; networking with partners; and seeking funds from donors. They also oversee the various research stations in and around their duty station (or as defined by their specific terms of reference); and supervise and assess the large number of scientists working in their Projects. This makes their jobs difficult to do well.

To make the DDs' jobs more manageable, the Panel concurs with the 2005 CCER recommendation that each of the major MTP projects should be led by an experienced Project Manager. These project managers would be practicing scientists who would also be responsible on a part-time basis for leading project-level planning and priority setting, ensuring the quality and relevance of science undertaken in their project, supervising scientists on an ongoing basis, managing operational funds and other resources, delivering and monitoring results, and contributing to preparation of project proposals and fund raising.

---

<sup>31</sup> Figure 5.2 IITA's Research for Development Council and Research Management Structure.

# R4D Strategy

**External Environment**  
Includes:  
• CGIAR  
• African Union  
• FARA, SROs  
• Countries, etc

Strategic Influences

**RDC**  
• DDG R4D  
• Elected scientists  
Supported by:  
• C&G Officer  
• Head of Communication

Makes strategic recommendations  
• MTP framework  
• Positions  
• Locations

Recommend

**Board of Trustees**  
Oversees

**Director General**  
Decides

**R4D Directorate**  
• DDG R4D  
• Deputy Directors  
Directs

**Scientists**  
Implement

# R4D Management



Report

The Panel recognizes that having project managers would add to the time and effort devoted to research management, but notes also the very real scientific costs of not managing the research program and scientists as effectively as needed. Strengthening the project management function would give the Deputy Directors time for undertaking their broader research leadership functions; would enable them to disengage from the routine of project- and science management; would allow time for sharing the workload of the DDG (R4D); and would improve the career development opportunities of scientists interested in strengthening their project management skills.

*Accordingly, the Panel recommends that IITA's research management structure and accountability be strengthened by: a) clearly specifying the responsibility, authority, and lines of reporting for the DDG (R4D), Deputy Directors, and scientists; b) utilizing the Research for Development Council primarily as an advisory body to the DDG, as per its new Board-approved terms of reference; and c) strengthening the research management function, by appointing Project Managers reporting to the Deputy Directors, for managing the MTP projects included in the research portfolio.*

### 5.5.2 Finance

#### *Fund Raising and Cost Recovery*

As noted previously, the review period started with actual operating results for 2001 showing a deficit (of about US\$1.5M). This was largely due to declines in funding from key donors, coupled with a decline in World Bank matching funds. In response, IITA Management put in place a plan to turn around the financial position within two years. The plan focused on: a) reduction on dependence on 'core' funding which had become unpredictable; b) diversification of the funding portfolio (in 2003, a third of IITA funding was from one donor (see Table 5.3); c) a freeze on capital expenditures and staff recruitment for vacant positions; d) emphasis on full cost recovery for special projects; e) emphasis on efficiency in provision of corporate services (which remains an issue, as discussed below); and f) bidding for larger, though managerially more complex, projects.

**Table 5.2 Income and Expenditures based on Audited Results 2001-2006 (UD\$'000)**

	2006	2005	2004	2003	2002	2001
Grants Received-- Unrestricted	12281	11898	12152	9520	10701	12282
Grants Received-- Restricted	29974	28128	30226	26520	19882	19547
Challenge Programs	2671	1325	971	9	0	0
<i>Sub-total</i>	44926	41351	43349	36049	30583	31829
Other Income	1416	1538	1505	1266	1911	1965
<b>Total Revenue</b>	<b>46342</b>	<b>42889</b>	<b>44854</b>	<b>37315</b>	<b>32494</b>	<b>33794</b>
<b>Direct Operating Expenses</b>						
Research Program	39234	34146	36504	29996	25270	26456
Research Support	1339	1833	1921	2143	1476	1745
Research/Management Operations	784	690	504	266	437	556
<i>Sub-total</i>	41357	36669	38929	32405	27183	28757
Less: Indirect Cost Recovery	4638	4061	4001	2937	2094	2072
<b>Total Direct Operating Expenses</b>	<b>36719</b>	<b>32608</b>	<b>34928</b>	<b>29468</b>	<b>25089</b>	<b>26685</b>
<b>Indirect Operating Expenses</b>						
Management and Administration	5929	5441	5204	5246	4241	4350
Common Sustenance Services	1570	2226	3038	2442	3348	4245
<b>Total Indirect Operating Expenses</b>	<b>7499</b>	<b>7667</b>	<b>8242</b>	<b>7688</b>	<b>7589</b>	<b>8595</b>

<b>Total Operating Expenses</b>	<b>44218</b>	<b>40275</b>	<b>43170</b>	<b>37156</b>	<b>32678</b>	<b>35280</b>
<b>Operating Results</b>	<b>2124</b>	<b>2614</b>	<b>1684</b>	<b>159</b>	<b>-184</b>	<b>-1486</b>
<b>Indirect Cost Ratio</b>						
Indirect/Direct Cost (%)	20.4	23.5	23.6	23.7	24.7	22.6
Working Capital (days)	169	167	140	113	130	110

**Table 5.3 IITA's Top Donors 2001-2006 (US'000)**

	<b>2006</b>	<b>2005</b>	<b>2004</b>	<b>2003</b>	<b>2002</b>	<b>2001</b>
USAID	12100	9436	11749	12152	9971	10568
Nigeria	2545	3176	4284			
World Bank	2511	2606	3027	2192	2885	3715
Canada	2351	3404	3525	2199		
European Commission*	2059	2221	2293	2942	1874	1170
Japan					1538	3073
Denmark				2020	2081	1790

\* Approximately US\$2M of unrestricted funding budgeted for and due from EC in 2006 was unexpectedly withheld towards the end of the year. This is not included in the amount shown above.

Table 5.2 highlights the decline in unrestricted funding for IITA during the review period. Such funding dropped from US\$12.3M in 2001 to a low of US\$9.5M in 2003. On the other hand, restricted funding grew from US\$19.5M in 2001 to US\$26.5M in 2003, and US\$30.2M in 2004. Restricted funding for 2007 is forecast at US\$33M, and unrestricted funding is expected to be stable at about US\$12 M, for a total of US\$45M. The hard decisions taken by Management in 2002-03 have helped return the Institute's finances to a healthy state. Having accomplished this, in 2004 the moratorium on salary increases was lifted; and since then, more scientists have been hired, the positions of DDG (R4D) and DDG (R4D-Support) were created and are currently filled [a new DDG-S is expected to join in August 2007], and the upgrading of some of the infrastructure, which is quite old, has commenced.

In terms of fund raising, the DG has increased awareness of IITA among donors, and has positioned IITA as an institute that serves the whole of sub-Saharan Africa. As a result, IITA has expanded its activities and operations in East and Southern Africa. Some increase in overhead and other costs at locations other than Ibadan can be expected as a result of this expansion; and efforts are being made to share corporate services with other Centers where feasible.

Efforts have also been made to support the capacity of scientists to produce project proposals and to manage projects. The Contracts and Grants Office was established in 2003 to help scientists prepare project proposals and to administratively manage the larger number of special projects. This has helped, and the improvements are commended by the Panel (the ratio of successful proposals to proposals submitted is around 40%). However, there is still the problem of controlling costs at the Ibadan location; in the presentation to the Panel it was indicated that it costs about US\$ 9M annually for the three functions this location serves for IITA—serving as its headquarters, as a sub-regional hub, and as a research station.

#### *Financial Management and Operations*

In general, IITA seems to have managed its finances well. It has successfully increased funding, and has rationalized operational expenditure and capital investment. A culture of full cost recovery for all services provided by units is being instilled into staff and work units. The capacity of the staff in the Budget and Finance Unit to undertake financial management and

budgetary control is adequate; and qualified accountants occupy most of the key positions in the Unit.

During the period covered by this review, a number of specific concerns have been raised by the internal and external auditors, and by the Board's Audit Committee in relation to the accounting system. Some of these include: a) inability of the system to bring forward balances of prior years (staff advances) into individual advance accounts; b) difficulty in obtaining a fully-reconciled set of accounts from the system; c) absence of checks and balances on treasury transactions initiated by the then CFO (in 2004, amounting to about US\$0.5M); d) proper accounting of "goods in transit" and "freight suspense" accounts; and e) some inadequacies in the back-up procedures and security of the computer /server room at some stations.

The Finance staff and IITA Management have responded adequately to these concerns. Their corrective actions have included: a) in 2005, an adjustment of US\$2M was made to prior year balances; b) measures to tighten controls over bank transactions/transfers (the case of fraud by the then CFO is in the hands of Interpol and the Nigerian police); c) efforts to strengthen the capacity of station accountants, and to ensure adequate fixed assets custodial controls; and d) improvements in fixed assets management, though this remains a continuing challenge.

The cost of fixed assets owned by IITA as at 31 December 2006 was US US\$31.9M, and the net book value of the assets was US\$6.7M. Laboratory and scientific equipment had the highest net book value at US\$3.1M, followed by motor vehicles at US\$1.2M. In recent years disparities have been noted between assets physically held at station and details contained in the asset register at Ibadan, raising the risk that the values in the financial statements may be inaccurate. Problems have mainly related to non-capture of assets in the register due to delays by staff/stations in providing information on assets transferred or purchased. These deficiencies need to be corrected, as part of the proposed improvement of materials management services.

#### *Financial Planning, Budgeting, and Monitoring*

Budget preparation for the following year commences with the Planning Week in November of each year. The total funds available are projected on the basis of donor pledges and other Center income; and strategic allocation of core funds is/was (since the TORs have now been changed) done by the RDC, and annual allocation to Projects by the relevant DD and DDG-R. All estimated costs for R4D and administration are collated and presented to the Board for approval. Once approved, the budget is communicated to DDGR and DDs, who then allocate the budget to scientists and research support staff. The Finance office is advised of the budget spread for input into the Oracle system, and accounts are updated on a regular basis.

Monitoring is done by budget holders who have online access to financial reports, and by the Contracts and Grants Office together with the Budget and Finance Officer. On a monthly basis, management accounts are prepared, with copies to DDs and DDGR for information, and to assist in following up with budget holders. A two-page finance report is prepared for the Board every quarter. Reports on the Institute's financial operations are prepared monthly, quarterly, and annually; and are reviewed by Management and the Board as required. The Panel considers this process systematic and satisfactory.

The Oracle reports enable both the Budget and Finance Unit and the individual budget holders to monitor the expenditure on their projects against the project's budget. Access is available on line for Ibadan staff, and via the internet for other stations. Staff complaints regarding the lack of

timely and accurate information on project expenditures have declined in recent years. Periodically, as required per donor agreements, financial reports are prepared and sent to the Contracts and Grants Office for attachment to the narrative report. There is constant interface and consultation between the manager responsible for special projects and the budget holders.

IITA has been using the Oracle management and financial information system since January 2002. Support for Oracle is provided by Computer Services and MIS. Oracle is robust and capable of accommodating the requirements of IITA for accounting information and financial reporting purposes. It is fully implemented at Ibadan and only partially at the other stations, which use Platinum for Windows, through which they are linked into Ibadan. Stations have to send returns monthly, which are entered onto the Oracle system. It is the aim of both Support Services and Budget and finance to fully deploy the Oracle system in all stations and to obviate the need to manually re-enter station information.

#### *Cash Management and Investment Policy*

IITA maintains accounts with 34 banks in different locations. It has 29 current accounts, 5 time deposit accounts, and 24 imprest accounts, 21 out of the 29 current accounts are for stations outside Nigeria. Controls over the treasury function appear to be adequate. Bank reconciliations in stations are undertaken by the resident finance officer and the OIC. Bank reconciliations are sent to Ibadan on a monthly basis where further reviews are conducted by the Special Projects section.

Exchange rates are computed weekly for use for all financial transactions for that week. Obviously, operating in 14 currencies in 11 stations outside Nigeria has implications for currency exposure. In francophone countries, the CFA, aligned to the Euro, is the unit of account. The US dollar, the reporting currency and main denomination in which cash assets are held by IITA, has been falling steadily for over the last 9-12 months. Management needs to limit IITA's exposure to the risk of exchange losses, particularly for transactions in francophone countries.

The institute's investment policy is conservative. Excess funds are invested in banks, in low risk instruments for periods of less than 90 days. As the Institute's liquidity had been increasing over the years from a cash position of US\$18.9M in 2001 to US\$34.1M at the end of 2006, the Audit Committee meeting of August 2006 recommended a review of the Institute's conservative policy to enable IITA obtain greater returns without increasing risk. It called for consideration of investment in US\$ instruments of longer duration providing minimum risk. The Panel supports this view.

The current challenges for financial management are: a) succession planning—only the Chief Finance Officer has hands-on experience and knowledge of all areas of budget and finance and the related management information system, hence it would be prudent for Management to identify and groom his possible successor; b) information from stations outside Nigeria has to be entered into Oracle from Platinum, and full deployment of Oracle in all stations is needed to ensure efficiency and timely availability of information; and c) automation of some processes, such as loan applications, travel advances and retirement, is needed.

Other broader continuing challenges--that do not have simple solutions--are that a) a few donors are unwilling to pay the full overhead rate for projects, necessitating the need for IITA to subsidize overheads from unrestricted funds; b) reporting requirements by donors are different, the timing and formats of the reports are also different, and meeting the needs of the different

donors takes a lot of staff time; and c) IITA is seeking to move away from a large number of small “scientist-generated” projects to much bigger “institute-sponsored” projects, but the latter are managerially more complex, and could require collaboration with partners with insufficient capacity to adequately manage project funds.

#### *Internal Audit.*

The fifth EPMR recommended that an effective internal audit function be put in place; and the external auditors have repeatedly recommended in their Internal Control letters the need to appoint an Internal Audit (IA) head to strengthen the Unit. However, IITA was without a substantive Head of Internal audit since 2001, though there was an “acting” Head for four years. In 2005 the Audit Committee recommended that the Acting Head of internal audit be confirmed in the position, as he had demonstrated his capacity to effectively discharge this responsibility. This recommendation was implemented in 2006.

A key challenge for the IA Unit is the turnover of staff as soon as they gain some experience (the average stay of IA staff at IITA is 2 years). Due to the nature of financial operations and the computerized accounting system in use by IITA, the IA Head continually has to orient new IA staff to understand the Oracle system; and as a result he often has to participate in the audits himself, rather than supervising others and providing guidance on the areas being audited.

The Head of Internal Audit reports functionally to the Audit Committee, and administratively to the DG. The Panel considers this appropriate; but believes his job description needs to be clarified. For example, one of his responsibilities is “preparation, review and amendment of revenue and expenditure as well as systems” – which inappropriately connotes a managerial rather than audit responsibility. In addition, the internal audit policy by which the unit is governed is quite old (1986), and needs updating. Its scope does not cover areas such as risk identification and management, fostering quality, and continuous improvement in the Institute’s control processes, all of which are now included in internationally recognized audit charters.

However, on the positive side, the internal auditor has been able to cover about 70% of the audit plans approved by the Audit Committee. IA reports are quite detailed; and of late provision has been made for audited units to respond to issues and recommendations made in the IA reports. On balance, the Panel believes that pertinent issues have been raised by the IA department, and its work has provided a necessary check on controls and operations of the Institute.

#### *External Audit.*

A change of auditors was made in 2002 in line with CGIAR practice to appoint new auditors every five years. The external auditors have access to the Internal Auditors’ reports; but it is notable that they were not aware that the former CFO had defrauded the Institute in 2003, a matter which was investigated by the Internal Auditor (but conclusive proof was not available at that time). The external auditors were informed of this possibility during the Audit Committee meeting in 2004. It is imperative that a closer professional working relationship be developed between the external auditors and the internal audit unit to ensure that the service provided to IITA is better coordinated and complementary. The Panel notes that following the appointment of the current chair of the Audit Committee, there is more effective interaction by the external auditors with IITA staff.

A meeting was held with the Audit Manager in charge of the external audit of IITA. The auditors perceive the accounting and internal control environment within IITA to be adequate; and

believe that the capability of the finance department had been boosted by the appointment of qualified personnel to key positions in recent years. They are comfortable with the Oracle system used for financial information management as it is robust enough for the needs of IITA as long as it is well supported. In relation to the internal audit function, the recent confirmation of the Head of the Unit is welcomed. They however felt that the Unit should recruit one or two additional experienced auditors to strengthen its capacity to undertake a larger proportion of the audits planned for each year (currently only 60-65% of the annual audit plan can be covered).

#### *Risk Assessment*

The IITA Board and Management agreed in May 2006 on a Risk Management policy for the Institute. This policy, appropriately, covers much more than financial risks; it “applies without exception everywhere and to everyone throughout the Institute. Individual Units must identify risks to which assets, staff, and activities are exposed, the likeliness of occurrence, the severity of consequences and the adequacy of existing controls. Units must plan budgets for containment of their own risks, compensation, restoration and disaster recovery, and have a written emergency procedure, including recovery measures.” The policy recognizes that the overall responsibility for the establishment of an appropriate risk management system lies with the Board, acting through the Audit Committee; the Director General is responsible for institution-wide implementation of the risk management system; and Unit heads are responsible for ensuring that risks are considered for all business processes and for identifying cost-effective risk mitigation strategies. The Panel commends this approach.

For helping implement this policy, IITA has established a Risk Management Committee, comprised of ten members, drawn equally from the R4D and Support Service groups (with the internal auditor assisting the Committee), to serve as a “focal point” for integrating the results of risk management activities throughout the Institute. This Committee has conducted a workshop with Unit heads on the risk management framework; has devised a questionnaire for assessing, reporting, and mitigating Unit-level risks; and is currently in the process of getting this risk assessment activity completed by all Units. Action by these Units has, however, been slow thus far. The Committee and Management are taking steps to expedite the planned actions so that a preliminary Institution-wide implementation update could be submitted for review at the next Board meeting in August 2007.

#### **5.5.3 Support Services**

The Support Services division is managed by the DDG-R4D Support. This position has been occupied on an interim basis for the past nine months by an experienced manager who is returning to his parent institution in June. A new DDG-S has already been recruited, and is expected to join in August 2007.

As per the reorganization of May 2007, the responsibilities of Support Services include the following eight areas, each headed by a Manager:

- a) Human resources, with four main sub-units (internationally recruited staff, nationally recruited staff, IITA clinic, and IITA school);
- b) Material Management Area--Corporate service, including materials management and logistics, purchasing, shipping, and expediting;
- c) Computer services, including IVDN and telephones;
- d) Management information services;
- e) Communication service, including library, publishing, and corporate communications;

- f) Hotel and catering (including I-House, staff canteen, I-Guest House, travel services, Ikeja office, sports club, and community store);
- g) Physical plant and engineering services (PPS), with various sub-units (automotive, construction, buildings and grounds, telecommunication, electrical services and water, refrigeration and air conditioning, heavy equipment, and scientific equipment and electronic services), and security and central and farm stores; and
- h) Aircraft operations (under R4D).

Many of these units are covered below. The Finance Unit, which includes finance, payroll, project finance, corporate accounting, and treasury, reports directly to the Director General.

Overall, IITA Management recognizes the challenges it faces in delivery of efficient corporate services, despite the substantial improvements already made or set in motion during the past few years. It considers the effective delivery of corporate services essential for the Institute, and has launched a two-year program to address administrative deficiencies. Some of the issues being addressed are: a) provision of adequate and efficient support to research, and maintenance of staff welfare, despite declining unrestricted funding; b) strengthening the provision of corporate services at stations other than Ibadan; c) retention of staff, particularly in the MIS and finance and budget units; d) strengthening computer/MIS connectivity and capacity at field stations; and e) the improving communication and understanding between the users and providers of support services.

#### *Human Resources Management*

The HR Manager, who now reports to the DDG-S is responsible for both internationally- and nationally recruited staff (respectively IRS and NRS) at IITA. For IRS issues she works directly with the Management, scientists, and administrators, both at headquarters and at various locations; and for NRS issues in Nigeria, she oversees the work of the Personnel Manager and his staff at headquarters. However, while personnel policies established by Management and the Board cover all staff--as do the responsibilities of the headquarters-based HR Manager--the station administrators at locations are responsible for personnel management of locally-recruited national staff at their respective locations (e.g. the IITA-Benin station has a Station Administrator responsible for NRS staff issues).

Even though only 45% of IRS and 57% of NRS are located at Ibadan, this centralized management of all IRS from corporate headquarters, and decentralized management of NRS wherever they are located, is necessary and appropriate for a deconcentrated organization such as IITA – which is spread over 12 locations in 9 countries over sub-Saharan Africa (including the Ibadan station/headquarters in Nigeria). However, the HR Manager is unable to have regular face-to-face contact with most IRS; and this presents challenges common to other similarly dispersed organizations. This has been the case even for IITA's station in Benin--where substantial NRS issues, with potentially-major implications for both Centers, need to be addressed, as part of the proposed alignment of corporate services with WARDA, as further discussed below.

Several other factors have added to the complexity of managing IITA's dispersed workforce. The number of internationally recruited staff at IITA has not been very stable during 2001-2006. About half the current IRS joined IITA during the period 2001-2005; and many of the IRS are in mid-career (two-thirds are in the age range 45-59, and only 3% are in the "young scientist" age bracket of 30-34 years). Furthermore, although most stations/sites have been in operation for a decade or more, the staff at these locations has not remained the same, mainly due to shifts in

research program activity from West and Central Africa (WCA) to East and Southern Africa (ESA). During the past 5 years, 10 IRS have been relocated from headquarters to field sites; 45 IRS have been recruited for non-Ibadan locations; and 276 NRS have been hired at these non-Ibadan facilities.

Personnel policies and procedures, especially for IRS, have also undergone considerable change during the past 3 years. These include new policies for housing; standardization of education, shipping allowance, and other benefits at different locations; introduction of the option of self-managing the employee's contribution to retirement funds; the withdrawal of the provision of a vehicle exclusively for family use; and changes in policies regarding spouse travel, and the duration of contract terms. In addition, a salary adjustment for IRS was undertaken in 2003; a market adjustment increase was granted in each of the years 2004-2006; a central HR database system was installed in 2004; and an on-line recruitment system was established in 2006. These are commendable achievements.

For undertaking salary reviews for NRS in Nigeria, a new process was put in place in 2004. It requires inputs from the joint staff/management consultative committees, an external market survey conducted by an independent consultant, and professional advice from the HR and Finance Managers and the DDG-S—based on which, the DG decides. The methodology for doing the market survey is the same every year, though all comparators to be used are decided by the DDG-S and the DG in consultation with HR. This process has been accepted by staff as reasonable and fair, given the financial situation faced by the Institute, and has led to much better staff-management relations than was the case in IITA some years ago.

However, some other policies and the online HR management systems for IRS, such as for annual work planning and performance appraisal, have at the time of the EPMR only been in place for a few months, and both staff and their supervisors/managers are still getting used to making them work as intended. There are established policies and procedures for IRS recruitment, promotion, and contract renewal; but the Panel has been confidentially informed by staff (including through the anonymous "staff satisfaction survey" undertaken by the Science Council for the EPMR) that in some instances they perceive that these policies have not been followed in a rigorous or transparent manner.

One reason for this could be the frequent changes in the HR Manager position at headquarters (there have been 3 incumbents in this position since 2001). HR management is expected to be headed by a qualified specialist who could ensure that all line managers (including the DG and DDGs) routinely and in a fair manner follow institution-wide policies, systems, and procedures rather than seemingly-deviating from approved processes for recruitment, promotion, and contract renewal of individuals.

This is a source of concern to the Panel; but we consider it inappropriate to comment on specific instances, if any, of such deviations, except to say that managerial discretion in such matters is expected to be used only on a truly exceptional basis, and for reasons that are included in the official record of such decisions. This will enable IITA to move closer to its goal of attracting "the highest quality and most diverse pool of candidates in an efficient manner," in accordance with its recently-updated procedures for IRS recruitment. These procedures are expected to be utilized for recruitment and promotion of all scientists and managers, including Deputy Director and DDG vacancies, so that these senior managers are recruited only after an open and

transparent external search for the best available candidates (internal candidates can of course compete openly for promotion to these positions).

Another area in which improvements are needed is the objectivity and process for performance management, for IRS as well as NRS. The performance appraisal form for IRS consists of the job description (TOR), work plans for the current and next year, report on achievements for current year, and the performance rating/score. Detailed guidelines have been provided for the professional activities report for scientists. The form includes the criteria to be used, and provides for the customization of weights for each criteria depending on the work plan of each IRS. The criteria include work plan achievement, quality of science, communications, capacity building, resource mobilization, management of staff and resources, other professional activities, personal effectiveness, constraints, and career development needs.

While this system seems appropriate in principle, and the work plan is expected to be “reviewed intermittently between the staff and the supervisor(s) in the course of the year and updated as needed,” it appears from the staff survey conducted for this review that supervisors/reviewers are sometimes unable to devote sufficient time and attention to monitoring the work of scientists and providing timely feedback. As a result, some staff members believe that there is scope for increasing the fairness of the annual performance appraisal exercise, as well as its usefulness for staff and their managers.

The annual appraisal ratings are also expected to lead to decisions regarding career advancement and salary increases. As in other organizations, nationally recruited staff (NRS) expect annual salary increases based on a market survey, as well as a performance-based increment (as a % increase in basic salary). However, it appears that in IITA most NRS also expect high ratings, which are apparently routinely given by their supervisors; and this defeats the purpose of an “objective” performance appraisal system, and makes it difficult to link rewards with performance. To remedy this deficiency, the Personnel Unit has arranged training seminars for supervisors, but this effort has apparently not been sufficient to change their behavior.

A related problem is that there are few possibilities for re-classification or promotion of NRS from one grade to another. Such progress is possible only if an employee successfully competes for a vacancy at a higher level, or if the incumbent was initially appointed (for developmental or other reasons) at a grade lower than that specified in the position description. However, there are few such opportunities for re-classification; and most employees remain in the same grade for long periods of their tenure at IITA—and hence, salary increases based on “high” ratings are seen by both the NRS and their supervisors as the only means available for tangibly linking rewards with performance.

Since the workforce at IITA headquarters has few opportunities for internal mobility--and the overall numbers at Ibadan are unlikely to grow (and might even need to contract) as part of the upgrading of support services or shifting of research programs and projects from headquarters to field locations--there is no easy solution for the lack of opportunities for career advancement and salary enhancement. However, some attempts could still be made to increase the job responsibilities, and hence the salaries, of individuals--but in many cases this would also require that they have opportunities for skill upgrading, so that they could improve their contribution (and value) to IITA.

This would be especially important for some highly-technical positions (e.g. in Physical Plant and Engineering Services-PPS, accounts and finance, materials management, information technology, hotel catering etc) in which skills need to be periodically upgraded to remain competitive with the changing external marketplace. The institution-wide training budget for IITA is low—it was about US\$6000 in 2006 for long-term courses that the individual staff member was attending, excluding the substantial funds expended on short courses to which the individual was sponsored by the institute. The investment in skill development could be increased; and needs to be utilized for targeted-training of individuals, linked to their career advancement plans. For this, staff of the HR Unit would have to devote more attention to identifying and responding to the training needs of staff.

This “raising of the bar” in the performance of the HR function appears to be needed not only at headquarters, but at the Benin field station as well, in the context of the proposed alignment of corporate services with WARDA. Under the recently-signed Memorandum of Agreement (MoA) between the two Centers, all of IITA’s NRS at Cotonou would cease to be its staff; and some of them would become part of the corporate services at that location. This agreement is expected to be fully implemented by December 2007.

The DDG-S (IITA) and the ADG (WARDA), as well as the HR Managers (and other Unit heads) of both Centers have recently started taking suitable anticipatory action to address the complex HR issues involved in aligning corporate services between IITA and WARDA. However, there still remains a lot of difficult preparatory work that would have to be done by both Centers before the two institutions can be ready for moving into the final “implementation” phase of the MoA. Both Centers have recently appointed professionally-qualified HR Managers; and IITA has finalized the recruitment of a new DDG-S. These new appointees will now have an opportunity to work closely with their counterparts in WARDA, as one team, so that potential HR problems that will affect both Centers—that already share common physical facilities at Cotonou—are managed smoothly.

In view of the above pending requirements for strengthening the effectiveness of the HR Unit at IITA, the upcoming needs of the IITA-WARDA alignment of corporate services, and because the results of the staff satisfaction survey indicate some concerns regarding the consistent use of existing HR systems for staff recruitment, promotion, and retention, *the Panel recommends that the HR management Unit at IITA become more proactive in establishing effective systems for recruitment, performance management, career advancement, and retention of both IRS and NRS; and in ensuring that the approved HR processes and procedures are consistently followed by managers and staff throughout the organization.*

#### *Materials Management*

The Materials Management and Logistics (MML) Unit at IITA is responsible for about US\$13-14M of annual purchases of goods and services to support research and related activities at its headquarters and field stations. The staff satisfaction survey conducted by the Panel indicates that most respondents are not satisfied with the timeliness of the procurement undertaken at IITA; and this impression was reinforced by interview data that indicates a high level of frustration among scientists and managers regarding the quality and responsiveness of services provided by the MML unit. Staff members are concerned about long delays in processing requests for purchases and receipt of goods; and believe that the price of goods charged to their budget is higher than the prevailing market price.

This “over-pricing” is in part due to the high transportation cost for obtaining goods from overseas. IITA currently uses an agent based in the UK to handle its international procurement; and has a shipping consolidator in the US to expedite shipping of goods originating there. Delays in the receipt of goods are partly attributed to the shippers requiring that a container be full before any goods can be shipped. This requires advance planning by scientists to accommodate the expected lead time and “delays”; but this planning has not been easy to do in practice, since many scientists apparently prefer to order as need arises. In 2004, credit cards were introduced, as part of the fast-track purchasing system meant to hasten the purchase of urgently required materials. However, an internal audit review of usage of the credit cards found that they are not used as frequently as had been expected--only 19 purchases valued at US\$32,500 had been made over a period of 21 months.

Local procurement has not been efficient; e.g. in some instances, stock purchased some years earlier are more expensive than those available on the market today, or staff can find lower cost items in the local markets. To avoid the high stock costs, staff has been known to purchase their requirements directly and request for reimbursement from stores later. The purchasing system uses Oracle software to enable staff to track the progress of their orders. A new head of materials and stores was recruited in 2004 after the dismissal of the former Unit head and his deputy for unprofessional conduct. Purchasing and inventory management have improved somewhat after this, but not up to the level expected.

In addition, large amounts of inventory, costed at US\$4.2M (before obsolescence provision of US\$2.8M) was held in stores, as of 31 December 2006. Although recommendations have repeatedly been made to dispose of ‘obsolete’ stock, some inventory, such as spares for old equipment, is still kept in stores because these spares would be almost impossible to find in the market. However, retention of large amounts of stock has its attendant costs and risks; for example, spare parts for generators worth US\$30,000 disappeared from stores in 2005, and some staff had to be dismissed.

Management is aware of the major problems related to procurement; and in February 2007 commissioned an external procurement expert to undertake a comprehensive review of the Institute’s materials management and procurement system. The consultant’s report of March 2007 confirmed that IITA faces substantial challenges in its procurement operations, in part due to the institutional context prevailing in the countries where IITA operates, including poor infrastructure, limited pools of qualified staff, and unstable and limited scope of local supply markets.

In addition, the report noted significant issues of procurement delays, poor quality, high prices, as well as an ineffective procurement and communication system. Many of these issues were being exacerbated by the geographic spread and decentralization of IITA’s operations; but the report also traced these deficiencies to lack of clarity of policies, duplication of effort, ineffective application of systems and procedures, and gaps in the human resource capacity of the MML unit. The report noted that these problems were inter-related, and recommended that follow-up actions be taken by IITA at the institutional, policy, systems and procedures, and HR levels over the next few years.

The Panel commends Management for having commissioned a comprehensive review, and believes that the consultant’s report provides a good starting point for markedly improving the procurement function at IITA. As follow-up, Management has developed a road map for

implementing the report's conclusions and proposed actions. In view of the importance of ensuring that materials management becomes fully capable of supporting IITA's research operations, *the Panel recommends that suitable follow-up action for strengthening the procurement function be taken by Management in the coming months, along the lines proposed by the external procurement experts.*

#### *Physical Plant and Engineering Services (PPS)*

PPS is critical to IITA, especially in the context of the weak infrastructure and engineering services available off-campus, in the town of Ibadan. The scope of work covered by PPS includes maintenance of buildings, houses, motor vehicles and equipment at the Ibadan campus and at other IITA campuses in Nigeria. PPS is also responsible for production of potable treated water, treatment of sewerage and waste, and ensuring constant power supply to the whole campus. The stations outside Nigeria rely on Ibadan for technical assistance where the service required is critical or cannot be efficiently sourced locally. PPS currently employs 191 NRS and 2 IRS staff. This is far fewer than the 280 staff employed by PPS in 2001, and reflects the substantial productivity gains and streamlining of work achieved by the manager and staff of PPS in recent years.

In 2003 IITA embarked on a major infrastructure upgrade with a capital expenditure budget of US\$3.6M. Some of the major works being undertaken at the Ibadan campus include installing a 5 mega-watt transformer to replace the old unit; replacing the 11kv overhead line and underground cable; waterproofing roofs of the international guest house (I-house), dormitories, apartments and other buildings; installing centrifugal water chillers to replace old units; refurbishing the old sewage plant, and constructing a new plant; installing a new digital telephone system and link with IITA Benin; replacing underground pipes for all houses and apartments on the Ibadan campus; constructing new water pumping station, and refurbishing water treatment plant. Work has also been commenced or completed at other stations, including a variety of works at Maiduguri, Kubwa-Abuja, Kano, Onne, Tanzania, and Cotonou. All this has been done despite the reduced number of staff and with a stable operating budget of US\$1.15M for 2006 (the same as for 2005 and 2004). The Panel commends PPS for these achievements.

The main challenges faced by PPS are: a) the fleet of trucks and tractors used to service research sites are very old and frequently break down; b) the machine used for removing weeds from the lake is very old and is no longer effective; c) irrigation pipes and attendant equipment is no longer adequate to efficiently irrigate research fields; and d) the level of education and capacity of some support staff is low, and they require additional training to remain current, particularly those handling high-tech machinery and equipment.

Since IITA's financial situation is better now, it should be possible to improve, in a phased manner, the physical plant, equipment and facilities that enable PPS to continue to provide efficient support to research operations and to staff and residents on campus. Additional efforts and funding are also needed for in-house as well as external training of staff so that their technical skills can be upgraded. This would enable the PPS staff to be utilized to their full potential; and could facilitate their retention and possible career advancement at IITA.

#### *Management Information System*

The MIS unit provides computer hardware and software applications/services to support IITA's research, financial, administrative, and managerial information needs. The Oracle management

and financial information system has been in use since 2002. Because of the many sites/stations in which the Institute operates, many of the MIS products and services are deployed over the internet. For processing accounting information, the Platinum-for-Windows system is deployed at IITA locations outside Nigeria. Weekly batches of information are sent from these locations to Ibadan for input into Oracle. Many add-ons to support specific end-user needs have been developed in house.

These information products and services include: a) the operating details report, which provides budget and performance information to budget holders; b) the projects management information system for contracts and grants office, enabling management of projects from conception through funding and conclusion; c) the purchasing tracker, which enables tracking of overseas purchases through the system; and d) the personnel accounts report, helping staff to track their personal accounts with IITA.

Some of the challenges faced by the MIS unit include: a) providing timely solutions to MIS related problems identified by end users; b) loss of skilled and experienced staff to competitors within Nigeria and abroad; and c) concerns relating to physical security. A recent internal audit report on risks and controls related to IITA's corporate computer operations points to the need to strengthen server room security, and improve the back-up facility. The Panel was informed that computerized information is backed-up on a daily basis, but the back-up tapes are stored in the same building that houses the MIS. The Unit's staff have proposed an off-site back-up facility.

