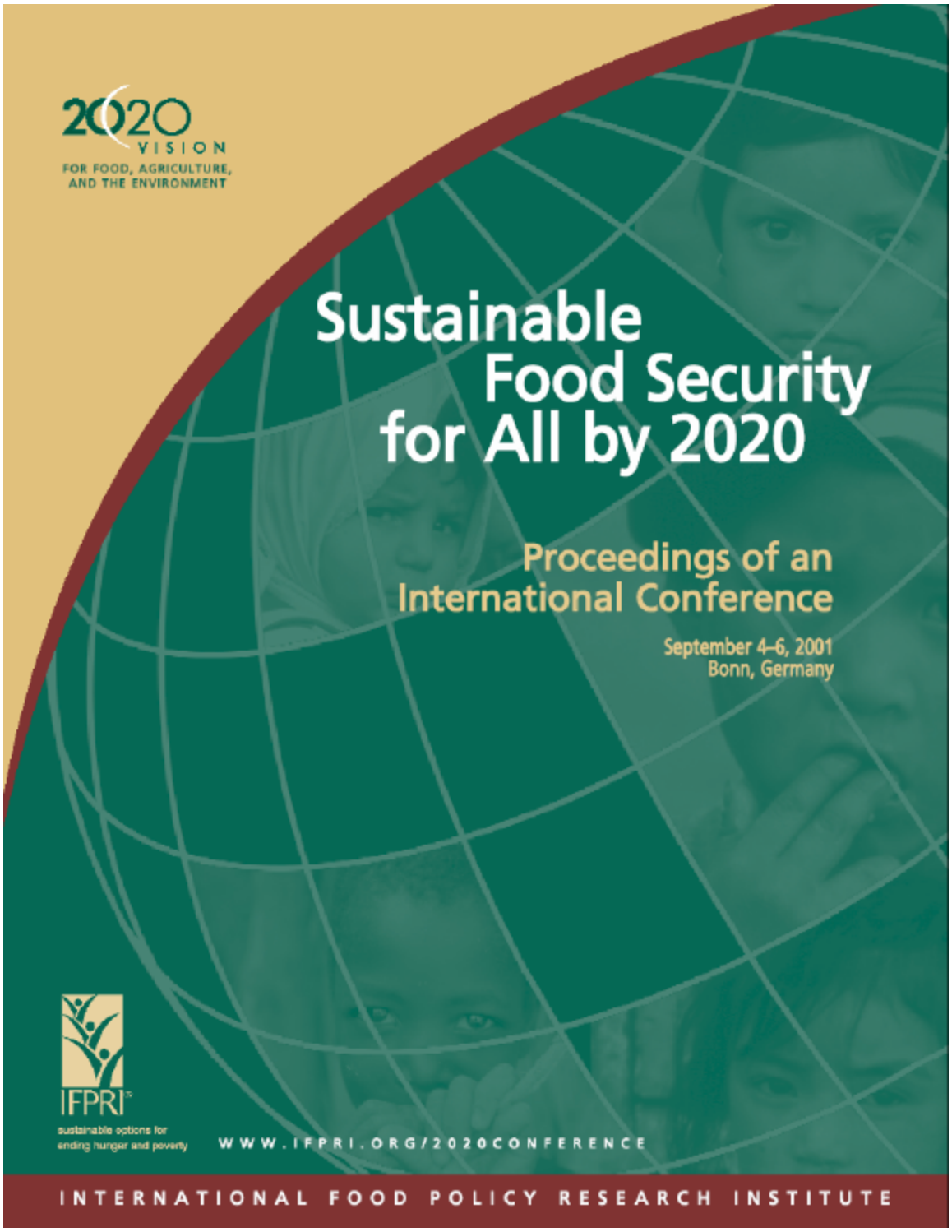

you can also download the entire book under:
http://www.botanischergarten.ch/IFPRI/Sust-Food-2020-Bonn-IFPRI.pdf

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Table of Contents

Foreword vii

Acronyms And Abbreviations x

Part 1 Introduction

1. **Welcome and Opening Remarks** 2
   Chair: Geoff Miller 2
   H.E. Johannes Rau 2
   H.E. Apolo Nsibambi 5
   Heidemarie Wieczorek-Zeul 7
   Bärbel Dieckmann 10
   Per Pinstrup-Andersen 11
2. **Food Security in a New Context: The Need for This Conference** 13
   Rajul Pandya-Lorch 13

Part 2 Food Insecurity: Why Haven't We Solved the Problem?

