



**Report on Activities January, 2003 through March, 2004**

**Submitted To:  
World Bank, The Executive Council, and the Science Council of the CGIAR**

**April 2004**

## 1. Executive Summary

The goal of HarvestPlus is to reduce micronutrient malnutrition among poor populations in Africa, Asia, and Latin America, thereby improving food security and enhancing the quality of life. This will be accomplished by providing agronomically-superior biofortified staple crops as a low cost sustainable option, which builds on existing dietary preferences and behavior.

The primary objectives of the 10-year plan are to:

- Select and breed nutritionally improved varieties of six major staple food crops with superior agronomic properties that make them attractive to farmers to grow;
- Demonstrate convincingly in the short to medium term the nutritional efficacy of the biofortification strategy;
- Develop efficient, accelerated mechanisms for testing materials on farms, including in areas among the most nutritionally disadvantaged, in order to identify varieties with superior agronomic, socioeconomic, and farmer-acceptable traits;
- Undertake activities to promote the adoption and dissemination of these varieties efficiently and rapidly in selected developing countries in Africa, Asia, and Latin America among the nutritionally disadvantaged; and
- Measure the nutritional and other effects of these nutritionally improved varieties in community-based studies where these varieties have been adopted.

The primary goals to be achieved during 2003 were:

### **1. Raise \$50 million in funding over four years for full start-up of the project beginning in 2004**

Funding for the proposed core activities has been raised, although some donor commitments necessarily continue on a year-to-year basis.

As a result of approval of the Biofortification Challenge Program by the CGIAR membership at its AGM in October 2002, the World Bank released \$3 million to HarvestPlus for 2003. These funds were used for research and organizational activities in 2003. If the World Bank continues its stated policy of providing \$3 million per year to all approved Challenge Programs, this will contribute \$12 million toward HarvestPlus' funding during 2004-2007.

An agreement between IFPRI and the Gates Foundation, with funding being jointly administered by CIAT and IFPRI, was signed in August 2003. The agreement calls for the Gates Foundation to provide \$25 million in funding over four years. The funds will be released in four tranches (\$7 million in August, 2003; \$7 million in January, 2005; \$7 million in January, 2006; \$4 million in January, 2007).

The Deputy Administrator of USAID recently signaled their intention to provide \$3 million per year in funding in a plenary session at the Subcommittee on Nutrition meetings in March 2004, which were held at the United Nations in New York). One-half of the funding is to come from the Global Bureau for Health and the other one-half come from the Global Bureau for Economic Growth, Agriculture, and Trade (EGAT). If USAID continues its stated policy of providing \$3 million per year to HarvestPlus, this will mean \$12 million in funding during 2004–2007: \$6 million from “new sources” of funding (Global Bureau for Health) and \$6 million from “traditional sources” (EGAT).

DANIDA has indicated approval of 3 million Danish Kroner (DKK) per year for three years, 2004-2006 (about US \$500,000 per year at the current exchange rate). Two million DKK are designated for complementary activities to be undertaken by seven Danish institutions (upstream research activities not described in the BCP proposal) and 1 million DKK are designated for core HarvestPlus funding. SIDA has contributed 800,000 SEK, about \$100,000 for 2004.

If the World Bank and USAID continue with their presently stated policies, \$31 million in funding during 2004-2007 would come from “new sources” (Gates Foundation + USAID/Global Bureau for Health) and \$19 million would come from “traditional sources” (World Bank + USAID/EGAT + DANIDA + SIDA).

This success in fundraising, however, does not preclude the need for seeking additional resources during 2004-2007: (i) to increase the number of developing countries involved, (ii) to accelerate the pace of delivering impact in selected countries by expanding on extension/seed systems/behavioral change activities for ‘fast-track’ activities (e.g. orange-flesh sweet potatoes in Africa), and (iii) to increase the magnitude of future impacts by exploring promising new areas of research such as breeding for single compounds that improve the bioavailability of a range of minerals and vitamins.

## **2. Maintain ongoing research activities for the six Phase 1 crops under funding obtained before the approval of the Biofortification Challenge Program proposal**

Contracts were written to begin research in 2003 at modest levels of funding (compared with 2004), in many cases building on research activities that were initiated under the auspices of the CGIAR Micronutrients Project, which ran from 1995 through 2002. These contracts included all the Phase 1 and Phase 2 crops and the Breeding Objectives research. Ongoing programs at the time of approval of the Biofortification Challenge Program included (i) high-iron rice funded by the Asian Development Bank and USAID, (ii) high-betacarotene maize for Africa funded by USAID, (iii) high-iron beans for Africa funded by USAID, and (iv) orange-flesh (high-betacarotene) sweet potatoes for Africa supported by a number of agencies.

Of note, efficacy trials were completed for both sweet potatoes and rice – helping to fulfill the second Program objective above – demonstrating convincingly that both vitamin A status and iron status could be improved in human subjects (under experimentally controlled conditions) through the consumption of micronutrient-dense staple foods. Scientific papers are presently being prepared for publication in peer-reviewed journals.

## **3. Prepare the organizational groundwork for a ten-fold scaling up of HarvestPlus research activities beginning in 2004.**

As described in the Biofortification Challenge Program proposal, five staff positions were filled, including that of the Program Director. A Project Advisory Committee (PAC) was formed to provide governance and oversight. To operationalize the complex collaborative interdisciplinary relationships, and develop efficient and consistent strategies and annual workplans for 2004, a series of planning meetings were convened during 2003. These meetings laid the groundwork for initiation of HarvestPlus in 2004. With the foundation of inter-active partnerships having been laid, substantially fewer meetings will be convened in 2004.

It will take ten years to realize the widespread effects of the biofortification strategy. To maintain funding over such an extended period, it will be important to maintain long-term support for the biofortification strategy among a broad range of stakeholders.

In July the Biofortification Challenge Program was renamed “HarvestPlus.” The motivation for this modified ‘branding’ was that communication with a broader audience outside of the CGIAR will be more effective. The name selected (by a committee of seven people from a list of forty submissions) was widely discussed among collaborators and stakeholders before the decision was taken. A logo designed by staff at CIP (winner of a competition) was also selected by the committee.

Some institutional “lessons learned” during 2003:

The fact that much smaller precursor projects (e.g., the CGIAR Micronutrients Project) were already in place and provided experience/lessons in interdisciplinary collaboration and communication has (i) facilitated productive planning meetings and (ii) provided a means for efficient use of part of the World Bank 2003 funds for continuing ongoing activities (e.g., breeding, germplasm screening, nutrition studies), even as the collaborating organizations prepared for scaling up activities in 2004.

That the World Bank funding was already in place helped in discussions with the Gates Foundation. The eight anonymous, external reviews commissioned by the iSC were made available to the Gates Foundation and this shortened the time required in their review process.

The optimal situation for team building is one in which the partner institutions are all known at the start of the planning process. Competitive bidding can hinder this process of team-building in three ways. First, if one does not know that his/her proposal will be selected, he/she will be more reluctant to fully buy into the planning process or may not have been invited to participate in the planning process at all. Second, a winning bidder agrees to undertake a specific activity. Challenge Programs must be flexible as ongoing research and external circumstances dictate changes in overall plans. Unless fully integrated into a culture of teamwork, the winning bidder may be reticent to alter the terms of reference of the winning bid, which may have taken quite a substantial amount of work to prepare. Third, it is usually expected that competitive bids will be decided only on the basis of technical competence, perhaps also with a value placed on capacity building. However, ability/willingness and compliance to collaborate across disciplinary boundaries is essential and difficult to assess in evaluating formal proposals.

Building consensus among collaborating institutions is key to the success of HarvestPlus. The Program Director reports to (i) a Project Advisory Committee that has ultimate decision-making power over workplans and budgets, as well as the Directors-General of CIAT and IFPRI. Such a structure inherently forces consensus-building. Nevertheless, consensus-building requires considerable transactions costs.

The signing of several contracts with non-CGIAR institutions was delayed by several months due to the IP policy which stated that all output from the project would be jointly owned. Eventually an accommodation was reached with all institutions while maintaining this policy in every instance.

## **2. Background**

### **2.1 Goals and Objectives**

The goal of HarvestPlus is to reduce micronutrient malnutrition among poor populations in Africa, Asia, and Latin America, thereby improving food security and enhancing the quality of life. This will be accomplished by providing agronomically-superior biofortified staple crops as a low cost sustainable option, which builds on existing dietary preferences and behavior.

The primary objectives of the 10-year plan are to:

- Select and breed nutritionally improved varieties of six major staple food crops with superior agronomic properties that make them attractive to farmers to grow;
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Complementary objectives are to:

- Initiate prebreeding studies to determine the feasibility of undertaking full-scale breeding programs for an additional eleven food staple crops;
- Understand better how dietary factors influence the bioavailability of micronutrients in undernourished populations in developing countries, especially interactions between physiological status and micronutrients, anti-nutrients such as phytates, and promoter compounds;
- Inform decision makers in developing countries about cost-effective food-based approaches and policies to improve the dietary quality and micronutrient status of the poor.

