



## **A Century Of Crop Improvement: From Vavilov to Biotechnology**

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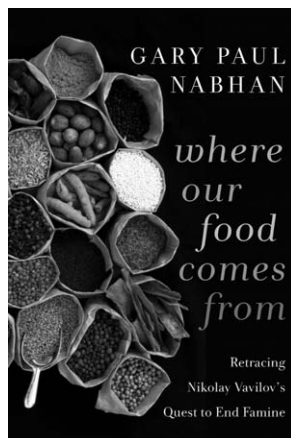
## A Century of Crop Improvement: From Vavilov to Biotechnology

CAROL AUER

Crop plants are having their moment in the sun as the American public focuses more attention on the food they eat. Michael Pollan's book on American agriculture, *The Omnivore's Dilemma: A Natural History of Four Meals* (Penguin, 2006), has been on the *New York Times* best-seller list for more than a year. Barbara Kingsolver's popular book *Animal, Vegetable, Miracle: A Year of Food Life* (Harper Perennial, 2008) presents her personal story about food and farming. Because of a food safety scare, the mass media have recently produced many stories about an iconic American food—peanut butter. Thus, it appears that a confluence of current events and public interest has supported a wealth of books, movies, Web sites, and commentaries about our agricultural system, from farm to fork.

Among these new publications are two books that present very different stories about crop improvement over the last century. Gary Paul Nabhan tells the story of Nikolai Vavilov, a Russian scientist of the early 20th century who championed the preservation of plant biodiversity and Mendelian genetics for crop improvement, in *Where Our Food Comes From: Retracing Nikolay Vavilov's Quest to End Famine* (Shearwater Press, 2008). *The Public, the Media and Agricultural Biotechnology* (CABI, 2007), edited by Dominique Brossard, James Shanahan, and T. Clint Nesbitt, examines the interface between science and society in the adoption of today's genetically modified (GM) crops. Despite the century between Vavilov's work and today's plant biotechnology, both books explore similar themes, such as the role of science in food security, the concept of food democracy, the role of government in food production, and the importance of public trust in agriculture.

Gary Nabhan's latest book accomplishes two goals through its overlapping narratives: it relates the life and work of Vavilov (1887–1943), whose story is familiar to relatively few scientists today, and it presents the author's perspectives on crop improvement, genetic diversity, and food democracy. Vavilov was born before the Russian revolution and reached the peak of his career during the early



years of the Soviet Union. *Where Our Food Comes From* begins by describing the siege of Leningrad during World War II and contrasting the fate of two important collections—the artworks inside the Hermitage and the seed collection that Vavilov had created. Although much of the art was smuggled to safety, there was no official effort to protect the seed collection, which was also a significant part of the country's cultural heritage. As Vavilov sat in prison, the staff at his institute struggled to protect the germplasm collection for 900 days during the horrific siege. It is remarkable that much of the collection was saved, because the seeds and tubers could have fed the starving researchers trapped inside the city. The seed collection exists today as part of the N. I. Vavilov Scientific Research Institute of Plant Industry in St. Petersburg.

Vavilov accomplished much during his career as an internationally recognized plant explorer, geneticist, plant breeder, and research administrator. His publications and breeding programs built upon his expeditions to 64 countries on five continents. The fruits of his expeditions developed into one of the world's largest plant germplasm collections, with about 150,000 accessions of seeds, roots, and tubers. Vavilov developed a map that he believed identified the geographic centers for crop genetic diversity. His ethnobotanical work connected his observations about human cultures and linguistics with the history of agricultural plants. While his primary interest was in the agronomic crops important to Russia, he also studied apples, dates, and rubber-producing plants. Considering the difficulty of travel in the early 1900s, it is hard to imagine how Vavilov was able to cross so many international borders to attend scientific meetings and collect plants in such widely diverse nations such as Ethiopia, Italy, Kazakhstan, Mexico, Brazil, and the United States.

The second major narrative in this book covers Nabham's travels and his assessment of crop biodiversity nearly 100 years after Vavilov's journeys. The author is an ethnobiologist, a MacArthur Fellow, a recipient of the John Burroughs Medal for nature writing, and a professor at the Southwest Center of the University of Arizona. He cofounded Native Seeds/SEARCH, a nonprofit group working to preserve crop biodiversity in the desert Southwest. Nabham's philosophy about the value of crop biodiversity and indigenous agricultural knowledge is apparent throughout his travelogue. His expertise becomes most evident in chapters 9 and 10 when he relates Vavilov's trip

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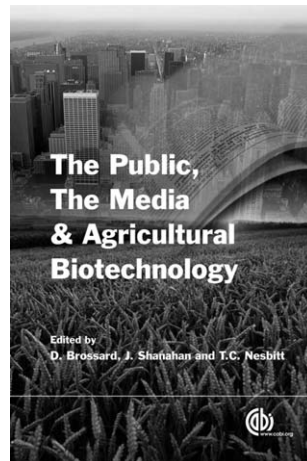
to Arizona and Mexico, a region Nabhan has studied with regard to the cultural value of ancient corn landraces, crop biodiversity, agricultural practices, conservation issues, and native communities. Nabhan brings Vavilov's story into the present when he discusses the current controversy over gene flow between GM corn and the local corn landraces developed by indigenous cultures.