3. **How Committed Are We to Ending Hunger?** 16
   Chair: Piet Bukman 16
   Keynote: Sartaj Aziz 16
4. **Successes and Failures in Achieving the Goals of the World Food Summit** 21
   Chair: Michael Rewald 21
   Keynote: William H. Meyers 22
5. **800 Million Still Hungry: Why Have We Made So Little Progress?** 27
   Chair: Angela Thoko Didiza 27
   Volker Hausmann 27
   Heinz Imhof 30
   David Beckmann 32
   Discussion 34
6. **Perspective from the Next Generation** 37
   David Dalrymple 37
7. **Alternative Futures for Food Security** 43
   Chair: Manfred Kern 43
   Mark Rosegrant 44
   Discussion 49

Part 3 Emerging Forces: From Here to 2020

A. Demographic, Health, and Nutrition Forces

8. **A World in Flux: Changing Population Profiles and Needs** 52
   Chair: H.-Jochen de Haas 52
   Demography: John Bongaarts 53
   Nutrition: Lawrence Haddad 55
   Dietary Changes: Susan Horton 59
   HIV/AIDS: Gabriel Rugalema 62
   Discussion 63

Table of Contents

B. Economic Forces

9. **What Productive Resources Do the Poor Really Need to Escape Poverty?** 66
   Chair: Christian Friis Bach 66
   Keynote: Michael Lipton 66
   Discussion 72

10. **Making Globalization Work for Developing Countries: The Role of the World Trade Organization** 73
    Chair: Mahmud Duwayri 73
    Keynote: Supachai Panitchpakdi 73
    Discussion 77

11. **Putting Globalization to Work for the Poor** 80
    Chair: Isher Judge Ahluwalia 80
    Eugenio Díaz-Bonilla 80
    Robbin Johnson 83
    Chee Yoke Ling 84
    Robert L. Thompson 87
    Ango Abdullahi 89
    Discussion 91

12. **The Long Arm of Industrialized Countries: How Their Agricultural Policies Affect Food Security** 94
    Chair: Wen Simei 94
    Alex McCalla 94
    Shishir Priyadarshi 97
    Discussion 99

13. **Promoting Broad-Based Economic Growth and Food Security: A View from the European Union** 101
    Chair: Per Pinstrup-Andersen 101
    Keynote: Poul Nielson 101
    Discussion 105

C. Technological and Environmental Forces

14. **The Future of Agriculture in Sub-Saharan Africa and South Asia: W(h)ither the Small Farm?** 107
    Chair: Peter Hazell 107
    Sub-Saharan Africa: Dunstan Spencer 107
    South Asia: Ashok Gulati 109
    Discussion 112

15. **Turning Up the Heat: How Will Agriculture Weather Global Climate Change?** 116
    Chair: Pedro Sanchez 116
    Keynote: Martin L. Parry 117
    Discussion 123

16. **Complementary Technologies, One Goal: Approaches to Sustainable Food Production** 124
Chair: Klaus Ammann 124
Agroecological Approaches: Jules Pretty 125
Agroecological Approaches: Manuel de Jesús Reyes 127
Conventional Approaches: Prabhu Pingali 128
Conventional Approaches: K. Rajarathinavelu 131
Biotechnological Approaches: Jennifer Thomson 133
Discussion 135

17. **Troubled Water, Water Troubles: Overcoming an Important Constraint to Food Security** 140
Chair: Margaret Catley-Carlson 140
Keynote: Frank Rijsberman 141
Discussion 144