There is also a longer-term issue of ageing hardware that needs to be upgraded or replaced. For this, a three year salvage plan has been put in place, to phase out old and critical software and cables, and to enhance efficiency of the MIS. In addition, the Unit has profiled risks for its operations and continuity, and has outlined mitigation plans and safeguards to counter such risks, and to ensure adequate and uninterrupted support to IITA's needs. The Panel commends this forward-looking approach.

#### *Hotel and Catering*

The hotel and catering services Unit provides accommodation and meals at the I-house on the Ibadan campus and at the Ikeja guesthouse in Lagos. It also manages the dormitories at Ibadan which are used to accommodate staff and external guests. These facilities were built in the early days of IITA, when training was a major activity on campus. A few years ago, occupancy rates had dropped due to various reasons--including transfer of IITA staff to other stations, and relocation of the national capital from Lagos to Abuja (thus reducing the use of IITA facilities by staff members affiliated with the CGIAR system, diplomatic missions, UN agencies, and other multinational organizations). This had led to the need for increased subsidies to the Unit to keep its services operational.

With the recruitment of the current head of the Unit, however, a number of measures have been taken to cut costs and improve revenue generation. The quality of services has been enhanced, and staff have been involved in making decisions, with positive results. Cleaning services have been outsourced, and staffing levels have been reduced to save costs. Additionally, the reduction in charges for IITA projects and for collaborators using the Institute's facilities has increased occupancy rates. As a result, the Unit has become a net-revenue generator--with income in 2006 in excess of direct expenses by almost US\$300,000. This is a commendable achievement.

### *Medical Services*

Following the accidental death of an IITA member of staff on campus in 2002, a team of consultants was appointed to review the medical services offered. A medical services committee was set up to implement the recommendations of the consultants. The changes made include increasing the operational hours of the clinic to keep it functioning 24 hours a day (including weekends), and the recruitment of a general practitioner. There are now two resident doctors on campus, a senior nursing sister plus support staff, and a 24-hour ambulance service. These improvements are appreciated by staff and families living on the Ibadan campus.

### *Security*

Security services were outsourced to a private company in 1999. Annual savings from outsourcing the service are estimated at US\$100,000. IITA, however, employs a Security Manager and Security Supervisor who reside on campus. The security situation in Nigeria remains volatile; and this has necessitated the cultivation of a strong relationship with the Nigeria police service. Regular police patrol the Ibadan campus perimeter fence, and routinely provide escort service for IITA's official vehicles. As a result, safety and security on campus is not considered problematic at present.

### *Alignment of Support Services with WARDA*

In April 2007, IITA and WARDA signed a Memorandum of Agreement (MoA) for eliminating duplication of corporate services in Benin, Tanzania, and Nigeria. The CGIAR expects this alignment of services will capture efficiencies, and will serve as the building block for CGIAR-wide corporate services alignment in West and Central Africa (WCA). Accordingly, IITA's station in Cotonou (Benin) is expected to be used by IITA, WARDA, Bioversity, and possibly IRRI, CIAT, and other Centers operating in the WCA region.

For IITA's Nationally Recruited Staff (NRS) and WARDA's General Support Staff (GSS), both Centers have agreed in the MoA to work toward the goal of "harmonization of all human resource aspects as much as possible including remuneration packages". Both parties will also endeavor to appoint common external auditors. At Cotonou, IITA will retain legal ownership and management of the property, land, and facilities, and will thus retain a responsibility to maintain these. However, it has agreed that "WARDA is in the best position to manage and deliver corporate service functions in Benin"; and accordingly IITA will transfer the provision of corporate services from IITA to WARDA. Such services include general administration, farm management, information technology (computer systems), library and communications (multi-media), physical plant services (PPS), and finance. [Details of these services are given in Appendix 1 of the MoA.]

Both IITA and WARDA will retain their current legal status in the countries of origin. The Agreement also notes, in particular, the expected impact on IITA's nationally recruited staff in Cotonou, and outlines the process envisaged for their transition from IITA to WARDA. It states that the transfer of corporate services from IITA to WARDA will be implemented in four phases, with a target implementation date of September 2007 (as agreed at the CGIAR's annual general meeting in 2006). These phases are: a) the design phase (for developing a staffing plan, plan of action and budget); b) the proposal phase (for preparing final proposals to IITA/WARDA managements for approval of implementation); c) the notification phase (for notifications and explanations to staff); and d) the implementation phase (from September to December 2007).

An overall Agreement Management Committee is to be established, as well as a Local Implementation Committee for each of the three locations (Cotonou, Ibadan, and Dar es Salaam) covered by the MoA. The Agreement stipulates that WARDA will provide corporate services in support of IITA's research agenda at Cotonou; while IITA will provide such services to WARDA at Ibadan and Dar es Salaam. It gives details of how the two Centers will share facilities, services, and staff at each of the three locations. The items covered include office, laboratory, and field research space; irrigation; human resources; other services and utilities; and miscellaneous facilities and services. The cost of providing these services plus overheads will be recovered on a charge-back or cost-sharing basis, depending on the type of service, in the manner specified in the MoA.

The MoA is a detailed document; and the two Centers are working on a draft "road map" for the coming six months. A number of "transition task forces" are expected to be appointed in June (for HR, finance, computers, purchasing, PPS, general administration). This approach is promising, and hopefully will be implemented systematically and with sensitivity to the people-, system-, policy-, and legal issues that are bound to arise in the coming months. Some of these issues have already been anticipated by staff of the two Centers, and by the Unit heads and Managers responsible for the transfer of corporate services—and detailed planning is now underway (though somewhat belatedly) to address them. Hence the Panel commends IITA Management for its commitment to eliminating duplication, and for the steps being taken to implementing the MoA. It cautions, however, that instead of trying to meet the arbitrary deadlines specified in the MoA, the alignment proceed with due care and diligence, even if the process takes a little longer than originally expected.

It believes also that as the two Centers move ahead with alignment of their support services, it would be useful for them to benefit from the experience of other CGIAR Centers that have recently aligned their corporate services. For example, the model being followed by IWMI and WorldFish - who have agreed that a newly-formed organization titled International Research Support Services (IRSS) would deliver outsourced corporate services to them, covering Finance, HR, and IT—is quite different from the approach adopted by WARDA and IITA. While it may be too early to know if this model will work as intended, the IRSS seems to have started on a promising note. The experience of ILRI and ICRAF, the two Centers headquartered in Nairobi that have agreed to align selected corporate services, could be instructive as well. Both these examples could provide lessons that might apply to WARDA and IITA.

In view of the complexity, long-term importance, and strategic implications of the alignment of corporate services for WARDA and IITA, and the potential for severe adverse consequences if the harmonization process is not managed well, *the Panel recommends that the staff and DDG-S (IITA) and ADG (WARDA): a) continue a very collaborative approach to ensuring that the transfer/alignment of corporate services proceeds smoothly; b) closely monitor on a regular basis the progress made by the various Transition Task Forces and the Local Implementation Committees at Cotonou and other sites covered by the MoA; and c) seek to benefit from the experience of other Centers that are aligning corporate services.*

## 6 IITA TODAY AND IN THE FUTURE

### 6.1 IITA today

The enduring assets of the Center are its capable and highly motivated staff, its array of germplasm, and its fund of documented research experience on the management of natural resources and farming systems.

Today, IITA's staff possesses a diverse range of complementary skills needed for improving germplasm that can be utilized for sustainable farming systems in SSA. Historically, IITA has had major success in the development of crop cultivars with resistance to diseases, and in the deployment of biological control agents against pests. The impacts of this type of research, measured many years later, show productivity gains estimated at US\$1.36 billion for improved maize over a 20 year period and benefits 100 times larger than costs of the biocontrol research. IITA's current contributions to cassava brown streak and banana wilt, if successful, would be expected to generate similarly large returns to the research investment.

The balance of disciplines amongst staff is well suited to deal with research issues, though key areas such as biometrics, soil fertility and agronomy for yams and cassava still require strengthening. Staff are well trained, and IITA's facilities are generally adequate to maintain the quality of research. There is a culture of science that exists among staff; and it is fostered through cordial staff relationships, teamwork, a strong work ethic and a shared vision of what science can accomplish in development. Retaining trained staff at IITA has proved difficult, in part because of the Ibadan environment, but despite this difficulty, the Center has the needed complement of well qualified scientists. A relatively recent innovation in research leadership, the RDC, includes elected members chosen because of their experience and wisdom from among staff. It now operates as an advisory body to senior management, and is expected to provide strategic advice. The Center has in place an IP Policy, an effective germplasm health unit, and good biotechnology capacity in Ibadan and at the BECA facility in Nairobi to serve IITA and partner needs. The guiding principles for biosafety are in place, and the Center's biosafety regulations have been of value to countries in Africa seeking to establish national legislation in this area. IITA has a comprehensive approach to the storage and management of research data.

During the past five years, the leadership of IITA has set in motion the new Research for Development (R4D) approach that positions some of IITA's research staff a little further downstream than previously. As a result, IITA is currently in transition. It is vigorously pursuing the DG-initiated, but now staff- and Board-supported, R4D strategy that requires a deeper involvement in development. At the same time, it is protecting its core competencies by ensuring that they continue to be adequately supported by unrestricted funding. Despite Africa's challenges of low literacy rates, HIV/AIDS, inadequate infrastructure, and sometimes difficult policy environment, IITA has cultivated an optimistic attitude towards its potential contribution to Africa's development. It has consolidated and built on its previous technical accomplishments, and has chosen to create awareness of what targeted agricultural technology can contribute to national- and, by aggregation, Africa-wide development.

IITA is a dispersed institute with around half its staff at locations outside Ibadan. A number of restricted core projects are underway at these locations, some with significant administrative loads. All this, plus the administrative requirements of seven MTP projects, has placed additional demands on management. As this Report has sought to make clear, the Center needs to invest

further in managing research so that senior staff can better address the strategic needs of the Center and conduct thorough planning for the future. The Program Committee of the Board plays a role in this planning process, but IITA needs to tap this resource more effectively. In other respects, the Board and financial oversight functions are generally sound. Improving the Center's procurement function will increase the timely conduct of its science. IITA is seeking to improve the number and stability of its senior managers, having recognized that it has been somewhat 'under-administered' during this EPMP's review period. IITA has also started to engage professional project managers in some projects in Nigeria.

New crops have been added to the research agenda, a new Strategic Plan is being drafted, and the current MTP describes seven projects that encompass IITA's current research agenda. There are many research topics in the discovery to delivery continuum; the formulation of researchable questions in the new areas for IITA needs to be continually addressed by staff from the appropriate scientific disciplines. There has been a significant expansion in promoting cassava production for a wide range of end uses. This is largely uncharted but exciting territory for IITA, and it will be important that it synthesizes these experiences and defines principles for success. IITA has opted for active engagement with a range of new partners in agroindustry and ARIs, sometimes to the detriment of the older established partnerships with NARS. Sustaining development with new partners will be challenging, and there will be both successes and failures that the Center can learn from along the way.

IITA has the largest budget of CGIAR Centers and its R for D approach is strongly supported by its key donors, and by the host Government in Nigeria with whom it has established excellent relations. The resurgent attention to agriculture in Nigeria and incentives to agricultural research and production (like the regulation to include 10% cassava flour in all bread flour in Nigeria) have placed IITA in a strong position to make visible contributions to Africa's most populous country and to assist others. It is imperative that the Center react to new opportunities, and strengthen the alignment of its MTP- and restricted grant projects with its forthcoming Strategic Plan. When its crop improvement programs, the conservation of agrobiodiversity, and the emerging focus on diversification and value addition are considered, IITA's program is, however, well aligned with the CGIAR System priorities for research.

## **6.2 Continuing Challenges**

Germplasm of IITA's mandated crops is broadly based and generally widely adapted, and has been tailored to fit most of the major ecologies and farming systems of SSA. It now needs to be selected for input responsiveness so varieties with this characteristic will be ready for release when the inevitable intensification of crop production occurs. The conservation of agrobiodiversity within mandated crops continues to be effective and secure, though the regular regeneration of vegetatively propagated germplasm is costly and can lead to genetic drift. Long term cryopreservation of tissues may relieve this burden. Some progress is being made on characterization of accessions, and core collections have been identified in major crops. The challenge is to use the growing molecular information on genetic diversity in an effective manner. Genetic variation generally has not limited breeding progress, except for intractable traits such as *Maruca* resistance in cowpea, or resistance to the parasitic weed, *Striga*. In the first of these cases scientific partnerships with ARIs have provided access to transgenic variation from outside the species, and Bt cowpea may shortly be in the hands of IITA scientists. Genetic gains in yield potential appear to be taking place, though the Center needs to document the impact of its progress in that regard. These gains are effectively safeguarded by crop protection specialists

and biocontrol experts second to none in expertise. Improved germplasm is being tested and distributed to NARS through testing networks linked to the SROs in West, East and Southern Africa. However, delivery of improved germplasm to farmers remains a major problem. The seed industry in SSA is still modest in ESA, and is pitifully small in WCA. Few of IITA's breeders can point to solid evidence of seed and planting materials being moved out to farmers' fields via the private sector. The panel is convinced that there is progress, but in the absence of an established industry that markets seed, propagules or other planting materials, use of improved materials is hard to quantify and difficult to sustain. Rapid progress will be thwarted until this bottleneck is resolved by a healthy and expanding private sector. There are signs, however, that this is starting to occur.

The natural resource base of much of SSA is deteriorating, and net nutrient outflows are thought to be occurring from most farming systems across much of the continent. In the Guinea and Sudan savannas, often considered the bread basket of West Africa, fallows have disappeared and almost all suitable land is farmed. Fertilizer use per hectare in SSA averages less than 10% that of tropical Asia and the farm-gate price for fertilizer is amongst the highest in the developing world. IITA has made solid attempts to address the issue of soil fertility decline, and after a period of reliance only on biological N fixation and manure, is now establishing sustainable cereal-legume cropping combinations augmented by judicious amounts of fertilizer. Unfortunately these are still operating at yield levels well below the potential limits set by climatic factors. The carrying capacity of farm land that supports a growing human population along with animals dependent on crop residues for feed could be significantly increased with additional crop nutrients. And while improved cereal legume cropping systems have been developed, critical measures of widespread impact and of farmer modification are scarce. There is a strong cadre of socioeconomists on staff to analyze these trends, but many have recently joined and lack adequate mentoring.

It is likely that as new political alignments take place in Africa, there will be more formal and informal exchanges of agricultural materials. There are many benefits of this, but there will be associated challenges as well. IITA will probably have to enhance its capacity for phytosanitary engagements across Africa. It is likely that IITA will be expected to take a leadership role in relation to information on seeds and seed systems. The area of vegetatively propagated material is particularly challenging for most countries due to its potential for distributing dormant disease agents. IITA has a long history of handling such materials, and it will be important for the Center to provide greater leadership in this area.

The major emerging topic of biotechnology is of critical importance, especially because of national and regional biosafety considerations. This will certainly impact on technology generation decisions and delivery pathways, and IITA should look at the implications of the opportunities for introducing GMOs as well the challenges posed by regulatory requirements.

### **6.3 Where can IITA be in five years?**

In 2012 Africa's agriculture will almost certainly be more productive and diverse, but there will be 80-100 million more people in Africa who will require feeding. Farmers will be a smaller proportion of the African population but they will be more efficient in supplying the food and feed needs of their countries. They will be earning higher incomes and their efforts will be a source of non-farm income for people working in agricultural processing, marketing and related issues. Input markets will have become more efficient. As a result, fertilizer use, especially in the

savannas, will be increasing. The greater productivity of farmers and the diversification of agriculture will provide larger food baskets and increasing incomes to ensure greater food security. It is hoped that IITA will be receiving deserved recognition for its role in these developments and, consequently, will gain increasing influence in the decisions that guide the future of African agriculture. To succeed in this role IITA will have maintained a vibrant and dedicated group of researchers, and it will have a well-established presence throughout sub-Saharan Africa.

Some of IITA's success will be based on its traditional skills. It will have maintained strong breeding programs in important food staples that will be the sources of productive varieties. It can be expected that the breeding programs will continue to be a crucial bulwark against devastating plant diseases; and they will be doing this by maintaining adequate genetic variation that leads to resistant varieties, and by ensuring that they are deployed in a timely manner. Its plant protection and crop management skills will provide additional methods that help protect farmers from biological and climatic risks.

In addition, some of its success will be based on new science. It is expected that IITA will have invested resources in learning how to get beyond genetic barriers that currently limit plant breeders' capacities to take advantage of the plant genome. The use of biotechnology will have provided markers and other tools to speed the work of the breeders, and genetic transformation will have begun to fulfill its promise of delivering varieties that meet the needs of Africa's smallholder farmers.

But the success will not simply be due to the science practiced in the laboratory and the field. The innovations emerging from IITA's research will increasingly be the products of demands from agricultural markets that require crop varieties for expanding markets and a wide variety of uses. Africa's agricultural research systems will be responding to the incentives of the commercial agriculture envisioned in IITA's R4D paradigm. At the same time, a more market-oriented agriculture will require high quality inputs, many of them, such as seeds, planting material and biocontrol products, that embody IITA's research products. The growing strength of commercial agriculture will provide more incentives for land stewardship and some resolution of the challenges of resource degradation and soil fertility decline.

The confluence of advanced agricultural technology and a more diversified and demanding market will require supportive policies from African governments that provide farmers a strong voice in technology generation, provide strong and efficient input and output markets, and offer opportunities both for a growing sector of commercial farmers and for those households for whom agriculture is part of a more complex livelihood strategy. IITA will be using its experience and accomplishments to provide guidance for the formulation of such policies.

#### **6.4 How would it have got there?**

IITA's vision and goal is to alleviate poverty and reduce hunger with the commitment to bring about positive change through the power of agricultural research.

New opportunities are emerging as governments in many African countries are liberalizing their policies to encourage the development of the private input market. The lack of such markets (e.g. for both seed and agro-chemical products) have significantly curtailed advances in African agriculture in the past. IITA will need to pay close attention to these developments and position

itself to be counted among the important players in African agriculture. The NEPAD-CAADP program will impact heavily on what direction African agriculture will take.

The success of R4D and the destiny of IITA's mission and goal are going to be tied to its continued commitment to science. The adoption of the Research for Development paradigm encompasses different trajectories and points of application for research. Firstly, there is the improvement of crops to enhance yields and ensure food security in the face of increasing human population pressure and the stress of crop diseases and pests. Secondly there is the possibility of creating local income from the diversification of farming systems (to include higher value commodities such as fruit and vegetables, as encouraged by the new CGIAR System Priorities for Research). Thirdly, and as proposed in the new IITA draft strategy document, is the possibility of developing agri-industrial approaches for commodities (such as cassava) that have alternative products and outlets. The Panel believes that IITA will require new expertise to accomplish the agri-business approach.

There will be an increased need for economic and market analysis, and increased sophistication in the development of public private partnerships and business plan development. There will be a requirement to balance the long term research thrusts of the Center on commodity improvement (which has provided IITA the comparative advantage to enter into agri-business ventures as the technical backstop) with the shorter term analyses, adaptive product development research and formation of partnerships with the private sector that such an approach requires. It is not clear that IITA is currently staffed appropriately for this third task and may need to link with adequate long term support of these types. Further, IITA needs to address issues of sustainability – which includes the underpinning of continued crop production, the sustainability of partnerships and of markets. Cassava lends itself to the production of a variety of products (food, feed, and industrial glucose, starch and ethanol). Understanding feasibility and market interplay is necessary.

The Panel is concerned that the natural resource management issues which underpin crop production are losing prominence within the agenda focused on production and income. And there is some concern that in the current focus on the commodity chain, research may be overlooked and this needs to be a feature of the new Strategic Plan. IITA's wish to derive quick impacts should not lead it to circumvent traditional NARS partner contacts in some areas in favor only of universities and SMEs, who are unlikely to support these major projects in the absence of national programs. Indeed the Panel views IITA's efforts in the agri-business approach as legitimate experiments. There is evidence that success of particular national initiatives can draw the attention and involvement of other countries. IITA therefore must continue to bear in mind the appropriate reach of public funded research vis-à-vis the private sector and, secondly, set up the means to share the lessons learned so that a broader set of countries can benefit from the experiments. The ability of IITA to create feasible and lasting agribusiness ventures founded in solid institutional arrangements rather than on individuals will be the judgment of the next EPMR.

*In summary:* For the first time in the history of the continent, the leaders of African nations are beginning to dedicate their attention to key drivers of change in African agriculture and to understanding better the value of science in agricultural development. The Panel sees several interrelated elements that IITA should continue to address to help meet the research goals for African agriculture and to help build the necessary enabling environment:

- Ensuring that it is able to synthesize, learn from and transmit lessons from R4D

- Maintaining strong science and ensuring it is well planned with clear strategies.
- Taking advantage of new science (e.g. biotechnology)
- Maintaining and expanding understanding of political support and policy input
- Promoting commercial input delivery
- Addressing resource degradation and soil fertility decline
- Building NARS and other partners.

IITA has already started to develop strong partnership with some of these national, regional, and international organizations. The Center has earned some recognition by these governments, having been singled out to partner with these governments towards joint establishment of programs. IITA's successful approach to agricultural research in Africa in the past has emphasized working through partnership, particularly with the NARS and increasingly the SROs. IITA's philosophy was, and to a large extent still remains, one of active engagement with key contributors to accomplish its mission. Since 2002, IITA has reduced its role in traditional capacity building through courses, focusing more on project associated training. The Center's stance on type and mode of partnerships also appears to be unclear and ambiguous. However, the Panel believes that IITA should *"engage its partners more actively and more broadly in its R4D, so that all partners gain experience in moving through the spectrum of discovery to delivery and along the value chain"*. In its urgency to have impact IITA should not pursue what some of the NARS perceive as a "go it alone" approach. To have effective improvements in farming system productivity, and to raise debates to the policy level in germplasm conservation, input markets or other aspects of agriculture will require that the IARCs and their partners speak with the voice of their communal experience. Managing partnerships effectively will be one of the keys to IITA's success in the future.

**Annex 1**  
**General and specific Terms of Reference for the conduct of the**  
**6th External Program and Management Review of IITA.**

**General TORs for the EPMR**

**Objectives and Scope**

The EPMR for IITA, in line with the SC guidelines will seek to inform CGIAR members whether their investment in IITA is sound, or recommend measures to make it so. Through this EPMR members of the CGIAR and other stakeholders will be informed to the extent possible whether the Center is doing its work effectively and efficiently. This EPMR will be both retrospective and prospective and it should at the end of the exercise help ensure the Centers' excellence, relevance and continued viability, as well as the proof that the Center adheres and is coherent to the tenements of the CGIAR System. This review is expected to be strategic in orientation and as comprehensive as the situation warrants.

The broad objective of the EPMR is to:

1. Provide CGIAR members with an independent and rigorous assessment of the institutional health and contribution of IITA and,
2. Provide the IITA Center and its collaborators with assessment information that complements or validates its own evaluation efforts, including the CCERs.

The EPMR Panel is charged to specifically study and analyze the various dynamic realignments in IITA particularly in the last five years since the last EPMR conducted in December 2001 and assess:

- a) The Center's mission, strategy and priorities in the context of the CGIAR's priorities and strategies;
- b) The quality and relevance of the science undertaken, including the effectiveness and potential impact of the Center's completed and ongoing research;
- c) The effectiveness and efficiency of management, including the mechanisms and processes for ensuring quality; and
- d) The accomplishments and impact of the Center's research and related activities.

The topics expected to be covered by the EPMR include but not exhaustively:

**A. Mission, Strategy and Priorities**

- The continuing appropriateness of the Center's mission in light of important changes in the Center and its external environment since the previous external review.
- The policies, strategies, and priorities of the Center, their coherence with the CGIAR's goals (of poverty alleviation, natural resources management, and sustainable food security), and relevance to beneficiaries, especially rural women.
- The appropriateness of the roles of relevant partners in the formulation and implementation of the Center's strategy and priorities, considering alternative sources of supply and the benefits of partnerships with others.

**B. Quality and Relevance**

- The quality and relevance of the science practiced at the Center.
- The effectiveness of the Center's processes for planning, priority setting, quality management (e.g. CCERs, peer reviews and other quality and relevance assurance mechanisms), and impact assessment.

**C. Effectiveness and Efficiency of Management**

- The performance of the Center's Board in governing the Center, the effectiveness of leadership throughout the Center, and the suitability of the organization's culture to its mission.
- The adequacy of the Center's organizational structure and the mechanisms in place to manage, coordinate and ensure the excellence of the research programs and related activities.
- The adequacy of resources (financial, human, physical and information) available and the effectiveness and efficiency of their management.
- The effectiveness of the Center's relationships with relevant research partners and other stakeholders of the CGIAR System.

**D. Accomplishments and Impact**

- Recent achievements of the Center in research and other areas.
- The effectiveness of the Center's programs in terms of their impact and contribution to the achievement of the mission and goals of the CGIAR.

**Specific TORs (Strategic Issues) for the EPMR of IITA**

1. How good is the science at IITA? How much of the IITA effort is involved in development activities and does this come at the cost of a focus on research that generates IPGs?
2. The budget of IITA has grown substantially over the review period (the proposed figure of US\$ 50.6M for 2007 is 40% higher than it was in 2001). Has the new donor investment enhanced or detracted from the accomplishment of IITA's research outputs? What have been the long term effects of this growth in budgetary resources in relation to the sustainability of IITA's undertakings and the Center's impact?
3. What is the impact of IITA's research on NRM over the last 10 years?
4. Does the Center adequately balance its relationship and role with respect to NARS to avoid impinging on national implementation and private sector contributions to agricultural development?
5. The Science Council notes that IITA has been slow to respond to the Recommendations of the last EPMR? Does the Panel judge that a satisfactory response has been made overall and what systems are now in place for priority setting and the evaluation of impact?
6. Does IITA have adequate capacity in socioeconomic and policy analysis? If so do their inputs adequately contribute to the strategic planning and alignment of the research activities and the creation of an enabling environment?
7. IITA has adopted a Research for Development Council to guide research. Is this an effective solution for research priority setting and day to day oversight of projects and scientific quality?
8. How does IITA place itself strategically in relation to SSA as a whole? What will be the opportunity cost to research for the West and Central Africa region of extension to other sub-regions?
9. Does IITA have a clear rationale for its involvement in agricultural diversification and high value crops? Is it collaborating with or duplicating other possible sources of research and market expertise?
10. Is the progress towards WARDA-IITA alignment adequate and appropriate?
11. What are IITA's relationships with other CGIAR Centers and initiatives in Africa e.g. with the WCA, ESA and SSA CP MTPs?

## Annex 2

### Recent Center Commissioned External Reviews of IITA and its Projects and Programs

This Annex contains the collected recommendations of these CCERs (as listed in Chapter 1.8) and donor review. Further EPMR Panel Commentary on the CCERs is reported in section C of this annex and is made in the text of the EPMR Report.

#### A. CCER RECOMMENDATIONS AND BOARD AND MANAGEMENT RESPONSES

---

##### 1. CCER: Systemwide Program on Integrated Pest Management (see separate Annex 8)

---

##### 2. IITA Board response to the CCER on Governance and Management

---

The IITA BOT appreciate the work of John Griffith and Wanda Collins in reviewing governance and management at IITA, their extensive review of Board and research management documents, their interaction with staff, national and international and with the Board. The IITA Board agree with the major thrust of the recommendations made.

#### GOVERNANCE

##### Recommendation 1: The Right People

- *the NC Chair be made a member of the Executive Committee immediately;*
- *The NC develop a list of governance competencies that IITA will need over the next 5 years, a so-called Board Profile;*
- *the NC update its list of current governance competencies;*
- *a gap analysis be provided the full board within the next three months along with a suggested approach to filling the identified competency gaps;*
- *the Board review and approve a new Role and Agenda statement for the NC at the next meeting.*
- *The Panel recommends that the Board temporarily add a Trustee with governance experience and competencies who would assist IITA as it transitions and upgrades its oversight functions over the next 18 months. The term of this special, fixed term appointment would be 18 months, or three board meetings, and would commence as soon as a suitable candidate can be found and appointed to the IITA board.*

##### Board Response:

- The governance section of the report revolves around the need for change in the composition of the Board. It sees the historic criteria for selection for membership as disciplinary expertise directly relevant to the science at the Institute. The Board also noted that a majority of Board members have governance experience as well as their disciplinary expertise. Selection criteria for the Board include this. The Panel sees this as only a partial requirement, its historic dominance now outmoded. The Board is of the view that disciplinary expertise is fundamental and that governance experience is also required of nominees.
- The CCER makes the case for a 'Self Evaluation Model' based on new demands emerging from the financial scandals in the private sector in the early 2000s, particularly in the USA, and being adopted by donors. Although this 'model' is not fully elaborated in the report, the Panel is specific in identifying skills in finance, in four categories of risk assessment, in governance and in human resource management as central to effective governance.
- The IITA BOT agrees these are key skill areas for members. It would add that experience in the operation of the R4D continuum is an important attribute that allows the BOT to see IITA's role in

an overarching function to which it makes a contribution and would include it as a criterion to be satisfied by the Board profile. Historically the IITA BOT has been aware of the need for skills in the four areas identified by the panel, though risk management has been narrow, largely subsumed under finances. The four categories of risk management identified help broaden the Board's awareness of risks.

- Historically,
  - given the complexity of the IITA programs, with a wide range of disciplinary skills involved, and
  - given an institute operating an interdisciplinary strategy; and
  - given the pressure to reduce the number of its members,the BOT has tried to combine the skills highlighted by the Panel with disciplinary excellence in its assessment of candidates.
- The Panel recommendation implies a change. Options for change range from a re-weighting across the multiple criteria used towards the identified skills, or, more radically, selection solely on the basis of these skills and the use of temporary panels, as in program oriented CCERs, to evaluate quality and relevance of the science of the institute. **The BOT is discussing these and other options.**
- Given the emphasis put on the need for these skills on the Board, the Board did not see the clear advantage of a temporary appointment of expertise on finance. Note the recommendations about shorter terms, and the emphasis placed on re-appointment only if the member/candidate has skills required for the future rather than the past. The Board has accepted this recommendation and has made a routine appointment (a first term of three years with eligibility for a second term of three years) of a Trustee with expertise in finance and governance.
- The recommendations specifically related to the NC have been implemented immediately or are in various stages of implementation. The Board wishes to record that the Nominating Committee has always conducted gap analyses for filling Board future Board vacancies.

\*\*\*

#### **Recommendation 2: The Right Issues**

- *The Panel suggests that the Board seek an opinion from Counsel on the legality of the CDC 'binding decisions' issue and act accordingly and, internally, change the rules of procedure so that the full Board approves the budget in a timely manner.*
- *The Board Chair and the DG carefully vet the meeting agenda and with input from all members of the Board try to ensure that presentations and discussions are strategically focused.*

#### **Board Response**

- The Board has requested the Director General to seek legal opinion on CDC "binding decisions" and is awaiting the outcome.
- The Board Chair and the DG carefully vet the meeting agenda and with input from all members of the Board focus on ensuring that presentations and discussions are strategically focused.

\*\*\*

#### **Recommendation 3: The Right Processes**

- *The Panel suggests that the Board Chair and the DG set the level of expectations in respect of board processes and ensure/enforce compliance.*

**Board Response**

- The full Board has been involved in setting the level of expectations and has made specific recommendations on the documentation and the timing of the documentation that is required by the Board to effectively perform its oversight functions as reflected in the Minutes of Board Meetings, May 2005 and January 2006.

\*\*\*

**Recommendation 4: The Right Self-Evaluation**

- *The Panel recommends that the Board's Rules be modified so that if a Trustee misses two consecutive meetings comprising either a board and/or a Committee meeting, his/her appointment will be terminated.*
- *The Panel also suggests that the Terms of Reference of the Board Chair be modified to reflect the new responsibilities implied in the new self evaluation model described above.*

**Board Response:**

- The Board considers the recommendation on terminating Trustees who miss two consecutive meetings of either a board and/or a committee to be too rigid, as it does not reflect a number of activities performed by Board members outside of meetings. Effectiveness of Trustees is reviewed on a case-by-case basis and takes into consideration the actual circumstances for the non-attendance.
- The annual Trustee self-evaluation process is being implemented under the incoming Board Chair (August 2006) and the Board's Policies and Procedures modified to include this additional responsibility.

\*\*\*

**Other Board Comments**

- The Panel provided useful comments on the Nominating Committee which is urged to raise its game to effect the 'change of mindset' needed for a 'Self evaluating' Board. It would have also been useful to get the Panel's advice on committee structures, mandates and performance more generally for its other committees.
- The Board would have appreciated a comment from the Panel on the frequency of Board meetings which the Board has frequently debated. Although not explicitly stated the Panel favor two meetings a year when they say, 'The term of this special, fixed term appointment would be 18 months, or three board meetings, and would commence as soon as a suitable candidate can be found and appointed to the IITA board.' The Panel also notes: "with only one meeting a year, it could take a new Trustee at IITA up to half of the first term of office to gain familiarity with the center's activities, with his/her fellow Trustees and their work style and specific skill sets, with management's style and effectiveness and to gauge the quality and attitudes of the staff" The IITA Board has decided to explore the 2 meeting per year option which will also include conference calls.

## RESEARCH MANAGEMENT

### **Recommendation 1: Research Management Arrangement (RMA)**

*....IITA reconfigured its internal research management structure. Six mega projects were transformed to six programs with 19 component projects. At the time of the CCER the process was not complete and no research management plan had been formulated to adapt the current RMA being reviewed by the Panel, to accommodate the shift in research structure.....*

*In the panel's opinion, the shift in program structure, along with the possibility of integration with WARDA activities, represent a significant challenge to the current RMA. The panel report will provide guidance and will comment on general research management issues relevant to the RMA, but cannot address the outcome of those two significant changes in terms of the ability of the RMA to adequately and effectively manage research at IITA into the future.*

- *Therefore, the Panel recommends that the EPMR scheduled for 2007 revisit, in-depth, the Research Management Arrangement at IITA*
- *The Panel further recommends that IITA move quickly to modify the RMA structure and clearly articulate and implement a management plan for the new project portfolio, taking into consideration further recommendations for general strengthening of research management which follow in this section. This should be a planned, deliberate, and a thoughtful process resulting in a fully defined management plan.*

### **Board Response**

The Board notes the Panel's opinion on the impact of the change in program structure. The Board sees this as a change in title only. Use of the title 'program' for a collection of projects on a common theme avoids the confusion of using the word project twice in describing the operational hierarchy. The Board acknowledges the complexity of the negotiations with WARDA in the context of CGIAR reform but does not foresee any adverse implications for IITA's Research Management Arrangements. The Board agrees with the Panel recommendation that the EPMR includes an in depth review of the RMA at IITA and endorses the Panel recommendation that IITA move quickly to modify the RMA structure in the light of those recommendations made by the Panel as accepted or modified by the Board.

### **1.1 RDC, the Apex of the Research Management Arrangement**

- *The Panel recommends that the Research for Development Council be re-oriented to a Research for Development Advisory Council with decision-making authority devolved from the Director General at his discretion.*

### **Board Response**

The Panel perceives the RDC as the innovative element in the research management arrangements and concentrates many of its recommendations here. While it is attracted both to the intent of the RDC to democratize research management decisions, and also the support this has from staff, the Panel is concerned that the body as structured, dominated by elected members, does not have the competency to address broad research management issues and, in practice, has largely focused on relatively narrow matters of administration. **The Board agrees with this analysis.**

The BOT finds a contradiction in aspects of the Panel report on research management. Two of particular importance;

- The Panel suggests that the RDC should continue to have final decision making authority on those things it did well in its first two years, (performance review, internal budget allocation, etc.) yet also acknowledges that these things were largely in the administrative sphere rather than in research management, the raison d'être of the RDC. **The Board does not believe that the RDC should have a mainly administrative role.**
- The Panel recommends that the decision-making authority of the RDC be at the discretion of the DG. Historically this has been the case with matters delegated to the RDC that the Panel now finds it does not have the competency to address. While the Board recognizes the enthusiasm of the staff for participation in management it also sees a need to limit the **decision-making authority of the RDC, as presently structured, to issues within its competency.**

The BOT endorses the Panel recommendations on the RDC with the exception of delegation of authority to RDC at the discretion of the DG. Revised TOR are required for the RDC. These should distinguish clearly between matters on which the RDC has decision-making authority, and matters on which it is advisory. These revised TOR need Board endorsement, as do future changes in authority delegated by the DG to the RDC.

