The 2nd Global Conference on
BIOFORTIFICATION
Getting Nutritious Foods to People

A Global Consultation
March 31 - April 2, 2014 Kigali, Rwanda

Opening Speech—Dr. Howarth Bouis, HarvestPlus

Good morning His Excellency Prime Minister Habumuremyi, Honorable Ministers and Vice Ministers, and Distinguished Guests who are joining us in person and via live webcast.

"Getting Nutritious Foods to People." This is the theme of our conference for the next three days. This theme is intended as a call to action.

My primary message is this. Biofortified, nutrient-rich staple food crops are ready for scaling up. They are now available to improve nutrition and, so to improve lives.

We are here for three days to discuss and agree on a plan of action to scale up delivery of nutritious food staple crops. We hope that those on the frontlines of food and nutrition, including those who are here, will be bold in asking tough questions, sharing ideas and opinions, and building a specific path forward to integrate nutrient-rich staple food crops into comprehensive food and nutrition programs.

To provide background for our upcoming deliberations, I must address two fundamental questions:

- First, why biofortification? That is, what is the justification for biofortification?
- Second, will biofortification work? That is, what is broadly required for successful scaling of nutrient-rich crops?

In answering this first question -- why biofortification? It is of paramount importance that we set firmly in our minds the following: ***Agriculture and the food we eat are the primary sources of minerals and vitamins that people need to be healthy***. Let me repeat, ***Agriculture and the food we eat are the primary sources of minerals and vitamins that people need to be healthy***.

If you are here at this conference, I presume you are well aware that food systems are failing to provide sufficient minerals and vitamins to vast segments of women and children around the world.

Yes, we eat for enjoyment and to avoid hunger, but ***more fundamentally*** we eat to be healthy.

We have agriculture because we need to eat the right combinations of foods to be healthy. Providing good nutrition and health must be ***a primary*** function of agriculture -- if not ***the primary*** function of agriculture.

Yet time and again, I have been told by those working in agriculture that the focus of agricultural policy should be about increasing productivity, providing employment, and reducing poverty. Yes, agriculture must provide jobs and incomes with ever increasing productivity and efficiency. I am

trained as an economist, and, yes, I understand that. But at the same time, we consume the output of the agriculture in order to be well-nourished, which is essential for good health.

This is an uphill battle, to convince those working in agriculture that they have a key role to play – indeed ***an obligation*** – to contribute to improving nutrition and health.

And it is likewise an uphill battle to convince the nutrition and health communities that they require the enlightened cooperation of those working in agriculture to achieve better nutrition and health.

Indeed, a partnership among these and other sectors is necessary. We can demonstrate that kind of dynamic, forward-thinking partnership here during this conference.

As a volunteer in the Philippines, fresh out of college in 1972, and later in my training in graduate school, I saw and learned about the power of applying scientific knowledge to a seed. Many of us here know about the Green Revolution that swept South and Southeast Asia that raised cereal yields. Indeed, our keynote speaker tomorrow morning, Professor MS Swaminathan and the first recipient of the World Food Prize, is recognized as the Father of India's Green Revolution. Just last week, the centennial birthday of Norman Borlaug was celebrated at a conference in Mexico.

Agricultural research is done in a central location. Better seeds are made available in country after country. They multiply themselves year after year. This results in an extremely high economic return on investment – the incredible power of scientific research applied to ***seeds.***

Literally hundreds of millions of people eat the grain of the modern rice and wheat varieties, now for 35 years or more, day in and day out, normally three times a day. That is an ***incredible*** opportunity for nutritional impact. Yet the plant breeders who developed those wonderful modern varieties were focused on rapid population growth and how to prevent famine. They implicitly ignored the mineral and vitamin content of the modern varieties. It was not well understood in the 1960s and 1970s just how important dietary quality was to public health.

I thought, what if, looking back, the scientists had considered the mineral and vitamin content of the Green Revolution seeds? I thought, what if, looking forward, plant breeders would consider the mineral and vitamin content of future varieties? Getting the plants to do this work, loading more trace minerals from soil into the seeds, and getting the plants to synthesize vitamins in the seeds. To me, the economic efficiencies were obvious. A small investment in agricultural research and plant breeding, and a high payoff in public health benefits.

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But the second broad question I posed during my introduction could get in the way: Will biofortification work?