D. **Sociopolitical Forces**

18. **Food Insecurity—A Symptom of Poverty** 147
Chair: Courage Quashigah 147
Keynote: Clare Short 147
Discussion 152

19. **Empowering Low-Income Women** 153
Chair: Agnes Quisumbing 153
Education: Elizabeth King 153
Agricultural Programs: Wilberforce Kisamba-Mugerwa 157
Property Rights: Ruth Meinzen-Dick 159
Discussion 161

20. **Governance and Food Security: Acting in the Public Interest?** 167
Chair: Solita Monsod 167
Conflict and Food Security: Philippe Guiton 168
Right to Food: Charlotte V. McClain 170
Corruption: Tunku Abdul Aziz 172
Discussion 175

Part 4 Sustainable Food Security for All: Realizing the Vision

21. **The Roles and Responsibilities of Industrialized Countries in Assuring Sustainable Food Security** 182
Chair: Grace Akello 182
Keynote: Uschi Eid 183

22. **Setting the Priorities for Action** 188
Chair: Keith Bezanson 188
Introduction: Rajul Pandya-Lorch 188
Ian Johnson 190
Stewart Wallis 191
Mercy Karanja 193
Klaus Leisinger 195
Discussion 196

Table of Contents

23. Whose Responsibility Is It to End Hunger? 202
Chair: Joachim Von Braun 202
Introduction: Robert Paarlberg 202
Klemens van de Sand 204
Julian Gonsalves 206
Usha Barwale Zehr 208
Harris Mule 209
Discussion 211

24. Concluding Remarks 217
Per Pinstrup-Andersen 217
Geoff Miller 221

Box: Award Announcements 40

Comic Strips: AIDS 36
Modern Technologies Bypassing the Poor 115
Water Crisis 146
Women 166
War 179

Appendix 1: Conference Program 225
Appendix 2: Speakers—Biographical Notes 231
Appendix 3: Selected Summary Notes Prepared by Speakers 243
Appendix 4: IFPRI 2020 Publications Released In Conjunction with the Conference 281

Foreword

In 1995, the International Food Policy Research Institute's (IFPRI's) 2020 Vision for Food, Agriculture, and the Environment Initiative held its first international conference, which articulated a global vision for eliminating food insecurity. Since then, profound developments have occurred with extraordinary implications for global food security prospects, compelling IFPRI and its 2020 Vision Initiative to hold a second conference, entitled "Sustainable Food Security for All by 2020," in Bonn, Germany, on September 4–6, 2001. The ultimate objective of the Conference was to influence and catalyze action by key actors—including governments, international aid agencies, nongovernmental organizations, business and industry, and media—to achieve sustainable food security for all by 2020.

Over 900 individuals from 71 countries participated in the Conference. One-quarter of the participants were from developing countries, and 40 percent were female. A wide variety of stakeholders came together—one-quarter of the participants were from nongovernmental organizations, one-fifth from government, one-tenth from media, and just over one-twentieth from business and industry. In addition, the Conference attracted very senior policymakers.

The Conference began by taking stock of the current situation and prospects for the future. The second part, or heart, of the Conference focused on four key emerging forces: (i) demographic, health, and nutrition forces; (ii) economic forces; (iii) technological and environmental forces; and (iv) sociopolitical forces (see Appendix 1 for Conference program). The third and final part built on the action items identified in the previous sessions but focused on the larger issues of setting the priorities for action and identifying the roles and responsibilities of key actors.

This proceedings volume compiles the presentations made by the 73 speakers and chairs (see Appendix 2 for biographical notes) and synthesizes the discussions held throughout the three days. Note that these presentations have been transcribed and lightly edited. All speakers and chairs were invited to submit written summary notes for distribution during the Conference. These are available on the Conference website at http://www.ifpri.org/2020conference; we encourage you to consult them for more information. In certain cases, for those who were unable to present their summary note or whose presentation significantly differed from the written note, summary notes are included in Appendix 3.

