Meet the Nourishing the Planet Advisory Group: Chuck Benbrook

In this regular series we profile advisors of the Nourishing the Planet project. This week, we feature Chuck Benbrook, Chief Scientist at the Organic Center.

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Location: Enterprise, Oregon

Bio: Dr. Charles Benbrook is Chief Scientist at the Organic Center. He worked in Washington, D.C. on agricultural policy, science and regulatory issues from 1979 through 1997. He served for 1.5 years as the agricultural staff expert on the Council for Environmental Quality at the end of the Carter Administration. Following the election of Ronald Reagan, he moved to Capitol Hill in early 1981 and was the Executive Director of the Subcommittee of the House Committee on Agriculture with jurisdiction over pesticide regulation, research, trade and foreign agricultural issues. In 1984 Benbrook was recruited to the job of Executive Director, Board on Agriculture of the National Academy of Sciences, a position he held for seven years. In late 1990 he formed Benbrook Consulting Services.

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On Nourishing the Planet: Promoting agricultural and economic development in Africa requires intimate understanding of the resources people have to work with, and the factors shaping the decisions farmers make about what to grow and how. Such understanding is a prerequisite to cost-effectively relax multiple constraints in unison. The "Nourishing the Planet" project excels at gathering and sharing this sort of key information and, for this reason, has much to contribute in shaping development assistant programs that produce meaningful, sustained results.

Can you describe the possible ways that organic agriculture methods can help improve farmers' income, increase food security, and decrease world hunger?

If you dispassionately look at what is needed to promote productivity and food security in chronically food short regions, core organic farming principles and practices have much to contribute, and certainly far more than the GMO and chemical-intensive corn-soybean production system in the U.S. corn belt. This is particularly true in restoring soil fertility and reversing the steady decline in soil organic matter.

Six core principles and objectives of organic farming must form the foundation of sustainable food systems, and hence food security in Africa –

- Build the quality of the soil by increasing soil organic matter;
- Promote above and below-ground biodiversity for its inherent, multiple benefits (biological control, more diverse diet, lessening risk of catastrophic crop loss, etc);
- Integrate crop and livestock operations to exploit synergies between the two;
- Use crop rotations, cover crops, multi-cropping systems, and agro-foresty to utilize available sunlight and moisture more fully, especially in the spring and fall months;
- Avoid the use of toxic chemicals and hot fertilizers because of their potential to burn up organic matter, kill or reduce populations of non-target organisms that play valuable roles in food chains ultimately helping to feed people, and pose risks to people living in close proximity to treated areas; and
- Produce high-quality, nutrient dense products that will hopefully command a premium price in the market place, reflecting their true value.

What are some specific innovations, policies and techniques that could be implemented to promote organic agriculture while also improving livelihoods?

Obviously, the combination of new practices, inputs, and technologies needed will vary tremendously based on local conditions. Nearly everywhere, soil quality must be restored, a process that will require a number of years and a proper sequence of changes in management systems and inputs. What a farmer does in the first three years of this journey will differ considerably from common practices ten years down the road.

Early steps will be dependent to a greater degree on fertilizer and organic soil amendments from outside the farm, and will often need to be shipped hundreds of miles into the region, while in later years, much more of the organic materials needed to sustain soil quality will be generated on the farm or locally.

Unfortunately, many projects and policy initiatives have delivered uneven, unsustainable results because they stopped at just subsidizing fertilizer, and failed to support the farmer's evolution toward more biologically-based methods to sustain soil fertility.

It is critical to support this incremental evolution, because the real and sustainable economic benefits to farm families kick in only after the transition is well along toward systems that have a high level of internal self-sufficiency, stability, and resilience.

It would be helpful for researchers and development organizations to provide recommendations for cost-effective trajectories of change in soil quality, including recommendations for the most cost-effective steps, and investments that will promote sustainable progress during each stage of the process.

More efficient capture and use of water, especially through micro-irrigation schemes, will also deliver significant benefits in many areas. Diversifying rotations to include small plots of several short season vegetable crops in various combinations will also deliver multiple benefits. Diversifying livestock enterprises to include more small livestock like chickens and rabbits is also a promising addition to the development assistance tool kit.

The lack of safe storage and markets for new crops, or difficulties in storing and utilizing new foods, often emerges as a major constraint to positive changes on the farm, and in terms of the diversity and quality of diets. It seems to me that this is an obvious area for development assistance programs to target resources.

Why should wealthy consumers care about hunger in other parts of the world?

For the same reason that everyone should – helping assure everyone has enough to eat is a universal moral imperative. There is no chance for peace and stability in a world where chronic poverty and hunger afflicts one-sixth of mankind. Hungry people are desperate people, and the actions they sometimes take, or embrace, to feed themselves and their families erode the fabric of civilization, just as erosion saps soil quality.