### **1.2 Directors Research for Development—the fulcrum of the RMA**

- *The Panel recommends that IITA urgently seek to acquire expertise at the Institute-wide level of research management and leadership. This can be accomplished by recruiting a permanent Deputy Director General. It might also be accomplished through a shorter-term appointment of a similar competence. The important factor is to secure the services of a proven, seasoned research leader who can complement the roles of the Directors and provide cohesive oversight at the Institute level through the next few challenging and critical years*

#### **Board Response**

The BOT acknowledges that the CCER occurred when the RMA were in a state of rapid change. The BOT notes that prior to the CCER, it had asked for the recruitment of a DDG, recommended changes to the decision-making authority of the RDC, and asked for increased support to the Program Leaders. At the time of the CCER, and indeed to date, these Board decisions are in various stages of implementation. Several of the Panel recommendations on RMA support the BOTs own recommendations as recorded in the minutes since 2004.

### **1.3 Program Leaders—The Foundation of Research Management**

- *The Panel recommends given the growing complexity of its research portfolio, that IITA take immediate steps to strengthen and nurture research management at the Program Leader level; the panel strongly suggests that strengthening at this level will reinforce the entire structure above and eliminate some weaknesses that now exist at higher levels. Program management and leadership should become a highly valued skill with adequate investment in its development.*
- *The Panel recommends that, at a minimum, the process of electing program leaders be dismantled and replaced with a process of selecting (recruiting or appointing) leaders who demonstrate both commitment and skill for the position.*

#### **Board Response**

The Panel considers that too little attention has been paid to supporting those in the Program Leader role and concentrates several recommendations in this area. The importance attributed to the Program Leader role, and the need for support, concurs with the views of the BOT as recorded in the minutes of the 04 and 05 meetings. **The BOT endorses the Panel recommendations in this area, including the recommendation that the Program Leader be appointed rather than elected.**

## **Recommendation 2: Investing in Management and Leadership Development**

- *The Panel recommends that IITA develop a training and orientation program for all staff occupying management roles within the RMA. This is particularly critical and urgent, for Program Leaders who will shoulder the burden of managing the new 19-project portfolio. Training should take advantage of external consultants who could facilitate internal workshops and bring professional expertise to the process; however, external opportunities should also be made available for management leadership development. Directors should have similar opportunities at their level for development. And finally, if project leaders will be named to manage each of the new 19 projects, they should also be afforded relevant training.*

### **Board Response**

The Board agrees with this recommendation in the context of the revised Research Management Arrangement. A training and orientation program should be developed at all levels of staff as required.

### **Conclusion:**

The Board asks that IITA management work to implement the recommendations from the CCER as endorsed or modified by the Board and recorded in the minutes of the February 2006 BOT meeting.

Revised by the IITA Board February 2006

---

## **3. Management and Board response to the Report of a Center-Commissioned External Review (CCER) of IITA's Project B: "Developing biologically based plant health management options and conserving biodiversity for sustainable agriculture", November 2004**

*Reviewer: Marlene Diekmann, GTZ Project "Advisory Service on Research for Development" and Associate Professor, Institute for Plant Diseases, University of Bonn, Bonn, Germany*

The IITA Board of Trustees and Management greatly appreciate the work of Marlene Diekmann, GTZ Project "Advisory Service on Research for Development" and Associate Professor, Institute for Plant Diseases, University of Bonn, Bonn, Germany in reviewing IITA's Project B ("Developing biologically based plant health management options and conserving biodiversity for sustainable agriculture). The extensive review of research documentation and related information, their interaction with staff, national and international and with the Board members was very welcomed.

The IITA Management, fully endorsed by the Board of Trustees response to the review of Project A is below.

### **History of Project B**

*In late 2001, following the last External Program and Management Review (EPMR), IITA restructured its 14 projects into 6 projects. Projects A to C are of a disciplinary nature, D to F are agro-ecological zone projects. Project B builds on the projects of the former Plant Health Management Division, namely Project 7 "Biological Control and Functional Biodiversity", Project 8 "Integrated Management of Legume and Maize Pests", Project 10 "Integrated Management of Cassava Pests and Diseases" and the plant protection-related activities of Project 1: "Conservation and Genetic Enhancement of Plant Biodiversity", Project 2 "Improving Plantain- and Banana- based Systems, Project 5 "Improving Yam-based Systems". Project B, like the other IITA projects, is really more like a program, and confusion with donor-funded 'projects' sometimes occurs.*

The budget of project B slightly increased from 2003 to 6.86\$m in 2004 in is expected to remain stable in 2005. It is the second largest of the 6 project budgets.

### **Summary of Recommendations and Management and Board Responses:**

#### **Recommendation 1**

- *It is recommended to list activities as they relate to the outputs.*
- *Inputs are missing in the logframe. Milestones are listed for each output for the years 2004 to 2007, resulting in rather long lists*

#### **Board and Management Response:**

- IITA appreciates these recommendations that clearly indicated many weaknesses in the past MTPs. The new format of the MTP projects no longer accommodate activity level reporting but this is now accommodated within scientist workplans where they are linked to specific outputs.

\*\*\*

#### **Recommendation 2**

- *It is recommended to list the milestones under the activities, and where appropriate combine those that relate to one pest.***Board and Management Response:**
- IITA appreciates these recommendations that clearly indicated many weaknesses in the past MTPs. The new format of the MTP projects no longer accommodate activity level reporting but this is now accommodated within scientist workplans where they are linked to specific outputs.

\*\*\*

#### **Recommendation 3**

- *It is recommended that IITA link with institutions that are (or should be) concerned with the spread of pests (FAO, IAPSC, ...) and jointly explore ways to identify funding to mitigate the invasion of pests at early stages.*

#### **Board and Management Response:**

- IITA accepts this recommendation. In terms of collaboration with other bodies, stronger links have been established with IAPSC (which is undergoing major restructuring at the moment) and GISP (Global Invasive Species Program).
- We have and will continue to explore for opportunities to link to FAO, who deals more with policy related issues of invasive species rather than with technical matters. For example, IITA's biodiversity center at Cotonou is currently aggressively searching for funds to tackle a new invasive and highly destructive fruit fly species (*Bactrocera invadens*) through strategic partnerships.

\*\*\*

#### **Recommendation 4**

- *It is recommended to add to all donor project proposals that make use of services such as taxonomy, or the germplasm health unit (development of new cultivars, etc.) a budget line to recover the cost of these services.***Board and Management Response:**
- IITA accepts this recommendation. The recovery of these costs is now being budgeted into project proposals or charged directly to users.

\*\*\*

### **Recommendation 5**

• *It is recommended to establish an estimate of minimum core positions and to ensure these are filled.***Board and Management Response:**

- IITA accepts this recommendation. The RDC has developed a set of core competencies for IITA. These have been identified on the basis of future needs for disciplinary focus as well as location. These core competencies are reviewed annually by the RDC. These are the basis for recruiting and retaining core scientists.

\*\*\*

### **Recommendation 6**

• *It is recommended to review training needs in NARS and offer the appropriate training (group, individual, in-house, in-country).***Board and Management Response:**

- IITA is committed to capacity building of NARS and other partners. Thus, we accept this recommendation.
- We also incorporate training needs in project proposals when ever possible. We attempt to meet any training needs that are demanded by the NARS or other partners. We would work with NARS to determine training needs if requested.
- The RDC has established a new graduate training scholarship program in 2006.
- We have always considered training needs of the IITA technical staff as a high priority.

\*\*\*

### **Recommendation 7**

• *It is recommended to consider granting of sabbaticals (not as an entitlement, but as a possibility as and when needed) and to encourage participation in international conferences, preferably with key note addresses if possible (this would raise the profile of IITA on the international stage), etc.*

#### **Board and Management Response:**

- IITA accepts this recommendation. The RDC established a Strategic Travel Fund in 2006 to fund these types of opportunities from core funds. We give high priority to presentations at International Conferences.
- We are willing to consider opportunities to allow the scientists to do study leave if they are of high priority to our research agenda.
- We also are willing to fund travel cost of researcher from ARI's to come to IITA to bring new skills or knowledge.

\*\*\*

### **Recommendation 8**

• *It is recommended to establish a system to avoid inadvertent introduction of pests to and from IITA locations other than Ibadan, in cooperation with the respective national plant quarantine service.*

#### **Board and Management Response:**

- IITA takes very seriously its responsibility to insure safe germplasm transfer. Thus, we accept this recommendation. IITA has a germplasm health facilities and expertise in Ibadan which establishes standards and gives training of existing support staff at other locations when needed. Germplasm

health testing and certification capabilities continue to be developed in collaboration with NARS and IAPSC (for material transfer).

- Recently, Dr. Maria Ayodele has been very instrumental in upgrading skills of NARS and IAPSC staff in terms of germplasm health testing.

\*\*\*

#### **Recommendation 9**

- *It is recommended to change the project B title to: "Developing sustainable plant health management options"***Board and Management Response:**

- IITA appreciates these recommendations that clearly indicated many weaknesses in the past MTPs. This recommendation was fully accommodated after the CCER and in the 2006/2008 MTP.
- The new MTP has resulted in more integration of the Project B outputs and activities within the new projects and the shift away from disciplinary projects. Thus the name change is not longer evident.

\*\*\*

#### **Recommendation 10**

- *It is recommended to modify the titles of outputs to match the suggested new project title as follows:*
  1. *Knowledge base on distribution and biology of pests and their natural enemies improved, and agro-biodiversity characterized*
  2. *New knowledge on the interactions between pests, host plants, natural enemies and the environment generated*
  3. *Effective integrated control options against important pests in farming and aquatic systems developed*
  4. *Crop protection products based on entomopathogens, botanicals, semiochemicals and elicitors developed towards commercialisation*
  5. *NARES capacity to develop and apply integrated pest management components and safe use of pesticides enhanced.*

#### **Board and Management Response:**

- IITA appreciates these recommendations that clearly indicated many weaknesses in the past MTPs. The new MTP has resulted in more integration of the Project B outputs and activities within the new projects and the shift away from disciplinary projects. These outputs are now accommodated within the new MTP Projects.

\*\*\*

#### **Recommendation 11**

- *It is recommended to widen the range of crops to include those important in the farming systems (e.g. cotton).*

#### **Board and Management Response:**

- IITA accepts this recommendation and will continue (and expand, funds permitting) our work on pests and diseases of non-mandated crops (e.g. pineapple mealybug) or non-crop pests (e.g. water weeds). This commitment has also been accommodated in the 2007/2009 MTP projects.
- With regard to cotton, we have been in contact with national and international (mainly IRD and CIRAD) institutes concerning aspects of plant protection where IITA has a comparative advantage, i.e. development of biopesticides and biological control. Currently, we are in a dialogue with CIRAD with respect to collaboration on the primary cotton pest, *Helicoverpa armigera*, both in terms of ecological studies and also biological control, and we anticipate a joint

project leading to the deployment of a CIRAD scientist at IITA Benin. Maurice Vaissayre, principal cotton entomologist of CIRAD, has recently visited IITA Benin, and a draft proposal for the above collaboration is being prepared

\*\*\*

#### **Recommendation 12**

- *It is recommended to review whether project B staff is posted in the location where they likely have the greatest impact.***Board and Management Response:**
- IITA accept this recommendation. We recognize the need to carefully consider the location of all of our scarce scientists. The routine performance review process, which is held at the end of each contract as part of the renewal process contains a review of the appropriateness of the location for the future contract.
- The RDC has established a set of core competencies which also consider the location of each position. Thus we have a number of mechanisms available to review the placement of staff.

...

---

#### **4. Management and Board response to the Report of a Center Commissioned External Review (CCER) of IITA's Project D: "Research for Development Enabling Environment" October 2004.**

*Reviewer: Dr Alfred Hartemink of ISRIC – World Soil Information*

The IITA Board of Trustees and Management greatly appreciate the work of Dr. Hartemink in reviewing IITA's Project "D" (**Research for Development Enabling Environment**). The extensive review of research documentation and related information, their interaction with staff, national and international and with the Board members was very welcomed.

#### **History of Project**

*The activities in Project D were grouped by 7 outputs and these are essentially discipline-based (e.g. markets, production). Each Output has a number of activities that mostly are based on special projects.*

CCER recommendations for Project D

**Recommendation 1** - Re-labelling and restructuring

**Recommendation 2** - Commodity Chains

**Recommendation 3** - Setting of clear targets

**Recommendation 4** - Stimulating, inspiring, rewarding but also keeps scientists accountable

**Recommendation 5** - The think-tank

**The IITA Management, fully endorsed by the Board of Trustees response to the review of Project C is below:**

#### **Implementation of recommendations:**

The CCER made a number of recommendations, but two general categories were reflected; these being "re-labelling and restructuring" and "strategic planning".

#### **Re-labelling and Restructuring:**

The following recommendations included:

- **Rename** the project from "Promoting food security and income generation through sustainable production and commercialization of starchy and grain staples in Eastern and Southern Africa" into "Project D – Food security and markets in Eastern and Southern Africa"

- **Re-group** activities either by commodity chains (banana, root and tuber crops, cereal legume systems) or by disciplines (IPM, breeding, soils, economics, networks, capacity building). Such a restructuring should facilitate planning and strategy building and streamline the project with IITA's overall structure.

#### **Strategic planning:**

- The area was an attempt to create an environment for research strategizing and planning according to scientific breakthroughs ("R4DEE – Research for Development Enabling Environment).
- Although this field was not specified in detail, the suggestion was to create "think-tanks", either on the project or the IITA institute-wide level, and to engage in more strategic planning while exploring the comparative advantages of Project D's multi-disciplinarity.

#### **Developments within IITA affecting Project D**

Since the CCER, the Program D was subject to several organizational changes within IITA, which basically affected the way the CCER recommendations were addressed. Consequently, the implementation of the CCER recommendation has to be seen with this "historical lens".

- In early 2006, the then existing program structure was realigned from six to three programs, the new programs being established around "geo-domains" including the Mid-altitude zone and the Savannah zone, which basically led to a more coherent organization in terms of agricultural management similarity as well as having smaller more manageable geographical domains. Prior to this change it covered much more than half of the geographic area IITA is operating in.
- In the 2007-2009 MTP, established in 2006, among others, three "commodity based" MTP-projects were established that reflected the commodity chain approaches suggested in the CCER. These projects were Banana and Plantain Systems, Roots and Tuber Systems and Cereals and Legumes Systems. This again facilitated strategic planning, coherence along systems approaches, and, as these MTP projects were cross cutting across the agro-ecological zones, allowed a better coherence of systems approaches across IITA's mandate area.

#### **Measures Taken 2004-2005**

In this phase, which basically covered a timeframe of 14 months from the CCER, the following actions were taken:

- **Re-structuring and scope of project D**

The MTP 2006-2008 developed in 2005 was, in terms of Program D, streamlined to two projects: Eastern African Banana Based Cropping Systems (D1) and Eastern African Roots and Tuber Systems (D2). This basically reflected the CCER-requested re-orientation towards commodity chains.

- **Strategy building**

A strategy development meeting was held in October 2005 where the two major research areas were discussed (Banana based cropping systems and Roots and Tubers). Major breakthrough research thrusts were defined for both areas, and aligned with the SC priorities. Key disciplines and investments were assigned to each research thrust.

- **Staffing and scope of Project D**

To address the issue of scope of work vs. staffing, started in 2005 (and ongoing in 2006, see below), core positions were relocated to concentrate and provide critical masses at one site, and new core positions were created. Specifically measures taken included:

- The total staff number in the Program D area was increased from 18 at the time of the CCER to 31 scientists in November 2006 with the number of core positions in the region was increased to 14, now representing 45 % of the positions;
- In Uganda, staffing actions concentrated on "banana related" scientists;

- In Tanzania, staffing focused on cassava (breeder, virologists etc.). Here, four new positions were created (nematologist, bio-technologist, pathologist, economist)
- In Southern Africa (Malawi and Mozambique) staffing actions focused on cassava and cereal/legume specialists.
- **Position along the R4D continuum and research approaches**  
The issue of farming systems and benchmark approaches is integrated in new projects such as the DGDC funded project on banana and plantain systems in the Great Lakes Region, as well as in the USAID-funded joint IITA-CRS Crop Crisis Control (C3P) project, where biotic stresses are related to households wealth and food security in six Eastern African countries.

#### **On-going implementation of CCER recommendations – current status**

- **Staffing**  
The creation and deployment of core positions as stated above continues in 2006. New positions filled are a legumes agronomist for Mozambique and a soybean breeder for Malawi.
- **Re-structuring and scope of project D**  
In Southern Africa, a focus is now laid on cereal and legume systems, with core positions being deployed and projects on cereal-legume systems being developed.
- **Strategy building**  
Following the process of strategy building on an IITA-wide scope, strategy meetings are being continued and held, since Strategic Planning Week 2005, for the major commodities. Strategy meetings in 2006 were and are:
  - The biotechnology strategy meeting in Nairobi
  - The *Musa* strategy meeting in Jinja, Uganda
  - The strategy meeting on roots and tubers in Ibadan, Nigeria

#### **Overall conclusions**

- IITA has accepted all the recommendations.
- At the time the CCER was carried out Project D was the largest single project at IITA in terms of geographic and disciplinary coverage, as well as in terms of subjects and crops. This meant that a restructuring was required but also that any restructuring of Program D could not have been efficiently done without re-aligning IITA's entire program structure. Both have taken place and are still ongoing.
- What was Program D up to 2005 is now a number of better defined agro-ecological zones (the area now belongs to two agro-ecological zones), as well as coherent commodity based MTP projects that allow focusing and synergies across SSA.
- A "strategy culture" is in place which has led to a further improvement of the focusing process as well as the definition of the breakthrough areas that were requested by the CCER.

#### **Additional Background information**

##### ***Scope and Goal of the CCER***

- The aims of Project D were to enhance food security as well as to improve livelihoods and socio-economic development in ESA, by developing and promoting the adoption of improved technologies and market support services.
- In October 2004, a CCER for Program D was carried out with a basic assumption of the CCER was that Project D had "no single clear strategy to accomplish its aims (...)." Therefore the goals CCER were aimed to assist in at developing a new strategy for Project D.
- The CCER's objectives were:
  - To characterize the current structure and coherence of Project D;
  - Improve the ability to formulate and execute IITA's strategy for Eastern and Southern Africa;

- Organize activities coherently to make decisions that optimize the comparative advantage in achieving IITA's R4D mission;
- "It was not a "standard CCER" because it focused solely on strategy development; it did not include scientific evaluation of Project D."
- **Problems of Project D as outlined by the CCER**  
The CCER document refers to several weaknesses and issues, without always being explicit. However, the major areas for action included:
- **Scope of Project D**
  - Although Project D was considered "unique" amongst the three IITA eco-regional projects (D, E, F), this uniqueness was considered at the same time a potential weakness, due to its "immense geographical, agro-ecological, commodity and disciplinary coverage." It was stated that during the years 2001 to 2004, it had expanded tremendously in its scope and therefore needed a strategic realignment.
  - The – over-expanded – scope as the project had seven disciplinary outputs that were cutting across 6 crops.
  - Geographically, the project was concentrated on Uganda, Kenya and Tanzania, with smaller country sites in Malawi, Mozambique and Zimbabwe. Additionally, it operated in 6 more countries in the ESA-region (Rwanda, Burundi, Zambia, DRC, ROC and Sudan).
- **Staffing**
  - At the time of the review there were only 18 scientists of which only four were on core funding, with the other 14 (78 %) on special project funding. Apart from the fact that scientists seemed to be thinly spread, the CCER expressed concern about the scientists also being involved in too much administrative work.
- **Position along the Research-Development continuum and research approaches**
  - It was stated in the report that there was a concentration on research in the East, whereas much of the development work was mainly in more southern countries.
  - It was also made clear that Project D participants were heavily involved in "networks". Some of the research fields were well established (IPM), whereas other research fields were relatively new (e.g. cassava agronomy).
  - The CCER stated further that little work done on "farming systems" in benchmark areas.

\*\*\*

---

## **5. Management and Board response to the Report of a Center-commissioned External review (CCER) of IITA's Project E: "Enhancing Livelihoods in the Humid and Sub-Humid Zones of West and Central Africa through Profitable and Sustainable Intensification of Diverse Agricultural Systems" May 2004**

*Reviewers: Dr. Pierre Fabre, Head of Program, CIRAD Animal Crops Department Food Crops Program, TA 73/09 Avenue Agropolis, 34298 Montpellier, Cedex 5, France  
and Dr. Yves Savidan, Cooperation Internationale et Partenariat, AGROPOLIS, Avenue Agropolis, 34394 Montpellier Cedex 4, France*

The IITA Board of Trustees and Management greatly appreciate the work of Drs. Pierre Fabre and Yves Savidan in reviewing IITA's Project E ("Enhancing Livelihoods in the Humid and Sub-Humid Zones of West and Central Africa through Profitable and Sustainable Intensification of Diverse Agricultural Systems"). The extensive review of research documentation and related information, their interaction with staff, national and international and with the Board members was very welcomed.

## **Background**

Project E was a complex project in terms of its geographical coverage, diverse ecoregional and economic situations, and multidisciplinary scientific activities. Its dominant features and target systems were a mosaic of forest fragments and agricultural land use dominated by traditional mixed cropping patterns stratified spatially (niche-specific patterns) and hierarchically (gradients in labor and input use intensity). Its mission was to maintain and optimize the ecological and socio-economic functions, adopt an integrated producer to user approach across commodity chains and improve opportunities for smallholder farmers to enhance and sustain their livelihoods. Responding to concerns at the 2003 Board of Trustees meeting, and successive project meetings during 2003, project outputs had been restructured from a commodity to an intervention based approach across commodity chains.

The review report had been qualified by the comments from the reviewer that the scope of the review of a complex project such as this could not be attained by one person and in the time frame allocated for the review. Hence the report presented could not be considered an appraisal report that assessed the quality of the research or its possible impact but a review of the dynamics of the project and its place in IITA's research agenda. Some comments of note had been:

- (1) the lack of provision for interactions with national and/or local partners in a project largely based on field intervention;
- (2) the lack of interaction with disciplinary project coordinators for insights on scientific strategies
- (3) the general framework of the project was relevant to IITA's mission and consistent with the institute's strategic plan ;
- (4) There was a 'hazardous' dependence on development funds;
- (5) the institute's involvement in development should be handled in the context of a "sustained partnership with NARS; it should not get absorbed by implementation and dissemination."
- (6) a top down project largely led by management and a need to strengthen and rebuild the collective ownership by members

## **Summary of Recommendations and Management and Board Responses:**

### **Recommendation 1**

#### **CCER methodology**

- *The reviewer suggests meeting with the three disciplinary project coordinators to be a step of future reviews.*
- *In order to tackle RDC's 17 monitoring questions it would be necessary to complete the review with an appropriate scientific evaluation (maybe more disciplinary focused).*
- *The review suggests that meeting the key national and local partners be a step of future reviews.*

#### **Board and Management Response:**

- IITA accepts these recommendations. The reviewer's suggestions have been taken into account in planning for the CCER for SP-IPM.

\*\*\*

### **Recommendation 2**

#### **Relevance of Project E**

- *The reviewer feels that strengthening national and regional research capacities should be re-emphasized in the actual governance of the project.*

### **Board and Management Response:**

- IITA accepts this recommendation. This is an on-going process. The increase in end-user participation in our research brings in the additional elements of ‘bottom-up’ and ‘collective empowerment’ approaches suggested by the reviewer.
- The following are examples from work in 2004:
  - Efforts to strengthen the organizational capacity and marketing power of cocoa farmer cooperatives resulted in the elaboration of operational development plans for Tonikoko Farmers Union in Ondo State in Nigeria, Kuapa Kokoo Union in Ghana, and the emergence of a union of cooperatives in Côte d’Ivoire.
  - Farmers’ Field Schools (FFS) continued to prove a valuable tool for experiential transfer of technologies to improve the performance of cocoa farmers, reaching nearly 4,000 farmers in Ghana, Nigeria, Guinea, and Côte d’Ivoire.

\*\*\*

### **Recommendation 3**

#### **Collective project elaboration**

- *Streamlining and priority setting may be the key words for the internal challenge of (re)building project identity and rationale. Such an endeavor should be based on a large discussion between members.*
- *The review encourages the Project Coordinator’s and RDC’s present efforts to build this project in the long term and to accelerate this collective “refoundation”.*

### **Board and Management Response:**

- *Streamlining and priority setting:*
  - IITA accepts this recommendation. The process of streamlining and priority setting continued until the changes in Research Management Arrangement (RMA) and the development of the new MTP projects. This included the shifting of selected activities and outputs to other projects as noted by the reviewer.
  - The new research management structure of IITA and the implicit approach of planning through the formulation of strategic objectives by scientists active in the respective research areas reflect the implementation of the recommendation.
- *Collective “refoundation”:*
  - IITA accepts the recommendation. It has been implemented through the 2007/2009 MTP.

\*\*\*

### **Recommendation 4**

#### **Priority setting and reporting**

- *There is a need for syntheses on priorities and achievements from a strategy viewpoint. (Individual) reports on activities should be tailored on the same format giving a few lines summary and setting the details of the most relevant activities aside in an appendix. The general documents on Project E should give the synthesis of achievements in strategic terms, i.e. reflecting main scientific orientations, and not only a long list of milestones that is difficult to apprehend.*

### **Board and Management Response:**

- IITA accepts this recommendation. This was part of the process of streamlining and the suggested improvement in reporting of project achievements was noted.

- The new guidelines for the MTP have simplified reporting to the output target level. The activities and milestones are now reported in scientist work-plans.

\*\*\*

## **Recommendation 5**

### **Integrative research**

- *The review suggests that the articulation of disciplines within Project E should be formalized as a critical “supply and needs” exercise in order to spot the drawbacks the team in charge of Project E will experience.*
- *The review fully encourages these on-going efforts to build an integrated organization of Project E, with due articulations with clearly specified and mutually agreed disciplinary targets. Active help of RDC is required in this process.*
- *A decisive area of work for the construction of Project E is to determine the new questions raised by an integrative approach.*

### **Board and Management Response:**

- IITA accepts this recommendation. This has been handled at the RDC level through the definition of core competence and the inclusion of a review of the relevance or suitability of posting to specific duty station during contract reviews of all scientists.
- IITA accepts this recommendation. The development of the 2007/2009 MTP has resulted in better integrated projects. The output targets have been identified with a mix of disciplinary and interdisciplinary targets. The disciplinary activities have been fully integrated into the projects.
- IITA accepts the recommendation and the challenge of designing integrative research projects. This is being addressed in the 2007-2009 MTP and in the development of the 2008/2010 MTP.

\*\*\*

## **Recommendation 6**

### **Methodology**

- *Commodity approach must be completed by farming system approach*
- *“System agronomy”, microbiology (applied to soil), plant pathology and ecophysiology should be reinforced (they are either inexistent or insufficiently present) among the Project E scientists.*
- *The review suggests that effectiveness of Project E scientists working at farm level could be enhanced by developing*
  - *guiding principles for on-farm research,*
  - *guiding principles for innovation dissemination, and*
  - *training activities on these issues.*
- *Research on impact should be part of every scientist’s duty at some points during its individual “research cycle”. This would allow her/him to better understand farm management, constraints and opportunities. Conversely, decisive impact assessment should be monitored by external specialists to avoid biases of all kinds.*
- *Shouldn’t productivity per person, per workday or per CFA F spent in operations and investment be the standard units for assessing impact?*

### **Board and Management Response:**

*Commodity approach must be completed by farming system approach*

- IITA accepts this recommendation. Commodity chain approach has been utilized in the design of four of the MTP projects with an increasing attention to farming systems analysis.

*“System agronomy”...*

- IITA accepts this recommendation. There has been active involvement of a soil microbiologist based at Ibadan and supervising relevant work in Cameroon in addition to work in West Africa.
- Plant pathology research has been significantly increased through the work of new pathologists (senior scientist and postdoctoral fellow) based at Ibadan but also working actively in Cameroon.
- Ecophysiological studies have included the work of a scientist based in Ibadan and also through collaboration with the University of Reading on yams.
- Finally, the disciplinary contributions to the systems projects have been increased in the 2007/2009 MTP.

*The review suggests that effectiveness of Project E scientists working at farm level could be enhanced by developing guiding principles for on-farm research,- guiding principles for innovation dissemination, and training activities on these issues.*

- IITA accepts this recommendation. In addition to the old text by Mutsaers et al. (1997), research guides such as Gauhl et al (1998) and Schulz (2000) contributed to the basis for the on-farm research approaches being used.
- Subsequent training events, additional documentation of methodologies (e.g. Douthwaite, B. 2002; Ellis-Jones et al. 2005) and success stories (Tenkouano et al. 2006) have been the means to upgrade the capacities of scientists in on-farm research and dissemination of innovations.

Literature cited:

Douthwaite, B. 2002. Enabling Innovation: A practical guide to understanding and fostering technological change. Zed Books London & New York in association with CAMBIA, Canberra

Ellis-Jones, J., S. Schulz, D. Chikoye, N. de Haan, P. Kormawa, and D. Adedzwa. 2005. Participatory research and extension approaches. IITA Research Guide 71

Gauhl, F., S. Ferris, C. Pasberg-Gauhl, A. Lawrence. On-farm yield loss assessment of black sigatoka on plantain and banana. IITA Research Guide 67, 1998.

Mutsaers, H.J.W., G.K. Weber, P. Walker and N.M. Fischer. 1997. A Field Guide for On-Farm Experimentation. IITA-CTA-ISNAR. 235pp

Schulz, S.. Farmer participation in research and development: the problem census and solving technique. IITA Research Guide 57, 2000.

Tenkouano, A., S. Hauser, D. Coyne and O. Coulibaly. 2006. Clean Planting Materials and Management Practices for Sustained Production of Banana and Plantain in Africa. *Chronica Horticulturae* 46 (2):14-18

*Research on impact should be part of every scientist's duty at some points during its individual "research cycle"...*

- IITA accepts this recommendation. In an effort to enhance the involvement of biophysical scientists in impact assessment, social scientists have developed a framework for conceptualizing impact assessment and promoting impact culture at IITA.
- First, the linkages between agricultural research and rural livelihoods and the implications for evaluating the impact of agricultural technologies are illustrated, using the sustainable rural livelihood framework.
- Second, a strategy for institutionalizing an appropriate data system is proposed to make impact assessment an integral part of the agricultural research process.
- To operationalize the data system, data sheets for each stage of the impact assessment process are developed to guide researchers in gathering relevant and adequate information relating to each agricultural technology.

*Shouldn't productivity per person, per workday or per CFA F spent in operations and investment be the standard units for assessing impact?*

- IITA accepts the recommendation but impact assessment research at IITA uses quite a range of indicators - both partial productivity measures as well as returns to research investments - to demonstrate the benefits of research investments. These include yield increases (or yield losses avoided) per unit of land or per person day, rate of return, net present value, and benefit-cost ratio.
- A number of examples of evidence of impact of IITA's research, using several of these indicators, have been compiled in an IMPACT document 'Achievements in impact assessment of agricultural research: IITA experience, 2001-2006' and this is now in the process of publication. In many cases farmers value other 'things' such as spare time, health, etc as important effects of interventions. These are not easy to measure and difficult to value in monetary terms.

\*\*\*

**Recommendation 7**

## **Development focus**

- *Emphasizing on development compels to fine tune the management of human resources (as for scientists' careers) and the overall long-term scientific investment.*
- *Reviewer warns that the strong involvement of IITA in development be handled in the context of a sustained partnership with NARS, and that it does not get absorbed by implementation and dissemination.*

### **Board and Management Response:**

- *Emphasizing on development compels to...*
- *IITA accepts these recommendations. At IITA, the emphasis is actually on 'research-for-development' and part of the answer to this recommendation is the suggestion made in the next recommendation. While individuals hired for scientific research need to appreciate the ultimate development goals of their work such scientists are not required to become development workers.*

*Reviewer warns that the strong involvement of IITA in development be handled in the context of a sustained partnership with NARS.....*

- *IITA has remained very conscious of the needs for "a sustained partnership with NARS". And thus fully endorses the recommendation.*
- *Strategic partnerships with key NARS are a major aspect of research for development planning and of developing impact pathways. Facilitating partnerships between NARS and NGO's and the private sector is also important for implementation and dissemination.*

\*\*\*

## **Recommendation 8**

### **Managing interdisciplinary activities and partnership**

- *The review believes that questions on inter-disciplinary practices and partnership involvement reflect the major challenges facing Project E management. DDG-Rs and RDC should play a major role in that respect.*

### **Board and Management Response:**

#### **Managing interdisciplinary activities and partnership**

- *IITA accepts this recommendation. The questions on inter-disciplinary practices have also been thoroughly discussed at various levels in IITA, especially by the RDC, leading to a modified RMA and MTP projects that addresses some of the weaknesses of the identified in the CCER.*
- *Partnerships with relevant agencies have continued to expand while respecting our engagement protocol and always remaining conscious of the sentiment expressed in the previous recommendation.*

---

## **6. Management and Board response to the Report of a Center-Commissioned External review (CCER) of IITA's Project C: "Assessing Impact, Formulating Policy Options and Systems Analysis" January 2004**

*Reviewed by: Prof. Eric Tollens Catholic University Lueven Department of Agric. & Environmental Economics  
Faculty of Agricultural and Applied Biological Sciences de Croyleaan 42 B-3001 Leuven (Heverlee) Belgium*

**The IITA Board of Trustees and Management greatly appreciate the work of Professor Tollens in reviewing IITA's Project C ("Assessing Impact, Formulating Policy Options and Systems Analysis". The extensive review of research documentation and related information, their interaction with staff, national and international and with the Board members was very welcomed.**

### **History of Project**

*This review and monitoring exercise comes at a time when social science capacity at IITA is being expanded, largely driven by donor-financed projects. In fact, IITA has been very successful in attracting donor financing for competitive projects tendered by donors for sub-Saharan Africa.*

*Project C has 26 project members, of which only 4 are on unrestricted core budget. Total scientist input in Project C is 12 SSY (senior scientist years). The draft 2004 core budget of Project C is 2.4% of UC of IITA (\$70,000) while 13% of IITA senior scientist years are in the project. Thus, Project C has been very successful in attracting RC/SP financing. It is probably the most successful project at IITA in attracting donor financing. But this carries the risk that its research agenda is largely donor driven. This is not bad per se as long as IITA's core mandate in social science is fulfilled. This will be analyzed hereafter.*

### **Summary of Recommendations and Management and Board Responses:**

#### **Recommendation 1**

##### **Benchmark area research**

- *Social science interaction in the benchmarks is important enough to warrant a minimum of one social scientist as part of the resident team in each benchmark area. Needless to say, as much as possible needs to be done in partnership with NARS and NARS researchers, thus also contributing to capacity building.*

##### **Board and Management Response:**

- IITA accepts this recommendation. Although the term "benchmark" is still subject to discussion, as one could speak of "benchmark" sites, agro-ecological zones or other reference areas, which may differ in terms of scale and homogeneity; however, the distribution of social scientists has been improved since 2004.
- The improvement of distribution of social scientists across the IITA-sites in Sub-Saharan Africa is ongoing. During the CCER, social sciences who were mainly concentrated in West Africa, and there mainly in Benin and Nigeria (specifically Ibadan), a process was initiated to better allocate IITA's social scientists across Sub-Saharan Africa. By the end of 2006, social scientists will be based with IITA teams in Nigeria, Benin, Cameroon, Ghana, Uganda, Tanzania, and Malawi. The impact economist based in Ibadan has been transferred to Malawi, while a new impact economist for West-Africa has been employed since 2005. This means that now in each sub-region, there is at least one economist.