This requires addressing three more narrow questions. If the answer is "no" to any one of these three more narrow questions, then biofortification fails. When a small group of us began in 1993, the skeptics maintained that we should consider ourselves fortunate to get a positive answer to even one of the following three questions.

Question 2A. Can we breed high mineral and vitamin content into high-yielding, high-profit varieties?

In the beginning, many plant scientists said there would be an unacceptable tradeoff -- better nutritional content would necessarily be associated with lower crop yields.

Back when I was embarking upon my biofortification journey, it was my good fortune to meet two brilliant plant scientists, who amazingly enough also published in the human nutrition literature, Robin Graham and Ross Welch. They convinced me that the skeptics were wrong, that the development of nutritionally improved varieties could be successful. On this first question, they explained that seeds require trace minerals for their own good nutrition and better germination. It was a win-win. Better crop nutrition, better human nutrition.

By the way, Robin and Ross are both here with us and I hope you'll meet them.

It turns out that Robin and Ross were right. Several biofortified crop varieties now have been released in multiple countries (which I will list later) and have met standards for superior agronomic performance. Please convince yourselves in discussions with plant breeders about high yields during the Ideas Lab session right after lunch today.

Farmers will **not** adopt biofortified varieties unless they are high-yielding and among the most profitable available. During the field visits tomorrow, please ask questions about the yields and profitability of the **ten** biofortified bean varieties already released in Rwanda. There are more high-yielding, iron bean varieties to come in the breeding pipeline.

I hope you will get a chance to meet Steve Beebe, head of the bean breeding program at CIAT, who attended our first organizational meeting in 1994, and has been working on breeding iron beans since 1995, when we received our first limited funding.

Question 2B. Will the more nutritious staple food varieties improve the mineral and vitamin status of micronutrient-deficient populations?

The question of impact on human nutrition is, of course, central to the biofortification strategy. We are focused on three nutrients which the World Health Organization recognizes as priorities – vitamin A, iron, and zinc. The skeptics said that not enough of the minerals and vitamins would be absorbed to make a difference. Robin and Ross said nonsense! Deficient people would absorb these nutrients at higher rates than those whose nutritional status is adequate.

Again, I assert the positive evidence is there now, especially for iron and vitamin A, with the published evidence for zinc still to come by the end of 2015. For example, efficacy research in India shows that iron pearl millet is meeting the full daily iron needs of children. Robin and Ross were right again.

But I ask you to carefully interrogate the nutrition moderators during the Ideas Lab right after lunch. What is the scientific evidence from our nutrition trials? Please read the briefs which they have prepared and which have been included as part of your registration packets.

Question 2C. Can adoption of biofortified crops be scaled to sufficiently high levels to show a significant public health impact?

We do not yet have enough experience and evidence to answer this definitively. This is why we are here during these three days. To get your ideas on how to go to scale. To identify what we might and can do collectively.

Some initial ideas on scaling have already been put into action for several crops in several countries. Again, learn about this from those already involved in scale-up during the Ideas Lab after lunch. Read the briefs which have been prepared.

There is the most evidence and experience to date for orange sweet potato which is very dense in provitamin A. Indeed, some of you may equate biofortification with orange sweet potato. The International Potato Center has led this effort, a story that also transpires over many years, under the leadership, boundless energy, and perseverance of Jan Low. I hope you will get the chance to meet Jan as well. I will give you a hint how to find her – Jan will be wearing orange!

To summarize, we have positive answers to the first two questions -- regarding breeding for high yields and nutrition efficacy. One last question to go regarding scale up and measuring a public health impact.

Next, let me clarify four additional issues surrounding biofortification:

First, I know the term biofortification is not favored by all. We see your point, but we should think of biofortification as the technique or scientific approach. It is not the output. The outputs are nutrient-rich staple food crops – for example, iron beans, zinc wheat, vitamin A maize. Biofortification is the means by which to produce these foods.

Second, nutrient-rich staple food crops are by no means a silver bullet. Let me repeat. Nutrient-rich staple food crops are by no means a silver bullet.

Biofortification complements existing approaches. Biofortification does ***not*** require an overhaul of existing nutrition strategies to be implemented. Biofortification does ***not*** disrupt efforts around dietary diversity. What nutrient-rich crops do is provide a greater nutritional bang for our buck when it comes to key crops that are already consumed by billions of people as part of their normal diets.

