

MISSION MAN

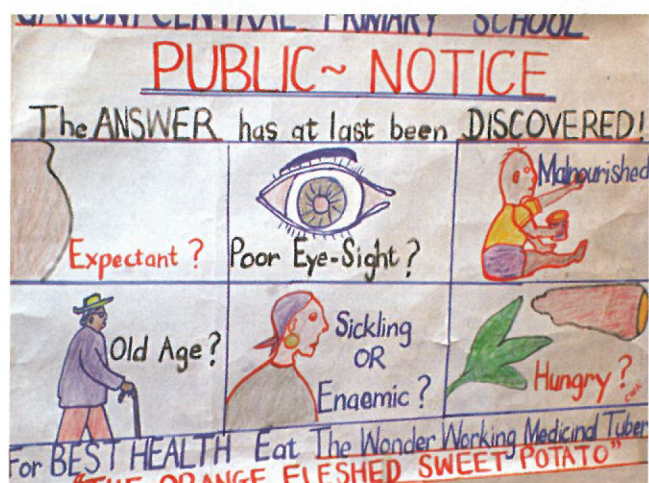
Howarth Bouis has found a way to alleviate childhood malnutrition in the developing world. So why haven't you heard of him?

BY JOCELYN C. ZUCKERMAN

ROUGHUI SOW MOANS SOFTLY from the bare foam mattress on the floor. "She has a fever," says her mom, 23-year-old Aissata Sy. "She always has a fever."

Taking refuge from the midday heat in the space she calls home—a single room in a dusty slum on the outskirts of Nouakchott, the capital of Mauritania, in West Africa—Sy tells the story of a child who has been listless all her life, with a nose that runs incessantly and diarrhea that never really goes away. And though the bits of orange string threaded through her little earlobes suggest a happy, gold-hooped adolescence ahead for Rougui, the 18-month-old is no heavier than a rag doll and has yet to utter a single

Getting his hands dirty: Howarth Bouis sees a bright future in the cultivation of orange-fleshed sweet potatoes.



'FOR BILLIONS OF PEOPLE, EIGHTY PERCENT OF THEIR DIET IS STAPLE FOODS. IF YOU COULD PUT NUTRIENTS IN THOSE? FABULOUS.'

PR blitz: A poster in Kenya promotes "wonder working" sweet potatoes.

word. Sy admits she can't afford to feed her daughter properly. She offers rice when she can, she says, but, given the trouble her husband has finding work, fish and vegetables are mostly out of the question. Asked how she intends to nourish her next child, the sibling-to-be now pressing against her pretty eyelet blouse, the young mother just looks away. "I am very tired of thinking about that," she says.

All across the developing world, in low-slung cement-block hovels like this one, and in tin shanties, cardboard lean-tos, and makeshift homes of mud and thatch, frustrated mothers tell similar stories—of sluggish infants and slow-moving preschoolers, of children plagued with vague maladies of every sort. Less overtly heartrending, perhaps, than the all too familiar toddlers with bloated stomachs and bony limbs, these kids also represent the face of malnutrition. And the so-called "hidden hunger" from which they suffer—caused by micronutrient deficiencies and the result not so much of a lack of food as of the right *sorts* of food—may be the most pernicious kind of all.

A third of all African under-fives suffer from stunted growth caused primarily by micronutrient malnutrition. Hundreds of thousands of preschoolers go blind annually thanks to a deficiency of vitamin A (a condition that also increases the risk of death from measles and diarrhea by an astonishing 24 percent); zinc deficiency leaves hundreds of millions vulnerable to infections and chronic illness; and iron deficiency contributes to some 840,000 deaths during childbirth every year. Because they have trouble concentrating, micronutrient-deprived children tend to drop out of school early, and with IQs as much as 15 points below those of their peers, they languish in adulthood as well. All of which makes you wonder why, amid all the talk these days about Africa's struggle to develop, no one seems to be paying attention to the prospect of entire generations crippled mentally and physically—not just temporarily but for life.

Well, almost no one.

Working out of a spartan office off K Street, in Washington, D.C., a soft-spoken 57-year-old named Howarth Bouis is well into his third decade of obsessing over precisely this issue. Hav-

ing traveled the globe repeatedly as an agricultural economist with the D.C.-based International Food Policy Research Institute, or IFPRI, Bouis (who goes by "Howdy") has met more than his share of Rougui Sows over the years. And he's asked himself which is the bigger scandal: The millions of children that malnutrition kills every year, or the millions it leaves behind?