- This placement of staff has also increased our opportunities to work in partnership with NARS, Universities and others in all the sub-regions and to contribute to capacity building more effectively.
- The next step will be to increase the number of scientists from other social science disciplines, such as sociology and anthropology at IITA.

\*\*\*

## **Recommendation 2**

### **Market development**

- *IITA's involvement and recent expansion in market development for its mandate crops are appropriate, but need to be linked at all times to process research conducted in the benchmarks.*
- *IITA should limit its work on (macro) market development to pilot schemes, not state or nationwide, but pilots large enough and diverse enough to provide adequate feedback to the biophysical scientists, and the other projects at IITA.*
- *It may be appropriate for IITA to develop also some (new) benchmarks particularly suited to market development, especially when they involve industrial type processing of commodities.*

### **Board and Management Response:**

- IITA accepts this recommendation although we also accept the need to consider the IPG nature of any outputs from these activities. We have expanded our research in commodity chains to include post harvest processing, product development and market analysis but have not considered market development for specific products as part of our MTP projects. We think that there are many appropriate partners for this research, especially in the private sector, and will take this partnership approach to any expansion in the area of market development. We also conduct this research as a focus of pilot schemes which are fully integrated with the biophysical scientists. We have a number of these integrated projects on-going within the MTP projects.
- We have also been involved, in partnership, with two new projects which will eventually focus on biofuels/ethanol production from cassava.

\*\*\*

## **Recommendation 3**

### **Agricultural policies**

- *IITA needs to permanently monitor macro agricultural policies and even help in the development of better agricultural policies when opportunities arise. But at the same time, IITA does not have a real comparative advantage to do policy analysis research on its core budget, on a continuing basis and with sufficient critical mass. Thus, IITA needs to link up and work together more frequently and more regularly on agricultural policies, particularly with IFPRI, but also with NARS and other partners.*

### **Board and Management Response:**

- IITA accepts this recommendation. IITA has partnered with IFPRI for a research in agricultural policy in Nigeria. Specifically, IFPRI scientists provided training on the IFPRI DREAM model to IITA scientists and their NARS collaborators which led to the publication of the book on Agriculture in Nigeria in 2005.
- Since 2005, IFPRI has been providing the leadership in the SAKSS project in sub-Saharan Africa for which IITA is responsible for implementation in West Africa. We have a number of other on-going collaborations with IFPRI and other partners (NARS and Universities) in the area of agricultural policies.

\*\*\*

## **Recommendation 4**

### **Project C - Title**

- *The present title of Project C: “assessing impact, formulating policy options, and systems analysis”, only poorly reflects IITA’s social science role in technology generation, validation, and scaling-out.*
- *It is recommended that a more appropriate title be adopted, which better reflects IITA’s social sciences activities as an international agricultural research organization.*

#### **Board and Management Response:**

- IITA accepts this recommendation. After a consultation process in 2004, the title of project C was changed to “Supporting Innovation Processes”, acronym: SINPRO. SINPRO also had its own logo.

\*\*\*

### **Recommendation 5**

#### **Logframes, outputs, activities, staffing, and budgets**

- *A major simplification is in order of outputs, logframes, and activities, a scaling down reflecting a sharper focus, with the cleaning out of activities that have been completed, the merging of similar activities, a constantly updated computer record of outputs and activities, percentages of time (senior and junior researchers) to be spent and budgets*

#### **Board and Management Response:**

- IITA accepts this recommendation. New guidelines established by the Science Council affected the development of the 2006/ 2008 MTP and the 2007/2009 MTP. By the beginning of 2005, Program C had been reduced from seven to five outputs. The simplification that has occurred and the integration of Project C activities within the new MTP projects have resulted in greater focus. The need to monitor output targets has resulted in many of the changes in accountability.

\*\*\*

### **Recommendation 6**

#### **GIS**

- *The excellent GIS activity at IITA has presently a biophysical orientation. More effort should be made to integrate vital socioeconomic information, such as population density, poverty mapping, social indicators, market flows, etc.*

#### **Board and Management Response:**

- IITA accepts this recommendation. The integration of socio-economics into the GIS work is important aspect of IITA focus. Since 2004 and increasingly in 2005, the GIS unit has been involved in mapping social and economic data. For example GIS has been used in a food security study in Nigeria in 2004, in the establishment of the West African SAKSS node which is housed at IITA-Ibadan, and in conducting GIS research in the SSA CP-benchmark sites of west, central, and southern Africa.
- With the continuation of the West African SAKKS and the launch of the East African Crop Crises Control Project, food insecurity and its prevalence in six countries is being evaluated through socio-economic studies and then “mapped” using GIS. There is also a strong linkage to the bio-sciences, such as the Crop Crises Control Project linking issues of food security and wealth to biotic stresses like cassava mosaic disease and banana bacterial wilt.

\*\*\*

### **Recommendation 7**

#### **FOODNET**

- *The question what constitutes IITA's comparative advantage in FOODNET type research needs to be addressed and more links must be developed with the biophysical scientists involved in technology generation/testing, dissemination.*
- *The important lessons learned so far must be documented in a synthetic paper, perhaps coupled with impact assessment and published in the Impact series at IITA.*

**Board and Management Response:**

- IITA accepts this recommendation. Up to 2004, FOODNET mainly operated through commissioned market studies. In the subsequent phase, starting mid 2004, FOODNET was re-directed to serve as a network to enhance market and post-harvest research in Eastern Africa. This was to meet the strong criticism of the first phase, where there had been an obvious lack of integration into the ASARECA network.
- FOODNET now facilitates research in the above mentioned fields together with NARS and other partners embedded in ASARECA. It also assists networks in impact assessment and provides market intelligence for commodity based networks and projects (e.g. for EARRNET, for the regional CFC cassava project, for the regional DGDC project on bananas in the Great Lakes region).
- FOODNET staff is now fully integrated in IITA's socio-economic work in Eastern Africa. Better documenting the "lessons learned" and the past impact of FOODNET is planned.

\*\*\*

**Recommendation 8  
RUSEP**

- *One needs to question the role of IITA as a research (and development) organization in scaling-up of RUSEP. It needs to happen with partners (and subcontracting) and IITA's role probably needs to be scaled down, not up.*
- *A lot can and should be learned from rapid rural industrialization in the mandate commodities in other countries and continents and IITA needs to tap that experience.*

**Board and Management Response:**

- IITA accepts this recommendation. The RUSEP project finished in 2004 and its work has continued through partnerships.

\*\*\*

**Recommendation 9  
Priority setting**

- *It is suggested that IITA limit itself to Nigeria for the integration of the three adopted approaches in priority setting.*
- *Priority setting is really an exercise in ex-ante impact assessment, and must thus be linked closely to impact assessment.*

**Board and Management Response:**

- IITA accepts this recommendation. A comprehensive priority setting for agricultural research in Nigeria has been undertaken in 2005. This exercise was based on the input of bio-scientists from NARS and CGIAR centers. It applied a comprehensive set of methodologies addressing potential impact on efficiency and equity, as well as food security from agricultural research domains. This study has led to various publications listed below.

Alene, A., Manyong, V.M., Tollens, E.F. and S. Abele (2006): The efficiency–equity tradeoffs in agricultural research priority setting: the potential impacts of agricultural research on economic surplus and poverty reduction in Nigeria. Contributed paper at the 26th Conference of the International Association of Agricultural Economists, Gold Coast, Australia from 12-18 August 2006.

Alene, A., Manyong, V.M., Tollens, E.F. and S. Abele (2006): Targeting agricultural research based on potential impact on poverty reduction: strategic program priorities by agro-ecological zone in Nigeria. *Food Policy*, in press.

\*\*\*

## **Recommendation 10**

### **Impact**

- *An impact "culture" needs to be created such that biological scientists, at every stage of the technology generation process, provide data to the impact assessors. They need to know what the minimum data set is for impact assessment. Such a minimum data set could, e.g. be made available as a template in an Access database.*
- *It is suggested to create an impact assessment working group in order to "cultivate" this culture and to sensitize the scientists. This working group could largely be "virtual", operating on an intranet website at IITA and communicating by email.*
- *The aim should be to produce two Impact publications per year.*
- *The suggestion is that with respect to macro-impact assessment, attention should be paid to the regular monitoring of market prices of the important IITA commodities in a country like Nigeria.*

### **Board and Management Response:**

- IITA accepts this recommendation. An "Impact Culture" has been promoted with the creation of an impact working group that is lead by two scientists. Market prices are routinely monitored for a number of the IITA commodities within Nigeria and in other countries where we are working. This group is working on the establishment of a 'minimum data set approach' to incorporate impact assessment into all our projects. A conceptual framework for impact assessment was established by this group who are publishing in the IITA IMPACT series.
  - There has been a series of IMPACT publications since 2004; 4 were published in 2004, 5 in 2005 and so far 9 have been published in 2006.
- IITA's impact work is also becoming more visible to the scientific community.
  - IITA scientists took part in and presented papers at the inaugural symposium of the African Association of Agricultural Economists (AAAE) in Nairobi, Kenya (6–8 December 2004).
  - At the International Association of Agricultural Economists' triennial conference in Brisbane in 2006, IITA's impact group was represented with a mini-symposium entitled "Assessing the impact of agricultural research on rural livelihoods in developing countries; Approaches, challenges and results". The mini-symposium included research findings from IITA (including a presentation on the integration of socio-economic data in GIS) and other research institutions, both from the North and the South.

\*\*\*

## **Recommendation 11**

### **Publications**

- *It is suggested that IITA make available a small budget (\$2000) for the publication of training modules at IITA from Project C.*

- It is suggested in terms of publications:
  1. to provide incentives for publications in refereed journals;
  2. to start a working papers series such that drafts of publishable papers can be circulated within and outside IITA, and can then be developed easily into publishable papers.
- For the more development oriented research activities at IITA such as FOODNET, RUSEP, WARMNET, etc. books should be prepared, e.g. at the occasion of workshops or seminars, with the major lessons learned from such projects.

#### **Board and Management Response:**

- IITA accepts this recommendation. Since 2004, 18 publications just on impact assessment have been delivered. The increasing pace of publications was partially due to the consolidation strategy of Project Program C that was pursued in 2004/2005, which included joint planning and focusing research, but also due to the shifts in core competencies, which increased and strengthened social scientist positions at IITA.
- Social sciences and in particular economics have received a greater interest in the last two to three years at IITA, due to the recognition that economic and social information is crucial for technology development and dissemination.
- Finally, overall IITA incentives have supported publications throughout IITA, and consequently also in the social sciences program. The working paper series of Program C was started up in 2005, with two working papers published so far.

\*\*\*

#### **Recommendation 12**

##### **Training**

- *There is a big need in the benchmark areas to do capacity building in partner institutions such that they can carry out local specific parts of the R4D continuum, and eventually manage the scaling-out process. Training and capacity building in this context is (still) a top priority.*

#### **Board and Management Response:**

- IITA accepts this recommendation. In Cotonou, IITA has established a social science lab with a special focus on training of national scientists. At Ibadan, there is also a social science laboratory where students in social sciences from neighboring universities spent short to long periods to get acquainted with new methods/approaches in social sciences. The work of social scientists at IITA is undertaken in collaboration with colleagues from partner institutions, thus providing the in-the-field training to NARS social scientists.

#### **General Comments - Overall conclusions**

- The central hope of the CCER was “It is hoped that this CCER will help to convey the message that some more soul searching within Project C is needed, in order to arrive at a consensus on the central role of social sciences at IITA, thus improving overall coherence and effectiveness.” has been met.
- Despite or maybe even as a result of the realignments in 2005 and 2006, social sciences at IITA are better integrated in the bio-physical work, better distributed among the other scientific fields and across geo-domains, while they are maintaining a strong coherence and effectiveness through their integration in the new MTP projects and at the same time being part of the MTP projects that cross cut in the fields of priority setting, impact assessment and social sciences (*Agriculture and Health, Opportunities and Threats, High Value Crops*).

\*\*\*

---

## **7. Management and Board response to the Report of a Center-Commissioned External review (CCER) of IITA's Project F: Improving and Intensifying Cereal-Legume Systems in the Moist and Dry Savannas , October 2003.**

*Reviewer: Dr. Jillian Lenne*

The IITA Board of Trustees and Management greatly appreciate the work of Dr. Jillian Lenne in reviewing IITA's Project F (Improving and Intensifying Cereal-Legume Systems in the Moist and Dry Savannas). The very extensive review of research documentation and related information, their interaction with staff, national and international and with the Board members was very welcomed.

The IITA Management, fully endorsed by the Board of Trustees response to the review of Project A is below:

### ***History of Project***

*Project F is one of six projects in the IITA research portfolio of three disciplinary and three agro-ecological zone projects (see above). It was created in January 2002 from the partial or total merger of 6 earlier projects:*

- Project 3. Improving cowpea–cereal systems in the dry savannas*
- Project 4. Improving maize–grain legume production systems in WCA*
- Project 8. Integrated management of legume pests and diseases*
- Project 9. Integrated management of maize pests and diseases*
- Project 11. Protection and enhancement of vulnerable cropping systems*
- Project 12. Improving of high-intensity food and forage crop systems*

*The main research base for Project F is Kano, Nigeria. It is supported by Zaria and Ibadan, Nigeria; BCCA, Benin; West and Central Africa Collaborative Maize Network (WECAMAN); Programa Nacional de Fortalecimiento da Agricultura Familiar (PRONAF); West African Seed Network (WASNET) and the IITA/GTZ West African Seed Development Unit (WASDU).*

### **Summary of Recommendations and Management and Board Responses:**

#### ***Recommendation 1***

- *It is recommended that Project F should recognize the importance of livestock in savanna systems in West Africa in the project title.*
- *It is suggested that the project title be modified to include livestock: "Improving and intensifying cereal–legume–livestock systems in the moist and dry savannas"*

#### **Board and Management Response:**

- In 2004, IITA accepted the recommendation and revised the title. The new project title is 'Improving and intensifying cereal-legume-livestock systems in the moist and dry savannas'.
- In 2006, IITA re-aligned its research program into 7 MTPs due to the need for greater integration of research activities. Project F has been renamed to 'Cereal and Legume Systems'. Livestock issues will be addressed by collaborating with ILRI and NARS as part of the cereal and legume production system.

\*\*\*

### **Recommendation 2**

- *It is recommended that the logframe should be revised based on the above suggestions if it is to function as a useful monitoring and planning tool.*
- *It is also suggested that Project F members would benefit from training in logframe function and value.*

#### **Board and Management Response:**

- IITA accepts this recommendation. The logframe of the Cereal and Legume Systems project was formulated according to the guidelines of the SC which shows clear linkages between activities, outputs, outcomes, and impact. The logframe is used for evaluating and monitoring of research activities (output targets) with respect to SC priorities.

\*\*\*

### **Recommendation 3**

- *It is recommended that Project F should develop a longer term planning horizon by translating its future priorities based on a well-drafted and realistic logframe and other planning tools (e.g. a strategic vision framework for ten years) into potential projects e.g. 1–2 page Concept Notes. Such Concept Notes could then be readily developed into projects when opportunities arise through core or special project funds.*

#### **Board and Management Response:**

- IITA accepts this recommendation. Cereal and Legumes Project has a planning horizon of 3 years, which is in line with the planning horizon of all IITA MTPs projects. These plans also fit in the IITA strategic plan of 2001 to 2010.
- Planning meetings including regular and annual field visits, project meetings as well as strategic work planning week have identified a number of priority gaps which have been developed into concept notes or proposals.
  - Examples include development of sustainable seed systems for West and Central Africa, Integrated control of *Striga* in West and Central Africa, Impact and adoptions of IAR4D technologies, and Pesticide issues (safe use, food safety, food quality, and impacts & capacity building).
- The Cereal and Legumes Systems project is in the process of developing a 5 to 10 year strategy, which will be ready by March 2007.

\*\*\*

### **Recommendation 4**

- *It is therefore recommended that a mechanism for monitoring Project F's contribution to the Institute goal should be developed by IITA.*

#### **Board and Management Response:**

- IITA accepts this recommendation. Each MTP's output targets, which contribute to the goals of IITA, are monitored by the deputy directors and Deputy Director General -Research for Development, through field visits, midterm reviews, project meeting, strategic planning week and seminars or annual reports.
- IITA has an online system for capturing, storing and reporting or assessing progress made toward achievement of output targets for each year.

\*\*\*

### **Recommendation 5**

- *It is recommended that:*
  1. *Project F undertakes a competency assessment of its core skill needs. Strategies, including a long-term planning horizon for staff replacement, should then be developed to sustain the core competencies over time through appropriate funds—either core and/or special project;*
  2. *IITA should assess the advantages in research efficiency and cost savings in locating a critical mass of scientists at Kano (agronomist, soil scientist, and socioeconomist in addition to current skills) and establishing an office and resourced field laboratory at Zaria. Other agroecological zone (D and E) projects based in Uganda and Cameroon have the advantage of a critical mass of scientists, including specific project socioeconomists, based in the main research location;*
  3. *Project F should establish a system for guiding and mentoring young and new project scientists by more experienced scientists where the need has been established; and*
  4. *IITA should foster a culture of accountability among scientists to meet their participation and reporting responsibilities in each project. This is especially important for part-time project F members, no matter what their time allocation.*

### **Board and Management Response:**

1. IITA accepts this recommendation. Core skills required to tackle key constraints in the savannas have been identified and recommendations made to the Research for Development Council (RDC), who have incorporated the suggestions into an institute wide assessment of core skills.
  - a. Realignment of the IITA research portfolio into 7 MTPs has improved interaction among different disciplines and has directly addressed this recommendation. The Cereals and Legumes program has a strong disciplinary team.
2. IITA accepts this recommendation. Over the past 3 years, Kano station has been functioning as a hub for research in the savanna of northern Nigeria. Scientists based at this station include a cowpea breeder, crop physiologist, weed agronomist, production economist, agronomist, and a production economist. ILRI recently advertised for a position of animal nutrition, which will be based at Kano. The team in Kano is backstopped by other scientists based in other locations especially Ibadan.
  - a. To improve our collaborative activities with the Institute for Agricultural research (our host institute in Kano), a small office/laboratory equipped with a computer and open air drying facilities is now fully functional in Zaria.
3. IITA accepts this recommendation. All IITA scientists (junior or new) are assigned supervisors (more senior scientists) and a deputy director who mentors and guides their research program.
4. IITA accepts this recommendation. IITA has developed an online data acquisition system, where all work plans and output targets for each scientist are archived and monitored by the respective Deputy Director. This system will improve accountability. Integration of MTPs has also improved the accountability with respect to reporting.

\*\*\*

### **Recommendation 6**

- *It is recommended that Project F, in close collaboration with Project C, realistically should assess what it can achieve in the current MTP planning period in Output 1 with available resources and then re-drafts the activities and milestones accordingly.*

- *It is further suggested that joint activities with Project C should be highlighted and reported on in both Project C and F annual reports.*

**Board and Management Response:**

- IITA accepts this recommendation. In February 2005, all activities under output 1 were reviewed and prioritized by project F and selected project C members. Project C addresses only cross-cutting and more strategic socio-economic issues and develops methodologies or frameworks that are tested or validated in Project F. Project F provides feedback to project C to refine methodologies. This approach has been retained in the new MTP projects.

\*\*\*

**Recommendation 7**

- *As IITA has been working on soil nutrient and weed management for many years, it is recommended that, where lacking, e.g. in the dry savannas, available information should be archived and analyzed to summarize results already achieved in Output 2.*

**Board and Management Response:**

- IITA accepts this recommendation. Most of the work on weed and soil management has been published in peer reviewed journals. This information is used to develop new strategies for integrated crop, soil and weed management farming systems in the savannas.

Soil management

- Work has been completed (over 20 articles) to unravel soil processes that play a key role in the technologies being developed to arrest soil degradation and improve crop productivity in the West African savanna. The focus has been on understanding the processes governing nitrogen and phosphorus availability to improve their use efficiency. Consequently, the status of soil P has been assessed, using both conventional and isotopic techniques. The soil P fractions have been quantified, and the P adsorption and desorption characteristics (including factors controlling them) have been described.
- In addition, the influence of organic residues and management practices on the labile P pools and, subsequently, on P availability has been studied. All these results are helpful in designing strategies for the improvement of P availability to crops and developing management practices that increase the use efficiency of N and P. These include the use of P efficient legume genotypes with high N<sub>2</sub> fixing ability, crop and fertilizer management practices that reduce N leaching, and a combination of organic and inorganic sources of nutrients.
- Methods have also been developed to investigate water–nutrient interactions hypothesized to be the key process behind the positive interactions between organic matter and nitrogen fertilizer when applied in combination to maize.

Weed management

- Publications (over 20 articles) on weed research include assessing the response of weed seed banks to different control options, assessing the impact of cover crops on weed density and composition, integrating the use of herbicides in smallholder cropping systems, evaluating competition between improved crop varieties and weeds under different input levels, testing weed models and developing and promoting the uptake of improved weed management practices by farmers.

\*\*\*

**Recommendation 8**

- *It is also recommended that additional and innovative opportunities should be considered in Output 2 for increasing organic matter in cereal–legume systems in the savannas such as living fences.*
- *As the 5th EPMPR highlighted the value of quantifying the contribution of IITA soil nutrient and organic matter management practices to halting degradation processes, it is suggested that existing long-term experiments and/or additional trials be used/established to respond to this recommendation in order to fully assess the impact of IITA’s technologies in the savanna system.*

**Board and Management Response:**

- IITA accepts this recommendation. As an increased level of soil organic matter is a prerequisite for increased crop production in the savanna; cropping systems that generate high quantities of organic matter have been developed and tested on-farm. The work includes the integration of crop varieties that produce high above-ground biomass that can be added to the soil after harvest, the use of off-site plant residues, and the production and preservation of good quality manure during the dry season. Improved cereal–legume cropping systems such as maize–soybean rotation have been developed that optimize the benefits from the legumes in terms of N input, reducing weed (*striga*) infestation, supplying high quality food, and generating income.
- IITA is promoting the use of animal manure and maintaining crop residues on the soil surface as means of improving soil organic matter in the soil. Research is under way to improve the availability of animal manure by feeding crop residues to livestock, collecting and storing the manure, which is applied to the field at the beginning of the rain season.
  - For example, maize, groundnut and cowpea intercrop can produce approximately 8 ton of crop residues, which can produce 3.5 ton of manure annually.
- IITA has long-term trials evaluating the contribution of organic matter by grain legumes (soybean and cowpeas), green matures (*Aeschynomene histrix* and *Pueraria*) and forage legumes (*Stylosanthes*) in the savannas.

\*\*\*

**Recommendation 9**

- *It is therefore recommended that careful thought should be given to combining the three breeding Outputs 3–5 into one Output to enhance cross-links and integration on generic breeding objectives and provide greater systems focus.*

**Board and Management Response:**

- IITA accepts this recommendation. The three breeding outputs have been combined into one output which captures the objectives of cowpea, maize and soybean breeding. This will give the Cereal and Legume Systems MTP project strengthened linkages between breeding, natural resource management and crop protection, and post harvest activities.

\*\*\*

**Recommendation 10**

- *In order to highlight the impact of IITA’s breeding programs, it is recommended that Project F should put further effort into quantifying the progress made in improvement of maize, cowpea, and soybean over the past 20 or more years, taking into account that targets and priorities have changed over this period.*

**Board and Management Response:**

- IITA accepts this recommendation. Studies on genetic gain of maize and soybean have been published (Journal of Agricultural Sciences 142 (5): 567-575-maize and project F annual report 2004-soybean).

\*\*\*

#### **Recommendation 11**

- *It is also recommended, as highlighted by the 5th EPMP, that the comparative advantage of IITA (vis-à-vis other key research institutes e.g. CIMMYT) in continuing to put substantial effort into breeding maize, cowpea and soybean should be clarified and quantified.*
- *Although impressive advances in developing dual-purpose cowpea varieties have been made, less effort has been given to-date to dual-purpose maize and soybean. No doubt, the advances in developing quality protein maize and enhanced  $\beta$ -carotene maize will contribute to both human and monogastric nutrition but a higher priority to improving stover/residue quantity and quality (especially digestibility) in both maize and soybean is justified by the increasing importance of ruminant feed in savanna systems in West Africa.*

#### **Board and Management Response:**

- **IITA accepts this recommendation. IITA's breeding work on maize in west and central Africa (WCA) focuses on the humid lowlands, while CIMMYT's work in eastern and southern Africa (ESA) concentrates on the mid-altitudes and highlands. The disease and insect pest complex in the lowlands of WCA are different from those in the mid-altitude and highland areas of ESA.**
  - **For example, major foliar diseases in the lowlands of WCA are southern corn leaf blight, lowland rust and Curvularia leaf spot, while in the mid-altitudes and highlands of ESA it is northern leaf blight, highland rust and gray leafspot.**
  - **The two species of stem borer that are important to maize in WCA are *Sesamia calamistis* and *Eldana saccharina*, while those that are important to ESA are *Chilo parthelous* and *Busseola fusca*.**
  - **There are also biophysical differences between the lowlands and the highlands that affect the adaptation of maize. Thus, the breeding program of IITA and CIMMYT are complementary because they address different constraints and agroecological zones.**
- **IITA and CIMMYT have collaborative projects in a number of fronts in Africa. For example:**
  - **The African Maize Stress Project, designed to develop and disseminate germplasm with resistance to Striga and stem borers, tolerance to drought and low soil nitrogen in East, Central and West Africa;**
  - **Mapping Striga resistance genes transferred from wild maize, *Zea diploperennes*, to cultivated maize where IITA developed mapping populations for East and West Africa, extracted progenies from these populations, and evaluated them in Nigeria. Seeds samples of the progenies derived from the East African mapping populations were supplied to the CIMMYT Biotechnology Unit for genotyping. IITA also provided the phenotypic data to CIMMYT for QTL analysis.**
  - **IITA is currently working with CIMMYT on a collaborative Quality Protein Maize Project for Africa where the two centers focus on the development of germplasm adapted to their respective regions and also share and exchange germplasm.**
  - **IITA also works closely with CIMMYT in the HarvestPlus Challenge Program. The two centers have exchanged ideas and developed a joint logframe for maize under the HarvestPlus Challenge Program. They also share their work plans as well as progress reports in the HarvestPlus project.**

\*\*\*

#### **Recommendation 12**

- *It is therefore recommended that higher priority should be given to improving stover/residue production and quality in trait improvement for maize and soybean.*

#### **Board and Management Response:**

- IITA accepts this recommendation. Improving the quality of maize stover is not an objective of the current breeding program because of financial constraints. However, when funds will be available, all genotypes with the 'stay green trait' will be tested for digestibility in collaboration with ILRI/NAPRI.
- One of the objectives in soybean breeding is identification of dual purpose genotypes with give good grain as well as fodder yield. A number of promising genotypes have been identified with a grain yield of 1500 to 2000 kg/ha and fodder yield ranging from 1500 to 3200 kg/ha.

\*\*\*

#### **Recommendation 13**

- *As IITA orientates its research agenda towards development of technologies to capitalize on commercial opportunities that are likely to be crop-specific, it is recommended that priorities should be given to maize, cowpea, and soybean and trait priorities in Project F should be re-assessed periodically with regard to marketing and agri-processing opportunities.*

#### **Board and Management Response:**

- IITA accepts this recommendation. A cowpea study has been undertaken and a report available. In this study, consumer preferences identified were seed size, seed color, taste, cooking ability, ability to grow in intercrop settings, etc. This information was made available to the cowpea breeder so that they can factor these requirements into the breeding program. IITA has also conducted a food demand study in Nigeria for cereals, including maize. The results are still in the draft format.

\*\*\*

#### **Recommendation 14**

- *It is recommended that efforts should be made to strengthen the socioeconomic input to Output 6 especially through enhanced links with Project C, RUSEP, and appropriate networks.*

**Board and Management Response:**

- IITA accepts this recommendation. Social science input into Output 6 has improved.
  - Examples of studies jointly carried out by biophysical and social scientists include assessment of adoption and impact of cowpea and maize varieties, cost benefit studies of cowpea ‘best-bets’ technologies, impact of balanced nutrient management systems in the savannah and developing farm household mathematical models in integrated crop-livestock systems. The Sub-Saharan Challenge Program for the KKM pilot site has provided an additional forum for a close integration of social and biophysical scientists through its new network of partners.
  - This is happening despite the end of the RUSEP project.
- Re-alignment of the IITA research program into the 7 MTPs further increased the multi-disciplinary approach, where biophysical and social scientists work together.

\*\*\*

**Recommendation 15**

- *It is recommended that efforts should be made to further incorporate appropriate IPM components into CASH through stronger links with Project B and PRONAF and, where appropriate, the use of farmer field fora.*
- *Although Output 6 (and Output 7) is potentially more able to win special project funds than other Outputs in Project F, as the activities are nearer-impact, this has a disadvantage for effective integration of disparate special projects supported by different donors into a coherent research program. CASH provides such a framework to link and integrate different projects.*

**Board and Management Response:**

- IITA accepts this recommendation. Activities on testing new crop, soil and livestock management practices are multidisciplinary in nature. A plant pathologist has joined the team to address some IPM issues, while the new production economist is using farm household mathematical programming modeling to understand how land, labor, animal traction and resource endowment affects crop-livestock systems. Participatory research and extension approaches were used to capture farmer’s perception on crop varieties (groundnut, cowpea, maize, and sorghum), labor requirements, and benefits. Farm household modeling will also capture farmer’s decision making processes.

\*\*\*

**Recommendation 16**

- *It is recommended that the CASH approach should be given high priority as well as support by core and special project opportunities in Project F and that the CASH approach be considered by other AEZ projects, if they are not already doing so.*

**Board and Management Response:**

- IITA accepts this recommendation. All systems projects in IITA are using a commodity chain approach where all constraints and opportunities along the production to consumption chain are addressed in a holistic manner. This approach is more comprehensive than the CASH approach which is only focusing on production issues in crop-livestock systems

\*\*\*

**Recommendation 17**

- *It is also recommended that where relevant, improved, farmer-acceptable technologies from non-IITA mandate crops such as improved varieties of, and management practices for sorghum, millet, groundnut, pigeon pea, and cotton be included in the best-bet combinations where they can make a contribution to improving and intensifying cereal–legume–livestock systems in the moist and dry savannas of West and Central Africa.*

**Board and Management Response:**

- IITA accepts this recommendation. In all systems project such as Cereal and Legumes, we focus on improving components of the entire system including non-IITA mandate crops. For example, improved varieties of sorghum and groundnuts are being promoted for widespread adoption by farmers in northern Nigeria (Borno State). In the Strategic Seed Reserve Project hosted by IITA-Kano, improved and adapted sorghum and millet seeds were produced and distributed to many farmers in northern Nigeria.

\*\*\*

**Recommendation 18**

- *It is strongly recommended that IITA and ILRI should give highest priority to fully re-resourcing Output 7 as soon as possible with experienced crop–livestock scientists to minimize disruption and so that it can fully realize the impact potential already established by the foundation activities and progress to date.*

**Board and Management Response:**

- IITA accepts this recommendation but the recruitment of a livestock specialist is the responsibility of ILRI, which IITA can not influence. However, when needed, IITA will source this expertise from national programs such as the National Animal Production and Research Institute and the faculties of animal science in Universities in West Africa (e.g. Ahmadu Bello University).

\*\*\*

**Recommendation 19**

- *It is therefore recommended that IITA should consider increasing its priority to livestock feed resources and crop-based feeding strategies in the institute research strategy and further strengthens collaboration with ILRI and other relevant partners.*

**Board and Management Response:**

- IITA accepts this recommendation. IITA is already collaborating with ILRI on improving availability of feed resources (e.g. dual purpose cowpeas). However ILRI does not have the expertise in West Africa required to expand activities on the use of feed resources and crop-based feeding strategies at the moment (see recommendation 18).
- The recent decision by ILRI to position an animal nutritionist in West Africa will improve our activities on crop-livestock interaction.

\*\*\*

**Recommendation 20**

- *It is recommended that the “best-bet” approach in Output 7 should be given high priority as well as support by core and special project opportunities in Project F.*

- *The need for livelihood baseline studies in priority systems; ex-ante impact assessment of various “best-bet” combinations; cost-benefit analyses; markets analyses and policy issues justifies the need for significant socioeconomic input to this Output from ILRI and the scarce resources available in IITA.*

**Board and Management Response:**

- IITA accepts this recommendation. The best-best approach used in output 7 is multi-institutional activity involving 3 CG centers (ILRI, IITA, and ICRISAT) and national programs from 3 west African countries. Within IITA, these activities receive adequate support from core funding (cowpea breeder) as well as special project funds (DFID/GATSBY/USAID). If needed additional funds will be sourced from investors.

\*\*\*

**Recommendation 21**

- *It is recommended that efforts should be made to strengthen the socioeconomic input to Output 7 including enhanced input from ILRI and links/joint activities with Project C, RUSEP, and relevant networks.*
- *Output 7 has been highly successful in winning special project funds and has successfully integrated and linked funds from GTZ, DFID, DANIDA, and Gatsby to create a coherent research program that covers the research to development continuum. It is suggested that this model should be considered in other IITA Projects.*

**Board and Management Response:**

- IITA accepts this recommendation. IITA social economists are already working in close collaboration with ILRI.
  - For example, a study on ‘Farmers’ perceptions of benefits and factors affecting the adoption of improved dual- purpose cowpea in the dry savannas of Nigeria (Agricultural Economics 32 (2005) 195–210) was jointly conducted by ILRI and IITA social economists.
- ILRI and IITA have developed joint proposals focusing on trade offs between the use of crop residue as fodder or soil cover for protection the soil (SLP), promotion of fodder crops in the savannas (DFID), crop-livestock integration (GATSBY). The activities have inputs from social scientists.

\*\*\*

**Recommendation 22**

- *It is recommended that Outputs 6 and 7 should be merged into one integrated cereal–legume–livestock output to provide clearer focus, improved priority setting and integration, and eliminate current overlap.*

**Board and Management Response:**

- IITA accepts this recommendation. Output 6 and 7 were merged into one ‘integrated crop-livestock output in the previous MTP.

\*\*\*

**Recommendation 23**

- *It is strongly recommended that efforts should be made by the PC and Output Leader to fully integrate Output 8 into Project F’s research priorities.*

**Board and Management Response:**

- IITA accepts this recommendation. Production and post harvesting mechanization is a priority constraint in the savannah and will be fully integrated in the research activities of the Cereal and Legume System MTP project.

\*\*\*

**Recommendation 24**

- *It is also recommended that Output 8 should be more pro-active in promoting knowledge about priority, labor-saving production, and processing technologies to enhance demand at the grass roots level.*

**Board and Management Response:**

- IITA accepts this recommendation. However, most activities were terminated in 2004 because of lack of expertise in IITA on production and post harvest mechanization.

\*\*\*

**Recommendation 25**

- *As many of the planned activities in Output 8 involve adaptation and promotion of developed technologies (future plans include impact assessment, marketing studies, engaging the private sector, policy interventions, etc.), it is recommended that efforts should be made to strengthen socioeconomic input through enhanced links and joint activities with Project C and RUSEP.*

**Board and Management Response:**

- IITA accepts this recommendation. Social scientists are members of all the systems projects in IITA, where they provide guidance, backstopping and direction on all social science issues

\*\*\*

**Recommendation 26**

- *It is recommended that Output 8 should be more pro-active in fostering public-private sector partnerships for the manufacture of equipment to facilitate the uptake of technologies and their sustainability (e.g. emphasis needed to identifying and encouraging suppliers of spare parts).*

**Board and Management Response:**

- IITA accepts this recommendation. This model is used in other IITA projects (cassava production and processing equipment). Lessons learnt from partnering with the private sector to fabricate and market cassava processing equipment will be used in the savannas to promote use of labor saving production and post harvest machines.