Ultimately, the Russian revolution and subsequent political shifts under Stalin destroyed Vavilov's career as a geneticist, plant breeder, and research administrator. Readers wishing to learn more about Vavilov's life, Russian history, and politics should read Peter Pringle's *The Murder of Nikolai Vavilov: The Story of Stalin's Persecution of One of the Great Scientists of the Twentieth Century* (Simon and Schuster, 2008). Pringle, a journalist, describes more of Vavilov's personal life and his unsuccessful battles to maintain Mendelian genetics as the basis for crop improvement against the neo-Lamarckian theories of Trofim Lysenko. After 1934, everything Vavilov had worked for unraveled under Lysenko, Stalin, and the programs for "people's agriculture." Geneticists and scientists close to Vavilov were executed as enemies of the state. In the end, a toxic combination of political treachery, crop failures, and famines led to Vavilov's public discredit and his imprisonment in 1940. In 1943, he died in prison from abuse and starvation, which is especially poignant, Nabhan points out, because Vavilov devoted his life to crop improvement.

Nabhan ends his compelling story by stating that Vavilov did more than anyone else in history to help humankind understand where our food comes from, and in the epilogue he discusses the roots of hunger in the world today. He argues that access to seed diversity at specific points in time is critical to food security and food democracy. In a food democracy, citizens can determine how to feed themselves with healthful, nutritious, toxin-free, and culturally appropriate foods. Furthermore, Nabhan argues that food democracy requires citizen participation, informed choices, and access to different types of foods. Nabhan also asserts that indigenous cultures preserv-

ing their crop biodiversity should receive as much support as glamorous projects like Svalbard, the new seed bank under the permafrost in Norway. The complex, overlapping narratives that Nabhan develops make this book valuable to scientists—and anyone else—interested in the cultural history of food plants.

*The Public, the Media and Agricultural Biotechnology*, examines the interface between science and society in the adoption of GM crops and animals. The editors have collected more than 400 pages of information and analysis in 16 chapters written by social scientists. In the first section of the book, the contributed chapters analyze public opinion about GM crops and animals in the United Kingdom, Germany, Switzerland, the United



States, and Brazil. The second portion of the book informs readers about the social framework of biotechnology, including the importance of framing in public debate and the effect of mass media on public opinion and government policy. The last section describes different approaches to science communication, public participation, deliberation, and consultation in the Philippines, Zambia, India, and the United States. Throughout the chapters, the authors use case studies and social science research to support their theories about the different reactions that people and nations have to the introduction of agricultural biotechnology. Brossard, Shanahan, and Nesbitt should be commended for including contributing authors from countries that have already adopted GM crops as well as those from nations that are still grap-

pling with the decision to produce or consume GM plants.

How much do people know about GM crops? W. Fink and M. Rodemeyer (chapter 5) summarize the results of public opinion surveys conducted by the Pew Initiative on Food and Biotechnology in the United States. It is unfortunate that this nongovernmental organization has closed its doors in Washington, DC, because it acted as a moderate voice in the shouting matches that have erupted frequently between stakeholders involved in agricultural biotechnology. Fink and Rodemeyer present evidence that Americans know relatively little about agricultural biotechnology—more than half of those polled said that they had not heard about GM foods. The surveys also show that, although Americans know little about GM foods, they generally support more regulation rather than less. Other findings from the surveys: about 80 percent of Americans would like to see GM food labeled, people are more supportive of biotech traits that will benefit them directly, and genetic modification is more acceptable for plants than for livestock or humans. Sadly, with the Pew Initiative shuttered, it is unclear who will analyze future shifts in public opinion.

In another chapter, W. Poortinga and N. Pidgeon report on public perceptions of biotechnology in the United Kingdom. They emphasize that it is a mistake to think that people are polarized into groups that are either for or against biotechnology. In fact, citizens often have a more nuanced, complex, and ambivalent attitude, seeing both potential benefits and risks from the technology.