### **2.2. Research Strategy and Priorities**

The objectives of the 10-year plan will be accomplished through a series of interdisciplinary activities. The major ones to be undertaken are:

- Plant breeding based at CGIAR centers and national agricultural research and extension systems (NARES) for the six Phase 1 crops, using a dual approach: early development of “fast-track” varieties that will convincingly demonstrate the validity of the biofortification strategy, and a more lengthy parallel development of varieties combining the best nutritional and agronomic traits in each crop, using adaptive/decentralized breeding methods and seed production where feasible;

- Prebreeding feasibility studies based at CGIAR centers for the 10 Phase 2 crops that are important in the diets of those with micronutrient deficiencies, but for which the knowledge base for biofortification has yet to be developed;
- Initial screening of promising lines for micronutrient bioavailability using *in vitro* and animal models and subsequent efficacy studies involving human subjects to evaluate nutritional impact of the most promising lines intended for release;
- Dissemination of nutritionally improved varieties through collaboration with farmers, NARES, and NGOs, and evaluation of effectiveness of the biofortification strategy after adoption;
- Application of novel advances in genomics, genetics, and molecular biology to identify and understand plant biosynthetic genes and pathways of nutritional importance; use of this knowledge (1) in marker-assisted selection for conventional breeding of Phase 1 crops and (2) in initial development (but not release) of transgenic lines;
- Research to understand economic and social factors that determine the dietary quality of the poor and their micronutrient status, and policy advocacy based on that research; and
- Use of behavior change communication methods within the crop diffusion strategies to effectively address consumer preferences and enhance the adoption of biofortified crops.
- Coordinated communication activities designed to provide support to internal project constituents and external audiences, including donors, the academic and development communities, public officials, and the general media.

### **2.3. Governance and Management Structure**

#### **Role and Function of the CIAT and IFPRI Boards**

CIAT and IFPRI have entered into a Cooperative Research Agreement (March, 2003) with the objective of cooperating with each other in the development and implementation of the BCP, now known as HarvestPlus, to achieve the objectives set out in the BCP proposal.

The CIAT and IFPRI Boards have delegated their authority and related responsibilities to the Program Advisory Committee (PAC) to undertake their mandate as an independent expert body. The Director-Generals of CIAT and IFPRI are responsible for reporting to their respective Boards the progress being made under HarvestPlus.

The initial PAC members were nominated by the CIAT and IFPRI Boards, but subsequent members will be nominated by the PAC itself and approved by the Boards of CIAT and IFPRI. In the event of conflict between CIAT and IFPRI and the PAC, CIAT and IFPRI and the PAC Chair will seek arbitration services and abide by the final decision of the arbitrator.

#### **Role and Function of the Program Advisory Committee (PAC)**

The HarvestPlus PAC is an external independent advisory body that provides governance and oversight to facilitate the Program's complex collaborative arrangements. The PAC is not a legal entity, but has been delegated authority from the CIAT and IFPRI Boards of Directors. The PAC comprises (i) 12 experts from developing and developed countries, (ii) one member each from the CIAT and IFPRI Boards, and (iii) the Director-Generals of CIAT and IFPRI, making a total of 16 members. PAC expert members serve for three-year terms with staggered departures and one

opportunity for a three-year renewal. All initial PAC expert members will serve for three years (from March, 2003), after which one-third of the membership will be replaced each year for three years as decided by the PAC.

Under the leadership of the Chair, the PAC will exercise shared responsibility for:

- Reviewing progress toward meeting Program objectives and over seeing the Program Management Team (PMT) in fulfilling its responsibilities.
- Discussing and approving Program strategic research priorities as proposed by the PMT.
- Reviewing and approving the annual work plans and budgets presented by the PMT.
- Ensuring an independent and transparent competitive grants process for specified components of the Program; approving peer review committees to referee submitted proposals.
- Assisting in advocacy and communications on behalf of the Program
- Nominating new members of the PAC as required, with nominations to be approved by the Boards of CIAT and IFPRI.

A vice-Chair, selected by the PAC, will exercise the responsibilities of the Chair in the absence of the Chair.

The PAC Chair and Directors-Generals of CIAT and IFPRI are consulted on matters relating to the above responsibilities when timely decisions are required by the Program Director and the PMT. In each instance, the Chair decides whether the entire PAC needs to be consulted; if the Chair is unavailable for any reason, the vice-Chair is consulted.

Appendix 1 lists the PAC members for 2004.

### **Roles and Function of the Program Director**

The Program Director for HarvestPlus holds a joint appointment with CIAT and IFPRI and is a non-voting member of the PAC. All Program staff report to the Director. The Program Director's mandate is to provide leadership to ensure that the roles and responsibilities of alliance members are fulfilled on an annual basis in such a way that:

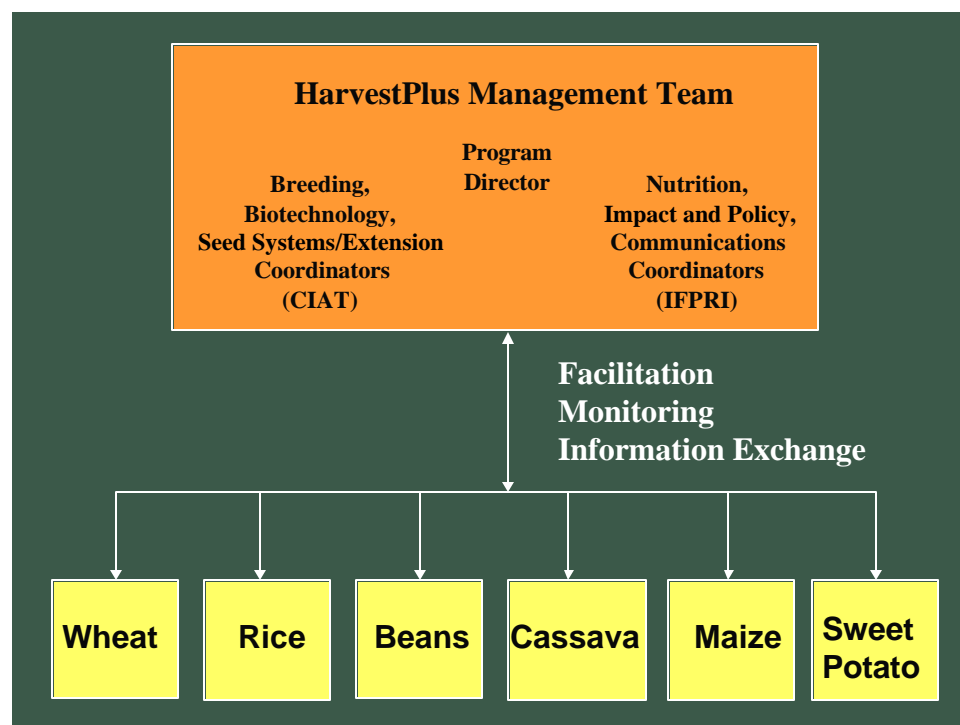
- HarvestPlus goals and objectives are met by:
  - o Proposing and implementing new strategic directions that are approved by the PAC;
  - o Overseeing the process of formulating and approving the annual work plans of collaborating organizations based on approved strategic directions and budget guidelines; implementing competitive bidding for selected Program components; monitoring progress in implementing the approved work plans, and reporting to the PAC, donors, and other stakeholders on progress;
  - o Planning and implementing PAC meetings; managing other exchanges with PAC members;
  - o Fundraising;
  - o Outreach to the public-at-large, the development community, and academia;
  - o Ensuring high standards of scientific excellence.

- HarvestPlus is efficiently and collaboratively managed according to its Principles and Guidelines by:
  - o Managing key relationships with collaborating institutions, donors, the PAC, and others in an effective value-driven manner;
  - o Providing organizational arrangements for the Program that are well suited to its needs;
  - o Developing the PMT in a way that continues to enhance its capability to serve and lead the Program.

## Program Management

The Program Director will serve as the custodian of HarvestPlus through effective oversight of operations and both internal and external interactions. The Program Director has final authority over management decisions that do not require the prior approval of the PAC and decides what current issues require the consultation of Chair and the Directors-General. The Program Director will be assisted by a number of teams that include the PMT, CWG, Crop Leaders, and the Functional Leaders (see Figure 1).

Figure 1.



### Roles and Functions of the Program Management Team (PMT)

The PMT are employees of HarvestPlus through CIAT and IFPRI (for terms of reference for Program Management Team members see appendix 3). The PMT includes: Program Director, Breeding Coordinator, Biotechnology Coordinator, Nutrition Coordinator, Communication Coordinator, Impact and Policy Coordinator, and End-user/Seed Systems Coordinator. It is the PMT's responsibility to develop the strategic direction, create the program identity, monitor internal and external progress, and coordinate and facilitate the flow of information to the public-at-large.