Several auxiliary activities complemented the Conference program, highlights of which are included in this volume. Poster and essay competitions invited young people from around the world to share in pictures and in words how they saw our world in 2020. Throughout the Conference, an electronic voting system quickly gauged the participants' views on key topics, subsequently catalyzing debates and discussions. An African artist was commissioned to create comic strips depicting his perspective on relevant topics.

A variety of outlets were used to extend the reach of the Conference. About 80 journalists from around the world participated in several press conferences. Summaries of the proceedings and press articles were distributed to leading radio stations and print and electronic media outlets throughout the world. The

Conference participants peruse the table of IFPRI publications prepared for the Conference.

Conference speakers address the media during one of the press conferences.

Conference website was effectively used prior to, during, and after the Conference to raise public awareness, undertake polls on food security issues, and share Conference outputs.

In conjunction with the Conference, the 2020 Vision Initiative commissioned IFPRI staff and other leading experts around the world to undertake research and syntheses on several key topics, producing a number of new 2020 publications (see Appendix 4). In addition, an action plan was drafted and presented at the Conference. With feedback from the participants and many others, the document has been revised and published. While it reflects the helpful advice received on the draft, it does not represent a consensus as such; rather, it reflects IFPRI's best judgment, as an institution, about the driving forces influencing the long-term prospects for food security and the actions needed over the next two decades to free humanity from the scourge of hunger.

Follow-up activities to the Conference are underway, including the creation of a Bonn Food Policy Circle, an action group of high-level policymakers in government and international institutions and other eminent personalities; an independent impact assessment of the Conference conducted via a questionnaire to participants (the report is available on the website); exploration of areas for further IFPRI research that emerged during the Conference; and presentation of the outcomes of the Conference to audiences around the world.

IFPRI and the 2020 Vision Initiative take great pride in having organized this Conference in collaboration with partners from the public sector, private sector, and civil society, and warmly thank the Government of the Federal Republic of Germany and the other cosponsors for their support: German Federal Ministry for Economic Cooperation and Development (BMZ); German Foundation for International Development (DSE-ZEL); German Agency for Technical Cooperation (GTZ-BEAF); Aventis CropScience; CARE; Cargill; Deutsche Welthungerhilfe; EuronAid; International Fund for Agricultural Development (IFAD); Mellemfolkeligt Samvirke; Syngenta; and World Vision. In addition, we express our appreciation to the following agencies that provided support for developing-country participants to attend the Conference: Canadian International Development Agency (CIDA)/Agence Canadienne de Développement International (ACDI); Centre Technique de Coopération Agricole et Rurale (CTA); Ford Foundation – Beijing; Ford Foundation – New Delhi; and Novartis Foundation for Sustainable Development.

We thank the Conference Advisory Committee for providing guidance in the design and preparation of the Conference. We are extremely grateful to the chairs, speakers, and panelists for their active involvement in the program and for sharing their knowledge and perspectives, contributing to a very rich and stimulating meeting. Special thanks to Eleni Gabre-Madhin for performing the duties of

Master of Ceremonies with great eloquence and ease and for effectively keeping the program flowing smoothly. We express our sincere appreciation to our colleagues throughout IFPRI, in particular Klaus von Grebmer and the entire Communications Division, for their unflagging support and contributions. We also thank Laurie Goldberg and Simone Hill Lee for going beyond the call of duty to efficiently coordinate and handle the complex logistical details in the preparations for and implementation of an international conference of this magnitude and scope. Vickie Lee's assistance is also warmly acknowledged. We are extremely grateful for the unwavering support and efforts of Evelyn Banda, Uday Mohan, and Heidi Fritschel in the timely production of all of the publications for the Conference. We were pleased to be able to gather a unique, committed, and enthusiastic team to assist with the logistics of the Conference in Bonn, and extend our deepest thanks to the IFPRI members of the Conference team as well as to the team members in Germany for keeping the Conference running smoothly. We offer our appreciation to the Mayor of Bonn, the Federal Ministry for Economic Cooperation and Development, and the German Foundation for International Development for hosting receptions for Conference participants. In addition, we express our sincere gratitude to H.-Jochen de Haas, Jürgen Richter, and Petra Kade for their exceptional support from the very beginning of this Conference activity. Finally, our heartfelt thanks go to Jenna Kryszczun for providing extraordinary and invaluable support in all of the programmatic and organizational activities before, during, and after the Conference. We particularly appreciate Jenna's leadership in organizing and compiling this proceedings volume, which entailed, among other things, overseeing the transcription and editing of the presentations, coordinating reviews with the presenters, preparing the highlights of the discussion sessions, and assembling the myriad components in such a way that the volume captures the fullness and intensity of these three days.