\*\*\*

**Recommendation 27**

- *It is also recommended that future efforts in Output 8 should be directed at the development and promotion of food processing equipment for use in peri-urban villages to produce nutritious and tasty snack foods from major savanna crops.*
- *Opportunities should also be sought for facilitating marketing of traditional snack foods from peri-urban villages to urban areas e.g. Kano, which would contribute mainly to women's income.*

**Board and Management Response:**

- IITA accepts this recommendation. However the focus should not only be on food processing equipment. We need to develop labor saving machines to facilitate timely land cultivation, planting, weeding, shelling and winnowing of grains. Research on improved storage technologies is also a priority to prevent spoilage through aflatoxins, pests and high humidity.

\*\*\*

**Recommendation 28**

- *As a considerable proportion of the activities in Output 9 involve partnerships with NARES to multiply and distribute seed, it is recommended that this Output should be more strongly focused on developing strategies for establishing sustainable seed systems for the major food crops in the West and Central African savannas.*
- *The lack of seed of improved varieties is a serious constraint to achievement of wider impact by Project F. More resources should be sought for this Output to more rapidly achieve the project purpose and contribute to the project goal.*

**Board and Management Response:**

- IITA accepts this recommendation. All promising technologies generated in outputs 6, 7 and 8 are promoted in Output 9 using various mechanisms (developed in output 1 or project C) and networks. Therefore the focus of output 9 is Technology Dissemination. Most activities undertaken here are down stream and therefore national programs take a lead role in on farm research, seed multiplication and distribution, and capturing feedback from users.

\*\*\*

**Recommendation 29**

- *It is recommended that non-seed technology transfer activities should be housed in Outputs 6, 7 and 8. This would ensure that "technology transfer" is an integral part of the research for development continuum in Project F, in preference to being separated into its own Output*

**Board and Management Response:**

- Technology transfer is a priority activity which needs its own output. Seed and non-seed technologies may be disseminated using common approaches. Furthermore, certain technologies are developed as a package (e.g. *Striga* resistant germplasm and "trap crop" technologies) and need to be promoted as a package. Separating non-seed technologies from seeds would present problems of disseminating integrated technologies.

\*\*\*

**Recommendation 30**

- *It is recommended that more effort should be made in monitoring informal spread of improved varieties.*

**Board and Management Response:**

- IITA accepts this recommendation. Three studies were completed that monitor the diffusion and adoption of extra-early maize, soybean and dual purpose cowpea varieties in northern Nigeria. All the studies highlight the importance of farmer-to-farmer informal mechanisms in the spread of improved seeds.

- However, the findings also show limitations of such informal mechanisms for the successful transfer of complex crop management practices that go along with improved seed, in particular for the dual purpose cowpea.

\*\*\*

### **Recommendation 31**

- *It is also recommended that ex-ante impact assessment should be an integral part of the promotional process for both seed-based and non-seed-based technologies for the benefit of Project F.*

### **Board and Management Response:**

- IITA accepts this recommendation. An ex-ante impact assessment of alternative commodity research programs for each agro-ecological zone for Nigeria was conducted to assess the potential impacts on poverty reduction. The priority-setting results suggest that cowpea, millet, sorghum, groundnut, and livestock research would have greater impact in the dry savannah. In the moist savanna, research should focus on maize, yam, and rice. Increased cassava and yam research would have greater impact on poverty reduction in the humid forest.
- A baseline Study for ex-ante impact assessment of high quality insect resistant cowpea in West Africa was carried out in Benin, Niger, Nigeria, Burkina Faso and Mali. Preliminary results show that:
  - (1) Information exchange and awareness are important for the adoption and large diffusion of Bt cowpea.
  - (2) There is a relatively high willing to pay for Bt cowpea seeds by farmers.
  - (3) Given the potential of reducing health hazards by lowering the use of toxic synthetic pesticides, both farmers and consumers are willing to pay a premium price for Bt cowpea as an alternative to harmful cotton pesticides. The opportunity costs of using cotton insecticides include the economic losses encountered by the farm household when a family member is sick due to the misuse of chemical insecticides.
  - (4) Urban consumers in regional markets believe that Bt cowpea may be safer than conventional cowpea treated with chemicals.
  - (5) Bt cowpea will raise incomes substantially at farm, household, community and regional levels.

\*\*\*

### **Recommendation 32**

- *It is therefore recommended that the following revised project structure and Outputs should be considered by Project F:*
  1. *Researchable issues in response to stakeholders' needs formulated, targeted, and prioritized through identification of key drivers of intensification*
  2. *Management practices for the optimization and stabilization of intensified production systems developed through enhanced understanding of soil and weed processes*
  3. *System and end-user constraints and opportunities addressed through the development of high yielding, dual-purpose maize hybrids and open-pollinated varieties; soybean breeding lines; cowpea breeding lines, and promotion of improved varieties of other important crops in savanna systems*
  4. *Intensified, farmer acceptable cereal-legume and livestock systems developed, validated and promoted through participatory, integrated, income-generating crop, resource management and IPM "best-bet" strategies*

5. *Client-oriented production equipment and post-harvest technologies developed to reduce drudgery, diversify food products, and add value (could also be merged with Output 4)*
6. *Sustainable seed systems for important savanna systems crops developed and enhanced*

**Board and Management Response:**

- IITA agrees with the suggested outputs expected from number 6. If IITA is to create impact, we need to ensure that technologies generated by project F are disseminated to the end users. Enhancing the productivity of savanna cropping systems will need the use of improved production technologies (seeds, appropriate crop, pest, and soil management practices, etc) and post harvest technologies (storage, drying, shelling, etc), which need to be promoted as individual technologies or integrated packages of technology.
- The focus of output 9 is dissemination the technologies to end users. Technologies promoted in specific locations will depend on the priority constraints and may not always be seed.

\*\*\*

**Recommendation 33**

- *It is therefore recommended that the RDC should consider options to enhance the input of PC's into the project and institute research strategies. This is critically important for the three AEZ projects.*
- *In discussion with the RDC, this was considered to be an oversight in the PC's terms of reference. RDC members were unanimous that PC's should play a lead role in project strategy.*
- *It was also noted that the RDC holds two meetings each year with the PCs. It is suggested that such meetings should concentrate on project and institute research strategies as well as identifying and expanding key linkages among the six research projects.*
- *The Annual Work Planning Meeting appears to be the only opportunity each year for the PC to meet with all project members.*

**Board and Management Response:**

- IITA accepts this recommendation. PC (now DDs) are invited to attend most RDC meetings where research strategies are discussed. DDs also have a lead role in drafting the MTPs which have to fit in the SC priorities.

\*\*\*

**Recommendation 34**

- *Accepting that it is not easy to bring all project members (more than 40) together often due to time, location, and resource constraints, it is recommended that realistic options should be developed to enhance the interaction between the PC and project members.*
- *One option would be to formalize several meetings each year between the PC and the Output Leaders (OL). OLs would act as a conduit of information and progress by Output members and any constraints to the PC at Output level. It would be easier for 6 Output Coordinators to meet periodically with the PC than for the whole project team. This would strengthen the flow of information in the project and as well as its coordination.*

**Board and Management Response:**

- IITA accepts this recommendation. Interaction is through field visits, mid term reviews, and annual or strategic work planning week meetings. Leaders for each output (who are senior researchers) play an active role in guiding project members.
- When face-to-face interaction is not possible due to different duty stations for project members, most of the interaction is through email communication.

\*\*\*

**Recommendation 35**

- *It is therefore recommended that the RDC should make a careful analysis of the allocation of IITA's socioeconomics resources to Project F at the next Work Planning Meeting. It is also recommended that the PCs of Projects F and C should fully clarify the existing contribution of socio-economists to Project F including highlighting both joint Projects C and F activities and any other contributions of Project C to F.*

**Board and Management Response:**

- IITA accepts this recommendation. Social economic support to project F has been strengthened by the recruitment of a production economist who is housed in project F. Other economists (agricultural economist, impact specialist, and sociologist, GIS specialist) allocate over 25% their time to activities jointly carried out by projects F and C. Also see recommendation 6.

\*\*\*

**Recommendation 36**

- *It is recommended that IITA and Project F should be pro-active in managing this sudden loss of ILRI and ICRISAT staff and not rely solely on ILRI and ICRISAT to provide the necessary skills to improve and intensify savannah systems in West and Central Africa.*
- *In the past, CGIAR institutional mandate ownership has unfortunately compromised logical research and development progress to improve agricultural systems in the developing world. Project F should therefore continue to seek the best opportunities to improve and intensify cereal–legume–livestock systems in the moist and dry savannas of West and Central Africa, irrespective of crop and research mandates.*

**Board and Management Response:**

- IITA accepts this recommendation. The void left by ILRI and ICRISAT will be filled by closer collaboration with national programs with the necessary skills to enhance activities of the savannah project.

\*\*\*

**Recommendation 37**

- *Although Project C has already initiated activities on analyzing methodologies for scaling-up and –out while Project F is already testing different approaches on-farm, it is recommended that an institute-level commitment and profile (in preference to individual project-based priorities) be given to sharing experiences for developing the best approaches to scaling-up and -out technologies.*
- *At this relatively early stage in IITA's involvement in scaling processes, it would be of value to form a small cross-project group of appropriate skills which could compile experiences from African and relevant non-African projects and advise the AEZ projects, especially, on appropriate approaches to test in their projects. It is suggested that this possibility should be discussed at the next Work Planning Week later this year.*

**Board and Management Response:**

- IITA accepts this recommendation. Project C has the responsibility for developing IITA' strategies for technology dissemination. The demand however comes for the systems projects F, E and D.

\*\*\*

...

## B. A DONOR-COMMISSIONED REVIEW OF PROJECT A:

### **IITA Board and Management response to the Review of Preserving and Enhancing Germplasm and Agro-biodiversity with Conventional and Biotechnology Tools:**

The IITA Board of Trustees and Management greatly appreciate the work of Dr. Pierre Fabre Head of Program, CIRAD, Animal Crops Department, Food Crops Program and Dr. Yves Savidan, Cooperation Internationale et Partenariat in reviewing IITA Project A (Preserving and Enhancing Germplasm and Agro-biodiversity with Conventional and Biotechnology Tools). Their extensive review of research documentation and related information, their interaction with staff, national and international and with the Board members was very welcomed.

While this study conducted by the EC was not a Center Commissioned Review, given its independence and scope, it serves a very similar function. The IITA Board and Management took advantage of this to add additional information concerning the reviews of programs at the center.

The IITA Management, fully endorsed by the Board of Trustees response to the review of Project A

#### **Recommendation 1:**

- *The present approach based on an ad-hoc use of biotechnologies to reach identified goals (and not as a compulsory step of any research) should be kept in the future. It allows putting the objectives first and is likely to avoid some expensive activities of little use for R4D*

#### **Board Response:**

- The IITA Management, fully endorsed by the Board agrees with this observation.
- The biotechnology strategy currently being developed will incorporate this recommendation.

\*\*\*

#### **Recommendation 2:**

- *As a part of its strategy on Biotechnology, IITA should carefully assess where and how to better focus its investments.*
- *Three options exist, but IITA should not get involved in more than one or two to ensure efficiency, visibility, and impact.*
  1. *Option one is BECA.*
  2. *Option two is CBL becoming the West African subregional platform (if acceptable by partners in the region).*
  3. *Option three consists in supporting another West African subregional platform outside of Nigeria (in that case, CBL being only a 'node').*
- *The panel strongly recommends that IITA urgently discusses the issue with WECARD/CORAF and partners in the region*

#### **Board Response:**

- The IITA Management, fully endorsed by the Board will address this recommendation in its newly developed biotechnology strategy. This will guide our future investments.

\*\*\*

**Recommendation 3:**

- *Attention and time should be devoted to develop a scientific strategy and move Project A out of being a mere collection of separated plant activities with little interlinks towards an enhanced team of scientists.*
- *It is time to discuss the lessons learnt from this gathering. Biotechnologies, participatory breeding, and IPM are probably the three areas that could help build a shared strategy*

**Board Response:**

- The IITA Management, fully endorsed by the Board agrees with the recommendation.
- All of these areas have been addressed in the new MTP projects which have been designed to enhance the integration of scientists' activities around clearer stated goals, objectives, and outputs within cropping systems.

\*\*\*

**Recommendation 4:**

- *While IITA should be commended for building a research agenda on the basis of transversal, multidisciplinary projects, the evolution from a patchwork of piled activities inherited from the past to a set of subprojects responding to an agreed upon, common project strategy, requires a strong leadership. IITA should seriously reconsider the terms of reference of the project coordinators*

**Board Response:**

- The IITA Management, fully endorsed by the Board agrees with this recommendation.
- The same observation was made for the Governance CCER. In response, we have realigned the project management with the new Terms of Reference for the Deputy Directors and shifted from elected to appointed DD.

\*\*\*

**Recommendation 5:**

- *It has to be carefully assessed whether the role of coordinator, for challenge program activities that are centered on biotechnology tools to enhance the use of diversity in breeding, might be more efficiently taken upon by a biotechnology specialist rather than by a bank curator already having to handle a complex, global and regional mandate on a large number of crops*

**Board Response:**

- The IITA Management, fully endorsed by the Board agrees with this recommendation.
- The GCP is now managed by a biotechnologist who has expertise in genebank management and genomics.

\*\*\*

**Recommendation 6:**

- *In order to have a real view of the project efficiency and to promote accountability, a list of expected results should be elaborated ex-ante and a similar list of achievements produced ex-post, both based on the logframe structure (with quantitative OVI and qualitative description of the scientific problem to be solved).*
- *These two lists must be presented in such a way that they can be directly and easily compared (e.g. in a table)*

**Board Response:**

- The IITA Management, fully endorsed by the Board agrees with the approach recommended.

- The new MTP projects with their output and output targets will address the observed need for greater accountability in our projects.

\*\*\*

**Recommendation 7:**

- *CCERs of large projects such as project A should better be conducted by a team rather than by one single well-known specialist, whatever his personal abilities*

**Board Response:**

- The IITA Management, fully endorsed by the Board agrees with this recommendation.
- The use of a team is adopted. The IITA Management and Board also appreciated the team of reviewers sent for this EU review.

\*\*\*

**Recommendation 8:**

- *A precise assessment of IITA's needs for investment in in vitro culture, sanitation, conservation, and multiplication for further germplasm exchanges and capacity building is required*

**Board Response:**

- The IITA Management, fully endorsed by the Board agrees with this recommendation. We have initiated this assessment with the recruitment of a new position for a tissue culture specialist.

\*\*\*

**Recommendation 9:**

- *IITA should assess with partners future demands (traits, crops, geographical areas) and investments in breeding, as part of project A strategy development*

**Board Response:**

- The IITA Management, fully endorsed by the Board agrees with this recommendation.
- The development of the new MTP projects will contribute to this strategy development.
- We are planning a series of strategy development workshops for each of the new MTP projects to allow us to address the concerns given here.

\*\*\*

**Recommendation 10:**

- *The panel recommends a stronger focus on MAS for several crops, by joining breeders with biotechnologists, instead of leaving biotechnologists to endow more in the development of genomics resources, and by looking for, and/or investing, more resources in this field*

**Board Response:**

- The IITA Management, fully endorsed by the Board agrees with this recommendation.
- We are addressing this recommendation in the new biotechnology strategy which takes into account the need for better links between the biotechnologist and the users of biotechnologies.

\*\*\*

**Recommendation 11:**

- *IITA should continue working to prevent the extension of CMD through monitoring and germplasm resistance*

**Board Response:**

- The IITA Management, fully endorsed by the Board agrees with this recommendation. It is an area of critical importance to serving Africa.
- We are expanding our core breeding program with a new regional cassava breeder for East and Southern Africa to better address the needs for resistance in this target area and linking up with ongoing projects to improve our monitoring experiences.
- We are also capturing our tracking, reporting and response approach to CMD, so that we can share it with the African Union's Commission on Rural Economy and Agriculture.

\*\*\*

**Recommendation 12:**

- *Project A should further discuss its strategy on nutritional activities with partners, both from the local public and private sectors, and further develop links with the HarvestPlus challenge program*

**Board Response:**

- The IITA Management, fully endorsed by the Board agrees with this recommendation.
- A new MTP project has been developed on Agriculture and Health. It will include the research previously found in Project A and links it to other initiatives being undertaken by other disciplines at IITA. This should allow us to expand our activities in this area, expand our partnerships, and develop expanded links with HP.
- We have created a new position for crop utilization to address these areas.

\*\*\*

**Recommendation 13:**

- *Project A should develop a training and capacity building strategy to avoid being overwhelmed by NARIs and/or SRO and RO's requests, at the cost of its own research quality and outputs. This could involve a multi-stakeholder consultation to design a regional training program*

**Board Response:**

- The IITA Management, fully endorsed by the Board has a capacity building strategy, but agrees with the reviewer's assessment on the need for improved systems to avoid being overwhelmed.
- We are exploring all options with our national and regional partners.
- We have just completed two agreements on better processes and monitoring with the universities from which we get the highest demand.

## C. ADDITIONAL PANEL OBSERVATIONS ON THE CCERS

### 1. CCER: Governance and Management

This CCER is referred to and assessed in the general review of governance and management (see Chapter 5)

### 2. CCER: Project B: Developing Biologically Based Plant Health Management Options and Conserving Biodiversity of Sustainable Agriculture

The majority of the 12 recommendations in this report are concerned with research management or administrative issues. For instance, **Recommendation 1** recommends "... to list activities as they relate to the outputs" and notes that "...Inputs are missing in the logframe". Similarly, in **Recommendation 2** – "It is recommended to list the milestones under the activities, and where appropriate combine those that relate to one pest".

For these recommendations, and others such as **Recommendation 3** (*It is recommended that IITA link with institutions that are (or should be) concerned with the spread of pests (FAO, IAPSC, ...) and jointly explore ways to identify funding to mitigate the invasion of pests at early stages*) – there was no disagreement from the Board or management and little further to be commented on.

Other recommendations concerned with cost recovery of services; establishing a minimum number of core positions; reviewing placement of staff; granting sabbaticals; and changing the name of Project B and the title of outputs – also do not require further comment.

In the case of **Recommendation 8** (*It is recommended to establish a system to avoid inadvertent introduction of pests to and from IITA locations other than Ibadan, in cooperation with the respective national plant quarantine service*) it certainly appears to have been complied with (if it was not already compliant at the time of the CCER).

However, there are two recommendations which are worthy of further review.

**Recommendation 6** - *It is recommended to review training needs in NARS and offer the appropriate training (group, individual, in-house, in-country).* While the Board and Management stated that IITA is committed to capacity building of NARS and other partners and accept this recommendation, it is questionable whether sufficient focus has been given to training activities at IITA. While IITA incorporates "...training needs in project proposals when ever possible" and attempts "to meet any training needs that are demanded by the NARS or other partners.", the strategy appears to be ad hoc and lacking an IITA corporate strategy on training. It is recommended that this issue be explored further in the 6<sup>th</sup> EPMR, particularly as it was an issue raised by the 5<sup>th</sup> EPMR.

**Recommendation 11** - *It is recommended to widen the range of crops to include those important in the farming systems (e.g. cotton).* The Board and Management accepted this recommendation and "...will continue (and expand, funds permitting) our work on pests and diseases of non-mandated crops (e.g. pineapple mealybug) or non-crop pests (e.g. water weeds)." However, since the demand for plant health expertise exceeds IITA's capacity and the opportunistic expansion of activities into other crops could have a negative impact on plant health activities in mandated crops, further consideration should be given to this recommendation.

### 3. CCER: Project D: Research for Development Enabling Environment

### 4. CCER: Project E: Enhancing Livelihoods in the Humid and sub-Humid Zones of West and Central Africa through Profitable and Sustainable Intensification of Diverse Agricultural Systems

This was a brief (5-day) review done in May 2004 of Project E ("Enhancing Livelihoods in the Humid and Semi-Humid Zones of West and Central Africa through Profitable and Sustainable Intensification of Diverse Agricultural Systems"). The major outputs of this project were listed as farming systems focused on plantain productivity, intensification of cassava production, sustainable yam production, and multi-product trees. The reviewer emphasizes that the focus was scientific governance rather than scientific quality. Although this project has now been rearranged into other projects (principally Root

and Tuber Systems, Banana and Plantain Systems, and High Value Products) the review may still offer relevant observations on research management.

Project E was an exceptionally complex endeavor, addressing a mosaic of land use patterns with no clearly identified strategies for specific eco-regions. One lesson from the review is the need to provide clear outputs and intervention areas for projects and to adopt explicit strategies. Although IITA was adopting a benchmark approach at the time, the reviewers found scant mention of the concept in the documents they reviewed, and consequently no clear methodology for prioritizing constraints or for scaling out project outputs on an eco-regional basis. A long list of objectives and achievements for the project was not consistent or easy to understand. The reviewer sees projects developing at the time of the review (such as STCP or Nigerian cassava initiative) as opportunities to provide a more cohesive focus to this kind of research. He also urges more attention to a commodity chain approach.

Among the other observations of the review that have relevance to current IITA activities:

- The project's lack of a core identity.
- An absence of identifiable across-system agronomy, microbiology, plant pathology and eco-physiology components.
- The fact that, despite a holistic rationale, the project remained commodity focused (not necessarily a bad thing) and evidenced little systems-based or interdisciplinary activity.
- IITA's apparent inability to determine milestones and priorities for restricted grant projects, so that the institute ends up pursuing a multitude of diverse obligations within what is supposed to be a unified project.
- The need for better diagnosis of constraints and potentials in order to determine research interventions; and for better measures of impact, especially on crop losses, and level of adoption.
- The danger of drifting too far into development activities and competing with local institutions, while sacrificing some scientific excellence (this is a constant tension, and we favor the Research for Development approach that IITA had adopted where research is justified by its application to development-related issues).
- The high proportion (~80%) of project vs. core funding

##### 5. CCER: Project C: Assessing Impact, Formulating Policy Options and Systems Analysis

The CCER on IITA's Project C ("Assessing Impact, Formulating Policy Options and System Analysis") was done by Prof. Eric Tollens in December 2003. At the time, the majority of IITA's socioeconomics activities were carried out under this project, although there were links to other IITA projects.

The report points out that the majority of resources for Project C were from restricted funds, which is a welcome indication of demand for this kind of work, but raises the possibility of a donor-driven agenda.

At the time of the report much of IITA's research was organized by agro-ecologies and benchmark areas and there were considerable requirements for socioeconomic input in each of these areas for activities related to technology generation (constraints analysis, production economics, monitoring adoption, etc). Such work needs to be done in interaction with biophysical scientists, but there were concerns that this type of interaction was declining.

On the other hand, the review points out that there is also need for socioeconomic analysis on constraints that operate at a higher level than the benchmark. Two such areas are markets and policies.

For markets, it was generally accepted that IITA should adopt a commodity chain approach, but the report pointed to considerable uncertainty about IITA's specific role in market analysis. Several large market-development projects were seen as having relatively few links to IITA technology generation. (FOODNET produced a series of sub-sector studies and RUSEP was an attempt to strengthen markets in Nigeria.) The report recommended that any IITA involvement in pilot marketing projects should have the clear aim of providing feedback to biophysical scientists. The report also discussed the IPG nature of analyses of commercialization processes, but gives no guidance on what aspects of these processes might be legitimate targets for IITA socioeconomic studies, nor who the potential audience might be.

For policy analysis, the report acknowledges that IITA does not have the resources to make wide-ranging contributions and recommends collaboration with organizations such as IFDC (with whom IITA has collaborated on an analysis of fertilizer policy in Nigeria) and IFPRI.

The report also gives attention to the areas of impact assessment and priority setting. There is increasing pressure from donors for impact studies, and the report makes a number of suggestions on specific topics and urges that IITA should produce two impact studies per year. There is also a need for more ex-ante assessment and the reviewer describes three possible approaches, recommends their integration, and suggests that such exercises be confined to Nigeria. There is also a recommendation that IITA's GIS work should include more socio-economic analysis.

Finally, the review points to the profusion of outputs listed under the project (partly as a result of a donor-driven agenda), expresses concern that there are not the resources to meet these goals in a professional manner, and recommends a simplification of logframes and activities.

IITA's response to the review was largely positive, and there is evidence that efforts have been made to address the recommendations. Nevertheless, there are a number of challenges remaining. IITA's reconsideration of its benchmark approach means that technology generation strategies are now more diverse, and socioeconomic input is correspondingly varied. IITA continues to emphasize market development for its commodities, but questions regarding IITA's comparative advantage in this area, and the type of socioeconomic analysis that it should perform, remain unanswered. Similar questions exist for the scope and focus of any policy analysis that IITA might engage in. In the last several years IITA has devoted increasing attention to impact analysis; several new studies have been produced and a strategy paper describing a framework for impact assessment has just been published. A recent project in Nigeria is the source of several papers on priority setting (at the national level).

#### 6. **CCER: Project F: Improving and Intensifying Cereal-Legume Systems in the Moist and Dry Savannas**

The objectives of the review were to examine the progress made by Project F with focus on strategic contributions of Project F to institutional goals measured against projected milestones; identify constraints of the project that may hamper progress; and to offer suggestions for modifications that would lead to Project F attaining its objectives and outputs.

The review involved two days of field trips to assess on-station and on-farm trials at two stations, namely Kano and Zaria representing the dry savanna and moist savanna farming systems and

ecologies, respectively, followed by a one-day formal review with presentation by team members, a one-half day discussion with the RDC on a draft report prepared by the reviewer.

This CCER was an accelerated exercise as the review was conducted over a short period of time. However, the report was very comprehensive with an exhaustive review encompassing wide ranging issues and components of Project F and making an extensive list of far-reaching recommendations. Assessments were made of the evolution of the project, strategy and priority setting and planning, the processes for identification of outputs, monitoring of progress, project management and coordination, linkages with other CG centers, as well as the state of critical mass and balance of necessary skills in the overall management and execution of Project F.

There were a total of 37 recommendations spelled out in this CCER giving it an impressionable first appearance of perhaps too many itemizations to draw serious attention from project scientists and administrators. However many of the recommendations were highly accurate on issues that, if implemented, would sharpen the focus and effectiveness of research at IITA on “improving and intensifying cereal-legume-livestock systems”.

Several of the recommendations were process oriented dealing with issues relevant to planning and reporting requirements. However, a number of the recommendations also dealt with ways in which the program could be made effective and sustainable. Some of the enumerated recommendations remain central to the various issues the 6<sup>th</sup> EPMR team is grappling with including a list of items openly discussed during the presentations at Ibadan by team leaders and in discussions with scientists and administrators during the review team’s visit of the Center in March, 2007. The following issues addressed in the CCER are particularly worthy of note:

- Emphasis on keeping core competency over time on research that focuses on “systems, including crop-livestock” to take advantage of ( in new environments and experiences) and build on the experience, history and legacy of past research at IITA;
- The value of keeping a critical mass of interdisciplinary scientists (including socio-economists) at each of the prime locations and not spread thinly;
- Need to establish a system for guiding and mentoring young and new project scientists to bring them to speed where the need has been established;
- Enhance cross-links and integration on generic breeding objectives and provide greater systems focus to accentuate the comparative advantage of IITA over other CG centers (e.g. CIMMYT);
- Strengthen collaboration with other CG centers (CIMMYT, ILRI) based on comparative advantage and potential synergy that would accrue;
- Document progress made in improvement of maize, cowpea, and soybean over the past 20 or more years taking into account that targets and priorities have changed over this period;
- Emphasize efforts in development of technologies to capitalize on commercialization of cereal and legumes, following the examples in other crops;
- Promote where relevant, improved, farmer acceptable technologies from non-IITA mandate crops such as sorghum, millet, groundnut, pigeon pea, cotton where they can make a contribution to improving and intensifying cereal-legume-livestock systems;

- Develop strategy for establishing sustainable seed systems for the major food crops in the West and Central Africa; (relevant to discussions on need to developing expertise for encouraging commercial multiplication and distribution of clonal materials).

General Commentary: As in other regions, the lack of functional seed systems in the west central Africa has limited the spread of improved crop cultivars from IITA's cereal and legume improvement programs. Private seed industry is at infancy and the public sector has not been effective. As a result, IITA scientist had struggled with finding effective ways to scale-up and scale-out their improved cultivars or find an efficient scaling of best-bet combinations of their systems research outputs. More recently, IITA had opted to engage with commercial interests directly in deploying technologies and encouraging private processing industry. Other centers, (namely CIMMYT and ICRISAT) have full time internationally recruited scientists (IRS) to catalyze seed industry developments. Should IITA consider establishing an in-house knowledge base on commercial scale propagation and marketing of planting materials for clonally propagated crops with IITA mandate?

"During the history of improving and intensifying cereal-legume systems in the moist and dry savannas of West and Central Africa, IITA has benefited from working closely with scientists from ILRI and ICRISAT who have linked their complementary skills in livestock and dry savanna crops to those of IITA's for a more holistic approach." With erratic funding support at all centers, how can such inter-Center linkage be sustained?

7. **CCER of SW-IPM:** This CCER was conducted later than planned by IITA and took place between the first and main phases of the EPMP. The Outcomes are given separately in Annex 8.
8. **Donor-commissioned Review of Project A:** Preserving and Enhancing Germplasm and Agro-Biodiversity with Conventional and Biotechnology Tools.

This review was conducted at the request of EU, who has funded Project A since its inception in 2002. The review was conducted between November 2004 and January 2005 by a senior geneticist and an economist. Twelve days of field visits were distributed between IITA, Ibadan and Abuja; BECA, Kenya; and NARO, INIBAP and IITA offices in Uganda. The review was conducted with professionalism and thoroughness, though the reviewers decried the notion that review teams comprised of 1-2 experts had the resident skills to properly assess a project as complex as this.

Project A was formed from several of the 14 projects in existence in 2001. The main outputs of Project A were: 1) Enhanced collection, characterization and safe dissemination of selected crops and their wild relatives; 2) Elucidation of the genetics of key traits, and development of efficient breeding methods; 3) Development of biotechnology tools, and their application to crop improvement and germplasm management; 4) Development of source breeding populations and parental lines with desired agronomic and quality traits. In 2006 the activities of Project A were divided to form the crop conservation and improvement elements of the current projects, namely Agrobiodiversity; Roots and Tuber Systems; and Cereal and Legume Systems. Many Project A goals are shared by these projects, so some of the reviewer comments continue to have relevance.

Project A had a clear common theme of germplasm conservation and the development of improved varieties. Reviewers nonetheless found that it lacked a strategic thread, and rather resembled a collection of loosely linked activities. They concluded that the project needed a clear science plan, and strong consistent leadership for several years. Outputs (ex post) should be compared directly with goals (ex ante) when writing annual reports, so there was transparency in the degree to which goals

were met. They rejected the notion that biotechnology should be seen as an independent program; rather it was another set of tools to be applied when it showed comparative advantage. Because of the cost of equipment and the need to access supplies that easily spoiled, reviewers suggested that IITA focus its biotechnology resources in Kenya (at BECA) and either in IITA headquarters or some other location in West Africa. Concern was expressed over an apparent division between molecular breeding methods and conventional breeders. Reviewers noted that there was no current marker-assisted selection underway, or any apparent plans for any in the future. They recommended that breeders and biotechnologists co-lead any major biotechnology initiative in the future. This would free up additional scientist resources to focus on genomics. On the other hand, they felt that Generation Challenge Program initiatives at IITA should be led by a trained biotechnologist. Given the increasing demands for *in vitro* conservation and multiplication of clonally propagated crops, it was recommended that IITA's investment in *in vitro* culture be carefully assessed to ensure adequacy in staffing and facilities. The report commended IITA's prompt response to the severe CMD outbreak in cassava, and its increasing concern for improved nutritional quality of its mandated crops. Plant breeding was considered to be in good heart, though reviewers strongly suggested an increase in participatory breeding with end-users. Capacity building, once considered strong, and with obvious impact, was identified currently as a weak link in the project. Reviewers felt that the quality of science in Project A was quite adequate, provided its relevance was assured by being focused on an appropriate development issue. Links with social scientists were considered somewhat weak. Finally, the report emphasized the need to involve national program partners in project design, in determining the priority traits needed by germplasm, and in tactics involved in improving crop nutritional value. The reviewers concluded by recommending a continuation of EU financial support for these activities, and felt it would achieve significant impact in the future.

Many of the issues raised in this review have been addressed by IITA, though the central issue of the role of biotechnology in crop improvement is still not satisfactorily resolved. Capacity building, once a flagship activity at IITA, remains weak, and utilization of conserved germplasm by stakeholder breeding programs requires careful monitoring. Prebreeding, defined here by reviewers as supplying proven disease-free Germplasm Bank accessions, was considered a real strength, and it remains so today.

## Annex 3

### IITA THIRD EPMR PANEL COMPOSITION AND BIODATA

#### *PANEL CHAIR*

**Cyrus G. Ndiritu**

Panel Chair

Greenplanet Africa Ltd.

Beverly Court, Marcus Garvey Road,

P.O.Box 10460-00100,

Nairobi, Kenya

Tel/Fax 254-20-2731037/8

Mobile +254-722-716234

Email: [ndiritucg@yahoo.com](mailto:ndiritucg@yahoo.com)

#### *MEMBERS*

**Greg Edmeades:**

43 Hemans Street, Cambridge, New Zealand

Phone: +64-7-823-0918

Cell: +64-27-335-0488

Email: [greg\\_edmeades@msn.com](mailto:greg_edmeades@msn.com)

**Gebisa Ejeta**

Department of Agronomy

915 W. State Street, Purdue University

West Lafayette, Indiana 47907-2054

Tel: 765-494-4320

Fax: 765-496-2926

Email: [gejeta@purdue.edu](mailto:gejeta@purdue.edu)

**Pammi Sachdeva**

430 Glyndon St. NE, Vienna,

VA 22180, USA

Tel: +703 242 8892

Email: [PSSachdeva@aol.com](mailto:PSSachdeva@aol.com)

**Robert Tripp**

1 Ridgley Road

Chiddingfold, Surrey GU8 4QQ, U.K.

Telephone: +44 (0)1428 684985

Email: [r.tripp@odi.org.uk](mailto:r.tripp@odi.org.uk)

#### *CONSULTANTS*

**Mary Ncube**

M T Ncube and Associates

Postal Address: P.O. Box 35550, Lusaka

Physical Address: Plot 201 Kasangula Rd Lusaka,  
Zambia

Tel: +260 1 29-1352 or +260 1 29-1386

Fax: +260 1 29-3004

Email: [marytncube@yahoo.co.uk](mailto:marytncube@yahoo.co.uk)

**Geoffrey Norton**

Professor Geoff Norton

Center for Biological Information Technology

Level 6, Hartley Teakle Building

The University of Queensland

Brisbane, Queensland 4072, Australia

Tel: 61-(0)7-3365-1854

Fax: 61-(0)7-3365-1855

Email: [G.Norton@cbit.uq.edu.au](mailto:G.Norton@cbit.uq.edu.au)

#### *RESOURCE PERSONS*

**Peter Gardiner** (Panel Secretary)

Science Council Secretariat

c/o FAO, Viale delle Terme di Caracalla

00153 Rome, Italy

Tel. +39 06 570 52458;

Fax +39 06 570 53298

Email: [peter.gardiner@fao.org](mailto:peter.gardiner@fao.org)

**Manuel M. Lantin**

CGIAR Secretariat

The World Bank, 1818 H Street, N.W.

Washington, D.C. 20433 U.S.A.