Under the leadership of the Program Director, the PMT's work ethic is one that encourages, looks for, and is receptive to new and innovative ideas—be they technical, institutional, or otherwise. HarvestPlus seeks to create an environment in which collaborators feel comfortable to either ask for individual counsel or express general concerns. Reasonable concerns will be addressed expeditiously. PMT members will work to support collaborating institutions through field site visits as frequently as is feasible.

The specific roles and functions of the PMT are as follows:

#### **Developing the Strategic Directions and Research Oversight**

- Developing the strategic direction of the Program through interacting with and monitoring the external environment, identifying and analyzing issues and opportunities, and submitting proposals for newly-commissioned and competitively bid activities to the PAC for consideration.
- Ensuring that the approved strategic direction is translated effectively and efficiently into the Program work plans and overseeing the process of developing, modifying, and approving annual work plans and budgets for the collaborating institutions.
- Implementing the competitive bidding in the different functional areas. This includes bringing in new collaborative partners and human resources as needed.
- Monitoring the implementation of the Program's work plan, intervening proactively as needed, responding to requests for assistance in solving problems, and facilitating the exchange of information between Program components.
- Providing annual evaluations of progress made by collaborating institutions in achieving their stated work plans, summarizing the accomplishments of each functional area and crop activity, and writing annual reports as required by donors.
- Ensuring that appropriate high standards of scientific rigor permeate the Program in all of its work.

#### **Executing contractual relationships**

- The PMT will endorse the assignment of key collaborators based on mutual confidence in their capabilities. Where this confidence is lacking, the PMT reserves the right to approve an assignment.
- The PMT will work with collaborators to ensure that high quality research outputs are delivered on time. Not only positive information, but also deviation from agreed upon work plans and disappointing research findings, must be communicated to the PMT in a timely manner. Future collaboration with the program will be jeopardized where either of these conditions is not met.

#### **Quality Control**

- Scientific rigor and quality control are central to the success of the program. The PMT will require and ensure that internationally recognized standards or methods, when available and appropriate in terms of cost, be applied across the program. When standards do not exist, the project managers (typically the functional and crop leaders) will seek advice from external experts.
- The PMT will ensure that all methods used are carefully described and documented as internal program literature.

#### **Internal Management**

- Planning for and implementing semi-annual PAC meetings; responding to PAC requests, and exchanging information with the PAC.

- Ensuring (key) relationships with CGIAR centers and other collaborating institutions, donors, the PAC, the CWG, the CGIAR Secretariat and Science Council, and others are treated in an effective, value-driven manner.
- Providing organizational arrangements for the Program that are well suited to its needs, i.e., organizational structure, systems and processes, coordinating and other reporting mechanisms, people, culture, leadership, management, and governance.

### **External Relations**

- Mobilizing financial resources to ensure the Program is able to deliver its commitments.
- Facilitating the exchange of Program pertinent information among the Program's staff, donors, stakeholders, policymakers, and the public-at-large.
- Representing the Program by interacting with multiple institutions and individuals.

### **Credit/Visibility**

- Ensuring collaborators and institutions are recognized for their individual achievements under the umbrella of HarvestPlus.
- Guaranteeing that authorship and time of release of information will be agreed upon before papers are written.

### **Communication**

- Establishing communication technologies that enable:
  - o All members of the PMT, CWG, and the PAC to be effective ambassadors for HarvestPlus using standardized communication materials.
  - o The HarvestPlus management to maximize the use of web-based technologies to support and communicate its decisions.
  - o The HarvestPlus members to make use of web-based technologies to facilitate efficient electronic dialogue and sharing of information.
  - o The HarvestPlus management and collaborators to use the official program identity (e.g., logo, slogan, and mission statements) when representing the program and in deliverables and outputs.

### **Roles and Functions of the Program Management Coordination Working Group (CWG)**

The CWG as an interdisciplinary group representing all components of the Program (see the organizational matrix below). It will meet once a year and is consulted throughout the year on how HarvestPlus can be managed more efficiently. The PMT will consult with the CWG on development of the strategic directions.

It is the responsibility of the Program Director to set the agenda, moderate the discussions, and summarize the conclusions and recommendations arising from the CWG meetings and discussions.

#### ***CWG Members include the:***

- PMT (7)
- Crop Leaders (6)
- Functional Leaders (2)
- Representatives from IITA, ICARDA, ICRISAT (3)
- Representatives from the NARES in Africa, Asia, and Latin America (3)
- Private Sector Representative (1)

## Organizational Matrix

Function	PMT Member Responsible for Oversight	Functional Leaders <sup>1</sup>	Rice	Maize	Wheat	Cassava
Breeding	Breeding Coordinator (Joe Tohme Acting)	Breeding Coordinator (Joe Tohme Acting) <sup>2</sup>				
Biotechnology	Joe Tohme	Joe Tohme <sup>3</sup>				
In Vitro Screening	Penelope Nestel	Ross Welch <sup>4</sup> & Penelope Nestel				
Human Nutrition	Penelope Nestel	Penelope Nestel <sup>5</sup>				
Food Processing	Penelope Nestel	Penelope Nestel <sup>5</sup>				
Extension and Seed Systems	Extension and Seed Systems Coordinator (to be hired)	NA for 2004 <sup>6</sup>				
Impact and Policy	Impact and Policy Coordinator (Howarth Bouis acting)	Impact and Policy Coordinator (Howarth Bouis acting) <sup>7</sup>				
Communications	Bonnie McClafferty	Bonnie McClafferty <sup>8</sup>				
Breeding Objectives	Penelope Nestel	Robin Graham & Penelope Nestel <sup>9</sup>	Not Applicable			
Phase 2 Crops	Breeding Coordinator (Joe Tohme acting)	Breeding Coordinator (Joe Tohme acting) <sup>10</sup>	Ten Phase 2 crops based at ICRISAT, IITA, ICAR			
Strengthening Regional NARES	Breeding Coordinator (Joe Tohme acting)	Breeding Coordinator (Joe Tohme acting) <sup>11</sup>	Africa			Asia
Contractual, Accounting, and Administrative Requirements	Howarth Bouis	Marianna Carbe				

Work plans required for areas shaded in green.

- <sup>1</sup> Functional leaders are responsible for organizing those who will develop the cell-level work plans and budgets. Often a functional leader is also a member of the PMT.
- <sup>2</sup> Phase 1 crop leaders draft the breeding work plans and budgets
- <sup>3</sup> The Nutritional Genomics team writes and implements the work plan and budgets.
- <sup>4</sup> A core-funded in vitro work plan and budget is written for all crops and program-wide research, but this work plan will have some crop-specific plans. Nutrition Coordinator will implement the competitive bidding for in vitro research.
- <sup>5</sup> Details to be worked out by Nutrition Coordinator during first quarter of 2004.
- <sup>6</sup> Proposal to be developed; funding sought for 2005-2007.
- <sup>7</sup> Center social scientists (Impact Leaders) write and implement work plans and budgets.
- <sup>8</sup> Direct funding not available in 2004 for crop-specific communications activities.
- <sup>9</sup> Robin Graham and Ross Welch write and implement work plans and budgets for core funded activities. Nutrition Coordinator will implement the competitive bidding for Breeding Objectives.
- <sup>10</sup> Phase 2 Crop Leaders will write and implement the work plans and budgets.
- <sup>11</sup> To be implemented for Africa, Asia, and Latin America in somewhat different ways.

### **Role and Function of the Crop Leaders (CL)**

Each crop leader has overall responsibility for coordinating the interdisciplinary crop teams, whose role is to get effective adoption of their crop-specific biofortified varieties in a pre-determined number of countries on a sufficient scale to significantly reduce the prevalence of micronutrient malnutrition in those countries. To that end, the crop leader will be responsible for:

### **HarvestPlus Program Management**

- Providing input on how to improve implementation of the overall Program and on setting strategic directions as active members of the CWG;
- Developing annual work plans and budgets to achieve the *breeding component* milestones in the strategic plan; including subcontracts with NARES and other collaborating institutions;
- Fulfilling the annual contractual obligations for the *breeding component* by meeting stated deliverables;
- In consultation with the PMT, ensuring that the (i) annual work plans and budgets of other disciplinary components (nutritional genomics, human nutrition, food processing, impact, extension/seed systems) also achieve milestones that conform to the strategic plan and (ii) interdependent inputs/outputs of the various disciplinary components are delivered on time;
- Communicating with the PMT as needed throughout the year on crop-specific issues. Crop leaders will provide the necessary information requested by the PMT that serve the needs of the donor community and PAC. Crop leaders are encouraged to actively participate in the larger program's deliberations;
- Providing a written annual crop-level summary of research findings and progress made in achieving milestones;
- With the assistance of the PMT and respective CGIAR Center representatives, fundraising for all crop activities, particularly the breeding and extension/seed systems components;
- Serving as ambassadors for the program and will represent HarvestPlus at various scientific fora and other conferences and meetings.

