

Halt before we reap the whirlwind

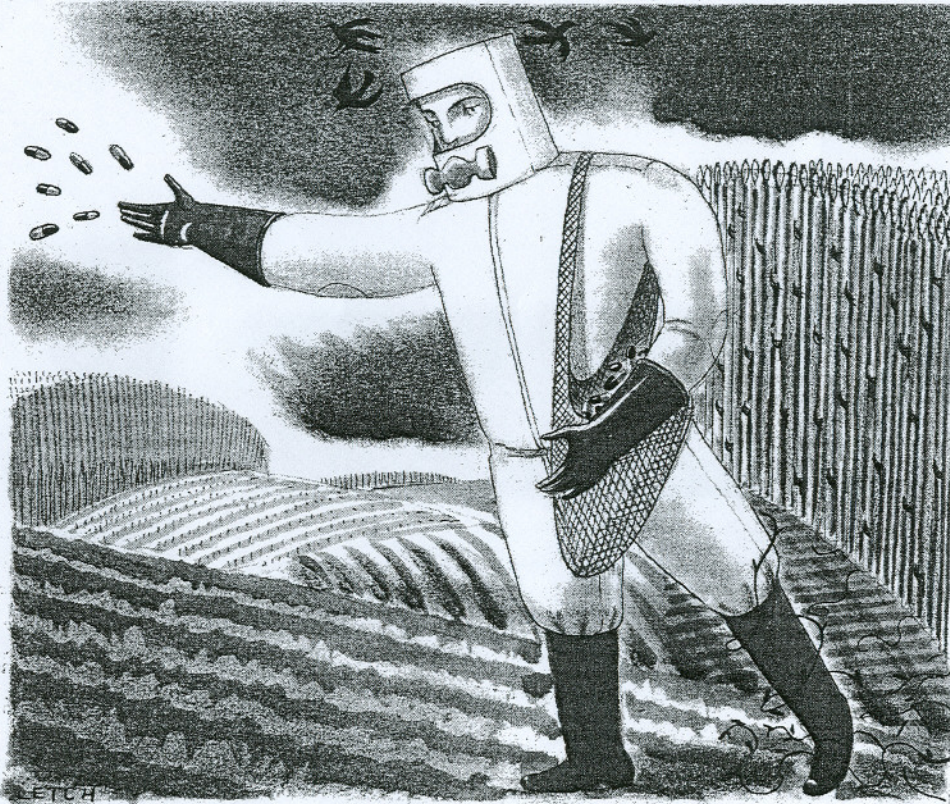
With genetic modification crossing plant, animal and human boundaries, a moratorium is essential, argues **Jeremy Rifkin**.

WHILE the biotech revolution will reshape the global economy and remake our society, it is likely to have an equally significant impact on the Earth's environment. The new technologies of the genetic age allow scientists, corporations and governments to manipulate the natural world at the most fundamental level: the genetic components that help orchestrate the developmental processes in all forms of life. In this regard, it is probably not overstating the case to suggest that the growing arsenal of biotechnologies is providing us with powerful tools to engage in what will surely be the most radical experiment on the Earth's life forms and ecosystems in history.

Imagine the wholesale transfer of genes between totally unrelated species and across all biological boundaries — plant, animal and human — creating thousands of novel life forms in a moment of evolutionary time. Then, with clonal propagation, mass-producing countless replicas of these new creations, releasing them into the biosphere to propagate, mutate, proliferate and migrate, colonising the land, water and air. This is, in fact, the great scientific and commercial experiment under way as we turn the corner into the biotech century.

Genetic pollution is already appearing and is likely to spread in the biotech century, destroying habitats, destabilising ecosystems, and diminishing the reservoirs of biological diversity. This newest form of pollution is also likely to create serious potential health risks for many animal species and humans.

Troubling questions are already being raised about the widespread introduction of genetically engineered crops in agriculture. The fact is, genetically engineered crops are radically different from conventional crops because they contain genes from completely unrelated species. For example, scientists have introduced an anti-freeze gene from flounder fish into the genetic code of



a tomato plant to protect the plant from cold. While scientists have long been able to cross close relatives in the plant kingdom, the new genetic tools allow them to cross "all" the biological boundaries, adding genes from viruses, bacteria, other animals and plants into the genetic code of traditional food crops.

