The Foundation on Economic Trends (FET) Statement of Support for Genomics Research and Marker Assisted Selection Technology within the Context of a Broader, More Holistic, Agroecological Approach to Farming

For years, the life science companies—Monsanto, Syngenta, Bayer, Pioneer, etc.—have argued that GM food is the next great scientific and technological revolution in agriculture, and the only efficient and cheap way to feed a growing population in a shrinking world. Non-governmental organizations (NGOs), including my own, The Foundation on Economic Trends, have been cast as the villains in this unfolding agricultural drama, and often categorized as modern versions of the English Luddites, accused of continually blocking scientific and technological progress because of their opposition to GM food.

Now, new cutting edge technologies have made gene splicing and transgenic crops obsolete and a serious impediment to scientific progress.

The new frontier is called genomics and the new agricultural technology is called Marker Assisted Selection, or MAS. The new technology offers a sophisticated, new method to greatly accelerate classical breeding. A growing number of scientists believe that MAS— which is already being introduced into the market— will eventually replace GM food.

Scientists are mapping and sequencing the genomes of major crop species and using the findings to create a new approach to advancing agricultural technology. Instead of using molecular splicing techniques to transfer a gene from an unrelated species into the genome of a food crop to increase yield, resist pests, or improve nutrition, scientists are now using Marker Assisted Selection to locate desired traits in other varieties or, wild relatives of a particular food crop, then cross breeding those plants with the existing commercial varieties to improve the crop. With MAS, the breeding of new varieties always remain within a species, thus, greatly reducing the risk of environmental harm and potential adverse health effects associated with GM crops. Rapidly accumulating information about crop genomes is allowing scientists to identify genes associated with traits like yield and then scan crop relatives for the presence of those genes. Using MAS, researchers can upgrade classical breeding and reduce by 50% or more the time needed to develop new plant varieties by pinpointing appropriate plant partners at the gamete or seedling stage.

An increasing number of researchers around the world in academic, government, and commercial laboratories are switching to MAS as an alternative to gene splicing technology in the development and enhancement of existing food crops.

Using MAS, researchers in the Netherlands have developed a new lettuce variety resistant to an aphid that causes reduced and abnormal growth in lettuce fields in California and Europe. Researchers at the US Department of Agriculture have used MAS to develop a strain of rice that is soft on the outside but remains firm on the inside after processing. Scientists in the UK and India have used MAS to develop pearl millet that is tolerant of drought and resistant to mildew. The crop was introduced into the market in India in 2005. Even Syngenta, one of the world's leading agribusiness companies, has begun to turn its attention away from GM and toward MAS. Syngenta researchers have developed a wheat variety with increased resistance to Fusarium blight.

Wally Beversdorf, former vice president of plant science research at Syngenta, candidly admitted that although the company was still engaged in GM technology, “marker assisted selection is the first choice” now in the company’s research priorities. Pioneer Hi-Bred International, a subsidiary of Dupont, is using MAS to develop new soybean varieties with enhanced disease and pest tolerance. John Soper, director of soybean research at the company says, “We have seen only the tip of the iceberg when it comes to the benefits MAS technologies will provide”.

While MAS is emerging as a promising new agricultural technology with broad application, the limits of transgenic technology are becoming increasingly apparent. Most of the transgenic crops introduced into the fields express only two traits, resistance to pests and compatibility with herbicides and rely on the expression of a single gene- hardly the sweeping agricultural revolution touted by the life science companies at the beginning of the GMO era.

MAS is in the early stages of development but has vast potential as an alternative to genetically modified crops using gene splicing within and between species. Of course, researchers emphasize that there is still much work to be done in understanding the choreography, for example, between single genetic markers and complex genetic clusters and environmental factors, all of which interact to affect the development of the plant. Until genetic engineers overcome the barriers to working with groups of genes, they are not going to get far on the traits like intrinsic yield and drought tolerance that really matter in agriculture.

Genomics research is steadily moving into this more promising arena of research and development, opening up the prospect of new ways of thinking about the relationship between genotype and phenotype and environmental context. Organic farmers and processors are particularly keen on MAS because of its potential to radically reduce the costs of bringing organic produce to market.

While MAS has great potential, a word of caution is in order. It should be noted that MAS is of value to the extent that it is used as part of broader, agroecological approach to farming, that integrates new crop introductions with a proper regard for all of the other environmental, economic, and social factors that together determine the sustainability of farming.