Tel: +1 202 473-8912

Fax: +1 202 473-8110

Email: [m.lantin@cgiar.org](mailto:m.lantin@cgiar.org)

## BIODATA

### Cyrus G. Ndiritu, Kenya

- Position:** Private Consultant in Rural Developmental Studies
- Expertise:** Veterinary medicine, animal diseases, livestock, agric research, research organizations in SSA
- Education:** Ph.D. University of Nairobi (1978-82); M.Sc. in Veterinary Medicine, University of California, Davis (1975-76); Bachelor of Veterinary Medicine (BVM), University of Nairobi (1970-74)
- Experience:** 2001 Feb/March consultant to review animal production and diseases research programs in Tanzania as an input to the World Bank mid-term review of the Tanzania Agricultural Research Project. August 2000 to February 2001 appointed Commissioner on International Research by the Danish Government for Development Related Research in Denmark to study research needs and make recommendations on research priorities and organizational framework. 1989-2000: Director, Kenya Agricultural Research Institute (KARI); Chairperson ASARECA Committee of Directors; 1990-: Board Chair of Kenya Veterinary Vaccine Production Institute (KEVEVAPI), and Board Member of Kenya Trypanosomiasis Research Institute (KETRI); 1990-: To review progress of the World Bank assigned Ethiopian Agricultural Research Project (EARP); 1990-91: Member of Administrative Council for the Small-Ruminant Collaborative Research Support Program (supported by the USAID); 1987-89: Director and Consultant with Agrivet Services Limited; 1980-87: Head of Research & Development Department in the Wellcome Disease Research & Clinical Programs; 1977-80: Lecturer in the University of Nairobi, Faculty of Veterinary Medicine, Department of Clinical Studies; 1975-77: Part-time work in the Department of Medicine & Surgery, Davis, CA.; 1974: Assistant Lecturer, University of Nairobi. TAC Member from 1996-2000; Member of the CGIAR Oversight Committee in 1995; Chairperson of the NARS-CGIAR Committee (1994); appointed Board Member on CIMMYT (1996); Chair of SSA CP Review 2006

### Greg Edmeades (New Zealand)

- Position:** 2005-present: Consultant, based in New Zealand
- Expertise:** Agronomy, plant physiology, plant breeding (maize), drought research, use of molecular approaches and knowledge of the private sector
- Education:** Ph.D., University of Guelph, Canada, 1972-76. Major: Crop Physiology. Minor: Mathematics and Statistics. Thesis title: "Aspects of plant-to-plant variability in maize (*Zea mays* L.)." M. Agric. Sci, Massey University, New Zealand, 1969-72. Major: Maize agronomy. Minor: Agricultural mechanization. Thesis title: "Maize in the Manawatu: a field study of the effects of spacing and variety upon the growth of *Zea mays* L." B. Agric. Sci., Massey University, New Zealand, 1965-68. Major: Farm management and agricultural mechanization
- Experience:** 2001-2004: Research Fellow, Pioneer Hi-Bred International, Waimea, Kauai, Hawaii, responsible for abiotic stress tolerance/trait development in Woodland CA, and Viluco, Chile; 1999-2000: Senior Scientist, Pioneer Hi-Bred International, Waimea, Kauai, Hawaii, responsible for Genetics Winter Nursery; 1991-1992: Visiting Research

Fellow, Plant Environment Laboratory, University of Reading, England, while on Study Leave from CIMMYT;; 1984-5 on study leave in New Zealand at the Plant Physiology Division, DSIR, Palmerston North); 1976-1978;; 1972 - 1976: Graduate Research Assistant, Crop Science Department, University of Guelph, Canada; 1970 - 1972: Lecturer, Agronomy Department, Massey University, New Zealand. Member of professional societies. Winner of the award Fellow, Crop Science Society of America (CSSA) in 2004. Author of a number of publications related to improving the resource use efficiency of agricultural systems at the farm level and developing genetic solutions to environmental constraints such as drought. CIMMYT: '98-'85: Maize Physiologist; 1978 - 1985: Maize Agronomist and Joint Coordinator, Ghana Grains Development Project, Kumasi, Ghana; CIMMYT: Post Doctoral Fellow Crop Physiology and Breeding, Maize Program, Ghana

### **Gebisa Ejeta (Ethiopia)**

**Position:** Distinguished Professor, Plant Breeding and Genetics, Department of Agronomy, Purdue University

**Education:** Ph.D. in Plant Breeding and Genetics (1978); M.S. in Plant Breeding and Genetics (1976), Purdue University; B.S. in Plant Sciences (1973), Alemaya College, Ethiopia

**Expertise:** Plant breeding, genetics, plant sciences, sorghum, pearl millet

**Experience:** 1988-1992: Associate Professor of Plant Breeding and Genetics; 1984-88: Assistant Professor of Plant Breeding and Genetics; 1974-78: Graduate Research Assistant, Purdue University; 1973-74: Principal Plant Breeder, International Crop Research Institute for the Semi-Arid Tropics (ICRISAT), Wad Medani, Sudan; 1973-74: Research Associate, Ethiopian Sorghum Improvement Project; 1971-72: Research Assistant, Institute of Agricultural Research, Ethiopia. Member of a number of professional societies, e.g.: American Society of Agronomy, Crop Science Society of Agronomy, American Association for the Advancement of Sciences and Sigma Xi. Over the last five years he has authored or co-authored over 40 scientific publications. Sub-Panel leader for ICRISAT study for TAC's systemwide Plant Breeding Methodologies Review. The greatest achievements regard Dr. Ejeta's sorghum research efforts in Sudan which culminated with the release in 1983 of Hageen Dura-1 as the first commercial sorghum hybrid in SSA. He also catalyzed the development of a seed industry in Sudan. These efforts coupled with an aggressive farmer education program that he initiated led to the rapid adoption and expansion of acreage under the hybrid and the establishment of a commercial seed industry in Sudan. As a result, annually, a minimum of 100,000 acres of Hageen Dura-1 was grown by Sudanese farmers since its release and reached a maximum of 1,000,000 acres per year in 1999. Such a rapid and phenomenal rate of adoption and expansion of an improved crop cultivar had not been witnessed since the remarkable agricultural change in Asia under the Green Revolution. He replicated a similar achievement in Niger after developing another drought tolerant sorghum hybrid, NAD-1 was officially released in 1992 as a commercial cultivar and is currently grown in thousands of acres annually yielding four to five times the national average for sorghum.

**Pammi Sachdeva (USA/India)**

- Position:** Independent Consultant, since 2001
- Expertise:** Program and institutional assessment, recruitment, and human resource management in the agricultural research and public health sectors
- Education:** Ph.D., Social Systems Sciences, the Wharton School, University of Pennsylvania, Philadelphia, 1988. Specialization in systems approach to organizational analysis, planning and management. MBA, the Indian Institute of Management, Ahmedabad, 1971. Major in organizational behavior and human resource management.
- Experience:** Recent clients include the World Bank, FAO, WHO, Islamic Development Bank, and the Global Water Partnership. Prior to this, he worked for over twenty years in the World Bank and the CGIAR, retiring in 2001 as adviser. At the CGIAR Secretariat, he undertook or facilitated comprehensive assessments (EPMRs) of the governance, strategy, programs, organization, and management of twelve of the fifteen CGIAR-supported international agricultural research Centers; and served as member of the CGIAR gender and diversity advisory board, and of various CGIAR task forces and working groups. At ISNAR, he served as Chair of HRM working group and head of training program; and led a research project on the organization and structure of national agricultural research systems in developing countries. He has undertaken work-related travel to over thirty developing countries.

**Geoffrey Norton, (UK/Australia)**

- Expertise:** Pest management, resource management, strategic planning techniques for specific pest management problems
- Education:** B.Sc. Agriculture, M.Sc. and Ph.D. (1968) (both in Agricultural Economics) - all from the University of Wales (Bangor); D.Sc. from University of London (1988)
- Position:** Director, Cooperative Research Center for Tropical Pest Management, Brisbane, Australia, since 1992
- Experience:** 1985-92: Director, Silwood Center for Pest Management, Imperial College, UK; 1970: Biology Department of Imperial College, University of London. In this post he worked on a range of resource management issues; 1968-70: University of Manitoba. He worked on resource management problems in the Inter-lake region. The major focus of his interests has been the development and application of inter-disciplinary tools for the analysis of pest management problems, aimed at providing support to those involved in policy, research, advisory and practical pest management decision-making. Key features of this approach include the development of economic, decision analysis, workshop and computer modeling techniques, and their application to specific pest management problems. Some examples of his past projects and consultancies include rice pests (Malaysia, Philippines, Vietnam, Thailand, Indonesia, and China), cotton pests (China) and tsetse fly (West Africa). He has consulted with a variety of organizations, examples of which are FAO, ADB, ODA, IRRI and EMBRAPA.

**Mary Ncube (Zambia)**

**Expertise:** Auditing, financial management, corporate governance

**Education:** 1988-1984 Associate of the Chartered Institute of Certified Accountants (ACCA), London School of Accountancy/ Zambia Center for Accountancy Studies; BA, Economics 1982, University of Zambia

**Position:** Since 1997: Chief Executive, M T Ncube and Associates (own firm).

**Experience:** Ms. Mary Ncube has over 23 years working experience as a consultant, accountant and auditor. She spent sixteen years with KPMG Peat Marwick, Zambia where she began as an Audit Assistant in 1982. In 1991 she was promoted to Audit Manager, and was admitted to Partnership in 1995. She is the first female of African descent to have been admitted to Partnership in KPMG globally. In addition to accountancy and finance related work, Ms Ncube has worked with a number of organizations on assignments related to economic and organizational development and management of aid and project funds including USAID, NORAD, World Bank, UNDP and UNHCR. Professional memberships are: fellow member of the Association of Chartered Certified Accountants (ACCA); Fellow member Zambia Institute of Chartered Accountants (ZICA); member of the Institute of Directors of Zambia and the Economics Association of Zambia. Also a Council member of the Medical Council of Zambia; a Tribunal Member of the Zambia Revenue Tax Appeals Tribunal, Board member to the HIVOS, Zambia; Chair Bank Audit Committee- Stanbic Bank Zambia, Director Energy Regulation Board of Zambia, Director on M.T.N. Special Engagements Limited (a consultancy firm) and M.T.N. Boardroom and Conferences Limited; and a member of the UN Conference on Trade and Development (UNCTAD) Group of experts on International Standards of Accounting and Reporting. Previous Directorships include: Director on Zamnet Communications Systems Board; Council member, Zambia Institute of Chartered Certified Accountants; Chairperson ZAMCOM Lodge Board; Treasurer, Zambia Women's Lobby; Chairperson, Audit Committee of Lusaka International Community School; Chairperson, Women's Capital Development Fund, Steering Committee of Securities and Exchange Commission (SEC).

**Annex 4**  
**List of Panel visits and persons met during the conduct of the review.**

**A: Outline Schedule of EPMP Panel's Interaction with IITA**

**03 March (Saturday)**

1100 – 1200                      Panel arrives Ibadan

**04 March (Sunday)**

0900 – 1100                      Panel meeting and introductions. (Meeting Room – I-House)  
Introductory talk on background to the Review

1100 - 1230                      Meeting of Panel Chair with the DG.

1400 – 1600                      Panel Meeting (cont'd.): Introductory talk on IITA and CGIAR indicators.

1930 – 2200                      Mixer/Reception

**05 March (Monday)**

0845                                      **Introduction of the Panel to staff**

0900 – 1330

**Formal Center presentations:**

- Challenges and strategic issues for IITA in meeting Agriculture research and development needs in Sub-Saharan Africa – *DG Hartmann*
- How IITA's Strategy and Research plans are developed – DDG-Research, *Dr. Paula Bramel*
- Responding to needs: Relating IITA's program to its partners –
  - DDG-Research – *Dr. Paula Bramel*
  - Immediate Past Dean, Faculty of Agriculture, University of Ibadan – *Dr. Janice Olawoye*
- Managing Resources -
  - DDG-Research – *Dr. Paula Bramel*
  - DDG-Support – *Dr. Campbell Davidson*

Panel Discussion Recess (closed)

**05 March (Monday)**

- **Presentations of Projects - Deputy Directors**

1430-1630

- Agro Biodiversity – *Dr. Robert Asiedu*
- Roots and Tuber Systems – *Dr. Robert Asiedu*

Panel Discussion Recess (closed)

## 05 March (Monday)

1630 – 1800

- **Presentations on Projects (cont'd.)** - Deputy Directors
  - Banana and Plantain Systems – *Dr. Steffen Abele*

Panel Roundup (closed)

## 06 March (Tuesday)

0900 – 1330

### **Presentations of Projects (cont'd.)** - Deputy Directors

- Agriculture and Health – *Dr. Steffen Abele*
- Opportunities and Threats – *Dr. Steffen Abele*
- Cereals and Legume Systems – *Dr. David Chikoye*

Panel Discussion Recess (closed)

- High Value Products – *Dr. David Chikoye*
- System wide Program-Integrated Pest Management – *Dr. Braima James*

1430 – 1730

Panel segregates to conduct visits of field and laboratory research and research-support facilities on the IITA site e.g.

- Genebank/ Breeding /Pathology
- Biotechnology Laboratories
- Support functions Library/ Training Unit/ Physical plant services and farm operations

## 07 March (Wednesday)

0900 – 1330

- IITA's Research Sites-
- Presentations by Officers in Charge from Uganda, Tanzania, Malawi, Kano
  
- Panel Discussion (closed)

### **Group discussions**

*Small-group discussion with selected Scientists*  
(followed by Panel Discussion)

- Agriculture and Health Project
- Agro-biodiversity Project
- Cereal and Legume Systems Project

1430 –1700

### **Group discussions** with Scientists (cont)

- High Value Products Project
- Opportunities and Threats Project

- Root and Tuber Systems Project

Panel Roundup

**08 March (Thursday)**

0900 – 1030

**Group discussions** with Scientists (cont)

- Systemwide Program on Integrated Pest Management

Key players: *Dr. Paula Bramel* (DDG-Research), *Drs. James, Manu, Legg*

1100 – 1300

**Group (including Unit Heads and staff) discussions with:**

- Computer and MIS Unit
- Communication Unit
- Human Resource Unit
- Physical Plant and Farm Services;
- Finance
- Audit
- Contract and Grants Office/Training Unit

(The panel will break into smaller groups to interact with support units)

1400 – 1800

Session starts with Panel Roundup and Planning Discussion (closed)  
Individual meetings, consultation and visits

**09 March (Friday)**

0900 – 1300

Panel Chair to lead open ended discussion with:

Research Development Council [elected scientists], Deputy Directors (3) and DDG-Research on research priority setting and coordination

Otherwise free for individual meetings, consultation and visits

1400 – 1800

Panel Meetings (closed)

**10 March (Saturday)**

Departure of Program Members of Panel

Morning free for individual meetings, consultation and visits if required.

**11 March (Sunday)**

19:30

Dinner in honor of EPMR Panel.

**12/13 March (Monday/Tuesday)**

Panel Chair and Governance expert may meet with arriving IITA Board Chair/ IITA Board Trustees.

### 14-17 March

Panel Chair and Governance expert monitor IITA Board Committee Meetings and Full Board of Trustees Meeting

### 15 March

Meeting of Finance Expert with External Auditors  
IITA Guest House, Lagos

### 17<sup>th</sup>-25<sup>th</sup> May

Panel visits research locations

1. BECA, Nairobi, Kenya
2. East Africa – including Mozambique, Malawi, Tanzania and Uganda
3. West Africa – including Ghana and Benin
4. Nigeria – Kano (scheduled revised to visit between the 1<sup>st</sup> to 3<sup>rd</sup> of June)

### 28<sup>th</sup> May to June 8<sup>th</sup>

Panel drafts Report  
(drafts shared for factual corrections in second week)

### June 8<sup>th</sup>

Presentation of Report to staff

### June 9<sup>th</sup>/10<sup>th</sup>

Panel depart Ibadan

## **B: Panel Visits to IITA regional locations**

### **1. BECA**

(Ejeta, Ndiritu)

#### **3-4 May 2007**

ILRI campus , initial joint session with IARCs on site (ILRI, AATF, ICRISAT, BECA, Rockefeller, USAID)

Morag Ferguson, Akin Adesina, Peter Matlon, Joe Devries, Peter Newell

### **2. East Africa – including Mozambique, Malawi, Tanzania and Uganda**

#### **Mozambique (Ndiritu)**

##### **17 may 2007**

am Cyrus Ndiritu arrive in Maputo (Sicco Koljin-IITA)

pm Daviid Chikoye arrives, dinner with partners (USIAD, IITA, Technoserve, CIP, ILRI, ICRISAT, IIAM)

##### **18 May 2007**

am IIAM (Calisto Bias, M.Amane, Annabela)

USAID (Christine de Voest)

Technoserve (Juma Juma)

pm IIAM Tissue culture lab

CIP, ILRI, ICRISAT (Maria Andrade, Carlos, Doinguez)

**19 May 2007**

am flight to Nampula (Gary O' Connor, Siboniso Moyo, Calo Domingues)  
Cassava primary multiplication site – Nampula (E.Kanju & Amaral Chibeba)

pm Dinner with partners (Martin, Richard Dixon, Gary Chitio)

**20 May 2007**

am CLUSA (Martin Mason)  
Save the Children (Richard Dixon)

pm PAN-IIAM/IITA (Legumes, cassava, post harvest, tour of facilities)  
Private sector (feed mill, poultry farm, & Tissue culture hardening facility)

**Malawi (Ndiritu)****21 May 2007**

am depart for Lilongwe (Nzola mahungu)  
Visit Packaging Industries Malawi Limited (PIM) factory  
Meeting with NARS, extension partners and IITA staff  
Visit banana farmers' fields with partners  
Meet NARS-Horticulture and Roots and Tubers commodity teams. Field visit

pm Visit biotech, University of Malawi  
Meeting with cassava farmers association and processors

**22 May 2007**

am Visit IITA premises, Meet CG Center partners  
Meet the Director of Research (Dr. Mitukuso)  
Meeting with key partners and individual interactions

pm Meeting with Ministry officials (Secretary of Ag or J.Luhanga, CAS)  
Leave Malawi

**Uganda (Ejeta)****20 May 2007**

pm Arrival (pickup by D.Coyne-D.Coyne)

**21 May 2007**

am ASARECA (C.Mugoya, S.Ketema), DG-NARO

pm IRS presentations

**22 May 2007**

am Kawanda (Drs. Tush, Magunda)

pm lunch with partners NaCRRI, AGT (E.Njuki), tour of IITA facilities in Namulonge & NaCRRI, AGT(A.Bua, Y.Baguma, E.Njuki, etc.)

**23 May 2007**

am Depart for Dar-es-Salaam

**Tanzania (Ndiritu, Ejeta)****22 May 2007**

Cyrus Ndiritu arrival (Victor Manyong, S.Abele – IITA)

**23 May 2007**

am Field visit of panel chair to Farmers' association at Bungu  
Meeting with Farmers Group Themes: cassava diseases in the field (CBSD and CMD) and technology transfer to end-users

pm Gebisa Ejeta arrival

Gebisa joins panel chair and field visit of both to private sector (Power Foods)  
 Meeting with private sector (Power Foods). Theme: value addition, markets

**24 May 2007**  
 am visit to officials at the Ministry of agriculture (Dr Haki and/or PS and/or Minister)  
 meeting with IITA+NARS at the Meeting Room of the Ministry of agriculture  
 pm WARDA ICRAF and Mikocheni  
 visit to MARI Biotech lab; wrap up meeting with IITA IRS at Mikocheni  
 Gebisa, Cyrus leave for Nairobi

### **3. West Africa – including Ghana and Benin**

**Ghana** (Edmeades, Tripp) accompanied by Dr. C. Davidson, acting DDG-Support, IITA

**20 May 2007**  
 pm meet with Isaac Gyamfi (Stephan Weise) and STCP team

**21 May 2007**  
 am Meeting with EC Delegation Ghana Head of Section - Rural Development (Koen Duchateau)  
 pm Telephone Conference with Mars Inc. (John Lunde)  
 Meeting at Cocoa Research Institute of Ghana (Program by CRIG)  
 Meeting with Executive Director and several scientists; small CRIG tour  
 depart for Kumasi

**22 May 2007**  
 am Visit Participatory Research Site (Jeninso Village) – Fertility Management  
 Visit Participatory Research Site (Jeninso Village) –Diversification  
 pm Meeting at Crop Research Institute (Program by CRI)  
 Meetings with Director Drs. Ben Asafo-Adjei, Emmanuel Otoo, and J. Afuakwa

**23 May 2007**  
 am depart Accra for Cotonou via Togo

**Cotonou, Benin** (Edmeades, Tripp)

**24 May 2007**  
 am Biodiversity characterization (Dr. Georgen)  
 Biocontrol technologies (Drs Hanna and Tamo)  
 Biological pesticides (Mycoherbicide and bioinsecicides Dr. Godonou)  
 Post harvest food quality (Dr. Hell)  
 Capacity building and impact assessment (Drs Coulibaly and James)  
 pm Field visit: demonstration of bio control ( Mr Atcha)  
 Group meeting with staff

**25 May 2007**  
 am Visit to FSA/UAC (Prof. Dr. Agbossou/Dr Vodouhè/Prof. Ahanchédé/Dr. Ahohouendo)  
 Visit to INRAB (DG INRAB, Mme Assogba-Komlan)  
 Visit to SPV (Director SPV/Dr. Boulga)  
 Meet with SONGHAI Director  
 pm Field visit at SONGHAI (Director of SONGHAI)

**4. Nigeria – Kano (scheduled revised to visit between the 1<sup>st</sup> to 3<sup>rd</sup> of June)**

(Edmeades, Tripp)

**31 May 2007**

pm arrival

**1 June 2007**

am Tour of Minjibir Farm

Visit to IITA farmers, Bichi

Pm Tour of Kano Station

Meet with IITA Partners

Meet with IITA Scientists based in Kano and Maiduguri

## Annex 5 Geographical spread of IITA

### Geographical coverage<sup>14</sup>

IITA focuses its research on SSA, essentially on tropical Africa. Its scientists are located accordingly (see Figure 6 below). However, some of its strategies are designed with the whole of Africa in mind. IITA views the rest of Africa, the Sahel, as an important market for food and agricultural products that could originate out of SSA. Livestock feeds, for example, can be made from cassava and sold to the Sahel countries that tend to have large livestock populations. For some subjects—phytosanitation, regional research, agricultural trade barriers, and food-related health issues—the Institute will continue to work with Africa-wide bodies such as Forum for Agricultural Research in Africa (FARA), the RECs, and the AU.



Figure 7. Current Scientist Clusters

Administratively, IITA scientists will be supported from four hubs (see Figure below). The hubs will provide some minimal level of administrative, financial, procurement, audit, and infrastructural support, as needed. The hubs will be supported by the respective Unit at Headquarters. This arrangement will evolve with improvements in technologies and access (including cost) – communication technologies, and east-west air travel.



Figure 8. Regional Support Hubs.

## **Annex 6**

### **Indicators of Science Quality**

The heart of IITA's mission is to conduct research that addresses key issues of development in SSA. The quality of that research directly affects the impact of the center, both in the short and long terms, and is therefore of direct interest to the Panel. In seeking to address this issue the Panel recognizes that although its mandate is to review the previous five years research, a great deal of IITA's strategic research on germplasm improvement and natural resource management may take 10-15 years before its efficacy and impact can be properly assessed.

Quality of science is not easily defined, since it must always be tempered with relevance of research goals in the R4D continuum and expected return on research investment, as well as the more traditional measures of quality. The following indicators were considered by the Panel:

- **Relevance of science to sub-Saharan Africa:** This considers if research is strategic in nature, addresses an important constraint, whether outcomes are applicable to a large number of beneficiaries and are likely to be adopted.
- **Rigor of science conducted:** This includes the role of scientists in designing science components of projects; if research meets international standards of hypothesis formulation, design, methods and analysis, and if results have been published, and in what fora.
- **Enabling high quality science:** Is the skill set of IITA scientists adequate to meet its mandate? Is there is a critical mass of skills at IITA to address key research areas? The quality of support in statistics and information management services is considered, as well as the adequacy of laboratories and field facilities
- **Maintaining science quality:** Considered here is whether IITA has been successful in hiring the best scientists available, and how well it maintains and improves skills through visiting fellows, seminars, in-service training, study leaves, conferences, internet and library services. The adequacy of internal review procedures (CCERs, publications and annual research plans and evaluation of staff research) is also considered, and the challenges of short term vs. long term research are considered.
- **Impacts of science:** Good science should ultimately have measurable impacts, so indicators of adoption, and the rate of return on research investments are sought.

## Annex 7

### Global Importance of Bananas and Plantains

Bananas and plantains are perennial crops that grow quickly and can be harvested all year round. Records indicate that by the year 2000 there were some 9 million hectares of bananas and plantain globally with world production averaging 92 million tonnes per annum in 1998-2000 and estimated at 99 million tonnes in 2001. These figures are an approximation because the bulk of world banana production (almost 85 percent) comes from relatively small plots and kitchen or backyard gardens, where statistics are lacking. Banana and plantain are a staple food crops for millions of people in developing countries.

About 90% of production takes place on small farms and is consumed locally. Only 10%, mainly from commercial plantations in Latin America and the Caribbean, enters world trade. Much of the remaining harvest is consumed by subsistence farmers in tropical Africa, America and Asia. For most of these farmers, banana and plantain are staple foods that represent major dietary sources of carbohydrates, fiber, vitamins A, B6 and C, and potassium, phosphorus and calcium<sup>32</sup>. Banana is now one of the most popular of all fruits. Although it maybe viewed as only a dessert or an addition to breakfast cereal in most developed countries, it is actually a very important agricultural product in the overall global diet equation. After rice, wheat and milk, it is the fourth most valuable food. In export, it ranks fourth among all agricultural commodities.

In parts of sub-Saharan Africa and Latin America and the Caribbean, average per caput consumption is 150 to 300 grammes per day, and the crop provides 25% or more of the daily calorie intake, in addition to being a source of Vitamin B, notably B6, and potassium. Plantains are extremely rich in Vitamin A and bananas are high in ascorbic acid. During the 1980s, total production in the developing countries increased by about 15%. The importance of bananas as a food crop in tropical areas cannot be underestimated. In Uganda, for example, annual consumption per capita was some 243 kg in 1996, and between 100 and 200 kg in Rwanda, Gabon and Cameroon. In these 4 countries, bananas account for between 12 percent and 27 percent of daily calorie intake of their populations.

Diseases are among the most important factors in banana production worldwide. They are one of the major reasons for which the world's breeding programs were created and remain a primary focus of all current programs. Recently, diseases have also become principal targets of biotechnological efforts to improve this crop. The main challenges to research include breeding for resistance to Black Sigatoka disease, Fusarium Wilt (Panama disease), Bunchy Top Virus and banana weevil, alongside the development of improved production systems.

According to information available from FAOSTATS, banana and plantain are critically important in East and Central Africa (ECA) even much more than in West Africa.

#### For Plantain the data indicates that:

57% of plantains in SSA are produced in ECA, and 43% in WCA. In ECA the big producers are: Uganda (67%) and Rwanda (20%). In WCA production is dominated by Nigeria (24%), Ghana (24%), Cote d'Ivoire (14%), Cameroon (13%) and DRC (12%).

Production has increased at 1% /yr in ECA and about 2%/yr in WCA since 1990. Yield changes have been small or not significant in both regions.

---

<sup>32</sup> The world banana economy 19885-2002 FAOSTAT

In 1990-99 there was a small increase in production of 1-2% /yr, driven mainly by increasing yields in ECA and by area expansion in WCA.

From 2000-2005 yield increases were not significant, and increases in production were only significant in WCA.

And for the Banana:

63% are found in ECA and 37% in WCA – quite similar to the distribution of plantains. Main producers are: ECA: Uganda 45%; Kenya 16%; Burundi 17%; and in WCA Cameroon 37%, DRC 14%, Angola 14% and Cote d'Ivoire 7%.

Production in the period 1990-2000 has risen by 1.4%/yr in ECA, but is unchanged in WCA. In recent years (2000-2005) production has increased at 1.6-3%/yr from increased yields. Area planted has remained unchanged.

The importance of the banana and plantain in Africa is underscored by the priority rating these crops have been given by the sub-regional organizations like ASARECA and CORAF/WECARD, and particularly so in the ECA countries where Banana and plantain are in the top four commodity and factor research priorities.

**Annex 8**  
**Recommendations of the CCER of the Systemwide Program on Integrated Pest Management**  
**(Conducted May 2007)**

[All the Recommendations were accepted by the IITA Board and Management].

**Recommendation 1:** *The SP-IPM coordinator should prepare a short report indicating how cross-cutting research on IPM addresses CGIAR System Priorities.*

**Recommendation 2:** *The cross-cutting approaches used in the SP-IPM Medium-term Plan for 2007-09 should be used as the basis for further research planning.*

**Recommendation 3:** *The Program should develop clear criteria for identifying a limited number of new thematic areas of research in which there is clear added value to the majority of the partners.*

The governance and management of the SP-IPM were reviewed with regard to structure and membership of governance and operational arms, roles and responsibilities and implementation mechanisms.

The structure and membership of the operational arms of the SP-IPM have evolved from a community of practice to a formalized Steering Committee and IIWG. Currently both bodies have overlapping membership and include CG and non-CG partners. The review team considers that the Steering Committee has more members than needed to perform its essential functions and be representative and effective. The merit of having an independent Chair of the Steering Committee should be considered. The roles and responsibilities of the governance and operational arms of the SP-IPM were revised and further formalized at the 2007 Steering Committee meeting. The lack of TORs for the IIWG needs to be addressed. The team also feels that the confusion regarding the equity of non-CG members needs resolution. Restricting the Steering Committee to exclusively CG members is unlikely to continue to foster the open and willing exchanges enjoyed in the past. It is also likely to be a disincentive for non-CG members to participate even in the IIWG. The added emphasis on policy analysis in the MTP 2007-2009 will require this expertise to be represented in the IIWG. The development of TORs for the Convening Center and its Board of Trustees has strengthened the governance of the program. The critical positions for effective and efficient functioning of the SP-IPM are considered to be the Chair of the Steering Committee and the Coordinator. Ideally, the Chair and the Coordinator should have global IPM vision and international reputations in IPM to enhance the profile of the program and to give it stronger visibility in the CG and the donor community. Resource mobilization is considered to be one of the most important responsibilities of both the Chair of the Steering Committee and the Coordinator.

**Recommendation 4a:** *If the SP-IPM continues with the existing structure, it is recommended that it carefully considers the membership of the Steering Committee and IIWG whereby all significant partners can participate in the processes of program planning and priority setting and decision-making is inclusive, fair and transparent.*

**Recommendation 4b:** *It is recommended that the SP-IPM resolves the current confusion and carefully considers the merit of a smaller but representative Steering Committee (largely elected on a rotational basis from members of the IIWG) to enhance the effectiveness and transparency of decision-making processes and resource allocation.*

**Recommendation 5:** *It is recommended that the SP-IPM considers seeking a Chair who is not associated with either a CG or a non-CG member for greater independence in decision-making. For enhancing the profile of the*

*SP-IPM, it would be desirable to seek a person with an international reputation in IPM. With the enhanced emphasis of the SP-IPM on policy analysis, it is also recommended that a member with policy analysis expertise be invited to join the IIWG.*

**Recommendation 6:** *It is recommended that the SP-IPM should develop TORs for the IIWG to highlight its roles as a discussion and priority-setting forum and clearly distinguish its responsibilities from those of the Steering Committee with which it currently shares many members. It is also recommended that annual evaluation of the Chair be included in the TORs of the Steering Committee and the evaluation report should also be forwarded to the Convening Center.*

**Recommendation 7:** *It is recommended that the SP-IPM take account of the suggestions made concerning the required qualities of both the Chair of the Steering Committee and the Coordinator when recruiting for these positions in 2007. It is also recommended that the responsibilities of the two positions for resource mobilization should be greatly enhanced. In addition, the Chair and the Coordinator should consult with existing donors to the SP-IPM on what they expect from the program.*

As part of the revival process of the SP-IPM, an externally facilitated workshop should be organized in 2007 to discuss the recommendations of the CCER and the EPMP and to effectively operationalize those recommendations on focus, value-addition, substance and process including: improved research planning and priority-setting processes including necessary capacity building; transparent funding allocation to program activities; innovative funding streams; a phased resource mobilization plan; and accepting and operationalizing the MTP 2007-2009.

**Recommendation 8:** *It is recommended that as part of the revival process the SP-IPM implements an externally facilitated workshop in 2007 to discuss the recommendations of the CCER and the EPMP and to effectively operationalize those recommendations on focus, value-addition, substance and process.*

**Recommendation 9:** *It is recommended that the SP-IPM gives urgent attention to improving its priority setting processes and focuses on no more than three key priority themes during the revival phase. In order to achieve a more equitable, demand-driven and transparent process, external facilitation of priority-setting may be needed initially.*

**Recommendation 10:** *It is strongly recommended that a transparent procedure on 2007 funding allocation be urgently agreed among SP-IPM members based on a) achievement of the outputs in the approved MTP 2007-2009 log-frame, b) start-up development of a selected and further prioritized group (no more than 3) of the identified emerging R4D and c) other activities recommended by this review e.g. facilitated capacity building workshops for SP-IPM members. It is also recommended that the SP-IPM seek more innovative and transparent ways of funding its activities based on proven examples used in other system-wide programs.*

**Recommendation 11:** *It is recommended that the SP-IPM urgently develops a phased resource mobilization plan based on focused and realistic outputs to re-build the program and, especially, on donor intelligence.*

Based on the Science Council ruling of 2005, the SP-IPM now reports both technically and financially through the Convening Center, IITA. Unfortunately, this has fostered a perception that the SP-IPM is an IITA program. To avoid such perceptions, activities supported by the SP-IPM in individual centers should be attributed to the program in all reports. In addition, reporting to the current donor SDC must be improved.

**Recommendation 12:** *To avoid further misconceptions and confusion of attribution, it is recommended that the SP-IPM should identify centers involved in all inter-center activities in its reports and in the rolling MTPs*

*and that individual centers explicitly acknowledge support from the SP-IPM in their reports and rolling MTPs. It is also recommended that the SP-IPM Coordinator clarifies future reporting requirements with SDC.*

Apart from the EPMP, annual meetings of the Steering Committee and the IIWG appear to be the only other opportunities for monitoring project activities. Currently, a robust internal system for monitoring and evaluation is lacking in the SP-IPM. The team feel that internal monitoring should be an important responsibility for the Coordinator through site and partner visits. However, this needs to be embedded in a SP-IPM monitoring and evaluation system.

**Recommendation 13:** *It is recommended that the SP-IPM builds an effective internal monitoring and evaluation system that will accommodate on-going monitoring and formative evaluation of both program management and research progress as well as ex ante and ex post evaluation of projects to demonstrate links between research and poverty alleviation. It is also recommended that the SP-IPM contract a consultant to help to develop and establish such a system in the program.*

There are some good examples of CGIAR pest management and IPM research which have resulted in significant impact. There has been limited assessment of the impact of technical interventions in the SP-IPM to date from either projects and/or pilot sites.

The review team believes that there may also be evidence of significant impact from work conducted at some of the SP-IPM pilot sites. Benefits appear to have been greatest at the Morocco pilot sites. Studies are needed in 2007 to capture this potential impact.

**Recommendation 14:** *It is recommended that priority should be given to impact assessment in those pilot sites where significant achievements appear to have been made e.g. Morocco and Kenya. It is also recommended that - funding permitted - the SP-IPM should initiate actions to ensure that as much as possible is achieved by the program in 2007 to contribute to future outputs in the MTP 2007-2009 through investment in appropriate activities as outlined above.*

#### Options to pursue the SP-IPM in future.

A new rolling MTP for 2008-2010 will be submitted to the Science Council in 2007. Firstly, it is hoped that the timing will allow the critical recommendations made by the CCER and EPMP to be included so that there is initial buy-in and ownership by SP-IPM members and the revival process can proceed rapidly. Secondly, the team strongly feels that the MTP 2007-2009 effectively captures the concept of *adding-value* to center and global IPM activities and should be given a chance to be further operationalized. This is considered to be the best option for pursuing the SP-IPM in future. The added value is targeted at key bottlenecks especially on methodology. This area is supported by the SDC. In addition, the generic outputs on impact assessment, policy, communication and advocacy allow new areas of work i.e. new themes to be accommodated easily without major changes to the logframe from one year to the next.

