Genes, Trade and Regulation: The Seeds of Conflict in Food Biotechnology. Thomas Bernauer. Princeton University Press, 41, William Street, Princeton, NJ 08540, USA. 2003. 229 pp. Price: US $ 26.95.

Cultivation of food crops developed using recombinant-DNA techniques (genetic engineering) is a controversial issue that has generated intense, highly emotive debates all over the world. In such discussions, one of the most frequently asked question is why the Europeans are so vehemently against the genetically engineered (GE) crops, while they have been widely accepted in USA. Dramatically opposite conclusions on the safety of GE crops, are drawn from the same set of data by the decision-making bodies of the two largest economies of the world. This has created a great deal of apprehension in other countries, particularly in the economically and scientifically less developed parts of the world. The opponents of GE crops in India also cite the example of the European Union (EU). The book under review provides an indepth analysis of the controversy, and makes suggestions to derive the potential benefits of the technology. The author, Thomas Bernauer, is a Professor of Political Science at the Swiss Federal Institute of Technology (ETH), Zurich. ETH is also the leading centre for agricultural biotechnology in Europe, and 'Golden rice' with high vitamin A content was developed there. In 1998, there was a public referendum in Switzerland to seek complete ban on all kinds of recombinant-DNA research in the country. This was the first time in the history of science that senior professors and researchers moved out of the laboratories to the streets, holding posters and placards to educate the public on the utility of their research, and urging them to vote against the initiative. This overwhelming support and interaction of the academics with public was mainly responsible for the rejection of the demand by two-third of the voters.

In the preface the author states that at the time of the public referendum his colleagues 'in the "hard" sciences discovered that there were social scientists at their university who might have something useful to say about issues they were concerned about'. That is how he got into examining the political, economic and societal challenges to agricultural biotechnology. The book is written by adopting the posture of a fence-sitter in a policy area with hardcore pro-and anti-biotechnology (read genetic engineering) groups. Passing a judgment on whether agricultural biotechnology is 'good' or 'bad' is avoided.

The first chapter starts with asking a number of provocative questions that are addressed in the book. It begins with a statement: 'Agricultural biotechnology, the most cutting-edge contemporary technology in food production faces an uncertain future'. 'Will it revolutionize food production round the world? Or will it follow the example of nuclear energy, which turned out to be one of the most unpopular technological innovations in human history. It has not collapsed entirely. But it has never reached the adoption rate and market share that the proponents originally predicted'. The reviewer feels that the comparison is not valid. Both represent high S&T; commercial nuclear power is limited due to the possibilities of clandestine diversion of nuclear materials for weapons, and the desire of the nuclear-weapon countries to restrict the entry of other nations to the 'nuclear club'. GE crops can never be used to make weapons of mass destruction. Furthermore, the current nuclear share in the world's electricity production is 16%, and in France it was 77% as on January 2002.

Disagreement over GE crops is a part of current controversies on new knowledge that includes *in vitro* reproductive technologies, cloning, stem-cell research, xenotransplantation, genetic testing and enhancement in humans. These, along with more general issues of globalization, the widening gap between rich and poor, intellectual property rights, patenting of life forms, and the role of science in society divides societies into opposing camps. The US approach is based on scientific evidence, while the EU has adopted the 'precautionary principle' when there might be a risk to public health and environment, but the scientific knowledge is incomplete, implying 'better safe than sorry'. EU imposed *de facto* moratorium on GE crops since April 1998 (The European Commission has approved the import and marketing of a type of genetically engineered sweet corn, known as BT11, for human consumption in May 2004, thus ending a six-year *de facto* moratorium on GM products.). Differences among nations in their approach to risk are well illustrated by citing a poetic anecdote by an anonymous author.

'The Risk of Nations
In the US products are safe until proven risky
In France products are risky until proven safe
In the UK products are risky even when proven safe
In India the products are safe even when proven risky
In Switzerland products are risky especially after they have been proven safe
In Kenya products are safe especially after they have been proven risky
In Canada products are neither safe nor risky
In Brazil products are both safe and risky
In Ethiopia products are risky even they have not been developed'.

The second chapter deals with the challenges of societal controversy over health and environmental risks, corporate dominance of the food chain using patents, and ethical issues. Consumers have not directly benefitted from GE crops so far; farmers have gained, but are worried about negative consumer reactions and possible loss of exports. Ethical and ideological concerns of corporate dominance of the seed industry by multinational or private companies are often raised. Large captive markets with high purchasing capacity have restricted investment in major crops of interest to the developed countries. The third chapter examines the regulatory and market responses in EU and the US, and the impact of their decisions on policy issues in other countries. EU made it mandatory to carry the label 'Genetically Modified' for all such products, and later the labelling was extended even if the food additives and flavourings were derived from GE organisms. The US policy is totally against labelling. Other countries have either aligned to EU or the US, depending upon their trade and economic dependence. While Canada has aligned with the US; Switzerland, Central and Eastern European countries have aligned with EU. Many other countries have tried to find some middle path. This polarization also affects other countries and hampers further progress in GE crops; it has delayed approvals in many countries as the cultivation of GE crops may adversely affect the commodity exports. Opposition by rice exporters to the cultivation of GE rice in India illustrates this fear. These developments have also affected the policies and investments in GE crops by MNCs all over the world. Chap-

ter 4 deals with the politics of the different interest groups in EU and the US. Public risk perception, industrial structure and behaviour of NGOs are different on either side of the Atlantic, leading to weakening of the pro-biotech support in EU. Excess production capacity, inferior competitiveness of European farmers, low public trust in the regulatory system, pressure by NGOs, processors and retailers decision not to use or market GE products have contributed to the opposition. The author concludes that reversal of this trend is unlikely in the near future. Though some cracks in the pro-GE policy have been seen in the US, any major reversal is ruled out.