By every measure, the Conference was a tremendous success. It brought new information, new ideas, new perspectives, and new actors with regard to global food security to the forefront, it helped to further knowledge on emerging developments and on priority actions required to assure sustainable food security, and, by attracting participation from all stakeholder groups and facilitating different perspectives to be heard, it encouraged dialogue and debate between traditional and new stakeholders. We thank all of those who participated for their contributions. This proceedings volume aims to not only share the richness and excitement of the event but also to rekindle and maintain the sense of urgency generated at the Conference for achieving sustainable food security for all by 2020.

Per Pinstrup-Andersen
Director General, IFPRI

Rajul Pandya-Lorch
Head, 2020 Vision Initiative, IFPRI

Chapter 16

Complementary Technologies, One Goal: Approaches to Sustainable Food Production

Manuel de Jesús Reyes, a farmer from Honduras, offers his views on agroecological approaches to food production. Roland Bunch of Cosecha translated.

Chair: Klaus Ammann
Director, Botanical Garden, University of Bern*

We have an unfinished agenda. We also have an unfinished debate about what will be best for each country if it is to avoid hunger catastrophes in the future. This is the foremost task of this Conference, to find solutions. And the purpose of the session is to show you that actually there are many ways and many roads that give us solutions. I would like to make six broad statements.

First, I am against eco- and corporate imperialism. I think more decisions should be made by countries and regions on their own. We should all be open-minded. All of us have lots of gaps in our knowledge. We should listen to each other. We should not leave the field to a few experts with big mouths.

Second, I think organic farming and high-tech farming need to go together in the future. We simply have no time for ideological debates and battles over these issues. We should have a collaborative learning process instead.

Both of these seemingly polar strategies in agriculture, organic and high-tech, have advantages and disadvantages. So, my third statement is, let's benefit from the advantages and avoid the disadvantages. I'll give one example of the advantages of organic farming. Maybe not everyone is aware of Switzerland's 20-year-long experience with organic farming, wherein all the major proponents of different strategies got together and set up a field experiment, that really showed the disadvantages and advantages of each production method. To sum it up, organic farming showed lots of advantages when you looked at soil life. It had a bit less yield, but only a bit less. Other farming strategies also did very well. Strikingly enough, we now know through various field experiments that, for instance, the widely made claim that nontarget insects on transgenic crops cause considerable damage is not really true. You cannot distinguish the insect populations in transgenic and nontransgenic Bt maize fields.

But, and this is my fourth statement, we certainly need to monitor new technologies and establish regulatory frameworks for them.

My fifth statement is equally brief: Have a look at UNDP's *Human Development Report*, which states that we should not exclude modern agricultural technologies as a whole in our approaches.

The last statement is my dream: in the future, maybe 10 years from now, I'd like to smoke an organotransgenic cigar.

* Summary note included in Appendix 3.

SUMMARY NOTE

Panel Discussion: Complementary Technologies, One Goal: Approaches to Sustainable Food Production
Panelist: Klaus Ammann, Director, Botanical Garden, University of Bern
Title: Thoughts About the Future of Agriculture: Science and Fiction in the Risk Assessment Debate

Many Different Roads to Success in Plant Breeding and Farming

Instead of indulging into a fruitless debate about what strategy would be appropriate in agriculture, it would be much more rewarding in looking at the best way forward for a given country, a given ecology and economy. Looking for sustainable and equitable farming methods means in my eyes to refrain from any kind of ideological debate and concentrate on pragmatic decisions in order to find the best solution for a given region.