THE OBVIOUS SOLUTION TO HIDDEN HUNGER is a balanced diet of fruits, vegetables, meat, and fish, but Bouis realized early on that for the poorest of the poor, such a fix isn't an option. Even if they could get access to a variety of foods, they wouldn't have the means to pay for them. Over the decades, efforts have been made to provide nutrients by distributing vitamin pills and by fortifying food as it's processed. Though these initiatives have saved millions of lives, they have generally failed to reach the rural population that comprises 70 percent of the world's poor. "That's all fine in the United States," says Bonnie McClafferty, communications coordinator of HarvestPlus, the organization Bouis founded to combat chronic hunger. "But try getting that stuff out to villages where no one's using the market system."

There's also the issue of cost. The international community spends roughly \$500 million every year on vitamin A capsules alone but does little to treat the underlying problem. Which is why Bouis figured that if you could somehow fortify the staple crops, if you could mix the nutrition right into the foods that poor folks actually eat—rice, beans, maize, tubers—you could not only reach millions more people but avoid the never-ending outlays of cash as well.

Try explaining that, though, to the development community as constituted in the early 1990s. "We've got enough headaches as it is," the breeders at the Consultative Group on International Agricultural Research (CGIAR), a partnership that holds the world's plant germplasm in trust, told Bouis—what with trying to develop crops that were resistant to pests, disease, and drought. Also, they said, everyone knows that if you start breeding for increased nutrients, your yields are going to go down and nobody's going to want your crops anyway.

But Bouis was determined. He spent the next decade, in fact, hopscotching across the continents trying to find someone to share his vision. The little support he was able to rustle up enabled him to make progress on an initiative to breed iron into rice, but even that effort proved fraught at every turn. Not only did the lanky Stanford Ph.D. lose his star breeder in a car accident, but two consecutive typhoons wiped out his team's entire fortified rice crop, setting the project back a full 18 months. It wasn't until 2002, when the CGIAR selected Bouis's "bio-fortification" concept (as he'd taken to calling it) for its new "Challenge Programs" that the initiative finally got any momentum. "Meanwhile," says McClafferty, "he was just clunking along on his own. I mean, for the longest time, Howdy was working on like \$30,000 a year to get this idea off the ground."

In January 2003, Bouis approached the Bill and Melinda Gates Foundation for a second time. (He'd tried to bring them on board two years earlier but had been turned down.) Eight months later, stepping off the elevator in his office building, he was met by a colleague wielding a phone. "Congratulations," said the Gates representative at the other end. "You've just been awarded twenty-five million dollars."

"Then there was just a big sea change in the way we were perceived," Bouis says with a laugh. "Before, it was kind of 'Oh, what about this? What about that?' And now, suddenly, it was



With these seeds: Bouis at a USDA greenhouse in Beltsville, Maryland.

“Oh, this is a no-brainer. Why’d it take so long to get funding?”

In addition to enabling him to take on more breeders and nutritionists, the Gates money allowed Bouis to begin getting his supercrops out to the folks they were meant for. A young Kenyan mother named Rose Otamuna explains how she was approached a few years back by a field worker from a HarvestPlus-affiliated organization who was bearing a handful of sweet-potato varieties, all of which, unlike the white-fleshed roots grown in her native region for generations, were bright orange inside—and packed solid with vitamin A. In a country where 70 percent of preschoolers are deficient in that vitamin, she’ll tell you, this was no cosmetic trifle.

NEITHER, says Sammy Agili, a Nairobi-based breeder who works with HarvestPlus, was getting those particular tubers into that particular woman’s hands merely a matter of transferring vines. Some 300 miles away, at the Kakamega branch of the Kenya Agricultural Research Institute, the scores of tiny white signs perched at regular intervals in the dirt tell a far more complicated story. It is here, under an unforgiving sun and amid fields hemmed in by sticks and wire, that Agili has looked at thousands of varieties of the tuber and, together with his colleagues, monitored their every attribute. These test plants in turn had been developed thousands of miles away in Peru, at the International Potato Center, where HarvestPlus-affiliated scientists sifted through the germplasm of many more thousands of varieties to find those that were high in beta-carotene and then breed them into the high-yielders. Following clinical trials to determine the plants’ efficacy in improving blood stores of vitamin A (which beta-carotene becomes once inside the body), the vines were sent

to fields like this one, where they were adapted to the particular conditions of the microclimate. “You can’t just throw these things out there,” says McClafferty. “You have to disseminate in a very systematic, scientifically observable way.” For example, she says, “the Rwandans are chomping at the bit” to get their hands on the high-iron beans that are now in the works, but HarvestPlus can’t release them until the clinical studies have been completed. And though breeders have made great progress in developing high-zinc pearl millet in India, it will probably be eight years before the crop is ready to be introduced to the desertlike conditions of places like Mauritania.

