Foreword

The last three decades have witnessed spectacular progress in the plant sciences, especially regarding our knowledge at the molecular level. It was only possible within such a short period of time because of genetic engineering. The plant gene engineering endeavour started with the finding that soil bacteria like *Agrobacterium tumefaciens* that were known to induce crown galls were also able to force a plant to synthesise exudates in these galls, containing a high concentration of a class of odd amino acids. These novel compounds are nutrients for these infecting Agrobacteria, hence this has been called "genetic colonisation". The next step was the unravelling of the molecular mechanism that made this possible. Surprisingly it was a transfer and integration into the plant genome of a bacterial DNA segment, part of a large plasmid harboured by this very *Agrobacterium* strain. These findings, from the 1970s, culminated in 1983 in the demonstration that it was possible to turn these *Agrobacterium* strains into efficient and reliable systems for delivery and expression of foreign genes into healthy plants.

Most research centres directly accepted this new technology in their attempts to discover the molecular basis of plant physiology and plant growth and development. They also started to make the first prototypes of novel crops through genetic engineering. As the development and production of commercially valuable novel crops is not the task of public research institutes, new actors appeared. Spin-off or start-up companies, often situated in or near the universities where the innovative science was generated, could raise the money and attract the post-docs and skilled technicians to construct the first genetically modified (GM) crops.

Agrochemical companies were very well aware of this opening up of the plant sciences. The prospect of obtaining more efficiently improved cultivars through this genetic engineering technology convinced them to join the race. They bought up the best-performing seed companies, and laid the foundation of Crop Science departments worldwide. They became the bases for developing a successful intensive global agriculture.

From the beginning of gene cloning, concerned scientists asked to discuss the 'safety' of the recombinant DNA technology. The Asilomar conference (February 1975) triggered decades-long debates on 'biosafety procedures' that generated helpful inputs as well as distortions, among which the Cartagena Protocol is one related to plant biotechnology. The first publication of the Cartagena Protocol appeared in 2000 with concerns based on the lack of experience of the recombinant DNA technology applied to plants of the middle 1970s and without any reflection of the experience and knowledge

gained in the intervening three decades. Some political parties, particularly in Europe (mostly belonging to the 'Green movement') and globally well-structured NGOs such as Greenpeace and Friends of the Earth saw in the Cartagena Protocol an opportunity to mobilise people respectful of nature and active in organisations expressing environmental concerns. They took advantage of the absence, in most of the schools of agriculture, of basic training in molecular genetics to spread misinformation. In those days the structure and function of genomes were not yet well documented and it was not difficult to fuel fear of the 'unknown'.

On the other hand, scientists so well trained in rational thinking and fact finding in their own discipline have not been able to effectively balance the misinformation with science-based facts. Deprived of science communication strategies, isolated from social, political and economic sciences, and with poor exchanges with the civil society, plant scientists were astonished that they were not listened to when they praised the technology.

All humans, scientists or not, have during many tens of thousands of years of recent evolution developed a neurobiology that stimulates their social behaviour and the awareness of the consequences of their actions. This 'emotional thinking' is deeply rooted in our neurophysiology and we should not expect that some hundred years of 'scientific enlightenment' would alter the trend.

We have made enormous progress in the life sciences. But we all know that our knowledge in medicine, agriculture and environmental care is rudimentary compared with what we will know within a few decades. The question that arises is how deep our understanding of the technology has to become before we can declare it safe. But, to convince society, we should not count on explaining science. Scientists are needed in broader public debates. To build up trust in a new technology, it is necessary to have a continuous, open, two-way exchange of information and opinion on the impact of the technology on societies and the earth's environment.

The regulatory hurdles are holding back innovative developments, especially those of concern to agricultural systems in low-income countries and emerging economies. There is an urgent need for a regulatory framework that fosters rather than discourages innovation. Only through open debate can we create confidence that we all, sincerely, want and can offer better living conditions for fellow citizens of this planet. More than 90% of the specialists in the field are convinced that we are moving in the right direction. To the best of our knowledge the new tools are not more hazardous, for humans and animals, than the traditional crop improvement techniques. On the contrary, the new approaches can bring major contributions for many environmental, social and health problems. Industry meanwhile has demonstrated the economic advantages. In many developing countries farmers have accepted the technology and 10% of the world's agriculture is growing transgenic plants.

It is also our responsibility to have a sound regulatory framework. Technological advances will be pivotal if we want to democratically improve global societal and environmental welfare. This book is a valuable contribution towards the implementation of an internationally harmonised scientifically based biosafety framework. I congratulate the authors for their efforts in communicating their unique experience in the field and

raising relevant issues that influence biosafety decision-making processes in developing countries. The lessons learned from the biosafety case studies and regulatory models in different countries and organisations should serve in the current debate about a thorough renewal of GMO crop regulation worldwide.

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