Roads to success in these areas are many, and we must pursue them all. In the first stage of fascination with the new technologies, a number of other pest-control strategies lost much—too much, in my view—of their appeal. We should have a closer look at mixed cropping and test critically its sustainability. Also, we will have to enforce research in biocontrol, which should also include a good package of risk assessment. Modern agriculture could benefit enormously from the knowledge and experience of organic farmers, whom I regard as visionaries of no less importance than the genome researchers who bring us important progress. We should apply our new knowledge about individual genes constructively to methods of cultivation that preserve or enhance soil fertility. On the basis of our new, sophisticated genomic knowledge it should be possible to develop transgenic plants capable of defending themselves against pests by producing their own organic pesticides, substances that remain active for a limited time only and, ideally, perform their functions only in specific endangered organs. Scientists are now looking for means of controlling genes in such a way as to prevent the formation of these effective ingredients in plant reproductive organs. In this way, the risks involved in crossing out undesirable genes could be elegantly avoided. There are several ways of preventing gene flow as such: Apomixis is a very promising one, where embryos develop spontaneously, not needing to be started by cross-fertilization—a strategy used by many wild species. Wyse use of technology protection mechanisms could also help to prevent geneflow, at least for the strictly autogamous crops. We should also have a close look at the seemingly old-fashioned methods of breeding pollen sterile crops—in maize this has been achieved recently. Does this sound like a futuristic vision? Admittedly, it will take several years to accomplish many of these improvements, but thanks to the breakthrough in genome decoding, such dreams are now within reach.

We should take the unique opportunity to pursue this ecological approach to plant breeding. This will require active cooperation with those organic farmers who are at least willing to entertain the possibility of incorporating other genes in their crop plants. At present, the market has nothing to offer organic farmers as an encouragement to join this still modest faction. Although lower pesticide and herbicide consumption is often cited as an argument in favor of these first transgenic varieties, most organic farmers are hardly impressed, as they have long since cut back the use of chemical agents substantially (albeit in favor of organic pesticides, which are not without significant problems of their own). Yet organic farmers frequently fail to think far enough ahead. They should not be indifferent to the fact that the transgenic, herbicide-tolerant soy bean permits a form of crop cultivation in which ploughing is virtually unnecessary—a giant leap forward in the battle against soil erosion. Like conventional farmers, organic farmers can ill afford to reject potential improvements out of hand on dogmatic principles. After all, yields in long-term organic field trials are still comparatively low, and it is in the best interest of those directly concerned to seek improvements.

On the other hand, we now know that soil organisms flourish considerably better in organically farmed fields, a fact that should give the defenders of conventional farming methods pause for thought. I have learned from my own personal contacts that dialogue is possible, although it is clear where at least one of the problems lies. With their heavily ideological point of view, many organic farmers tend to isolate themselves excessively from modern developments. All official advocates of organic farming categorically reject the introduction of other genes into crop plants, for example. They are quick to support the superficial fear-mongering arguments of nongovernment organizations that do not even hesitate to fuel resistance to transgenic livestock feed in the face of firmly established scientific knowledge. My own personal experience has shown me that dialogue is possible and that even the most dedicated organic farmers are capable of learning as well. My own surname can be traced back in a straight line to the Anabaptist founder of the Amish community in the US state of Pennsylvania—a certain Jakob Ammann, one of our families direct ancestors, who's name has been used to denominate the 'Amish.' This courageous emigrant, like so many others a victim of a broad and brutal campaign of religious "cleansing," established the Mennonite sect in 1693 and laid the cornerstone for the many Mennonite village communities now found throughout North America. These groups have preserved not only their religious beliefs but their traditional organic farming methods as well.