Not that success in the lab and the field guarantees adoption on the ground: When farmers in western Kenya first tasted Agili’s sweet potatoes, for instance, they complained about their unusual moistness. “The first request coming back,” says McClafferty, “was ‘Make it dry. We can’t eat this stuff!’”

Agili has no trouble addressing that particular concern, but things may prove a little trickier with some of the other crops in development. There’s the deeply hued carotenoid-enhanced maize, for example, whose dark color may offend in parts of sub-Saharan Africa, where yellow maize has long been negatively associated with animal feed and food aid. To head off such backlashes, extension agents distribute seeds and vines to local farmers and conduct exhaustive surveys, asking, for example, why people buy what they buy, how they cook it, and what they eat it with. “All the studies are gendered,” says McClafferty, “because women are the farmers, and women are the cooks, and women put the food in the babies’ mouths. And if we can’t get that vitamin A-rich sweet potato into the babies’ mouths, then what’s the point?”

Today, thanks to an extensive network of associates (the most colorful of whom has to be Jan Low, a scrappy 52-year-old former Peace Corps volunteer who operates out of a Nairobi office she’s painted entirely in sweet-potato orange with leaf-green trim), Bouis has the pleasure of knowing that vitamin A-rich sweet potatoes *are* getting into the mouths of babies. And the adults growing them are prospering in the process. Otamuna and the other members of the Nako Women’s Group have made enough from their roots to purchase beehives and begin marketing honey, and, thanks to a cookbook produced by Low and friends, they are frying the pounded tubers into the tangerine-bright chapatis and doughnutlike *mandazi* that now attract crowds outside local churches and primary schools. Last May, some 70 scientists and policymakers from across Africa attended a workshop sponsored by HarvestPlus, and this past March, Bouis signed a memorandum of understanding with the secretary of India’s department of biotechnology to collaborate on micronutrient-dense crop varieties in that country. (Even the U.S. Department of Agriculture has approached Bouis for help with incorporating nutrition into its programs.)

“It gives me chills, still,” says McClafferty. “I mean, I’ve been working on this forever. You’d think I wouldn’t get so misty-eyed every time I talk about it. But the effect could be profound. For billions of people, eighty percent of their diet is staples, and there’s almost *nothing* in them. When their babies are hungry, these moms are giving them another chapati, another tortilla. If you could put nutrients into those? Fabulous.”

Not everyone, though, is so impressed by Howarth Bouis and his crops. Vandana Shiva, founder of India’s Research Foundation for Science, Technology and Ecology, has problems with the entire HarvestPlus premise. Like the \$150 million Alliance for a Green Revolution in Africa (Continued on page 197)

announced last September by the Gates and Rockefeller foundations, says Shiva, Bouis's initiative, based as it is on implementing a market system and on crop varieties that will largely depend on chemical inputs, is more likely to benefit the multinational companies that make those fertilizers and pesticides than it is the farmers in the fields. (Bouis admits that, for example, the Green Revolution in Asia "was a boon for fertilizer companies," but says that you can't get yields up without inputs and "the only way we can feed the world is if we get yields up.") Instead of directing millions toward "one individual's resource endowment," Shiva advocates supporting local communities in a return to the organic cultivation of nutritious crops that have merely been forgotten.

Bouis's unabashed embrace of genetic modification has also sparked concern. While HarvestPlus has yet to devote more than 15 percent of its budget to research into GM crops (the sweet potatoes, for example, were achieved through conventional breeding), Bouis says that figure will climb as soon as the barrier for acceptance is lowered. "There's been a lot of fear and a lot of hypotheses about the dangers of this stuff," he says, referring to the carotenoid-enhanced Golden Rice developed by Syngenta seven years ago (with DNA from bacteria and daffodils) and still buried beneath regulatory red tape today. "But there's been no evidence. The scientists I talk to just can't understand why people are so fearful. They say, 'A gene's a gene. What could go wrong?'"