### **Crop Team Program and Project Management**

- In consultation with crop team members, developing a strategic plan and updating it annually as dictated by research findings.
- In consultation with the PMT, identifying appropriate collaborative partners as members of the crop teams.
- Consulting with individual crop team members throughout the year on progress; moderating discussions over the internet among crop team members as required; and organizing crop team meetings as deemed necessary (annual or bi-annual);
- As facilitated by the Breeding Coordinator, discussing with other crop leaders opportunities for collaboration across crops either on scientific issues or in specific countries on logistical issues.

### **Roles and Responsibilities of the Functional Leaders (FL)**

The functional leaders have overall responsibility for developing and implementing a disciplinary research strategy whose specific activities both serve the needs of each individual crop strategy and, when aggregated, accelerate overall Program progress by taking advantage of lessons learned from cross-crop comparisons. In general, this will involve the following:

### **HarvestPlus Program Management**

- Developing and implementing the functional area strategic plan;
- Monitoring implementation of the crop team work plans and providing technical assistance as needed;
- Facilitating information sharing across the component activities and giving feedback to the crop leaders and PMT;
- Providing an annual written summary of disciplinary research findings and progress made in achieving milestones;
- Representing HarvestPlus at various scientific fora and other conferences and meetings;
- As a member of the CWG, attending the annual meeting.

### *Functional Area Program and Project Management*

- Developing a disciplinary strategic plan
  - In consultation with crop leaders, identifying appropriate collaborative partners.
  - In consultation with the crop leaders and collaborative partners, discussing the individual crop strategy, based on the approved Biofortification Challenge Program proposal and designated budgets for that specific discipline.
  - Developing a draft strategic plan and budget, discussing it with the PMT, inviting comments from the CWG and others from outside of the Program, modifying it, and presenting it to the PAC for approval;
  - Modifying the strategic plan annually as dictated by research findings and other new information.
- Implementing the disciplinary strategic plan
  - In consultation with collaborative partners and/or through the competitive bidding process, ensuring that crop-specific annual work plans are developed to conform with the requirements of both the crop team and the disciplinary strategic plan.

- o Sharing draft work plans with the crop leaders for comments and modifying as needed.

## **Financial Management**

CIAT and IFPRI have joint responsibility for the financial management of HarvestPlus. The contract for each annual work plan and budget, after being reviewed, revised, and approved by the PMT (see Responsibility Charting below), will be designated as either the responsibility of CIAT or IFPRI for disbursing payments to and receiving deliverables (including the financial accounting) from collaborating institutions. These designations will be made such that disbursement of funds for both contracts and for direct management expenses are approximately equally distributed between the two institutions.

### **2.4 Public Awareness and Communication**

Communication for biofortification has three core functional responsibilities and benefits from a network of communications counterparts in sister CGIAR centers. The three include:

- to design and implement a proactive outreach and public awareness strategy to inform and be informed by our audiences (experts, informed professionals, and interested public), in two distinct disciplines (nutrition and agriculture), across many countries and in several languages.
- to provide an in reach function that will build state of the art tools to assist in information exchange and management of HarvestPlus research.
- to assist behavior change communication specialists, who work with researchers on technology adoption within countries, regions and communities.

## **Research Portfolio and Contractual Relationships**

### **3.1. Overview**

Implementation of the research activities by the collaborating institutions identified in the Biofortification Challenge Program proposal commenced in January 2004. At the time of writing this report, however, funding levels have been set at 70% of those proposed.

2003 was primarily a year of fundraising and preparing the organizational groundwork for start-up of full-time operations in January 2004. However, contracts were written to begin research in 2003 at modest levels of funding (compared with 2004), in many cases to building on research activities that were initiated under the auspices of the CGIAR Micronutrients Project, which ran from 1995 through 2002. These contracts covered all the Phase 1 and Phase 2 crops and for the Breeding Objectives research. This proved to be useful from an administrative sense in that the “boilerplate” contract wording was not always fully accepted by the collaborating institutions, and compromises had to be negotiated. Consequently, contractual arrangements for 2004 workplans/budgets have gone relatively smoothly in that these can now be written as amendments to the 2003 contracts.

On the issue of Intellectual Property (IP), HarvestPlus has maintained that all collaborating institutions jointly share ownership of the results from research funded by HarvestPlus. This involved considerable negotiation with several institutions, so much so that in some instances initial contracts could not be signed until 2004, but eventually all institutions agreed to the principle of joint ownership.

Most contracts were signed and funds were disbursed in the latter part of 2003. This means no research results are yet available.

### **3.2. Breeding**

In general breeding activities include (i) screening germplasm for high micronutrient density, (ii) genotype by environment studies, (iii) identification of molecular markers for large-scale selection programs, (iv) genetic and QTL analyses to determine loci involved in micronutrient content; and (v) development of varieties with high micronutrient concentration and superior agronomic traits, in collaboration with NARES. Contracts have been initiated with the following institutions and crop leaders:

#### **Phase 1 Crops:**

- Rice, Swapan Datta, rice, IRRI
- Maize, Kevin Pixley, CIMMYT,
- Maize, Abebe Menkir, IITA
- Wheat, Ivan Ortiz-Monasterio, CIMMYT
- Cassava, Hernan Ceballos, CIAT
- Cassava, Alfred Dixon, IITA
- Sweet Potato, Regina Kapinga, CIP
- Beans, Steve Beebe, CIAT

## **Phase II Crops**

Cowpeas, B.B. Singh, IITA  
Plantains, A. Tenkouano, IITA  
Yams, Robert Asiedu, IITA  
Potatoes, Meredith Bonierbale, CIP  
Barley, Stefania Grando ICARDA  
Lentils, Ashutosher Sarker, ICARDA  
Groundnut, K.K. Sharma, ICRISAT  
Pearl Millet, K.N. Rai, ICRISAT  
Sorghum, Belum V.S. Reddy, ICRISAT  
Pigeon Pea, K.K. Sharma, ICRISAT

## **Micronutrients Technical Assistance**

James Stangoulis and Robin Graham, University of Adelaide

Provision of field-based micronutrient expertise to the crop leaders, as well as research on the translocation of trace minerals in plants, contributing to the strategic development of the program.

### **3.3. Nutritional Genomics**

Research to identify and understand the underlying molecular and biochemical mechanisms of specific genes and loci affecting the nutritional traits of interest in model systems. This knowledge will then be applied, with the assistance and close collaboration of the CGIAR and NARES scientists, to improving the micronutrient density of staple crops.

Dean Dellapenna, Michigan State University (USA)

Peter Beyer, University of Freiburg (Germany)

Michael Grusak, USDA-ARS Children's Nutrition Research Center, Baylor College of Medicine (USA)

A competitive bidding process for a portion of the funds will be implemented during 2004.

### **3.4. Food Processing and Human Nutrition**

The Phase 1 crop varieties screened as being high in  $\beta$ -carotene or the minerals will undergo more complete compositional analysis, after which the effects of storage, processing, and cooking on the level of micronutrients retained will be determined. This work will be done by the CGIAR centers; Royal Veterinary University (KVL), Denmark; and/or analysts trained through HarvestPlus (see below). Most, if not all, will be completed in 2004.

Analysts from nine laboratories in developing countries will be trained in carotenoid screening and assay methods at the University of Campinas, Brazil, in 2004 to provide better access to regional-based assays. Interlaboratory quality control procedures will be put in place for both the carotenoid (University of Campinas) and mineral (University of Adelaide) assays.

During 2004 promising genotypes of rice, wheat, maize, and beans will be screened and ranked for iron bioavailability using an *in vitro* method (PSNL, Cornell; KVL) that will be validated in an animal model (PSNL, Cornell). This will be followed by a human isotopic study on to determine the bioavailability of iron and zinc in beans previously screened by the *in vitro* method (USDA, Grand Forks, ND).

*In vitro* (PSNL, Cornell) and animal studies (PSNL, Cornell, University of Adelaide) will begin to determine whether resistant starch and non-digestible carbohydrates increase bacterial activity in the colon and, thus, possibly improve the bioavailability of minerals.

Compounds known as the 'meat factor', which are found in meat, fish, and poultry, enhance iron absorption. During 2004, research to identify whether similar compounds exist in plant tissue that can be exploited as a promoter substance to improve the bioavailability will be started (PSNL, Cornell).

Work will also begin in 2004 on further development of an *in vitro* method to examine whether this is a potentially a useful tool for screening enhanced provitamin A carotenoids levels in identified lines if target crops. This work will be competitively bid.