In your chapter, "Biotechnology: Part of the Solution or Part of the Problem—or Both?" you make the point that developed nations should use biotechnology to better understand "the linkages between indigenous resources and knowledge and agricultural production and farm family well being." Can you elaborate on this statement?

Some people are convinced that breakthroughs in plant breeding in Africa depend on access to, and use of a set of genes, markers and molecular technologies discovered and now used in the U.S. and Europe by plant biotech companies. I doubt it. I just don't see Roundup Ready or *Bt* GE crops making much of a difference on most of the African continent.

Instead, I think that the modern tools of molecular biology should be deployed to understand and better utilize the genetic diversity that exists on the African continent. These tools are also extremely valuable in rooting out the subtle interactions between soil microbes, plants, pests, and the environment that can make or break a crop, and turn a nutritionally deficient diet into one that is both rich in nutrients and robust across seasons and circumstances.

There are many ways to work toward this goal that fully exploit cutting-edge science and technology. We need to find the pathways that will deliver tangible results more quickly and cost-effectively than creating a new food like Golden rice, which remains after many years and millions of dollars an intriguing technical challenge, but not a sound investment if the goal is to promote food security where it is currently lacking.

Can biotechnology be used to improve sustainable agriculture and farming in the developing world?

Sure, but the biotechnology applications will be very different than the GE crops now planted around the world.

In the publication, "The Impacts of Yield on Nutritional Quality: Lessons from Organic Farming," you conclude that organic foods are more nutritious than conventionally produced fruits and vegetables. Can you give a few examples of why organic produce is more nutritious and how this knowledge can help farmers in the United States and Europe, as well as the developing world?

In the U.S. and Europe, there has been a steady decline over 40-plus years in the nutrient density of conventionally grown foods, driven largely by incrementally higher nitrogen fertilizer levels and crop yields. Agronomists call this essentially unavoidable relationship between yields and nutrient density the "dilution effect." Organic farmers do not have access to the cheap sources of readily available nitrogen that serve as the fuel driving the dilution effect.

On average across most plant-based foods, organically managed crops mature a bit more slowly and produce fruit and vegetables that are somewhat smaller. But in terms of nutrient content per ounce or gram of apple, lettuce, carrot, or grapes, smaller is better.

There is also convincing evidence supporting the conclusion that in some years for some organic crops, a higher level of pest pressure, coupled with the lack of conventional pesticide applications, forces plants to divert energy from growth to defense mechanisms, which typically entail increased biosynthesis of plant secondary metabolites. Many of these are potent antioxidants and account for a significant slice of the unique health-promoting benefits – and flavors – of fruits and vegetables.

Supporters of biotechnology often make the argument GE crops are necessary to fight food insecurity as climate change and population growth put increased pressure on the food system. Can you give your thoughts on why or why not biotechnology can feed the world?

Today's commercially significant GE crops are herbicide-tolerant corn, soybeans, and cotton, and *Bt* corn and cotton. These crops are designed to simplify weed and insect pest management and are planted, for the most part, in specialized, chemical-intensive systems. Alternative technology exists to produce the same amount of crops per acre, and likely a bit more at lower cost to the farmer. Based on these realities, I conclude that today's commercial GE crops are making no unique contribution to world food security needs.

An argument could be made, in addition, that today's GE crop technology has actually undermined progress toward increasing production and meeting global food security needs. The discovery and commercialization of today's GE crops have totally dominated public and private plant breeding investments for nearly 30 years in three major crops, slowing the pace of progress in other areas of plant genetic improvement that would likely be of more direct benefit to a wider range of farmers around the world.

No one technology or farming system will emerge as universally optimal. Progress toward global food security will be accelerated by systemic efforts to promote diversity in farming systems and technologies. A healthy measure of experimentation is desirable in searching for optimal cropping patterns and production practices in a given region.

We must resist the enticing prospect that science and technology will deliver a magic bullet, or even a magic arsenal, that will miraculously optimize yields, stop pests in their tracks, always build soil quality, and thrive despite climate change. A sober reading of history suggests strongly that this is a pipedream.

Those arguing that global food security will be assured if we just unleash the powers of biotechnology are doing the world's poor a grave disservice. I know that many biotech promoters feel the same way about people like me who feel just as strongly that the most rapid and sustained progress will come from agricultural development programs and investments grounded in the principles of organic farming and agroecology.

One would hope and expect that the World Bank, FAO, CGIAR, foundations, and development assistance programs will insist that fair and unbiased assessments are made of the net returns to alternative paths to development in the years to come, but thus far I see little evidence of this happening on the ground. The "Nourishing the Planet" project should do all it can to encourage the major funders and development organizations to sponsor credible, independent assessments. May the best approach emerge, and let's hope that funders have the courage and political freedom to put the dollars behind the best system, in the hope of accelerating progress toward a goal shared by all.