International trade conflicts are analysed in Chapter 6. The different perceptions and the resulting regulatory framework have not only created tensions in international trade, but also a major conflict between the two largest bilateral trading partners, EU and the US. In May 2003, the US filed a complaint against EU's moratorium on GE crops in the WTO's dispute settlement. The possible future scenarios are examined. In the concluding chapter (Chapter 7), suggestions for policy reforms to avoid global confrontation and stagnation of technology are made. Policy reforms, including 'strong regulatory authorities backed by robust liability laws, market-driven product differentiation based on mandatory labelling of GE products' are suggested. Help for establishing regulatory framework in the developing countries is recommended. Labelling of GE products is mainly a European requirement to satisfy the public 'right to know' what one is eating. This however, differs from the widely accepted views of plant geneticists and the scientific community that the technique used for the development should not be the criterion for differentiation between cultivars.

The book is well written, though professional scientists may find repetition of thoughts, as is common in social sciences publications. Each chapter starts with a summary of the previous one, the main topic of discussion that is pursued in depth, and ends with the summary and the conclusions drawn. The book is recommended for all those engaged in GE research, its regulation and policy issues. Even youngsters entering the field would benefit by reading the first chapter – Introduction and summary, if not the entire book. The take-home message of the author for the technocrats engaged in R&D is 'success (or failure) of technological innovation hinges not only on what natural scientists or engineers achieve in their labs, but also on consumer perceptions, campaigns by NGOs, the political behaviour of the firms, government regulations, and the like'.

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Red List of Threatened Vascular Plant Species in India – Compiled from the 1997 IUCN Red List of Threatened Plants. C. Kameshwara Rao *et al*. (compilers). ENVIS, Botanical Survey of India, Ministry of Environment & Forests, Kolkata. 2003. 144 pp. Distributed free of cost on written request to Director, BSI Central National Herbarium, Howrah 711 103.

The impact of habitat destruction and habitat fragmentation mainly due to anthropogenic disturbance, is strongly perceived in the decline of species ranges and even extinction of some species. Globally, the natural forests are under great stress and forests are disappearing due to the tendency of man to exploit them for better-living. This has rendered a large number of biota threatened. The International Union for Conservation of Nature and Natural Resources (IUCN), rose to the occasion and focused the attention of biologists to the species of plants and animals that are under threat of extinction as early as 1963, in the form of *International IUCN Red Data Books* and provided guidelines to determine the threat status of a species. Although these guidelines were revised in 1994, the IUCN published a *Red List of Global Threatened Plants* based on pre–1994 IUCN categories and this list included 33,798 species of vascular plants under different categories of threat in different parts of the world, including the Indian region. No doubt, this publication brought considerable awareness among botanists for a relook on the status of these plants in their own region. Keeping in view the great demand for this book by Indian botanists, and also in view of extra efforts one has to put in for searching a species from a bulky document, it was useful to have a separate list of Indian Threatened Plant Species included in this massive volume.

The present compilation is a welcome contribution by the authors. This list enumerates 1255 species of vascular plants belonging to 573 genera and 140 families. The threat status of these plants according to IUCN per-1994 categories as Extinct (Ex), Endangered (E), Vulnerable (V) and Rare (R) is indicated for all plant species.

The enumeration of families of threatened plants is also according to the IUCN 1997 Red List and follows the system of classification of Cronquist (1981). For each species entry, the global threat status [Ex, E, V and R], correct name of the species with authors' name followed by a number that refers to a literature reference to the source of the threatened species, abbreviation for threat status of the species in the Indian region, its reference to the source indicated by a number, Indian distribution and again a number which is the literature reference to distribution data source are provided exactly as done in the massive global IUCN document.

Although the present book is just a compilation of the list of threatened plants of India from a massive global list, the work could have been made more useful by providing additional data on their threat status, conservation initiatives, additional distribution localities and many such useful information generated by flora writers and field botanists during recent years. Information from *Red Data Books* published by Botanical Survey of India could have also been included. Data on their reproductive biology (where known) could have thrown some light upon their rarity.

The publication of this list ends the search for an IUCN publication by the Indian botanists. Also being a handy compilation, this book helps all botanists in their fields/work. Being a partial reproduction from the global IUCN list, the book serves the same purpose for the Indian botanists as the IUCN list serves for the global community of botanists. On the whole, the book will be useful to Indian botanists, conservation biologists, teachers and students interested in conservation and sustainable utilization of natural resources.

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