The effects of aleurone cell layer thickness on both the vitamin and mineral concentrations and distribution in grain of genotypes of cereal species possessing the multiple aleurone gene trait will be identified in 2004 (PSNL, Cornell). This research will determine whether the multiple aleurone trait is a worthwhile breeding approach to enhance the vitamin and mineral levels in cereal grains consumed unmilled or without excessive milling and polishing

During 2004, the efficacy of micronutrients to improve health will begin. To test its efficacy to improve zinc blood levels and both ameliorate gastrointestinal damage and improve gastrointestinal function, hospitalized children with acute diarrhea will be given short term treatment with a high or a low zinc rice-based oral dehydration therapy (Children's Hospital, Adelaide, Australia).

To test the hypothesis that because of nutrient interactions vitamin A deficiency is responsible for some of the iron and possibly zinc deficiency prevalent in developing countries, the planning for a stable isotope to measure the bioefficacy of provitamin A carotenoids in sweet potato, maize, and cassava, on iron, zinc, and vitamin A status study will be begin in 2004. This study will also determine the vitamin A equivalence factors ( $\beta$ -carotene to retinol) in the crops studied. It is anticipated that this work will be supported through a collaborative agreement with the International Atomic Energy Agency. The research will be competitively bid in 2004 for implementation in 2005.

Selenium is an important antioxidant and low status can result in DNA damage. To test the efficacy of selenium to reduce DNA damage rates, men with above-average baseline level of DNA damage will be fed high or low selenium wheat and changes in DNA damage and other parameters measured (CSIRO, Australia). This study will test whether the DNA damage biomarkers used are effective measures of selenium absorbability and functionality. If so, this model will be extended to study zinc, iron, and  $\beta$ -carotene among subjects with marginal

baseline status of each nutrient. The model could also be used to study micronutrient interactions.

Preliminary data suggests that specific carotenoids (lutein and zeaxanthin) enhance iron bioavailability in poultry that are both iron and vitamin A deficient. The magnitude of the synergies among the enhanced iron, zinc, and provitamin A carotenoids will be tested in 2004 in an animal study using high or low iron and vitamin A diets (University of Adelaide). The interactive effects of iron absorption inhibitors and enhancers will also be looked at in the same study. If this study shows that breeding for high iron absorption enhancers and/or high carotenoids in grains can enhance iron and zinc status of mildly deficient animals, studies among mildly deficient human subjects will be carried out in subsequent years.

Sucrase activity is indicative of small intestinal damage and can be measured by a breath test. Other breath tests can indicate the potential of a prebiotic in a given crop to improve lower intestinal function. If the breath tests in the high iron rice/diarrhea study and the animal micronutrient interaction study predict iron and zinc nutritional outcomes in deficient individuals/animals, this simple, rapid, non-invasiveness technique will be validated against currently used indicators in human studies before being used in future efficacy and effectiveness trials.

A maize efficacy trial is planned for Nigeria (Wageningen University), subject to there being adequate post processing provitamin A carotenoids in the cooked food.

Ross Welch, PSNL, Cornell

Robin Graham, University of Adelaide (includes Children's Hospital and CSIRO)

Clive West, Wageningen University

John Beard, University of Pennsylvania (2003)

Delia Rodriguez-Amaya, University of Campinas

Nanna Roos, Royal Veterinary University, Denmark

### **3.5. Impact and Policy Analysis**

The overall objectives of the impacts and policy analyses component include:

- Ensure efficient use of resources through accurate targeting of countries and target groups
- Document and measure impact of the introduction of biofortified varieties
- Improve understanding of the role of dietary quality in food security
- Analyze role of policies (including biofortification) in improving dietary quality

Within the framework of these general objectives, the impacts and policy analyses in 2004 will focus on estimating the ex ante impacts of the development, dissemination, and adoption of biofortified crop varieties and the collection of useful information at the community and farm level. The latter will increase our understanding of household preferences and constraints in the production and use of the targeted crop(s) as well as their perceptions about nutrition. This information will be incorporated into ongoing work carried out by the crop groups and nutrition

teams to enhance the acceptability of the biofortified crop varieties. It will also be used in subsequent impacts and policy research.

Erika Meng, wheat, South Asia, CIMMYT

Hugo DeGroot, maize, Eastern and Southern Africa, CIMMYT

Victor Manyong, cassava-yams, West Africa, IITA

David Yanggen, sweet potato-beans, Eastern and Central Africa, CIP/CIAT

Nancy Johnson, cassava, South America, CIAT

Nancy Johnson, beans-maize, Central America, CIAT/CIMMYT

David Dawe, rice, South and Southeast Asia, IRRI

#### **4. Governance and Management**

##### **4.1. The Project Advisory Committee**

A Project Advisory Committee (PAC) was formed to provide governance and oversight, which is to facilitate the Program's collaborative arrangements. The PAC is made up of 12 experts from developing and developed countries, the Director-Generals of CIAT and IFPRI, and two Board representatives from CIAT and IFPRI (16 members in total). Besides oversight responsibilities, the PAC is also charged with setting strategic directions and approving Program budgets. Although the PAC is not a legal entity, it has been given authority by the CIAT and IFPRI Boards to undertake its mandate as an independent body.

PAC members are listed in Appendix 1.

PAC meetings were held in March and November. Their purpose, among other things, was to initiate the administrative arrangements (March and November), appoint a Program Director (March), and revise and approve a workplan and budget for 2003 (March) and 2004 (November).

Decisions taken are outlined in the official minutes of the two meetings.

##### **4.2. Planning Meetings**

To operationalize the collaborative relationships and develop efficient and consistent strategies and annual workplans for 2004, a series of essential and important planning meetings were held during 2003 as described below.

###### **4.2.1. Planning meeting of core collaborators and selected stakeholders, June 2-6, CIAT headquarters.**

75 persons attended this five-day meeting. The Coordination Working Group met for the first time for one full day on May 30.

The following objectives were achieved:

- Introduce and discuss the different broad components of the project to those who would be participating in the Program and other stakeholders; there was an initial unevenness among the collaborators/participants in their familiarity with the Program;
- Flesh out and revise the conceptual framework laid out in the proposal to ensure that the different components were designed to complement each other technically—thus, it was essential to engage in interdisciplinary learning and exchange at the meeting;
- Develop an operational plan to implement coordinated activities through the end of 2004; a workplan and budget allocation for 2003 was agreed upon;
- Open and set up lines of communication across the components—collaborators got to know each other much better, and crop leaders became more familiar with what would be involved in building and managing their crop teams;
- Hear, at a very broad global level, what might be stakeholder or collaborator concerns on the concept of the project as a whole and to get their buy-in.

#### **4.2.2. Crop Meetings**

After the June 2-6 Program-wide meeting, it was necessary to hold crop-specific meetings for each of the Phase 1 crops. The crop meetings ranged from 35 to 60 participants, 10 of whom on average had attended the Program-wide meeting. The objectives of the crop meetings were similar to those listed above for the Program-wide meeting in terms of developing collaborative relationships—in addition to discussing and developing a medium-term strategy for each crop and specifying the elements of a workplan for 2004. The following schedule of the crop meetings took place:

Wheat crop meeting, CIMMYT headquarters, September 10-12  
 Cassava crop meeting, Entebbe, Uganda, September 15-17  
 Sweet Potato crop meeting, Entebbe, Uganda, September, 17-19  
 Maize crop meeting, Addis Ababa, September 24-26  
 Bean crop meeting, Nairobi, Kenya, October 1-3  
 Rice crop meeting, IRRI headquarters, October 6-8

#### **4.3. Disciplinary Meetings**

Two disciplinary meetings (the rows in the above diagram) were held:

##### **4.3.1. Impact and Policy Analysis, IFPRI headquarters, September 2-3.**

The Bill and Melinda Gates Foundation had requested an expansion of activities in this area from what was described in the BCP proposal. Under a time constraint, activities and a budget were proposed and accepted. However, there was a need for collaborating institutions to discuss and flesh out a consensus workplan for these activities.

##### **4.3.2. Nutritional Breeding Objectives, Cornell University, September 4-5.**

As part of these activities are to be competitively bid, a core group of nutritionists along with significant representation from other disciplines were invited to help define the priorities areas of

research for the competitive bidding. In addition, the meeting helped to inform and to engage a wider group of nutritionists in HarvestPlus activities. The Breeding Objectives research is key to revealing additional strategies (increasing compounds that improve bioavailability; reducing compounds that inhibit bioavailability) that will further enhance the impact of biofortification.

#### **4.4. Additional Meetings**

##### **4.4.1. Private sector meeting, IFPRI headquarters, July 20.**

Representatives from DuPont/Pioneer and Monsanto corporations, ILSI, and USAID met with Howarth Bouis and Joe Tohme of HarvestPlus to discuss collaboration. The meeting was organized by Bill Neibur of the CGIAR Private Sector Committee. There was strong interest expressed on both sides to cooperate on the development of micronutrient-dense transgenic varieties.