Those who see these Amish farmers as stubborn learn in their first personal encounter with them that such is not the case. One is amazed at how deeply curious the Amish are. I can confirm, at any rate, that the friends I have been privileged to meet do not fit the stereotype of narrow-minded fanatics. As organic farmers, they do not reject technology out of hand but instead examine every innovation closely in an effort to determine whether it might pose a danger to their religion or way of life. If they are convinced of the potential benefit, they have no reservations about introducing milk cooling systems and other modern technologies. I had a number of surprisingly amiable, objective discussions with Amish organic farmers about genetic technology, and to my amazement, they decided to test samples of genetically modified seeds soon afterwards. Transgenic potatoes are currently being grown on a trial basis on their farms. And there is no reason whatsoever to suspect that these genetically altered potatoes might disrupt their religious and social system in any way at all.

I have no way of knowing whether the Amish will actually begin cultivating these new varieties of potato in earnest, and that is ultimately their decision alone, the latest news hint to an adoption case by case. I was impressed by how quickly these very traditional Amish farmers, of all people, accepted the idea of testing the new varieties of potato. As I learned later, the laudable pragmatism that characterizes their approach to such difficult issues is a function of their unique spirituality and the strong sense of security they derive from their religion.

I have gained a very similar impression in conversations with practicing Buddhists. Their natural curiosity and their willingness to consider even genetic technology without prejudice has fascinated and impressed me time and time again. The most striking example of such a seminal conversation I have ever experienced took place in the Botanical Gardens at the University of Bern, where I had the good fortune to spend a half-hour discussing genetically engineered crop plants with a dignified yet quite cheerful teacher of the Dalai Lama. He, too, exhibited neither prejudice nor fear with regard to this visionary technology that is unfortunately much too often condemned without a thorough hearing process in this country.

Science and Fiction in Risk Assessment Research Related to Transgenic Crops

The new knowledge in molecular genetics will have a much more profound impact on food production than the "Green Revolution" of several decades ago, it could enable us at long last to achieve rapid progress in the

breeding of the most common crop plants such as rice, corn and wheat. The growth of genetic knowledge will have consequences one never could have imagined before. The most promising genes of crop plants will be an open book within only a few years from now. Significant progress has already been made with the genetic material of the rice plant, and major private agricultural corporations have made some of the fruits of their rapidly intensified research available—free of charge—on a worldwide scale.

The optimistic and visionary outlook is one side of the medal, the other side is the bitter debate about the risks we are taking with field releases of transgenic crops. Opponents of the new technology range from fundamentalists denying the new technology all benefits and fervent defenders who do not see the slightest problems. There is unfortunately a lot of partisan thinking on both sides and—as often, the truth lies in-between.

Lets take the well known example of the Bt-crops. Ever since the Nature paper of Losey appeared, people had to learn that the colorful larvae the beautiful and popular Monarch butterfly in the US can be killed by Bt Pollen within 4 days by 40 percent. Shockwaves of newspaper articles went around the globe and Monsanto lost some 5 percent of its shares within a few days. But even Losey himself warned about the interpretation of his lab results. Today we know that the Monarch larvae and the adults will nicely survive in vast fields of Bt crops. We know it from field tests, there are today lots of data available. Beneficial insects even have a better life in Bt corn fields, since they are not showered by pesticides. Roundup Ready crops can be grown with the new conservation tillage methods, in favorable conditions the soil microflora thrives under no tillage conditions much better than with crops treated with classic herbicides. It becomes now visible that transgenic crops, wisely designed and used, will add to the sustainability of agriculture.

Also it has become clear in the last years, that gene flow happens wherever possible, as it has done in the former days of agriculture. But today the transgenes act as marker genes and we can, for the first time in history, follow up with extreme precision what is going on in the fields. The present day transgenes do not pose any significant problems once they have escaped to their wild relatives through outcrossing. And outcrossing is only possible there where wild relatives are in the reach of viable pollen grains of crops, which produce after pollination viable hybrids. The latest long-term experiment of Crawley shows that, after 10 years, the four transgenic crops tested just vanish and have a considerably lower survival chance than their non-transgenic counterparts.