**Recommendation 15:** *It is recommended that the SP-IPM accepts the MTP 2007-2009 as a rolling MTP during its remaining lifetime, with modifications for specific activities (e.g. a limited number of new R4D themes), as it effectively captures the concept of adding-value to center and global IPM activities.*

A sequence of actions for full revival of the SP-IPM to a functional system-wide program in 2008 is provided.

## Annex 9

### Description of the thrust and achievement of the crop breeding program at IITA, 2001-2006.

#### 1. Cassava

##### 1.1. Program Thrust:

**Geographical Focus:** Humid forest, moist savanna, dry savanna and midaltitude agroecological zones.

##### **Major constraints addressed:**

**Biotic:** Cassava mosaic disease (strains & variants), Cassava brown streak disease, bacterial blight, root rots, anthracnose disease, green mite and root and tuber scale.

**Abiotic:** Soil acidity, soil fertility, drought.

**Nutritional:** Root dry matter/starch content, mealiness (cooking quality), cyanide content, and beta-carotene and protein contents.

**Others:** Postharvest physiological deterioration (PPD).

##### **New Opportunities:**

- Industrial and diversified uses (e.g. high root starch content, starch quality such as waxy starch, and high sugar content for bio-ethanol production)
- Livestock feed (e.g. high root and foliage yield and protein content).

##### 1.2 Major Linkages:

**NARS:** 19 NARS in West and Central Africa: \*EARRNET (9 NARS in East Africa), and SARRNET (12 NARS in Southern Africa), EMBRAPA and IAC in Brazil.

\*DR Congo and Tanzania common to both EARRNET and SARRNET

**ARI:** University of Copenhagen, German Collection of Microorganisms and Cell Cultures (DSMZ), Plant Virus Division, Braunschweig, Germany), Ohio University, Donald Danforth Plant Science Center (Mo), Swiss Federal Institute of Technology, Zurich (ETH), Joint FAO/IAEA Agriculture and Biotechnology Laboratory of the International Atomic Energy Agency, Austria, HarvestPlus Challenge Program (Consortium of universities and research institutions worldwide), BioCassava Plus of the Grand Challenges in Global Health initiative (Consortium of universities and research institutions worldwide), and Generation Challenge Program (Consortium of universities and research institutions worldwide).

##### 1.3 Program Achievements

**No. cultivars released:** 48 varieties in 12 African countries (See appendix 1 attached).

**No. cultivars registered:** -

**No. cultivars deployed:** (area if known): -

**No. journal publications:** 268

- Journal Article: 62
- Book Chapters: 2
- Edited Conference Proceedings: 28
- Monographs: 2
- Manuals and Technical Bulletins: 6
- Invited Conference Papers: 12
- Conference/Workshop papers: 37
- Abstracts and Newsletters: 115

Appendix 1. Official varietal releases of improved cassava by NARS between 2001 and 2006:

Year	Country	Variety name	No.	Source material
2002	Sierra Leone	SLICASS 1, SLICASS 2, SLICASS 2, SLICASS 4, and SLICASS 5	5	IITA seed populations
2002	Central African Rep	+TMS 91/02322 and TME 1	2	IITA tissue culture clones
2002	Gambia	TMS 89/00959, TMS 90/01204, TMS 91/02312, and TME 12	4	IITA tissue culture clones
	Guinea Conakry	TMS 92/0057, 91/0730, 92B/0033, and TME 12 (Tokunbo)	4	
2002	Malawi	CH92/077 (Sauti) and CH92/112 (Yizaso)	2	IITA seed populations
2002	Togo	TMS 92/0326	1	IITA tissue culture clones
2003	Burkina Faso	TMS 91/02312, TMS 92/0067, TMS 92/0427, TMS 92/0325 and TMS 4(2)1425	5	IITA tissue culture clones
2003	Ghana	TMS 91/02327, TMS 91/02324, and TMS 92/0427	3	IITA tissue culture clones
2004	DR Congo	TMS 95/0211 (Disanka), TMS 95/0528 (Mvuazi), TMS 96/0160 (Nsansi), MV 99/0395 (Butamu), MV 99/0038 (Zizila), MM 96/0287(Liyayi), and MM 96/7204 (Namale)	7	IITA tissue culture clones and seed populations
2004	Swaziland	Clones 160, 48 & 65, TMS 92/0326, and Rushinga	5	IITA tissue culture clones and seed populations
2005	Benin	TMS 91/02322 (Manina), TMS 92B/00061(Ina – H), TMS 92/0427(Ina – Premier), and TMS 92/0067 (MR-67)	4	IITA tissue culture clones
2005	Ghana:	TMS 97/4962 (Abglifa), TMS 97/4414 (Bankyehemaa), TMS 97/3982 (Esam bankye), and TMS 97/4489 (Doku duade)	4	IITA tissue culture clones
2005	Nigeria	TMS 97/2205, TMS 98/0505, TMS 98/0510, TMS 98/0581, and TME 419.	5	IITA improved clones
2006	Nigeria	TMS 92/0326, TMS 92/0057, TMS 96/1632, TMS 98/0002, and NR 87184.	5	IITA improved clones and seed populations
2006	Sierra Leone	TMS 92/0057 (SLICASS 6)	1	IITA tissue culture clones

\*TMS=Tropical *manihot* selection (IITA designation for improved genetic materials distributed as in vitro clones

TME=Tropical *Manihot eculenta* = Selection of IITA genetic stocks from landraces distributed as in vitro clones

Others are selections from IITA improved seed populations by NARS

### Major research breakthroughs:

- Seven additional sources of resistance to CMD identified in landraces collected from West Africa and used to diversify and heighten resistance for durable control.
- Shattering of cassava yield plateau through massive use of African landraces and Latin America germplasm (increased yields in many African locations by 50-100% even without the use of fertilizer).
- After three cycle of recombination and selection using existing IITA parents (baseline  $\beta$ -carotene -  $\sim 4\mu\text{g}$ ) and introduced beta-carotene germplasm from CIAT and Brazil for population improvement, promising clones were identified with as high as  $12\mu\text{g}$  of total carotene ( $>10\mu\text{g}$   $\beta$ -carotene) indicative of a high possibility of hitting the HarvestPlus target level for  $\beta$ -carotene content ( $15\mu\text{g}$ ) in cassava that will have biological impact on human nutrition.
- Significant advances in broadening the genetic base of cassava in Africa and producing over 400 improved cassava genetic stocks and breeding materials which combines enhanced CMD resistance with improved post harvest qualities, multiple pest/disease resistance, wide

agrocological adaptation and greatly improved yield potential (which may also be used directly as varieties) and shared with NARS.

- Increasing number of improved varieties released by NARS in major cassava producing countries of the cassava belt as a result of broadening the genetic base of cassava at IITA with Latin American germplasm and the increased use of African landraces in the breeding program.

## 2. Yams

### 2.1 Program Thrust

#### **Geographical Focus:**

Primary = West and Central Africa

Secondary = East and Southern Africa

Tertiary = Yam growing zones outside Africa

#### **Major constraints addressed:**

##### **Biotic:**

*Yam Mosaic Virus (YMV) genus Potyvirus,*

*Yam Anthracnose Disease (Colletotrichum gloeosporioides),*

*Nematodes (Scutellonema bradys and Meloidogyne spp.),*

*Yam tuber rots (Botryodiplodia theobromae, Aspergillus spp., Fusarium spp.)*

##### **Abiotic:**

Low soil fertility

##### **Nutritional:**

Low tuber micronutrient density

Tuber content of antinutritional factors (phytate and tannins)

##### **Others:**

Low tuber yields

Poor texture of cooked tuber in *Dioscorea alata*

Enzymatic browning of tuber

Key plant characteristics (e.g. tuber morphology) responsible for high labor requirement for cultivation

#### **New Opportunities:**

Expansion of yam cultivation and use in East and Southern Africa in partnership with selected NARS

Application of DNA markers in marker-assisted selection

Potential for interspecific hybrids between *Dioscorea rotundata* and *D. alata*

## 2.2 Major Linkages

<b>Organization</b>	<b>Role</b>
<b>NARS</b>	
Center National de Recherche Agronomiques (CNRA), Côte d'Ivoire	Development of improved germplasm; testing rapid propagation techniques; training; and linkage with extension and private sectors
Savanna Agricultural Research Institute (SARI), Ghana	Development of improved germplasm; testing rapid propagation techniques; training; and linkage with extension and private sectors
Crops Research Institute (CRI), Ghana	Development of improved germplasm; testing rapid propagation techniques; training; and linkage with extension and private sectors
Institute Togolais des Recherches Agronomique (ITRA), Togo	Development of improved germplasm; testing rapid propagation techniques; training; and linkage with extension and private sectors
Institut National des Recherches Agricoles du Bénin (INRAB), Benin	Development of improved germplasm; testing rapid propagation techniques; training; and linkage with extension and private sectors
Institut National d'Etudes et de Recherches Agricoles (INERA), Burkina Faso	Development of improved germplasm; testing rapid propagation techniques; training; and linkage with extension and private sectors
Institute of Agricultural Research (IAR), Sierra Leone	Development of improved germplasm; testing rapid propagation techniques; training; and linkage with extension and private sectors
National Root Crops Research Institute (NRCRI), Nigeria	Development of improved germplasm; testing rapid propagation techniques; training; and linkage with extension and private sectors
Institute of Agricultural Research and Training (IAR&T), Nigeria	Development of improved germplasm; testing rapid propagation techniques; training; and linkage with extension and private sectors
State Agricultural Development Projects (ADP), Nigeria	Development of improved germplasm; testing rapid propagation techniques; training; and linkage with extension and private sectors
Institute for Agricultural Research & Training (IRAD), Cameroon	Development of improved germplasm; testing rapid propagation techniques; training; and linkage with extension and private sectors
Kizimbani Research Station, Ministry of Agriculture and Natural Resources, Zanzibar	Development of improved germplasm; testing rapid propagation techniques; training; and linkage with extension and private sectors
Jomo Kenyatta University of Agriculture and Technology and Kenya Agricultural Research Institute (KARI)	Studies on the distribution, diversity and conservation of yam species in Kenya; training of postgraduate students
University of Cocody, Cote d'Ivoire ; and Center Suisse de Recherches Scientifiques (CSRS) en Côte d'Ivoire	Development of improved yam germplasm; and testing of technologies for rapid propagation of clean planting materials
Bowen University, Nigeria	Characterization of Nigerian yam landraces for food and nutritional attributes
University of Ibadan, Nigeria	Research on interspecific hybridization; training of postgraduate students

Michael Okpara University of Agriculture, Nigeria	Molecular characterization of yam germplasm; training of postgraduate students
Kwame Nkrumah University of Science and Technology, Ghana	Molecular characterization of yam germplasm; training of postgraduate students
Copperbelt University, Zambia	Collection, maintenance and characterization of local yam germplasm
West Africa Seed Network (WASNET)	Facilitation of sub-regional priority setting and information exchange on the seed sector
<b>ARI</b>	
Center de coopération Internationale en Recherche Agronomique pour le Développement (CIRAD), Benin	Molecular analyses of yam biodiversity ; field evaluation of yam germplasm
Virginia State University, USA	Development of ESTs
University of Reading, UK	Collaborative studies on yam flowering and tuber dormancy

### **2.3 Program Achievements**

**No. cultivars released:** 8 official releases (7 in Nigeria and 1 in Ghana);

[Nigeria: TDr 89/02677, TDr 89/02565, TDr 89/02461, TDr 89/01438, TDr 89/01213, TDr 95/01924, TDr 89/02665

Ghana: TDr 89/02665]

**No. cultivars registered:** 0

**No. cultivars deployed:** The area covered has not been determined but our varieties are grown by several farmers (with or without official release) in at least the following countries: Ivory Coast, Ghana, Togo, Benin, Nigeria, Cameroon, Tchad, Sierra Leone, Guinea, Uganda, Zanzibar, South Pacific Islands, and Colombia

**No. journal publications:** 25

**Major research breakthrough:** High levels of host plant resistances to the two main diseases – Yam Mosaic Virus and Yam Anthracnose Disease

## **3. Maize**

### **3.1 Program Thrust:**

#### **Geographical Focus:**

Lowland and to a lesser extent, mid-altitude locations of West and Central Africa.

#### **Major constraints addressed:**

##### **Biotic:**

*Striga*, stem borers, diseases (ear rot, maize streak virus, downy mildew, curvularia leaf spot , blight, and rust)

##### **Abiotic:**

Drought and low soil nitrogen

**Nutritional:**

QPM, Aflatoxins, Vitamin A, Iron and Zinc,

**Others:**

End-user preferred traits – earliness for double planting and filling the hunger gap, floury grain type.

**New Opportunities:**

- i. Multiple stress tolerance (drought, low-N, *Striga*, stem borers)
- ii. Nutrient dense maize (QPM, Vita A, Iron and Zinc)
- iii. New breeding approaches – use of markers for rapid selection
- iv. Specialty corn for peri-urban areas for income generation
- v. High grit yield for the brewery industry
- vi. Catalyze establishment of viable seed sector to improve adoption of improved varieties and hybrids

**3.2 Major Linkages:**

NARS: All the 21 CORAF/WECARD member countries of WCA

**ARI:**

- i. Collaboration with the Purdue University to adapt laboratory bioassays to identify different pre- and post-attachment mechanisms of resistance to *Striga*.
- ii. In collaboration with IITA, SRRC-USDA-ARS Louisiana has invested considerable amount of resources and effort to combat the problem of ear rot and the associated aflatoxin contamination in maize.
- iii. USDA-ARS at Ithaca has a collaborative research with the IITA Maize Program to assess the suitability of an in vitro digestion model (Caco-2 cell model), which mimics the human digestive system, for determining iron bioavailability in maize.
- iv. To confirm the usefulness of Caco-2 cell model for predicting bioavailability, another collaborative research was undertaken with USDA-ARS Grand Forks Human Nutrition Center using single meal trials with women.
- v. A collaborative research between IITA and University of Illinois has been initiated to identify and characterize genes that are expressed under sub-optimal soil nitrogen.
- vi. In collaboration with the University of Illinois, IITA has accessed inbred lines with high levels of pro-vitamin A carotenoids for use as donor parents for increasing the levels pro-vitamin A content in adapted germplasm.

**3.3 Program Achievements****No. cultivars released:**

- 9 OPVs
- 6 hybrids

**No. cultivars registered:**

78 inbred lines.

**No. cultivars deployed:**

More than 15 cultivars are currently being grown by farmers in different countries of WCA without formal release. For example, in Nigeria, two extra early STR cultivars (2000 Syn EE-W and 99 TZEE-Y STR), drought tolerant cultivars, TZDT Syn-W and TZE-Comp 3 DT and the stem borer resistant cultivar, Ama TZBR-W are being grown without formal release. More than 1.2 million kg commercial seed of these deployed varieties have been produced for four years, enough for planting 60,000-70,000 hectares.

**No. journal publications:**

52 articles published.

**Major research breakthroughs:**

- i. Maize varieties having >15% more yield than standard checks have been developed and promoted in WCA.
- ii. Recurrent selection for tolerance to low soil-N increased grain yield in one of the populations by 147 kg ha<sup>-1</sup> cycle<sup>-1</sup> at 0 kg N ha<sup>-1</sup> and 116 kg ha<sup>-1</sup> cycle<sup>-1</sup> at 90 kg N ha<sup>-1</sup>.
- iii. A new generation of late maturing drought tolerant varieties, whose productivity exceeds that of a common farmers' variety, TZB-SR, in the savannas by 40-60% are currently under test. Hybrids have also been developed from drought tolerant inbred lines that produce 42-128% more grain under drought stress than a widely grown commercial hybrid (Oba Super II) in Nigeria.
- iv. Evaluation of new cycles of selection other populations improved for resistance to stem borers under artificial infestation with *Sesamia* and *Eldana* revealed an average yield gain of 7% from recurrent selection.
- v. Recurrent selection under artificial *S. hermonthica* infestation has significantly improved *Striga* damage rating, number of emerged *Striga* plants and grain yield under *Striga* infestation in two broad-based populations. The realized gain from selection for grain yield under *S. hermonthica* infestation was 14% per cycle in the intermediate and 26% per cycle in the late populations. The different extra-early, early and late maturing populations have been sources of varieties and inbred lines with consistently high levels of resistance to *S. hermonthica* across locations and seasons. Extra-early- and early- maturing *Striga* resistant maize varieties that sustain 14-43% less *Striga* damage, support 18-32% fewer emerged parasites and produced 1.0-1.8 ton per hectare more grain under infestation than the respective susceptible variety have been developed from source populations
- vi. Herbicide resistant hybrids have been developed. Most of the herbicide resistant hybrids were competitive to a commercial hybrid, Oba Super I, in yield potential in *Striga*-free plots. The herbicide resistant hybrids producing 2.5-5.5 ton per hectare grain with seed treatment in *Striga* infested plots, while the commercial hybrid did not produce any grain yield with seed treatment.
- vii. Diversity analysis of 41 *Striga* resistant maize inbred lines was conducted with AFLP and SSR markers to examine the genetic relationships among these lines and to determine the level of genetic diversity that exists within and between their source populations. Genetic similarities among all possible pairs of inbred lines varied from 0.45 to 0.95, with a mean of 0.61±0.002, for AFLPs and from 0.21 to 0.92, with a mean of 0.48±0.003, for SSRs. The inbred lines from each source population exhibited a

broad range of genetic similarity values with the two types of markers. Further analysis of genetic similarity estimates with the two markers revealed clear differentiation of the *Striga* resistant inbred lines into groups according to their source populations.

- viii. Three wild species and two QPM inbred lines, 21 inbred lines with high pro-vitamin A content, and 21 local collections have been introgressed into adapted breeding lines or populations.
- ix. Four extra-early, ten early and nine late maturing drought tolerant and/or *Striga* resistant varieties adapted to the lowlands have been converted to QPM and are being evaluated through regional or on-farm trials in partnership with the NARS of WCA and SG2000.
- x. Promising elite maize inbred lines with relatively high pro-vitamin A (4.5 to 9.8  $\mu\text{g g}^{-1}$ ), iron (24 to 42  $\text{mg kg}^{-1}$ ) and zinc (26 to 88  $\text{mg kg}^{-1}$ ) content identified.
- xi. Several promising S5 lines with aflatoxin values significantly lower than the respective US resistant recurrent parent or the elite tropical inbred parent have been selected for resistance-confirmation tests.

#### 4. Cowpea

##### 4.1 Program Thrust

**Geographical Focus:** Global mandate with more emphasis in the Sub-Saharan Africa.

**Major constraints addressed:**

**Biotic:**

- Insects:
  - o Aphid
  - o Thrips
  - o Maruca pod borer
  - o Complex of pod sucking bugs
  - o Bruchid
  - o Lygus (in US)
  - o Bean fly
  - o Ootheca beetles
- Diseases:
  - o Fungal diseases: anthracnose, web blight, brown blotch, Cercospora leaf sport, Septoria, scab and Macrophomina
  - o Viral diseases: cowpea yellow mosaic, cowpea aphid borne mosaic, blackeye cowpea mosaic, cowpea severe mosaic and southern bean mosaic
  - o Bacterial diseases: bacterial blight and bacterial pustule
- Nematodes:
- Parasitic weeds:
  - o *Striga gesnerioides* and *Alectra vogelii*

**Abiotic:**

- Drought:
  - o Intermittent moisture stress
  - o Terminal drought

- Low soil fertility:
  - o Low organic matter
  - o Low phosphorus
- Heat and cold

**Nutritional:**

- Micronutrient:

**New Opportunities:**

- Breeding for specialty foods
- Breeding for high protein and micronutrients
- Breeding for faster cooking

**4.2 Major Linkages**

**NARS:**

- ABU/IAR (Nigeria)
- INRAN (Niger)
- IRAD (Cameroon)
- INERA (Burkina Faso)
- SARI (Ghana)
- ISRA (Senegal)
- 

**ARI:**

- UVA (US)
- CSIRO (Australia)
- John Innes Center (UK)

**4.3 Program Achievements**

**No. cultivars released:**

79 cultivars released from 1985-2000  
IT99K-499-35 is released in Nigeri

**No. cultivars registered:**

19 cultivars registered (13 publications in Crop science)

**No. cultivars deployed:**

About 70 new advanced lines per year through Cowpea International Trials

**No. journal publication:**

More than 110 (articles, book chapter, abstracts...)

## **5. Soybean**

### **5.1 Program Thrust**

#### **Geographical Focus:**

Mid-altitudes, forest zones, Guinea and Sudan savannas

#### **Major constraints addressed:**

##### **Biotic:**

Diseases (bacterial pustule, frog-eye spot, rust, soybean mosaic virus) and insect pests (defoliators and pod sucking bugs)

##### **Abiotic**

Low P in some soils, mid-season low moisture stress

##### **Nutritional:**

Processing and utilization methods

##### **Others**

Ability to fix N<sub>2</sub>, lodging, pod shattering, high grain and stover yields (dual-purpose), capacity to stimulate germination of *Striga*, seed size and color, seed longevity

#### **New Opportunities**

Demand for soybean is increasing for food and feed (establishment of poultry farms and oil extraction businesses) in Africa. The role of soybean in improving soil health (fertility) is also making it a relevant legume in cereal dominated farming system of tropical Africa

### **5.2 Major Linkages:**

#### **NARS:**

Many NARS depend on IITA materials to develop varieties. In 2001 alone, 15 dual-purpose soybean lines with a grain yield of 2-2.5 t/ha and stover yields of 2.5-3.5 t/ha were supplied to collaborators in 21 National Agricultural Research and Extension Systems (NARES) in Africa, three in Asia, and one in the US. In 2002, 42 sets of soybean international trials involving 20 promising soybean lines were distributed to 36 collaborators in 21 countries on request. This collaboration is undertaken every year. A material selected from TGx 1835-10E developed at IITA was released in Uganda as a variety named MAKSOY 1N. This variety combines resistance to rust with resistance to pod shattering and lodging.

#### **ARI:**

IITA has initiated a collaborative project with USDA-ARS at the National Soybean Research Laboratory in the University of Illinois to develop soybean lines for resistance to soybean rust.

### **5.3 Program Achievements**

#### **No. cultivars released:**

4 [TGx 1910-11F (early), TGx 1905-2F (medium), and TGx 1910-8 (late)] and TGx 1835-10E (MAKSOY 1N)

**No. cultivars registered:**

TGx 1835-10E (MAKSOY 1N) in Uganda

**No. cultivars deployed: -**

**No. journal publications: 13**

**Annex 10**  
**Geographical foci of the breeding programs**

Cowpea	23
Soybean	1
Maize	78 inbred lines registered
	9 released OPVs
	6 released hybrids

Year	Country	Variety name
2000	Uganda	NASE 10, NASE 11 and NASE 12
2002	Sierra Leone	SLICASS 1, SLICASS 2, SLICASS 2, SLICASS 4, and SLICASS 5
2002	Central African Rep	TMS 91/02322 and TME 1
2002	Gambia	TMS 89/00959, TMS 90/01204, TMS 91/02312, and TME 12
2002	Malawi	CH92/077 (Sauti) and CH92/112 (Yizaso)
2002	Togo	TMS 92/0326
2003	Bukina Faso	TMS 91/02312, TMS 92/0067, TMS 92/0427, TMS 92/0325 and TMS 4(2)1425
2003	Ghana:	TMS 91/02327, TMS 91/02324, and TMS 92/0427
2004	Swaziland	Clones 160, 48 & 65, I92/0326, and Rushinga
2005	Ghana:	TMS 97/4962 (Abglifa), TMS 97/4414 (Bankyehemaa), TMS 97/3982 (Esam bankye), and TMS 97/4489 (Doku duade)
2005	Nigeria	TMS 97/2205, TMS 98/0505, TMS 98/0510, TMS 98/0581 and TME 419.
2006	Benin	92/0427 (Ina Premier), 92B/00061 (Ina-H), 91/ 02322 (Manina 91), and 92/ 00067 (MR-67)
2006	Sierra Leone	TMS 92/0057 (SLICASS 6)

In late 2006, an additional 5 varieties were also released in Nigeria.

Varietal Releases of a) cereals and legumes and b) root and tubers by IITA in the review period.

## Annex 11

### Natural Resource Management (NRM) Research at IITA over the past decade

**Status of natural resources related to agriculture in sub-Saharan Africa:** The agricultural environment in this region is characterized by declining soil fertility status, under-exploited water resources and aggressive weeds that are difficult to manage. Research on each of these falls within the IITA mandate, and management and conservation of natural resources is one of its major goals. Population increase is averaging 2.2% annually despite the ravages of AIDS, but annual percent increases in yield per unit area of mandated crops, with the exception of maize and soybean in WCA, and cassava and yams in ESA, are all less than this, and many are < 1% per annum. The panel is of the opinion that some key elements of NRM, especially nutrient management, have moved to the back burner of IITA's research agenda. Their continued neglect could see the soil resource of SSA irreparably damaged, while water resources remain unexploited. This paper draws heavily on an IITA-prepared paper on NRM provided to the panel.

#### A brief history of NRM research at IITA

Ten years ago scientists in NRM & Agronomy were part of the RCMD and were divided into two groups (humid forest and savanna systems) with several disciplines represented in each. The forest group studied primarily soil acidity and nutrient response, while the focus of the savanna group was animal-plant interactions, biological N fixation, P interactions, and Striga. There was little or no emphasis on fertilizers, since improvement of low input systems was the major goal. Agroforestry (maize-*Leucaena*) systems were developed, but were generally not adopted, and were followed by development of herbaceous legume systems (N fixation and forage). A CCER conducted in 2001 recommended that external inputs again be considered, so fertilizers and pesticides were combined with the best technologies of the previous years. The Humid Forest NRM team has since been disbanded, and the system-wide program, Alternatives to Slash and Burn has lost momentum in SSA. The Savanna NRM team, based in Kano, is now an integral part of the Grain Legumes and Cereals MTP Project.

Over the last decade NRM research has been focused around benchmark sites that were reference areas characteristic of major target areas (agroecological zones or megaenvironments). The extent of the extrapolation of results was then determined by using AEZ definitions, climate data, and GIS techniques. Recently the importance of benchmark sites has been de-emphasized. This was mainly because of their location (often isolated), the effort taken to characterize them, and factors that rendered them less representative of large areas than first supposed, resulting in significant genotype x environment interactions between them and parts of the target area. In several instances models based on benchmark sites suggested that some technologies would not be feasible (e.g. growth of *Mucuna* in the forest and transition zones), and have been proved wrong by farmers' experience. Nonetheless, they have proved useful in allowing IITA scientists to prioritize among production constraints based on the size of expected impact. The 5<sup>th</sup> EPMPR noted (p50) that "continued investment by IITA on leguminous cover crop trials, animal manures and crop residues would appear to be a case of diminishing returns", and suggested a shift in emphasis from experimentation to collation of "best bet" technologies based on existing data. The Panel therefore is interested in assessing if this suggestion has resulted in change.

## **A: NRM issues in the savannas, derived savannas and forest transition zone**

In the next decade it seems likely that savannas of WCA will be largely under continuous cultivation, so managing erosion, problem weeds, declines in soil organic matter (SOM) and nutrients, insect pests and diseases of cereals and legumes will be key to sustained and increased production. Opportunities for expanding crop area will be fewer. Many have regarded the savannas as the future key to large scale modernized food production in West Africa.

**Soil fertility:** The striking feature of SSA is the lack of fertilizer usage on the continent, which accounts for less than 1% of fertilizer usage globally. The average annual application rates over the cropped area are 8 kg/ha (regionally 16 kg/ha in southern Africa, 8 kg/ha in eastern Africa, and only 3 kg in Central Africa and 4 kg/ha in Sudano-Sahelian zone). This compares with 96 kg/ha in S and SE Asia, 101 kg/ha in south Asia, and 78 kg/ha in Latin America (Morris et al., 2007). In 2000 average cereal yields in SSA, E & SE Asia, S Asia and Latin America were 1.0, 3.4, 2.4 and 2.9 t/ha (FAOSTAT, 2007). Annual growth rates of yield between 1980 and 2000 were 0.7% in SSA, vs. 1.7 – 2.3% in other regions. The loss of SOM and fertility in the savannas is greater than in the forest, largely because of overgrazing, overpopulation, and the long history of annual burning of crop residues and forest. The 5<sup>th</sup> EPMR (p49) noted that “another well learnt, costly lesson is that low input systems without fertilizer have failed to provide adequate productivity gains in the resource-poor and degraded conditions that characterize much of SSA”. Low input systems are also low output systems. These low rates of nutrient addition have been accompanied by a sharp reduction or disappearance in fallows, deforestation and soil degradation. Nutrient mining is enormous, exceeding 30 kg nutrients/ha/yr on as much as 85% of the cropped land in SSA, and could reach 60 kg/ha on 40% of it – for a net loss of at least 4 million tons of nutrients annually in SSA (Morris et al., 2007; <http://www.africafertilizersummit.org/FAQ.html>).

Fertilizer usage in SSA grew rapidly in the 60s and 70s, but stagnated and fell in the 80s and 90s to its current level of 1.3 million tons/yr, in part because market reforms removed fertilizer subsidies. Despite the presence of raw materials (natural gas in Nigeria; rock phosphate in Togo), almost all fertilizer is imported, and shallow ports prohibit entry of large bulk carriers. There is no regional collaboration in ordering key fertilizers for smaller countries, nor is there evidence of regional strategies for importing specific nutrients. For example, there is little evidence for response to K of crops (with the possible exception of cassava) on West African alfisols, yet much is still imported as compound fertilizer (e.g. 15-15-15).

Zinc deficiency may be widespread on Guinea savannah soils, and as it worsens it reduces crop response to major nutrients. Zinc availability in alfisols is correlated ( $r \approx -0.6$ ) with soil organic matter level (SOM), so as this falls, zinc becomes more scarce. In many of the savannas SOM is now less than 1%. In general there is a gradient of increasing response to applied zinc from the forest through transition zones to the Guinea and Sudan savannas (Twumasi-Afriyie and Edmeades, 1983). Little or no zinc is added to compound fertilizers, however, despite its low cost/benefit ratio. In former times when vegetative cover was more adequate on the savannas, the area was often subject to annual fires, and elements such as S and N were volatilized. The loss of S was offset to some extent up till the 80s by the use of single superphosphate, but cropping intensity has increased in the last 20 years and fertilizer use has fallen away or been replaced with high analysis fertilizers that often do not contain S.

It is critical that a concerted effort be made to ensure a steady and timely flow of fertilizer to the Guinea and Sudan savannas at prices that are reasonably consistent year to year. In Nigeria the collapse of its two fertilizer manufacturing plants has been hastened by poor maintenance and an overt willingness to import fertilizer, a course of action that was dictated by interests other than those of farmers. A recent announcement that a 600,000 t/yr capacity urea plant will reopen in Nigeria ([http://www.africafertilizersummit.org/Online\\_Press\\_Room/NOTORE.pdf](http://www.africafertilizersummit.org/Online_Press_Room/NOTORE.pdf)) is welcome news, though its success will depend on it avoiding the traps of its predecessors that failed for “technical and managerial reasons”.

Key factors affecting low usage of fertilizer in SSA are its high farm gate price (low volumes; inefficient infrastructure; multiple fertilizer types; inefficient distribution network) and relatively high risk of uneconomic returns (climatic risk; market risk; untimely availability) (Morris et al., 2007). Biological responses to added nutrients, especially for maize and rice, are similar to those reported elsewhere, and because of the low base level of fertility, responses often extend to higher levels of application than Latin America or Asia. Fertilizer responses in cereals are high mainly because during their improvement over the past 50 years there has been selection for responsiveness, especially to N. Other traditional crops such as cassava, yams, and banana do not have a long selection history especially at high fertility levels, and show only modest responses to applied N. Yam production is declining on frequently farmed plots. Yams respond to fertilizer, though farmers are usually afraid fertilizer will damage yam quality. Additional yam research is needed, since yams are quite nutrient demanding, yet when grown under N they may produce excess vines and leaves and fewer tubers, suggesting they are poorly adapted to high levels of N. Little or no fertilizer is used on breeding plots of yam and cassava at IITA today, and testing of cassava progenies under different fertility levels is confined to 1-2 replicates of a 3-4 replicate yield trials grown under each of two fertility levels (A. Dixon, pers. comm., 2007).

The limitation of fertility dwarfs other constraints, and is worsening. SOM reductions over time have been modeled and well documented, and the role of SOM as the major source of soil nutrients and in helping retain soil moisture has been recognized. SOM concentration is extremely low in the savannas, and is often less than 1%. Low SOM also allows soil pH to fall rapidly when acidifying inorganic sources of N are used, and this induces further micronutrient deficiencies. Perhaps because it is assumed that biological N fixation (BNF) will supply adequate N, most of IITA's recent research has focused on the role of P in crop production, despite N being significantly more limiting than P to non-legume production. P availability is critical, since this nutrient has to be supplied externally. The possible use of rock phosphate as a source of P has been extensively examined, though ICRAF research suggests that a P-scavenging species such as *Tithonia* may be needed to extract P from this source in sufficient quantities. Legumes apparently make P more available to cereals in a legume-cereal rotation. The role of P in enhancing legume growth and N fixation has been extensively evaluated over the last decade, and a screen developed for identifying cowpea and soybean lines that perform well under low soil P status. Important and useful research has been conducted on improvements to BNF, through identification of improved strains of *Bradyrhizobium*. However, promiscuous nodulation of soybean by indigenous rhizobia has created a situation where nodulation occurs but N fixation is not efficient, and N fixation often barely meets the needs of the legume itself.

IITA research has established that farm yard manure (FYM) applications have little effect on soil P status, but boost crop yield, suggesting that this scarce but valuable resource supplies mainly N and additional SOM. Unfortunately FYM is bulky and of variable quality. As an example of an

improved technology for SOM generation, maize when intercropped with cowpea or groundnut can produce ~ 8 t/ha of crop residues (or 3.5 t/ha of manure) annually. Unfortunately the quality of stover for SOM or forage is usually inversely proportional to grain yield, though varieties with good “staygreen” may prove the exception. Cover crops such as *Mucuna* and *Puereria* that boost cereal yield have been identified, but offer no edible by-product to serve as an additional return for the water they use during growth. In general cover crops have given a better economic return in cassava than in maize in the transition zone, though the N contained in the cover crop has not proven to be important to maize growth in that ecology.

In summary, the combination of all reasonable sources of organic fertilizers with modest levels of appropriate forms of inorganic fertilizer has enhanced the responses from each. Cereal production will become increasingly important in SSA as population pressure and demand for animal feeds increase. As a rough rule of thumb, and based largely on on-farm yield data from Ghana, nutrients for cereal production in West Africa rank in importance as: N>> P, Zn > S, K. For grain legumes the rank would be P>> N, Zn, S. This, however, is subject to confirmation by careful assessment of existing literature and recent crop response information that reflects increasing levels of nutrient exhaustion on the more representative savannas in northern Nigeria. Zinc and sulfur deficiencies have been reported in the Guinea savannah, but not systematically evaluated across large areas.

Previous research conducted by IITA scientists has established the roles of soil erosion and nutrient mining on nutrient depletion in West African soils. IITA’s research on soil fertility over the past 10 years has been well documented in peer reviewed journals, and can be classified as a mature research area. It recognizes the limitation caused by low crop nutrient status, based mainly on research conducted by IITA in the 70s and 80s, but has not actively addressed the issue from all available fronts. Over 20 articles have been published in peer review journals on factors governing N and P availability over the past 5 years. Research data from the first 25 years of research (up till 1999) were summarized as scholarly publications in a special issue of the Soil Science Society of America (Tian et al., 2001), but this is not in a form that the fertilizer industry or policy makers could easily use, nor is the summary by nutrient and crop.