Well, patenting, for one thing. Already, says Shiva, the (World Bank-backed and increasingly controversial) CGIAR, originally envisioned as a "countervailing force to seed privatization," has "facilitated the transfer of what were the collective resources of the farmers of the world into the hands of a few companies who then patent them and sell them at huge profits." HarvestPlus doesn't currently have any alliances with the private sector, but McClafferty doesn't rule out pairing up "with the ADMs and Cargills of the world." Certainly, the 600,000 seeds that make up the CGIAR gene bank are of immense potential value to industries ranging from agribusiness to pharmaceuticals. (A Gates spokesperson says its grantmaking and investment arms comprise a "two-entity structure," whose branches operate independently, but it's worth noting that the foundation has major holdings in Exxon Mobil Corp. and BP, companies whose oil is a

key ingredient in the production of chemical fertilizers, and that it has more than a billion dollars invested in such plant-dependent "life science" companies as Abbott Laboratories, Merck & Co., Eli Lilly, Seattle Genetics, Pfizer, Wyeth, and Schering-Plough.)

Neither does Bouis see any problem with the fact that he himself sits on the Golden Rice Humanitarian Board and has worked with representatives of Syngenta, the world's second-largest agrochemical corporation and its third-largest seed company, which was awarded a "Captain Hook Award for Biopiracy" in 2006 by the Ottawa-based Action Group on Erosion, Technology and Concentration. "I don't have any fear" about the appearance of a conflict of interest, he says with a boyish laugh. "Maybe I should. My own feeling is that this is something that's gonna help people. I just feel like in the end the truth wins out. It may take longer than I'd hoped, but I'm confident that in the end it will win out."

Let others worry about the deep, dark motivations of his backers, Bouis seems to say; he's got more pressing things on his mind. With 54 partnering organizations, projects in 50 countries, and work progressing on 16 separate crops, it's all he can do these days to put on a matching pair of socks. And by the way, there are children suffering in slums and villages all over the world, the bodies and minds of entire adult populations hanging in the balance. ☞

THE VEGETARIAN'S DILEMMA

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GAME PLAN

1 WEEK AHEAD

Make vegetable stock for sauce

2 DAYS AHEAD

Toast green pumpkin seeds for salad

Roast and peel peppers for stuffed pumpkin

Make roasted-vegetable and wine sauce

Toast almonds for pilaf

Make pastry dough for pie and galette

1 DAY AHEAD

Roast root vegetables for stuffed pumpkin

Make pilaf (without almonds)

Make chocolate pecan pie

Prepare pumpkin

Wash and dry salad greens

5 HOURS AHEAD

Make apple galette

1½ HOURS AHEAD

Roast pumpkin ☞

COOKING TIPS

Measure liquids in glass or clear plastic liquid-measuring cups and **dry ingredients** in nesting dry-measuring cups that can be leveled off with a knife.

Measure flour by spooning (not scooping) it into a dry-measuring cup and leveling off with a knife; do not tap or shake cup.

Do not sift flour unless specified in recipe. If sifted flour is called for, sift before measuring. (Disregard "presifted" on the label.)

Salt: Measurements are for table salt unless otherwise specified.

Black pepper is always freshly ground.

Spices: Store away from heat and light; buy in small quantities.

Toast whole spices in a dry heavy skillet over medium heat, stirring, until fragrant and a shade darker, 3 to 5 minutes. **Toast nuts** in a shallow baking pan in a 350°F oven until golden, 5 to 15 minutes. **Toast seeds** either way.

Melt chocolate in a metal bowl set over barely simmering water, stirring; or microwave at low to medium power for short intervals (30 seconds or less; stir to check consistency).

Baking pans: We prefer light-colored metal. (If you are using dark metal, including nonstick, your baked goods may brown more, and the cooking times may be shorter. Lower oven temperature 25°F to compensate.)

Nonreactive cookware includes stainless steel, glass, and enameled cast iron; avoid pure aluminum and uncoated iron, which can impart an unpleasant taste and color to recipes with acidic ingredients.

Water bath for baking: Put filled pan in a larger pan and place in oven, then add enough boiling-hot water to reach halfway up side of smaller pan.

Produce: Wash and dry before using.

Greens and chopped/sliced leeks:

Wash in a large bowl of water, agitating them, then lift out and drain.

Fresh herbs or greens: Use only the leaves and tender stems.

Citrus zest: Remove the colored part of the rind only (avoid the bitter white pith). For strips, use a vegetable peeler. For grating, we prefer a rasp-like Microplane zester, which results in fluffier zest, so pack to measure.

Chiles: Wear protective gloves when handling.