##### **4.4.2. Meeting to discuss collaboration with AATF, IITA headquarters, August 4-6**

Several collaborators in the HarvestPlus maize crop activity met with representatives of the AATF management to discuss a collaborative role with AATF. It was agreed that AATF management would seek approval of maize biofortification activities by the AATF Board. The AATF Board now has approved this as one of AATF's initial activities.

#### **4.5. Meetings in 2004**

The above meetings laid the groundwork for initiation of HarvestPlus. With the foundation of inter-active partnerships having been laid, the number of meetings will be substantially reduced in 2004:

4.5.1. End User/Seed Systems/Behavioral Change meeting to be held at IPGRI headquarters, May 5-7. Funds have been allocated from the 2003 budget to cover this expense.

4.5.2. Third PAC meeting, May 31-June 1, CIAT headquarters, Cali, Colombia. The PAC will take a decision at the May 31-June 1 meeting whether it will need to continue to meet every six months, or to meet once a year.

#### **5.0. Staffing**

5.1. Howarth Bouis (United States) was designated by the PAC as Program Director in March 2003. He holds a joint appointment at CIAT and IFPRI. The position was internationally advertised during October-December 2002. Selection was conducted in March by a committee composed of PAC members and the Director-Generals of CIAT and IFPRI.

5.2. Marianna Carbe (Italy) began employment as Senior Administrative Coordinator at IFPRI in June after a job announcement/search (local hire) in March/April. Her primary responsibility is to manage the contracts and budgeting.

5.3. Bonnie McClafferty (United States) began employment in July as the Communications Coordinator at IFPRI after a job announcement/search (local hire) in May/June.

5.4. Penelope Nestel (United Kingdom) began employment in January 2004 as the Nutrition Coordinator. An IFPRI employee, she will be based at Wageningen University in the Netherlands as of April 2004. The position was internationally advertised during July/August. A committee composed of persons from CIAT, IFPRI, the PAC, and non-CGIAR institutions conducted selection in September.

5.5. A process has been initiated (international hire) for filling the Breeding Coordinator position. Applications have been received are now closed. It is expected that selection will be in April 2004. This will be a CIAT employee based at CIAT headquarters.

5.6. A process has been initiated (international hire) for filling the Impact and Policy Coordinator position. Applications have been received are now closed. It is expected that selection will be in April 2004. This will be an IFPRI employee based at IFPRI headquarters.

5.7. A process will be initiated in 2004 (international hire) for filling the End User/Seed Systems Coordinator position. This will be a CIAT employee to be based in Africa. The decision to create this position and expand activities in the area during 2004-2007 was undertaken at the November PAC meeting.

## **6. Communications Activities During 2003 and Plans for 2004**

### **Name and Logo**

The decision was taken in July to rename the Biofortification Challenge Program to “HarvestPlus.” The motivation for this modified ‘branding’ is that communication with a broader audience outside of the CGIAR will be more effective. The name selected (by a committee of seven people from a list of forty submissions) was widely discussed among collaborators and stakeholders before the decision was taken. A logo designed by staff at CIP (winner of a competition) was also selected by the same committee. The term “biofortification” (which CIAT has trademarked) will continue to be frequently used to describe the process of breeding for micronutrient-dense crops. This name change does not preclude the use of the name Biofortification Challenge Program internally for official CGIAR purposes.

### **Official Program Launch and Website**

On October 14, 2003, in connection with a Gates Foundation press release announcing its contribution to HarvestPlus, a press conference was organized at the National Press Club in Washington DC. This generated over 50 news articles. Afterwards a luncheon was hosted at the National Press Club. A HarvestPlus website was developed for use by the time of the October 14 announcement ([www.harvestplus.org](http://www.harvestplus.org)).

## **Inreach and Outreach by the Program Management Team**

Presentations and visits undertaken by the Program Director and other members of the PMT are listed in Appendix 2. In reach is important to answer questions, clarify misconceptions, and to build consensus/support for an operational plan involving dozens of collaborating institutions.

It will take ten years to fully realize the impact of the biofortification strategy. To maintain funding over such an extended period, it will be important to maintain long-term support for the biofortification strategy among a broad range of stakeholders – who also have questions and misconceptions. Thus, outreach is also critically important.

## **Objectives and Outputs for Communications in 2004**

HarvestPlus Outreach:

*Corporate Promotional material.* In 2004, HarvestPlus outreach communication and public awareness is focusing on the development of a suite of generic communication materials such as Program Brochures (general program brochure, crop-specific brochures (six) and brochures describing the disciplinary functions (seven)). PowerPoint presentations, posters, and office products (letterhead, business cards, etc)

*HarvestPlus Publications.* While proof of concept research is being conducted, our primary target audience for the first year is experts in the areas of agriculture and nutrition. As the program matures, it is expected that additional target audiences will be brought on to include more outreach to the informed and interested audiences including the general public. During this first year specific publications are being developed to reach this expert audience including HarvestPlus Abstracts (abstracts of papers published in peer-reviewed journals by HarvestPlus collaborators), Technical Briefs, Technical monographs (papers commissioned by HarvestPlus but not necessarily for journal publication, e.g. literature reviews and methodology papers), and HarvestPlus working papers (first drafts of papers written by HarvestPlus collaborators that are eventually intended for publication in peer-reviewed journals).

*HarvestPlus Seminar Series at IFPRI .* The HarvestPlus seminar series has been initiated at IFPRI. Three seminars are planned per year. On February 13, Ingo Potrykus and Joel Cohen delivered the first seminar titled, *Rethinking GMO Regulation through a Golden Rice Framework*, to an audience of approximately 50 representatives from the Washington-based international development community including, donors, NGOs, academics and policy makers. The second seminar is scheduled for May 11 and will present the result of the high iron rice nutritional efficacy study.

*Media.* HarvestPlus collaborates with the IFPRI media team to identify upcoming current events and opportunities for HarvestPlus presence in the media as well as links into existing opportunities to feature our research activities in trade journals and newsletters.

HarvestPlus In reach:

The primary focus for the in reach component of HarvestPlus communication in 2004 involves the development of an internet-based community of practice platform call the HarvestPlus Hub. Developed by Community Zero and Learningtimes, the Hub provides a storage and discussion space for the entire HarvestPlus research community and allows all members to share and store information on the internet in clearly partitioned spaces. As part of this resource, an electronic library of documents and images is being developed to assist researchers synthesize and communicate HarvestPlus research outputs.

Production of an internal monthly newsletter (similar to Inside IFPRI but for all HarvestPlus collaborators/activities), starting in May. This newsletter will be a hard copy complement to discussions and announcements that appear on the HarvestPlus Hub.

*Behavior Change Communication.* HarvestPlus Communication will work closely with behavior change specialists and crop leaders at the point of the diffusion of varieties to insure HarvestPlus principles and messages are consistent during the dissemination phase.

## **7. Financial Management**

### **7.1. Donor Commitments and Expectations**

As described below, funding for the proposed core activities (\$50 million over the first four years) has now apparently been raised, although some donor commitments necessarily continue on a year-to-year basis.

#### **World Bank**

As a result of approval of the Biofortification Challenge Program by the CGIAR membership at its Annual General Meeting (AGM) in October 2002, the World Bank released \$3 million to HarvestPlus for 2003. These were the funds used for the activities described above. A financial accounting is provided below.

If the World Bank continues its stated policy of providing \$3 million per year to all approved Challenge Programs, this will mean \$12 million in funding during 2004-2007.

#### **The Bill and Melinda Gates Foundation**

An agreement, officially between IFPRI and the Gates Foundation (although the funding will be jointly administered jointly by CIAT and IFPRI), was signed in August 2003, which calls for the Gates Foundation to provide \$25 million in funding over four years. The funds will be released in four trenches (\$7 million – August, 2003; \$7 million – January, 2005; \$7 million – January, 2006; \$4 million – January, 2007).

## **USAID**

USAID has very recently signaled its intention to provide \$3 million per year in funding (announcement made in plenary by the Deputy Administrator of USAID at the Subcommittee on Nutrition meetings in March, 2004, held at the United Nations headquarters in New York). One half of the funding would come from the USAID's Global Bureau for Health and one half come from the Global Bureau for Economic Growth, Agriculture, and Trade (EGAT). If USAID continues its stated policy of providing \$3 million per year to HarvestPlus, this will mean \$12 million in funding during 2004-2007 -- \$6 million from "new sources" of funding (Global Bureau for Health) and \$6 million from "traditional sources" (EGAT).

## **DANIDA and SIDA**

DANIDA has indicated approval of 3 million Danish Kroner (DKK) per year for three years, 2004-2006 (about US \$500,000 per year at the current exchange rate). 2 million DKK are designated for complementary activities to be undertaken by seven Danish institutions (upstream research activities not described in the BCP proposal) and 1 million DKK are designated for core BCP funding.

SIDA has contributed 800,000 SEK (about \$100,000) to HarvestPlus for 2004.