Third, because these released varieties are high-yielding, the price of biofortified grains in retail markets is the ***same*** as the price of grains of non-biofortified varieties. Let me repeat. The price of nutritious staple grains in retail markets will be ***equal to*** the price of today's lower-nutrient staple grain varieties. If you are a mother and you have this information, which would you buy and feed to your children?

Fourth, all the released varieties have been developed through ***conventional*** plant breeding. That is, transgenic techniques were ***not*** used. Development of these varieties through plant breeding has relied on the natural variation found in plant varieties collected throughout the world and then preserved in central seed banks. Making several biofortified varieties available to farmers ***improves*** the diversity of existing cropping systems, and ***increases*** choices available to farmers.

We are gathered in Rwanda because we have our first evidence-in-the-making that biofortification works with iron beans. We estimate that from one-third to one-half of the 1.2 million bean-growing farm households in Rwanda have planted iron beans, which are higher-yielding than bean varieties

customarily grown. This result has been achieved only two years after the first releases of iron beans in Rwanda.

Our global mission is that 1 ***billion*** people will replace their usual staple foods with nutrient-rich staple foods by 2030, just 16 short years from now. This may sound too ambitious, but a seed-based strategy makes this possible. Seeds replicate themselves. Nutritional supplements do not. The key is high yields. Seeding a better life. Our hope and our expectation is that this conference is a major step toward realizing this vision.

How do our three days together unfold?

Today, during Day 1, gaps and requirements for scale up of delivery of biofortified crops will be identified.

Day 2 provides examples of possible ways forward to fill these gaps and meet these requirements. What has been the experience to date in the field, and what can we can learn from and replicate or improve upon?

On Day 3, specific decisions will be taken to map actions for the way forward.

The conference will culminate on the afternoon of Day 3 in announcing the activities that all agree would be effective and are urgent for scale up. We hope that individual institutions will make specific commitments as to roles they might play—whether in filling research gaps, creating demand, accelerating supply, or providing support at a community level.

Let me now summarize what we have accomplished so far.

To some limited extent, if not yet on a daily basis, a conservative estimate is that women and children in 1.5 million farm ***households*** globally are consuming biofortified, nutrient-rich foods.

We have been able to establish pipelines from upstream research in gene discovery for breeding, to building breeding pipelines in CGIAR Centers and selected national agricultural research institutes, to release of crops, multiplication of seed, extension to farmers, development of markets for nutritious staple food crops, and retail sales of processed foods with biofortified crops as ingredients.

Nutrition trials have established efficacy and have justified messaging, advocacy and resource mobilization around protecting children from the harmful consequences of mineral and vitamin deficiencies – if they would substitute, one-for-one, a nutrient-rich food staple with the same, but lower-nutrient food staple.

We have been able to establish such pipelines for several crops:

- For provitamin A sweet potato in Africa, China, and Brazil
- For provitamin A cassava in Africa and Brazil
- For provitamin A maize in Africa, Brazil, and about to be released in China
- For iron beans in Africa, Brazil, and Central America
- For iron pearl millet in India, hopefully with West Africa to follow soon.
- For zinc wheat in India, with Pakistan to follow soon.
- For zinc rice in Bangladesh, with India and other countries to follow soon.
- For iron lentils in Asia

In conclusion, and to summarize the advantages of biofortification:

- Biofortification can make a significant contribution to the overall solution of making agriculture more nutritious. It can lead the way in demonstrating that cost-effective investments can be made to link agriculture and nutrition. Biofortification has the potential to reach hundreds of millions of people, multiple times per day, at low cost
- However, we must be clear that biofortification is only part of the overall solution. Biofortification complements other approaches.
- Biofortification starts with the farmer, and reaches into urban areas as surpluses of nutrient-rich staple foods are marketed. This complements fortification which starts in the urban areas where most foods are purchased in the market
- We believe that biofortification will be highly sustainable

To make this potential of biofortification a reality, the final step is to support the desire of leaders and practitioners across many sectors and geographies to build efficient and effective pathways to scale nutrient-dense staple food crops.

My fervent hope is that we can widen our current network of individuals and institutions during this conference to provide competencies that we require to achieve scale. After the conference, I pray that we find the perseverance to make our vision for sustainable, nutritious agriculture a reality.

I thank you in advance for your active participation, commitment, and creative energy in the upcoming deliberations.