Ecologists are unsure of the impacts of bypassing natural species boundaries. Consider, for example, the ambitious plans to engineer transgenic plants to serve as pharmaceutical factories for the production of chemicals and drugs. Foraging animals, seed-eating birds and soil

insects will be exposed to genetically engineered drugs, vaccines, industrial enzymes, plastics and hundreds of other foreign substances, for the first time, with untold consequences.

Over the next 10 years, life science companies plan to introduce thousands of laboratory-conceived transgenic plants over millions of hectares of farmland around the world. Ecologists tell us that the risks in releasing these crops into the biosphere are similar to those we've encountered in introducing exotic organisms into North America. While many of these creatures have adapted, a small percentage — such as gypsy moths,

kudzu vine, starlings and Dutch elm disease — have wreaked havoc on flora and fauna.

Whenever a genetically engineered organism is released, there is a small chance that it, too, will run amok because, like non-indigenous species, it has been artificially introduced into a complex environment that has developed a web of highly integrated relationships over long periods.

Much of the effort in agricultural biotechnology is centred on the creation of herbicide-tolerant plants. To increase their share of the growing global market for herbicides, life science companies such as Monsanto

and Novartis have created transgenic crops that tolerate their own herbicides. Monsanto's new herbicide-resistant patented seeds, for example, are resistant to its best-selling chemical herbicide, Roundup.

The companies hope to persuade farmers that the new herbicide-tolerant crops will allow for a more efficient eradication of weeds. Farmers will be able to spray at any time during the growing season, killing weeds without killing their crops. Critics warn that with new herbicide-tolerant crops in fields, farmers are likely to use even greater quantities of herbicides to control weeds, because there will be less fear of damaging their crops in the process of spraying. The increased use of herbicides, in turn, raises the possibility of weeds developing resistance, forcing an even greater use of herbicides to control the more resistant strains.

New pest-resistant transgenic crops, such as Bt Corn, are also being introduced. Monsanto and Novartis are marketing transgenic crops that produce insecticide in every cell of each plant. A growing body of scientific evidence points to the likelihood of creating "super bugs", resistant to the effects of the new pesticide-producing genetic crops.

Some ecologists warn of the danger of what they call gene flow — the transfer of transgenic genes from crops to weedy relatives by way of cross-pollination. New studies have shown that transgenic genes for herbicide tolerance and pest and viral resistance can spread pollen and insert themselves into the genomes of relatives, creating weeds that are resistant to herbicides, pests and viruses.

The insurance industry has quietly let it be known that while it will provide coverage for negligence and short-term damage resulting from the introduction of genetically engineered crops into the environment, it will not offer liability coverage for long-term catastrophic environmental damage. The industry clearly understands the Kafkaesque implications of a government regime claiming to regulate the new field of

biotechnology in the absence of clear scientific knowledge of how genetically modified organisms interact once introduced into the environment. Who, then, would be held liable for losses if a transgenic plant introduction were to trigger genetic pollution over an extended terrain for an indefinite time? The life-science companies? The Government?

The introduction of novel genetically engineered organisms also raises a number of serious human health issues. Most of these new genetically engineered crops contain genes from non-food-source organisms — for example, bacterial, viral and insect genes. With 2 per cent of adults and 8 per cent of children having allergic responses to commonly eaten foods, consumer advocates argue that all novel gene-spliced foods need to be properly labelled to help avoid health risks.

The British Medical Association has become so concerned about the potential health effects of consuming genetically modified foods that it has called for an open-ended moratorium on the commercial planting of genetically engineered food crops until a scientific consensus emerges on their safety. And the European Union announced a freeze on new licences for genetically engineered plants.

A worldwide moratorium should be declared now on releasing genetically engineered food crops and other gene-spliced organisms into the environment pending further study of the potential environmental and health risks and liability issues at stake. It would be irresponsible and foolish to continue seeding farmland with genetically engineered food crops when we have yet to develop even a rudimentary risk-assessment science by which to regulate these new agricultural products.

Jeremy Rifkin is the author of *The Biotech Century: Harnessing the Gene and Remaking the World* (Tarcher/Putnam, 1998). He is also president of The Foundation on Economic Trends in Washington, DC.