How do citizens form their opinions and attitudes? This question is partially answered through two themes that are repeated within the book: (1) the importance of trust and risk perception in forming personal opinions, and (2) the role of framing in public debate and government policy.

It will surprise many scientists to learn that objective knowledge about biotechnology is not a strong predictor of an individual's support for GM crops and animals. In fact, strong opponents of GM crops are often well informed about the science. This book makes clear that peo-

ple's opinions are influenced by many factors other than scientific knowledge. Because of the specialization and technical advances in modern society, it is impossible for citizens to be knowledgeable about every aspect of their well-being. Therefore, it makes sense that people often rely on shortcuts such as trust, their perceptions of risk, attitudes of family and friends, confidence in government oversight, and messages from the mass media.

Various contributing authors in *The Public, the Media and Agricultural Biotechnology* suggest that trust is a critical factor in attitudes toward agricultural biotechnology. People develop different levels of trust about all products, processes, institutions, and sources of information in their lives. Surveys have shown that trust in government regulation is a key factor for support of biotechnology. Trust also affects how people process the information that they receive. For example, Poortinga and Pidgeon describe the results of a survey in the United Kingdom that showed that doctors, consumer organizations, environmental organizations, and university scientists are the four most-trusted sources of information about GM foods. The four institutions at the bottom of the list were the biotechnology industry, food manufacturers, the European Union, and the national government. Fink and Rodemeyer report that a US survey conducted in 2001 found that the most trusted sources for information were the Food and Drug Administration, scientists, farmers, friends and family, consumer groups, and environmental groups. The groups with the lowest levels of trust were food manufacturers, biotechnology companies, religious leaders, and the news media.

The perception of risk also plays a role in people's attitudes toward GM crops. Brossard and Shanahan and other contributors discuss a general set of factors that affect the perception of risk from any technology. Among these factors are whether the risk is voluntary, can be controlled by the individual, offers clear ben-

efits, is a natural phenomena, is familiar, and affects everyone equally. Surveys have shown that "red" biotechnology (medical biotechnology) is consistently given higher support than "green" biotechnology (agricultural biotechnology), even though most people know relatively little about the underlying science in either case. This difference in attitude may be attributed to the perception that medical biotechnology provides direct benefit to the patient, can be chosen by the patient, and is the best alternative available. GM crops do not fare so well with some of the risk perception factors. For example, the novel traits in today's GM crops (e.g., herbicide resistance, insect resistance) do not directly benefit the consumer.

How do the media influence public attitudes and government regulation? M. C. Nisbet and M. Huge provide a fascinating analysis of the interaction between these three forces in the United States from the 1980s to the present. They argue that framing by the mass media, powerful social actors, and government agencies have played an important role in forming American attitudes. Although framing has slightly different meanings in different disciplines, it generally refers to the social construction of an event that is created by the mass media, organizations, social actors, politicians, and others. The process of framing packages an event with the intent to influence public opinion and direct public debate. The authors present their views about how powerful actors and the media have placed GM crops into a narrow technical frame that has had far-reaching effects on US policy and regulations. This narrow technical frame has been coupled with minimal media coverage and participation by a tightly controlled group of stakeholders, allowing the proponents of biotechnology to create a favorable regulatory framework from the early 1980s to the present. Nisbet and Huge use the StarLink incident—in which GM corn approved only for livestock feed was used in human foods—as a case study to examine the role of framing and the media.

The authors conclude that StarLink was a catalyzing event, but the framing of this event, the media, and other factors blocked any major effect on subsequent US policy. Readers interested in the concept of framing and its effects on international public debate and biotechnology regulation should read Sheila Jasanoff's *Designs on Nature: Science and Democracy in Europe and the United States* (Princeton University Press, 2007).

The strength of *The Public, the Media and Agricultural Biotechnology* is its wide-ranging approach in trying to explain the social dynamics underlying public attitudes and government policies about GM crops. Although this book is primarily aimed toward scholars, it will be useful to anyone who wants to understand why GM crops have not always been embraced as the best route to food security and food democracy. The book is well organized and provides a fairly comprehensive starting point for further exploration of the social science research literature. In addition, educators in the sciences, anthropology, and sociology will find reading materials for college classroom discussions about agricultural biotechnology.

*Where Our Food Comes From* and *The Public, the Media and Agricultural Biotechnology* provide snapshots of crop improvement at two different points in time. Both books reveal how cutting-edge science combines with many social factors to define the crops that are grown. Vavilov was the champion of the newly discovered principles of Mendelian genetics in the early 20th century. In the 21st century, molecular biologists and other stakeholders have been the champions of GM crops and animals. Both books tell important stories about the how science, society, government, and the media interact to determine the foods that we eat.

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