But one has also to realize that the early risk assessment data have been scanty and not at all convincing, and in the early days of the US approvals things looked a bit shaky in the hindsight. And also we should remain cautious about long-term effects and install some monitoring programs after commercialization. This would help us to avoid mistakes we have done earlier with the introduction of pesticides. We do not know enough today about the long-term effects in the highly-complex food web of insects.

It would also be wrong to dismiss the general anxiety of a large portion of the population about biotechnology, since it becomes clear now that biology as a science has lost its innocence and people have a very finely tuned sensitivity on what's going on. After all, the new molecular technologies will change the course of Evolution. But it is also true that we have started to strongly influence evolution a long time ago—with crops even several thousand years ago. In modern times we have without hesitation sped up mutational breeding with gamma radiation—with modern wheat we do still not know, what we have done to the genomes with those rather inconsiderate methods. But we all eat bread from wheat which has undergone such mutations. So the whole difference is that today we eat mutant food and in future we will eat gene food, where we know much better what we have done.

It would be a grave error to concentrate on the negative side of transgenic crops, since they offer important opportunities for modern farming. And it is modern farming we will have to install all over the world,

since it is a fiction to believe that a trend back to traditional methods would solve the most urgent problems in feeding the world. But it would also be naïve to think that genetic engineering alone would save us all. Well-established global civil society organizations and also the United Nations Development Unit advocate a more intensive agriculture in order to save the last unharmed biotopes of this globe.

We learned extraordinarily quickly from the early years of genetic engineering through experiments involving the introduction of individual genes from other organisms into genetic material. Some of these first-generation transgenic plants have since been introduced in many different countries and are now producing good yields. Although the ecological and economic benefits vary from region to region, and have been only modest in some areas, most farmers who have been able to use these varieties effectively are thoroughly convinced of the advantages they offer.

The rapid expansion of genomic knowledge will soon make it possible to create resistances against parasitic fungi that are still causing disastrous crop damage today. We should be wary, however, of simply replacing the chemical "club" with the genetic club in the field of pest control. We would be far better off applying the elegance of breeding methodology to more meaningful goals, such as enhanced tolerance against drought, high salt concentration in soils and a better crop performance in cold climates. First successful developments in research labs will soon approach commercialization phase.

Efforts to realize romantic notions about nature in the fields with the aid of genetic technology surely make little sense today. It should be possible, however, to increase species diversity in the agricultural context and thus put an end to the dismal reign of monocultures. Our endless war against wave after wave of new pests on these vast, monotonous fields should prompt us to rethink our approach. We must win such battles in the future if we are to increase our food supply while alleviating ecological consequences at the same time. It should also be stated very clearly that farming with transgenic crops is not scale dependent: this is shown in China, where thousands of small cotton growers are very happy with the transgenic traits. Imagine a bag full of seeds where all seeds have a streamlined genome adapted to local ecological conditions and specific quality demands. On the other hand the seeds in the same bag offer a full variety of different resistance genes (whether transgenic or not), thus enhancing dramatically biodiversity again.

An excellent way to solve these complex problems on risk assessment and risk management in an open debate offers New Zealand. In a rigorously open, balanced and transparent debate, all accessible on the Internet under http://www.gmcommission.govt.nz/, thousands of submissions, testimonies and rebuttals have been published, and recently the Royal Commission of New Zealand has come out with a balanced report which you can download from the given Internet address. This tedious and lengthy debate process did not leave any room for cheap populist slogans and will eventually lead to balanced solutions, well adapted to the needs of New Zealand.

Another good source of information is http://www.bio-scope.org, a new website with a content database accessible over hundreds of keywords, daily news about biotechnology, and a daily clipping service for newspaper articles. Also you have access to a range of experts willing to answer individual questions.

Note: The views expressed in this summary note are those of the author and are not necessarily endorsed by or representative of IFPRI or of the cosponsoring or supporting organizations.