#### Concerns:

- IITA-led strategies for promoting an upward spiral in yields, fertilizer use, and soil fertility are not apparent. Without any nutrient additions, cereal yields are ~1 t/ha, and variability and risk remain high. Consequently, the value of using improved input-responsive germplasm such as maize hybrids cannot be realized at the farm level, and the seed and input sectors struggle to establish. Can IITA play a part in alleviating a constraint that has complex causes and is continent wide? The NEPAD-sponsored Africa Fertilizer Summit in Abuja in 2006 has resulted in a set of resolutions that may result in coordinated regional efforts to stabilize fertilizer prices through tax reduction, coordinated regional ordering or raw materials, and the establishment of a financing mechanism. It encourages the establishment of a network of dealers, and has as its goal an increase in fertilizer usage from the current level of 8 kg/ha/yr to 50 kg/ha/yr by 2015. IITA should be fully involved in designing and supporting this strategy.
- Does further research by IITA have a role? Identification of genotypes efficient in the use of specific nutrients (N, P) is already underway, and should be expanded so all improved germplasm is characterized for response to key nutritional constraints. Secondly, the determination of the role of micronutrients, especially Zn and S, in reducing nitrogen use efficiency must be a high priority, since these can be expected to

worsen rapidly as use of NPK fertilizers begins to rise. SOM is continuing to fall, and micronutrients are increasingly scarce. Thirdly, the evaluation of crop nutrient status by remote sensing (e.g. SPAD chlorophyll meters; Greenseeker technology; satellite imagery) provides information that can be used to identify regions and even portions of fields with a quantified level of deficiency. This is of value to anticipating yield losses due to N deficits and providing a timely management response. Fourthly, and most importantly, we believe that advocacy based on a solid basis of science has an important part to play. Fertilizer use will be attractive to farmers if the biological response is high, the ratio of fertilizer price to output product price is low, and if value cost ratio is high.

- Needed is a comprehensive summary documenting the fertility responses and risks imposed by the environment and markets on IITA mandate crops over the past 35 years, to serve as a factual basis for policy formulation. This level of documentation, representing the combined efforts of soil scientists, agronomists, socioeconomists and modelers, does not currently exist in a form that can be easily used by policy makers and fertilizer manufacturers. The document should culminate in estimates of returns to specific nutrients, document and map the extent of responses, and lead to a recommendation of the 3-6 basic fertilizer formulations that can be imported in bulk or manufactured locally. IITA has an international mandate for its target crops within SSA, and advocacy for regional cooperation in manufacturing, importing, and distribution of fertilizers across megaenvironments should be exercised. Such advocacy has been effectively used within Nigeria to establish cassava as an industrial feedstock, and could be used to address fertilizer pricing and supply. Accurate advice to the fertilizer industry will be needed for the savanna zone. The summary document, supplemented by on-farm studies, and evaluation of “best-bet” technologies in fertility maintenance, and measures of SOM depletion and regeneration will position IITA well to provide that advice over the next 5-10 years.
- Breeding of key crops, including yams and cassava, should be conducted under at least two levels of fertility (farmers’ conditions (low) and ~100-150 kg N/ha (high)). Selection only under low fertility results in improved varieties that respond to applied fertilizer by producing luxuriant vegetative growth, misshapen roots or tubers, or increased susceptibility to diseases and pests. Improved crop nutrition will ultimately come to farmers’ fields in this region, and now is the time to select cultivars for this environment.
- Socioeconomic constraints to fertilizer use have been recognized, yet apparently not well documented.

## **Soil water**

Water deficits reduce crop production in the second season of bimodal rainfall distribution areas, and are more severe in soils low in SOM. Global climate change will likely increase variability of rainfall events, increase evapotranspiration and possibly reduce the rainfall amount. IITA’s crop breeders have focused on improving drought tolerance, some in collaboration with CIMMYT, and we endorse and encourage this effort. Other reviews (CIDA, final project review, Drought Tolerant Maize Varieties) have called for an increased effort in water harvesting technologies in the Sudan savanna. Collaboration with projects that have this as their primary goal is to be encouraged.

### Concerns:

- We see little reference in NRM literature over the past decade to strategies that increase water use efficiency on target crops under rainfed or irrigated conditions. Large scale

irrigation schemes will eventually be required, though current levels of management of existing schemes suggest their success may be elusive. Nonetheless, research investments on irrigation management, research on water use efficiency by crop within common cropping systems will provide the database of crop response needed to rationalize the use of this scarce resource.

## Soil physical conditions

### Concerns:

- We see no reference to changes in soil compaction, but this is one of the constraints to reduced or zero tillage technology in the savannas where the alfisols can settle into a hard compacted mass. Tillage seems essential in this zone, and the gathering of a mound of soil or a ridge for planting provides more nutrients close to the developing plant.
- There are few references to soil acidity – how it can be altered rapidly in poorly buffered low SOM soils, and what effects on pH result from applied N generally, and specific forms of N in particular (e.g. ammonium sulfate). Are high levels of aluminum a constraint to crop production, and if so where? Is there a response to lime? Is lime available, and at what price?

## Weed management

Farmers in Africa normally will plant a greater area than they can weed adequately, so poorly weeded crops are often observed. Herbicide use in SSA is very low. Two of the world's worst weeds (*Striga hermonthica*; *Imperata cylindrica*) provide immense management challenges to crop producers in the savannas and derived savanna zones. Other weeds such as *Rottboelia exaltata*, *Chromolaena odorata*, *Cyperus rotundus*, and *Eragrostis* and *Panicum* spp can also be severe in specific areas, especially in the forest margins, and are most effectively controlled by using herbicides. Fallows have traditionally been used to control weeds, but these are disappearing under intensification. Soil fertility and weed depredations are linked through plant competition - *Striga* is a more severe problem under low soil fertility, and under higher levels of fertility crops such as maize and cassava can be planted at higher densities and out-compete many of the weeds that are problems in infertile fields. (*Striga*-related issues are considered in more detail under Cropping Systems in this paper). Availability of herbicides is limited to relatively high yield potential areas, and suffers from similar constraints to fertilizer distribution and use.

During the last decade IITA scientists have made significant progress in non-herbicide control methods for major weeds, though herbicide options remain the most effective and are generally favored by farmers for *Imperata*. Herbicide options have been shown to be cheaper (lower labor requirements) and to provide better weed control than manual weeding options, though intercropping is often ruled out by herbicide treatments. Rotations can be threatened when herbicides with residual activity such as triazines are used. However, IITA research has shown that newer herbicides such as nicosulfuron are effective against *Imperata* in maize fields. Other cultural control measures for crops adversely affected by herbicides have included the use of aggressive legume cover crops (*Mucuna cochinchinensis*) to deplete rhizome biomass of *Imperata* before planting of cassava or maize. Integrating tillage, herbicide, optimum plant density and cover cropping has given good control of *Imperata*.

Green manure cover crops (*Mucuna*, lablab, pigeon pea, *Centrosema*, *Crotolaria*, *Pueraria*) used during fallows have also been shown to reduce significantly weed seed banks and *Imperata* rhizome biomass, provided there is sufficient rainfall to ensure a complete vegetative cover. Intercropping maize or cassava with cover crops led predictably to yield reductions due to competition from the cover crop, though the cover crop was more easily controlled than the *Imperata*. IITA scientists have shown that reductions in maize yields from competing weeds have been proportionally more severe when water was scarce, but that drought tolerance of maize hybrids also resulted in a greater tolerance to weed competition. In a useful cross-center research study the emergence of weeds (*Imperata* and *Ageratum conyzoides*) in relation to crop growth was modeled by IITA and IRRI scientists. Output can be used to predict optimum timing of manual weed control independently of the planting date of the target crop.

#### Concerns:

- In the majority of weed control studies undertaken by IITA scientists over the past 5 years the target crop has been maize, and occasionally cassava. Little or no mention was made of research targeting weed control in cowpea, soybean, yam and *Musa*, or in more complex intercropping systems. We acknowledge that few herbicide options exist specifically for cassava and yams, and cultural management of weeds is more complex. However, weed control in these crops adds greatly to the labor burden, and merits further efforts.
- There was little evidence of in depth socioeconomic analysis that guided the potential adoption of the technologies evaluated. Net benefit analysis usually indicated that the use of herbicides such as glyphosate and nicosulfuron for *Imperata* control was cheaper than intercropping with cover crops or manual weeding. But were the opportunity costs of growing a green manure cover crop vs. application of fertilizer or growing a crop providing directly usable yield from the same land, nutrient and water resources adequately estimated?

### **Cropping Systems**

There is a wide diversity of cropping systems, largely defined by the physical environment, farmer preferences and market signals. In general the commodity chain approach has proved to be more useful as a unifying research and extension theme than a specific cropping system *per se*, and is now widely used by IITA. Alley cropping, a major research theme and cropping system developed by IITA in the 80s, has largely been abandoned because of poor adoption, though a comprehensive analysis of the causes of this failure was not made available to the EPMR. A major failure in uptake of alley cropping involving maize, cassava and *Senna spectabilis* is concerning (S. Cameroon) – it seems to reflect inconsistent benefits that in turn probably reflected varying levels of water availability.

Current research emphasis has been on cereal-legume systems in the natural and derived savanna zones. Much of IITA's recent research has focused on the control of *Striga*, since about 2/3 of fields in the savanna zones of WCA and many mid-altitude locations in ESA are infested with this weed that parasitizes maize, sorghum or cowpea (each crop is favored by a different *Striga* species). Like other weeds, the competitive ability of the crop is key to minimizing its damage, so rapid ground cover (adequate fertility and appropriate planting density) will reduce the damage from *Striga*. A herbicide resistant version of adapted maize developed by CIMMYT allows seed to be coated with a dry formulation of imazapyr that kills *Striga* seedlings as they attempt to attach to the maize crop, but this mechanism has not been used in other crops to date.

IITA scientists have been at the forefront of *Striga* research in SSA for the past 30 years. During that time they have developed tolerant versions of maize and cowpea, and added greatly to our understanding of the basic biology of the weed and the mechanics of attachment and repression of the host. In the last decade *Striga* research focused on improving soil fertility and utilizing trap crops in rotation. Key aspects have been: use of rotations with soybean which is unaffected by *Striga* (though it may be attacked by *Alectra* spp); deployment of *Striga*-tolerant versions of maize and cowpea; maize-cowpea intercropping; and hand pulling and crop hygiene to prevent seed build up. When these practices are combined, yield losses to *Striga* are minimized, and sustainable cereal legume farming systems become possible. It does not, however, eliminate *Striga*, and the weed remains a long-term risk to production should key components of the technology be omitted.

Key “best-bet” methods of minimizing effects of *Striga* and reducing its seed bank have been deployed in farmers’ fields over the past 10 years. Two of these have generated significant farmer interest in Northern Nigeria. They are maize-promiscuous soybean rotations, and millet-dual purpose cowpea intercropping, both of which result in a reduction in *Striga* plant density and in the seed bank of the parasite. Both have been responsible for a 50-70% increase in gross incomes of adopting farmers compared to those following traditional practices. Concomitantly, soybean production in Nigeria has increased from 50,000 t to >400,000 t per annum from 1984 through 1999. A 10% increase in legume area in Nigeria, along with a 20% increase in grain yield results in an increase in fixed N worth US\$ 44M /yr (Sanginga et al., 2003). Some experimentation has also focused on the 4:2:4 planting scheme in the savannas, where 4 narrow rows of cowpea strip cropped among side two wider rows of maize. In the following season the physical positions of the two crops are reversed to facilitate N uptake and *Striga* seed reduction.

Research is refining these basic systems. More recent research findings have emphasized the need for increased density tolerance in maize hybrids, so suppression of *Striga* by shading will be more efficient. Cowpea is a highly profitable crop for savanna farmers, and maintaining a high proportion of cowpea in intercropping mixtures and in relay cropping systems has improved profitability and contributed additional N to the cropping system. Low harvest index grain legumes have shown benefits in quantities of N remaining in the soil in the derived savanna zone where cowpea grain is less profitable. Soybeans have been shown to fix from 44-103 kg N/ha/crop, and to leave up to 40 kg N/ha in the soil after grain harvest, as well as acting as an efficient trap crop for *Striga*. Maize following soybean takes up about 50% of N fixed by soybean, giving an overall utilization of soybean-fixed N by maize of around 25%. This is sufficient to boost maize grain yields by more than 0.7 t/ha, and, with an additional “rotation” effect soybeans more than doubled yields of the following maize crop. Maize genotypes have shown significant variation in multiple stress tolerance (i.e. tolerant to low N and drought), so continued improvement in performance of maize in such intercropping systems can be expected. These are however still very low yield levels, and much larger gains can be expected when balanced and adequate crop nutrition can be supplied. Low input interventions are adding no more than 1-2 t/ha to maize yields when the potential for maize hybrids in the savannas is ~9 t/ha. N is still the major limitation to cereal yield.

#### Concerns:

- IITA’s cropping system research focus over the past five years has been principally on systems in the dry savannas of West Africa. What of the humid forest and ESA? Some

of the *Striga* work will undoubtedly spill over to ESA, but is there sufficient research strength and commitment to long term trials to make a similar impact in ESA?

- There are no reports provided by IITA describing the deployment of CIMMYT-AATF developed imazapyr-resistance (or SU resistance) in maize hybrids adapted to the lowland tropics in *Striga*-infested areas, yet this is one of the truly exciting research findings in recent years. The IITA source of SU resistance has challenging IP issues surrounding its use, and this may ultimately sideline it. Furthermore there are no reports from farmers' fields of the performance of maize carrying *Zea diploperennis* sources of *Striga* resistance. And what of *Striga* resistant cowpea varieties?
- The lack of "bullet-proof " insect resistance in cowpea after 30 years of careful selection suggests that transgenic solutions (Bt cowpea, developed jointly by IITA and CSIRO) have a very real future in this crop, provided regulatory issues can be dealt with.
- There is a paucity of socioeconomic information related to *Striga* management. What is the net benefit of SU-resistant maize varieties vs. use of soybeans as a trap crop? How acceptable is herbicide treated hybrid maize seed to savanna farmers?

## **B: Humid and sub-humid forest zones**

Issues of NMR in this area are considered only superficially in the IITA-prepared paper provided to the panel. We have drawn also on the CCER for Project E (P. Fabre, May 2004). Key goals for IITA in these zones is to generate and promote productive farming systems based on plantain, intensified cassava production (in keeping with the Nigerian Presidential initiative), sustainable yam production, and multi-product trees. Currently all NRM research for this zone is integrated with agronomy, plant health management and varietal screening research. Because farmers in the humid forest have shown an unwillingness to invest in soil fertility directly, emphasis has changed to crops *per se*. Germplasm is being screened under farmers' field conditions for performance and resource use efficiency. Since the humid forest area is high in rainfall, leaching of nutrients can occur, especially after the onset of the rains when crop demand is low. An early planted vigorously growing crop is the best intervention to capture nutrients, reduce runoff and generate additional yield, though leaching losses can certainly occur if rains are heavy in the first 3-4 weeks of the season. Choice of species planted during fallows (where these are still practiced) has a large effect on the natural resource base.

For crops such as plantain, the use of small amounts of fertilizer plus control of nematodes tripled yields, thereby reducing the need to clear further forest. Green manure crops (*Mucuna* and *Pueraria*) have been shown to be twice as effective as a natural fallow in restoring soil properties and reducing the labor costs of clearing forest after a natural fallow.

### Concerns:

- No mention is made of soil acidity and how it is best managed. In high rainfall areas, especially where N fertilizers are applied, this can limit crop growth, especially when accompanied by a release of aluminum into the soil solution.
- What is the general nutrient status of the humid tropical zone? What levels of nutrient mining are taking place? What is the level of erosion occurring on typical ploughed land in this ecology typified by high energy rainfall events?
- Methods for maintaining and increasing SOM are not discussed. What is the role of low harvest index grain legumes (such as dual purpose cowpeas) vs. *Mucuna*? What are the

net benefits from using green manure fallows vs. inorganic fertilizers? What cropping systems involving *Musa*, cassava and cereals are possible in this zone?

### **Gaps in International NRM that should be addressed over the next decade**

#### **(IITA's own view)**

- Explore the ability of grain legumes to thrive under low P, and to mobilize P from relatively insoluble sources.
- Evaluate the extent and severity of non-NP nutrient deficiencies in the savanna (Zn, S, K, Ca, and Mg) (Panel view: this should be a high priority)
- Long-term sustainability of best bet technologies including improved varieties, fertilizers, pesticides and cropping systems.
- Compare promiscuous inoculation of soybean with inoculating seeds with improved versions of *Bradyrhizobium*
- Determine cropping system x genotype interactions in cereal-legume cropping systems in order to identify systems with stable output across megaenvironments that are identified by a combination of biometry, GIS and crop modeling.
- Use of conservation tillage/zero tillage to improve soil cover, SOM, and the productivity of crops and labor (Panel view: this should be a high priority).

#### **Panel's view of gaps and future needs in NRM**

- Geographical emphasis: There has been a relatively heavy emphasis on NRM issues in the savannas over the past 5 years, and comparatively less on issues from the humid forest and forest margins. Furthermore, there appears to be little NRM/agronomy research that is sourced in ESA, surely something that should have been addressed during the last 10 years. Sustaining output from the highlands of ESA, managing weeds in target crops in the ESA region, and collaboration with other CGIAR centers operating in those areas will be important in the next decade.
- Crop emphasis: NRM and agronomy research is strongly oriented towards cereal and legume crops, and largely neglects yams, cassava and *Musa*. We strongly suggest that IITA hire a roots and tubers agronomist to address this imbalance.
- Partners: These were barely mentioned in IITA's prepared piece on NRM. Who are the competent NARS in the target area, and what is the nature of collaboration with them?
- Fertility: Fertility work seems to have gone on the back burner, despite a steady decline in soil nutrients status with time. There is a need for a network in the savannas, perhaps similar to the SoilFertNet established under RF funding in southern Africa, where "best bet" technologies for stabilizing and increasing fertility status of soils under constraints faced by small-scale farmers are developed, promoted and documented. As it matures, the network could also address policy, capacity building and extension issues that directly bear on soil fertility management (see Morris et al, 2007). There is also a possibility that a Challenge Project may be developed around this theme in the next round. If so, IITA will undoubtedly play a key part in its direction, and should seek to host it.
- Fertilizers: There are no clear guidelines on the relative importance of specific nutrients in SSA. Is N really the first limiting nutrient followed by P and Zn? Where is S becoming limiting, and can it be linked to an environmental available, such as the probability of annual burning of residue? What is the role and importance of K? These issues are important if IITA is to offer advice on importation of fertilizer and/or establishment of a fertilizer manufacturing facility to best serve the needs of specific regions. See above for suggested action.

- We endorse the screening of germplasm under drought, low N and/or low P to capitalize on existing genetic variation for tolerance to low levels of these limiting resources, while encouraging breeders to continue providing a good level of resistance/tolerance to biotic challenges.
- The case for herbicide use: Has there been a serious analysis of reasons for the lack of herbicide use? Given the labor savings and the possibility of breaking the cycle of weed build up, where is the analysis of short and long term benefits from use of imazapyr, glyphosate and/or nicosulfuron? Reports of possible herbicide damage to arbuscular mycorrhiza require careful evaluation, so that P and water uptake are not compromised.
- Natural resource management will be practiced by farmers if they see a clear benefit from doing so. Application of inorganic fertilizers is one of the most obvious of crop responses, as is the use of herbicides on weeds such as *Imperata*, and the use of herbicide resistant germplasm in areas infested with *Striga*. Yet there seems little socioeconomic analysis of benefits of specific practices in the short and long term, and relatively little information on farmer circumstances that would favor adoption of one technology over another. In order to keep on farm prices for fertilizer relatively stable and similar to those in other parts of the world, IITA should consider investing socioeconomic resources in researching how to make African markets for fertilizers work more efficiently. There are a number of potential partners that would support this activity (e.g. IFPRI, BMGF/RF; SG2000 has a lot of experience in this area). A second area for an IITA policy initiative is developing a crop-based strategy for regional cooperation within WCA for the importation (or manufacture) and distribution of fertilizers in volume through a single deep water port in the region – but in collaboration with NEPAD regional initiatives.
- There is only peripheral evidence of the use of models and GIS techniques to establish spatial patterns of model output over large areas. The loss of crop modeling capability within IITA is regrettable, since it allows a range of crop management options to be pretested *in silico* before taking the most promising of these to the field.
- Intercropping: While there is real value in devising planting systems that include grain and legume intercrops or relays, systems of this nature will not be adopted in an unmodified form unless the ratio of grain output from the legume and cereal components reflects market demand. We see no evidence if this type of analysis having been undertaken in the past 5 years.
- Durable insect resistance: It will be important to thoroughly test Bt cowpea when it is finally available in an adapted cowpea background.
- Weed control: Glyphosate resistance in maize and cowpea would be of considerable value to farmers of areas severely infested by *Imperata*, and possibly against *Striga*. There are now two sources of this resistance available, each using quite different mechanisms – one inhibiting the EPSPS enzyme pathway (Monsanto) and the other the GAT pathway (Du Pont). Access to these gene systems for experimental purposes should be sought. Owners of these genes might be persuaded to consider incorporating them in cowpea (not an important first world crop) for little or no charge, probably through AATF. This possibility should be explored by IITA on humanitarian grounds, perhaps with budgetary assistance from the BMGF.
- Livestock and crop residues: We see no mention of livestock as a component of NRM. This deficiency was also recognized in previous reviews (Recommendation 1 CCER Proj F). Trends suggest that by 2050 the majority of farmers in the savannas of WA will be mixed crop-livestock farmers (CCER Proj F). What are the implications for crops, crop residues, SOM, nutrient migration in FYM, weed seed transfer, and traction power? Do

crop residues have an immediate economic worth as feed, fuel and fencing material, and how does that compare with the value of grain? Do IITA and ILRI plan to continue to collaborate on livestock related issues in the Guinea and Sudan Savannas?

- Tillage: we endorse research on the potential for conservation/zero tillage to improve soil cover, SOM, and the productivity of crops and labor while reducing the impact of raindrops on soil structure and erosion. The endorsement is made with the understanding that this is the traditional form of land preparation in the forest and forest margins, and that it has failed in the savanna mainly because of intractable weed problems and soil compaction. Availability of effective herbicides is a prerequisite to its use in areas where *Imperata* and *Striga* are common.
- Nematodes are a common problem in intensified agriculture. How well have the populations of nematodes been assessed and characterized in the savannas and derived savannas? Does IITA know what background yield loss might be associated with chronic nematode infection in its target crops and ecologies?
- Long-term NRM sites: These were established at Ibadan (21 years) and Zaria (11 years) under minimum tillage (hoe culture). Such studies are hard to support under shorter term special project funding. Models are predicting a slower rate of decline in soil organic matter than that actually observed at these sites. Assuming the original treatments are still relevant, these sites represent a valuable research investment in sustainability. The Panel strongly suggests that these sites be retained under their long-term management, and be fully utilized to determine long-term consequences of common cropping practices.
- Managed fallows in the humid forest margins: Managing fallows is probably wishful thinking when the trends are all towards the elimination of fallows. Instead, using short term green manure crops like *Mucuna* and *Pueraria* may make more sense.
- The recent emphasis within IITA on increased cassava production has placed greater pressure on natural resources in the Guinea savanna and forest transition zones, so it is important to revisit farming systems that include this crop. Very few studies described in IITA's NRM report included cassava. The increased emphasis on commercial banana production may also apply downward pressure to the natural resource base in the forest zone, and this should be carefully monitored.
- Human and financial resources: Research time available to the leader of the weed control group, Dr. Chikoye, is sharply reduced because of his administrative load. Because of the strategic importance of weed management, we strongly suggest that his research agenda be supported through a Post Doc appointment, or that an additional permanent weed scientists be hired.
- Skills: Modern field trial management requires strong biometrical skills, and IITA does not have a senior resident biometrician. New developments in G\*E analysis, pattern analysis and spatial trend analysis could increase efficiency of the field research processes, but there is no-one to lead the charge.
- Laboratory support for NRM: Equipment is aging and not being replaced, and manuscripts are sometimes rejected by journals because outdated and less precise analytical methods are being used. Plant samples cannot be analyzed for micronutrient content in house, and although outsourcing remains an option within Nigeria, quality of data is a concern. Rather than automatic replacement of out-of-date equipment with updated equivalents, we strongly suggest that a suitable modern analytical laboratory be identified in Nigeria and monitored for quality over time. Should quality consistently fail to meet IITA standards, then establishing a modern in-house analytical capability must be considered.

- Training: How is training in crop agronomy and NRM being conducted among IITA's national collaborators? Is it being handled through Kano where the savanna team is based? A training component in NRM needs to be built into every project, and key scientists from collaborating national programs should spend time with IITA counterparts at the location where cutting edge research is currently underway (e.g. Kano).

## References

Morris, M., V.A. Morris, M., V.A. Kelly, R.J. Kopicki and D. Byerlee. 2007. Fertilizer Use in African Agriculture: Lessons Learned and Good Practice Guidelines. World Bank, 144pp.

Sanginga, N., K.E. Dashiell, J. Diels, B. Vanlauwe, O. Lyasse, R.J. Carsky, S. Tarawali, B. Asafo-Adjei, A. Menkir, S. Schulz, B.B. Singh, D. Chikoye, D. Keatinge, and R. Ortiz. 2003. Sustainable resource management coupled to resilient germplasm to provide new intensive cereal–grain–legume–livestock systems in the dry savanna. *Agric. Ecosystems & Env.* 100:305-314.

Tian, G., F. Ishida, D. Keatinge (eds). 2001. Sustaining Soil Fertility in West Africa. Soil Science Society of America Special Publication #58, Wisconsin.

Twumasi-Afriyie, S., and G.O. Edmeades. 1983. Ghana Grains Development Project (CIDA 400/00502) Fourth Annual Report 1982. Part 2: Research Results. 119 p. Mimeographed.

## Annex 12

### IITA's GUIDING PRINCIPLES FOR DEVELOPMENT AND DEPLOYMENT OF GENETICALLY ENGINEERED ORGANISMS

The IITA believes that genetic engineering has an important role to play in improving production and utilization of food crops in developing countries. Genetically engineered organisms can thus contribute to IITA's principal goals of eliminating poverty and increasing food security.

IITA's decisions about, and investments in, genetic engineering will be guided by the following principles:

1. Safety consideration notwithstanding, IITA will use genetic engineering when it believes that it is more cost - or time-effective than other research techniques, or when other techniques have not been effective in achieving the desired ends.
2. IITA will take care to develop genetically engineered products appropriate for use by resource-poor farmers. This means products with needed traits, and minimum proprietary restrictions and technology-associated costs, which can be easily transferred to, and managed by, resource-poor farmers.
3. For developing genetically engineered organisms, IITA will give priority to using genes that occur naturally in closely related species.
4. IITA will conduct its work on genetically engineered organisms in a participatory and transparent manner, being sensitive to the diversity of opinions and values of its partners and stakeholders.
5. IITA will evaluate, on a case-by-case basis, and following science-based criteria, potential risks associated with application and development of environment, non-target organisms, food safety, and cultural, social and economic conditions.
6. IITA will avoid compromising farmers' rights to have fair access to the latest technologies to improve their livelihoods by limiting the deployment of genetically engineered organisms in the crop's centers of diversity (wild species and land races), but will take measures to avoid the loss of biodiversity in those regions.
7. IITA will work with national partners, using the best expertise available, to address potential risks and assure confidence in the product. If a recipient country lacks the expertise to conduct its own risk assessment, IITA will work with national partners to develop appropriate strategies and methodologies.
8. IITA will comply with national or regional biosafety, food environmental and policy regulations for deployment of genetically engineered organisms. IITA will not deploy genetically engineered organisms in any country lacking such regulations.
9. Management strategies will be applied to delay the development of resistant insect pests. This is with reference to, as an example, cowpea with Bt gene.

**Annex 13**  
**Number and categorization of IITA's partners**

A) IITA had, in 2006, established formal partnerships with over 160 organizations in more than 50 countries (source IITA's MTP for 2007-2009).

- 43 Governments and Governmental Organizations
- 36 National Agricultural Research System Organizations (NARS)
- 31 Advanced Research Institutes (ARIs, including Northern Universities)
- 17 Universities in SSA (Southern Universities)
- 11 International Agricultural Research Centers (IARCs)
- 7 Private Sector Partners
- 4 Foundations
- 4 International NGOs
- 3 Local NGOs (Southern NGOs)
- 3 Sub-Regional Organizations (SROs)
- 3 Civil Society Organizations (CSOs)

In addition, IITA supports several networks (WECAMAN, SARRNET, FOODNET and EARRNET) and regional organizations (FARA, AU).

B) Relationship between R4 D category and the category of partner (source IITA)

<b>Partner Category</b>	<b>Strategic Research</b>		<b>Applied Research</b>		<b>Adaptive Research</b>	
	<b>No.</b>	<b>%</b>	<b>No.</b>	<b>%</b>	<b>No.</b>	<b>%</b>
NARS	26	43	27	42	21	40
Governmental	8	13	10	15	7	13
Southern Univ.	4	7	5	8	1	2
Northern Univ.	13	22	7	11	6	12
Private	0	0	5	8	4	8
IARC	3	5	1	2	2	4
ARI	3	5	2	3	1	2
Northern NGO	0	0	3	5	3	6
Southern NGO	0	0	2	3	4	8
SRO	2	3	0	0	0	0
Foundation	1	2	0	0	0	0
CSO	0	0	2	3	2	4
Other	0	0	1	2	1	2
<b>Total</b>	<b>60</b>	<b>100</b>	<b>65</b>	<b>100</b>	<b>52</b>	<b>100</b>

## Annex 14 Acronyms

AATF	African Agricultural Technology Foundation
ADG	Assistant Director-General
AEZ	Agroecological Zone
AFLPs	Amplified Fragment Length Polymorphism
AGM	CGIAR Annual General Assembly
APO	Associate Professional Officer
ARIs	Advanced Research Institute
ASARECA	Association for Strengthening Agricultural Research in Eastern and Central Africa
AVRDC	World Vegetable Center (formerly Asian Vegetable Research and Development Center )
BECA	Biosciences East and Central Africa
BNF	Biological nitrogen fixation
BNMS	Balanced Nutrient Management System
BSV	Biological nitrogen fixation
BXW	Banana Xanthomonas Wilt
CAADP	Comprehensive African Agricultural Development Program
CABI	CAB International (formerly Commonwealth Agricultural Bureaux)
CBSD	cassava brown streak disease
CBSV	cassava brown streak viruses
CCER	Center-Board Commissioned External Reviews
CIAT	Centro Internacional de Agricultura Tropical (International Center for Tropical Agriculture)
CIDA	Canadian International Development Agency
CIMMYT	Centro Internacional de Mejoramiento de Maiz y Trigo (International Maize and Wheat Improvement Center)
CIRAD	Centre de coopération internationale en recherche agronomique pour le développement (French Agricultural Research Centre for International Development)
CMD	Cassava Mosaic Disease
CMV	cassava mosaic virus
CORAF	Conseil Ouest et Centre Africain pour la Recherche et le Développement Agricole (West and Central Africal Council for Agricultural Research and Development)
CRED	Community Research for Empowerment and Development
CSO	Civil Society Organization
DDG-R	Deputy Director-General for Research
DMS	Data Management System
DRC	Democratic Republic of Congo
DRIS	Diagnosis and Recommendation Integrated System
EACMV	East Africa Cassava Mosaic Virus
EAHB	East Africa Highland Banana
EARRNET	East Africa Root Crops Research Network
ECA	Economic Commission for Africa
EIARD	European Initiative for Agricultural Research for Development
ELISA	Enzytme-Linked ImmunoSorbent Assay
ELO	(The former) External Liaison Office (of IITA)
EPHTA	Ecoregional Program for the Humid and Sub-Humid Topics

ESA	East and Southern Africa
EST	Expressed Sequence Tag
ExCo	Executive Council (of the CGIAR)
FARA	Forum for Agricultural Research in Africa
FFS	Farmer Field Schools
GIS	Geographic Information System
GMO	Genetically Modified Organism
GRP	Graduate Research Program
HVP	High Value Products
IAPSC	Inter-African Phytosanitary Council
IAR	Institute for Agricultural Research (Nigeria)
IARCs	International Agricultural Research Centres
ICIPE	International Centre of Insect Physiology and Ecology
ICP	Integrated Cassava Project
ICRAF	World Agroforestry Centre (formerly International Centre for Research in Agroforestry)
ICRISAT	International Crops Research Institute for the Semi-Arid Tropics
IFDC	International Fertilizer Development Centre
IIAM	Instituto Nacional de Investigação Agrária de Moçambique
ILRI	International Livestock Research Institute
INRAB	Institut National des Recherches Agricoles du Bénin
IPG	International Public Goods
IPM	Integrated Pest Management
IRRI	International Rice Research Center
IRS	Internationally Recruited Staff
ISAAA	International Service for the Acquisition of Agri-biotech Applications
ITRA	Institut Togolais de Recherche Agronomique
JIRCAS	Japan International Research Center for Agricultural Sciences
KKM	Kano-Katsina-Maradi
M&E	Monitoring and Evaluation
MAS	Marker-Assisted Selection
MDG	Millennium Development Goal
MML	Materials Management and Logistics
MOU	Memorandum of Understanding
MTP	Medium-Term Plan
NARES	National Agricultural and Research Extension Systems
NARIs	National Agricultural and Research Institutes
NARO	National Agricultural Research Organisation
NARS	National Agricultural Research System
NEPAD	New Partnership for Africa's Development
NERICA	New Rice for Africa
NPK	Sodium Phosphorous Potassium
NRM	Natural Resource Management
NRS	Nationally Recruited Scientist
NVRC	National Variety Release Committee
P	Phosphorous
PCAP	Professional Capacity Advancement Program
PCR	Polymerase Chain Reaction
PLS	Pilot Learning Sites
PM	Performance Measurement

ProMIS	The project knowledge system for the Rice Wheat Consortium
QTL	Quantitative Trait Locus
RAPD	Random Amplification of Polymorphic DNA
RDC	Research Development Council
RPEC	Research Program and Executive Committee (IITA)
SAKSS	Strategic Analysis and Knowledge Support System
SARRNET	The Southern Africa Root Crops Research Network
SGRP	System-Wide Genetic Resource Program
SINGER	Systemwide Information Program for Genetic Resources
SMEs	Small and Medium-sized Enterprises
SMIP	Strategic Musa Improvement Project
SMTA	Standard Material Transfer Agreement
SNP	Single Nucleotide Polymorphism
SOCODEVI	Socodevi - Société de Coopération Internationale
SOM	Soil Organic Matter
SRO	Scientific Research Organisation
SRRC	Southern Regional Research Center (of the USDA) Louisiana, USA.
SSA	Sub-Saharan Africa
SSR	Single-strand Repeat
STC	Short-term Course
STCP	Sustainable Tree Crops Program
TCBN	Tissue Culture Business Network
TSBF	Tropical Soil Biology and Fertility Institute (of CIAT)
USAID	United States Agency for International Development Africa Rice Center (formerly West Africa Rice Development Association )
WARDA	
WASNET	West Africa Seed and Planting Material Network
WCA	West and Central Africa
WDI	World Bank Development Indicators
WECAMAN	West and Central Africa Collaborative Maize Research Network
WPW	Work Planning Week (IITA)
YMV	Yam Mosaic Virus
ZMM	Zimbabwe-Mozambique-Malawi Pilot Learning Sites of the sub-Saharan Africa Challenge Program



Science Council Secretariat  
c/o FAO  
Viale delle Terme di Caracalla, snc  
00153 Rome, Italy

[www.sciencecouncil.cgiar.org](http://www.sciencecouncil.cgiar.org)  
t +39 06 57056782  
f +39 06 57053298  
e [sc-secretariat@fao.org](mailto:sc-secretariat@fao.org)



SCIENCE COUNCIL  
**CGIAR**