## **Summary**

If the World Bank and USAID continue with their presently stated policies, \$31 million in funding during 2004-2007 would come from "new sources" and \$19 million would come from "traditional sources" (World Bank + USAID/EGAT + DANIDA + SIDA)

## **7.2. Audited Expenditures for 2003**

The workplan and budget for 2003 are based on the World Bank funds of \$3 million, the only funds available for operation of HarvestPlus until August of 2003 when the Bill and Melinda Gates Foundation made its first transfer of funds.

The 2003 activities of Harvest Plus in financial terms are reported upon as supplementary information to the audited financial statements of IFPRI and CIAT. The supplementary statement follows. IFPRI's external auditors, Price Waterhouse Coopers, and CIAT's external auditors, KPMG, have subjected these supplementary statements to the auditing procedures applied in the audits of the financial statements of the two centers and are satisfied that these are fairly stated. A separate report from each audit firm to this effect will be issued.

The program management costs in the year ended 31 December 2003 amounted to \$1.3 million in total in line with budgets as reported below. Total disbursements in 2003 amounted to \$2.018 million. The schedule below sets out the transactions for the Harvest Plus Challenge Program recorded in the accounting records of IFPRI and CIAT from October 2002, date of program inception through December 31, 2003.

<b>Cash Receipts</b>	<b>Total</b>	<b>IFPRI</b>	<b>(unaudited) CIAT</b>
World Bank	\$ 3,000	\$ 3,000	\$ -
Bill & Melinda Gates Foundation	7,000	7,000	-
Austria	54	54	-
Interest income	27	18	9
<b>Total receipts before transfers</b>	<b>10,081</b>	<b>10,072</b>	<b>9</b>
<b>Transfers</b>	<b>-</b>	<b>(5,000)</b>	<b>5,000</b>
<b>Total receipts</b>	<b>\$ 10,081</b>	<b>\$ 5,072</b>	<b>\$ 5,009</b>
<b>Cash Disbursements</b>			
CIAT	\$ 207	-	\$ 207
CIMMYT	133	-	133
CIP	78	-	78
ICARDA	40	-	40
ICRISAT	80	-	80
IITA	53	-	53
IRRI	60	-	60
Research Institute for Mindanao Culture	20	20	-
University of Adelaide	25	25	-
<b>Total disbursements for Research</b>	<b>696</b>	<b>45</b>	<b>651</b>
<b>Disbursements for Program Management</b>	<b>1,322</b>	<b>983</b>	<b>339</b>
<b>Total Disbursements</b>	<b>2,018</b>	<b>1,028</b>	<b>990</b>
<b>Undisbursed funds held by IFPRI/CIAT</b>	<b>\$ 8,063</b>	<b>\$ 4,044</b>	<b>\$ 4,019</b>

#### Allocation of 2003 Funding for HarvestPlus

<b>Category</b>	<b>Amount Committed</b>	<b>Amount Disbursed By December 31, 2003</b>	<b>Description</b>
Phase 1 crops breeding	\$750,000	\$565,000	Four crops @ \$110,000 (rice, maize, beans, sweet potatoes); two crops @ \$130,000 (cassava, wheat); includes costs of crop meetings (CIAT, CIP, CIMMYT, IITA, IRRI)
Phase 2 crops breeding	\$250,000	\$173,000	Ten crops @ \$25,000 (CIP, ICARDA, ICRISAT, IITA)
Phase 1 and Phase 2 crops	\$50,000	\$25,000	Micronutrients technical assistance from the University of Adelaide for Phase 1 and Phase 2 crops

Strengthening Regional Collaboration	\$87,000	\$0	EMBRAPA
Nutritional Genomics	\$105,000	\$0	University of Freiburg, USDA -ARS, Children's Nutrition Research Center at Baylor College of Medicine; Michigan State University
Nutritional Breeding Objectives	\$215,000	\$40,000	Initiation of work at the University of Adelaide and the USDA -ARS Plant, Soil, and Nutrition Laboratory at Cornell University
Food Processing, Human Nutrition	\$295,000	\$50,000	Measurement techniques/training, behavioral change; Wageningen University, Research Institute of Mindanao Culture, Michigan State University; Cornell University, Pennsylvania State University
Impact and Policy Analysis	\$81,500	\$56,500	IFPRI, CIAT
Organizational and Technical Meetings	\$440,000	\$440,000	Two PAC, Project-Wide, Impact and Policy, Breeding Objectives, Seed Systems/Extension, Private Sector, Others
Program Management Team Staff, Salaries, Benefits, and Operational Expenses	\$555,000	\$535,000	Program Director, Acting Breeding and Biotech Coordinator, Communications Coordinator, Senior Administrative Coordinator, Secretarial (IFPRI and CIAT)
Communications	\$68,500	\$68,500	Program Launch, Brochures, Website, Trademarking (IFPRI)
Administrative Fees and Other Costs	\$103,000	\$65,000	IFPRI and CIAT
<b>TOTAL</b>	<b>\$3,000,000</b>	<b>\$2,018,000</b>	

### 7.3. Budget for 2004

The following budget, approved by the PAC at its November, 2003 meeting, is set at about 75% of proposed funding (\$6.25 Gates Foundation + \$3 million World Bank + \$150,000 DANIDA)

Allocation of 2004 Funding for HarvestPlus		
Category	Amount Spent and Committed	Description
Phase 1 crops breeding	\$2,207,100	CIAT, CIP, CIMMYT, IITA, IRRI and collaborating NARES
Phase 2 crops breeding	\$700,000	CIP, ICARDA, ICRISAT, IITA

Phase 1 and Phase 2 crops	\$163,800	Micronutrients technical assistance from the University of Adelaide for Phase 1 and Phase 2 crops
Strengthening Regional Collaboration	\$560,000	NARES in Africa, Asia, and Latin America
Nutritional Genomics	\$1,050,000	University of Freiburg, USDA -ARS, Children's Nutrition Research Center, Baylor College of Medicine; Michigan State University
	\$213,200	Competitive Bidding
	\$50,000	Shared position with Genetic Resources CP
Nutritional Breeding Objectives	\$990,400	Initiation of work at the University of Adelaide and the USDA -ARS, Plant, Soil, and Nutrition Laboratory, Cornell University
	\$245,000	Competitive Bidding
Food Processing and Human Nutrition	\$450,000	
Impact and Policy Analysis	\$805,000	CIAT, CIP, CIMMYT, IITA, IRRI and collaborating insitutions
Program Management Team Staff, Salaries, Benefits, and Operational Expenses	\$1,240,000	Program Director, Breeding, Biotechnology, Nutrition, Impact and Policy, Seed Systems/Extension Coordinators, Senior Administrative Coordinator, Secretarial (IFPRI and CIAT)
Communications	\$245,000	IFPRI
PAC and Other Meetings	\$262,000	IFPRI
Administrative Fees	\$200,000	IFPRI and CIAT
<b>TOTAL</b>	<b>\$9,381,500</b>	

## 8. Problems Encountered and Lessons Learned

### 8.1 Resources and Time for Planning and Executing the Full Start-Up of Individual Challenge Programs Are Essential -- a minimum of 12 months.

The initial approval process and World Bank funding provided the resources necessary for the planning and start-up activities described above.

The fact that much smaller precursor projects (e.g., the CGIAR Micronutrients Project) were already in place and provided experience/lessons in interdisciplinary collaboration and communication has (i) facilitated productive planning meetings and (ii) provided a means for efficient use of part of the World Bank 2003 funds for continuing ongoing activities (e.g., breeding, germplasm screening, nutrition studies), even as the collaborating organizations prepared for scaling up activities in 2004.

For Challenge Programs that are just starting, in terms of actual operation and collaborator interactions, this initial start-up period may have to be extended beyond 12 months.

## **8.2. Challenge Program Approval Process Aided Fund-Raising From Non-Traditional Sources**

That the World Bank funding was already in place helped in discussions with the Gates Foundation. The eight anonymous, external reviews commissioned by the iSC were made available to the Gates Foundation and this shortened the time required in their review process. It is, however, important that the momentum to fully fund the remainder of the Program is maintained and to show that the bold initiative taken by a new major donor, a non-CGIAR member, is matched by other donor sources.

## **8.3. There are Some Incompatibilities Between Competitive Bidding and Interdisciplinary Collaboration**

Interdisciplinary exchange/communication is crucial for the success of HarvestPlus. Such interactions become increasingly productive as experience is gained, that is over time and through a series of meetings. HarvestPlus had an advantage in that a subset of collaborating institutions in precursor projects gained experience from this process, but many new non-CGIAR collaborators participated in the planning meetings in 2003. To motivate true collaboration, it is important that collaborating institutions share a common set of goals/objectives that must be jointly discussed and agreed on. Understanding across disciplines is hindered by technical language, which is not commonly understood, or has different connotations to different disciplines. These barriers must be surmounted. This all takes time and the give-and-take of interacting on repeated occasions.

The optimal situation for team building is one in which the partner institutions are all known at the start of the planning process. Competitive bidding can hinder this process of team-building in three ways. First, if one does not know that his/her proposal will be selected, he/she will be more reluctant to fully buy into the planning process or may not have been invited to participate in the planning process at all. Second, a winning bidder agrees to undertake a specific activity. Challenge Programs must be flexible as ongoing research and external circumstances dictate changes in overall plans. Unless fully integrated into a culture of teamwork, the winning bidder may be reticent to alter the terms of reference of the winning bid, which may have taken quite a substantial amount of work to prepare. Third, it is usually expected that competitive bids will be decided only on the basis of technical competence, perhaps also with a value placed on capacity building. However, ability/willingness and compliance to collaborate across disciplinary boundaries is essential and difficult to assess in evaluating formal proposals.

## **8.4. Distributed Decision-Making Power**

Building consensus among collaborating institutions is key to the success of HarvestPlus. The Program Director reports to (i) a Project Advisory Committee that has ultimate decision-making power over workplans and budgets, as well as the Directors-General of CIAT and IFPRI. Such

a structure inherently forces consensus-building. Nevertheless, consensus-building requires considerable transactions costs.

### **8.5. Outreach to the Public**

A decision was made to change the name of the Biofortification Challenge Program to HarvestPlus as a way to reach out more effectively to the public. This was important in terms of (i) sustaining donor support for a 10-year program, (ii) defending/explaining controversial activities related to development of transgenic crops, and (iii) meeting one of the goals of the Challenge Programs, which was to raise the public profile of the Future Harvest Centers. Not everyone agreed with the decision; several scientists were reticent to use such an 'imprecise' title. However, the decision-making process was highly participatory, the decision approved by a large majority, and accepted. Time will tell whether this name will serve us better in meeting the above three objectives. The lesson learned is that a name change can be accomplished.

### **8.6. Agreement on Contractual Wording With Respect to Intellectual Property (IP)**

The signing of several contracts with non-CGIAR institutions was delayed by several months due to the IP policy which stated that all output from the project would be jointly owned. Eventually an accommodation was reached with all institutions while maintaining this policy in every instance.

**Appendix 1**  
**Project Advisory Committee Members**

*Dr. Bui Ba Bong*  
Vice Minister of Agriculture  
Nationality: Vietnamese

*Prof. Richard Flavell*  
Chief Scientific Officer  
Ceres Inc.  
Nationality: British

*James W. Jones*  
Chair of CIAT Board  
Distinguished Professor  
Institute of Food and Agricultural Sciences  
Agricultural and Biological Engineering Department, University of Florida  
Nationality: American

*Dr. Michael Lipton*  
Research Professor & Director  
Poverty Research Unit, University of Sussex  
Nationality: British

*Dr. Adiel Mbabu*  
Director of Planning  
ASARECA  
Nationality: Ugandan

*Dr. Peter McPherson (PAC Chair)*  
President  
Michigan State University  
Nationality: American

*Ruth Oniang'o*  
Professor, Dept. Food Sci. & Postharvest Tech.  
Jomo Kenyatta University of Ag. & Tech.  
Nationality: Kenyan

*Dr. Maria Jose Amstalden Sampaio*  
Chief Scientific Advisor, EMBRAPA  
Ministry of Agriculture and Food Supply  
Nationality: Brazilian

*Peter Sandoe*  
Director, Center for Bioethics & Risk Assessment

The Royal Veterinary & Agricultural University  
Nationality: Danish

*Suttilak Smitasiri*  
IFPRI Board Member  
Head, Division of Communication and  
Behavioral Science  
Institute of Nutrition, Mahidol University,  
Nationality: Thai

*Dr. M.S. Swaminathan*  
UNESCO Cousteau Chair in Ecotechnology & Chairman  
M.S. Swaminathan Research Foundation  
Nationality: Indian

*Barbara Underwood (PAC Vice-Chair)*  
Retired, former President of International Union of Nutrition Sciences  
Nationality: American

*Joachim von Braun*  
Director General, IFPRI  
Nationality: German

*Joachim Voss*  
Director General, CIAT  
Nationality: Canadian

*Mark Wahlqvist*  
Director, Intl. Health & Dev Unit  
Asia Pacific Health & Nutrition Centre  
Monash University  
President, International Union of Nutritional Sciences  
Nationality: Australian

## **Appendix 2. Inreach and Outreach Activities in 2003 by the Program Management Team**

### **2003**

HarvestPlus presentation at joint meeting of rice breeders and human nutritionists, Bangkok, Thailand, January 20-21

Organized ADB High-Iron Rice Project, Dhaka, Bangladesh, January 27-29 and seminar on agriculture-nutrition linkages, January 30

HarvestPlus presentation at the Carter Center, Atlanta, Georgia, February 13

HarvestPlus presentation at Asian Congress of Nutrition, New Delhi, India, February 24-28

HarvestPlus presentation at a workshop held at the Central Food Technological Research Institute, Mysore, India, March 1-2

HarvestPlus workshop, World Bank, March 14

HarvestPlus seminar and meetings with CIMMYT staff, Mexico, March 30-April 1

HarvestPlus seminar and meetings with CIP staff, Peru, April 3-4

HarvestPlus seminar and meetings with CIAT staff, Colombia, April 7-8

Golden Rice Humanitarian Board meeting, Zurich, Switzerland, April 14

Meetings with University of Freiburg, Germany collaborators and administrators, April 15-16

HarvestPlus seminar, Swiss Development Corporation, Berne, Switzerland, April 17

Meeting of High-Betacarotene Maize Project, Iowa State University, May 1-2

Lecture, Johns Hopkins School of Public Health, Baltimore, Maryland, May 8

Planning meeting of Coordination Working Group, core collaborators, and selected stakeholders, May 30- June 6, CIAT headquarters

HarvestPlus presentation, USDA-sponsored conference for ministers of agriculture, Sacramento, California, June 23-25.

Private sector meeting, IFPRI headquarters, July 20 (Howarth Bouis and Joe Tohme)

Meeting to discuss collaboration with AATF at IITA headquarters, August 4-6.

HarvestPlus seminar and meetings with IITA staff, August 7-8.

Impact and Policy Analysis planning meeting, IFPRI headquarters, September 2-3.

Nutritional Breeding Objectives planning meeting, Cornell University, September 4-5

Wheat crop meeting, CIMMYT headquarters, September 10-12.

Represented HarvestPlus at a meeting of agencies involved in programs to reduce micronutrient malnutrition (UNICEF, Micronutrient Initiative, WHO, FAO, Helen Keller International, USAID, Centers for Disease Control), September 15-16, Wakefield, Canada.

Cassava crop meeting, Entebbe, Uganda, September 15-17 (Joe Tohme)

Sweet Potato crop meeting, Entebbe, Uganda, September 17-19 (Joe Tohme)

Maize crop meeting, Addis Ababa, September 24-26

Bean crop meeting, Nairobi, Kenya, October 1-3 (Steve Beebe)

Rice crop meeting, IRRI headquarters, October 6-8

HarvestPlus Seminar at IRRI, October 9

HarvestPlus Seminar at Asian Development Bank, October 9

HarvestPlus press conference and luncheon launch, Washington D.C., October 14

CGIAR Annual General Meeting, Nairobi, Kenya, presentations in plenary and at the business meeting, October 27-31

HarvestPlus presentation, Latin America Society of Food Technology, November 3-4, Campinas, Brazil

HarvestPlus presentation at workshop entitled “Transgenics and the Poor: Science, Regulation and Development Policy,” Cornell University, November 7-8.  
HarvestPlus seminar at the Royal Danish Veterinary and Agricultural University, meetings with Danish collaborators and at DANIDA, December 3-5.  
HarvestPlus seminar at CIRAD/AGROPOLIS and meetings with scientists, Montpellier, France, December 8-9.  
HarvestPlus presentation at IFPRI Internal Program Review, December 10  
HarvestPlus presentation at Counterpart International (NGO), Washington, DC. December 11

## **2004**

HarvestPlus seminar at Development Alternatives Inc., Bethesda, Maryland, January 8  
HarvestPlus seminar, University of Washington Medical School, Seattle, Washington, February 6  
Hosting Golden Rice Humanitarian Board meeting at IFPRI February 12, and seminar presentations about Golden Rice, February 13.  
HarvestPlus seminar at the Bangladesh Rice Research Institute, February 23  
HarvestPlus seminar at ICRISAT, February 27  
HarvestPlus presentation to IFPRI Board, March 2  
HarvestPlus seminar at ICARDA, March 8  
HarvestPlus presentation, Association of Applied Biologists Centenary Symposium: Increasing the effectiveness of world public sector agricultural research through partnerships - bases for novel paradigms, London, March 10  
HarvestPlus seminar, Subcommittee on Nutrition meetings, New York City, March 23