The wrinkle is that the continued introduction of GM crops could contaminate existing plant varieties, making the new MAS technology more difficult to use. Cleaning up contaminated genetic programs could prove to be as troublesome and expensive in the future as cleaning up viruses that currently invade software programs. Cross contamination of non-GMO and organic crops with GMOs is occurring in regions where large swaths of farmland have been planted with GMO crops. The danger is that conventional plant varieties and wild relatives of all major crop varieties will be contaminated with spliced genetic material from GM crops. In the US, where so much farmland is already planted with GM crops, the contamination is now widespread, threatening both conventional and organic food crops.

A landmark 2004 survey conducted by the Union of Concerned Scientists, found that non-GM seeds from three of America's major agricultural crops—corn, soybeans, and canola—were already "pervasively contaminated with low levels of DNA sequences originating in genetically engineered varieties of these crops". This sobering report concluded that "heedlessly allowing the contamination of traditional plant varieties with genetically engineered sequences amounts to a huge wager on our ability to understand a complicated technology that manipulates life at the elemental level". The authors of the study warn that "unless some part of our seed supply is preserved, free of genetically engineered sequences, our ability to change course if genetic engineering goes awry will be severely hampered".

Even the US Biotech Industry Association—BIO—now acknowledges that there is widespread GM contamination of a number of American food crops, dispelling the myth that GMO can coexist with conventional and organic food crops. There is no procedure that will prevent pollen flow across fields. The result is that the American government is engaged in discussion about how much GMO cross-contamination is acceptable to still certify as non-GMO .

European Environmental Commissioner Stavros Dimas raised the question of contamination of plant varieties and loss of biodiversity in a speech to environmental ministers of the 25 EU member states on April 5, 2006. Dimas told his colleagues that "GMO products raise a whole new series of possible risks to the environment, notably potential long term effects that could impact on biodiversity." Dimas said he was particularly concerned about loss of biodiversity because of the vast potential afforded by the new MAS technology. MAS relies on preserving heirloom varieties and landraces and protecting wild relatives of food crops to ensure that a diverse pool of valuable traits is available to crop breeders. Dimas noted that "MAS technology is attracting considerable attention" and said that the European Union "should not ignore the use of 'upgraded' conventional varieties as an alternative to GM crops".

Equally important, as MAS technology becomes cheaper and easier to use, and as knowledge in genomics becomes more dispersed and easily available over the next decade, plant breeders around the world will be able to exchange information about "best practices" and democratize the technology. Already, plant breeders are talking about "open source" genomics, envisioning the sharing of genes just as Linux and other open source IT organizations currently share software. The struggle between a younger generation of sustainable agriculture enthusiasts anxious to share genetic information and entrenched company scientists determined to maintain control over the world's seed stocks through patent protection, is likely to be hard fought, especially in the developing world.

Given these rapid new developments in genomics research, the prudent course of action now is to put GM food and feed crops on hold around the world, pending a thorough review of the recent breakthroughs in MAS technology. Governments need to solicit studies, hold hearings, and evaluate the potential negative impacts that widespread GM plantings might have on crippling the prospects for introducing the next generation of MAS biotech food crops.

If ever there was an appropriate moment to invoke the "precautionary principle" in agriculture, it is now. Introducing an out of date GMO technology could seriously undermine the vast possibilities that the new MAS technology holds for the future of agriculture around the world. If properly used as part of a much larger systemic and holistic approach to sustainable agricultural development, MAS technology could be the right technology at the right time in history.

Dr. Robert Goodman, dean of Cook College of Rutgers University, and formerly head of research at Calgene, a small biotech company that introduced the world's first GM food crop, the infamous Flavr-Savr tomato—the product failed in the market—summed up the great transition now taking place in agricultural biotechnology. Several years ago, Goodman, in an extraordinary change of mind, said "from a scientific perspective, the public argument about genetically modified organisms, I think, will soon be a thing of the past… The science has moved on, and we're now in the genomics era".

FET supports a rapid development of genomics research and the increasing use of Marker Assisted Selection to accelerate classical breeding and usher in a new era of sustainable and organic agriculture. FET calls for the establishment of a global MAS network made up of governments, agricultural research institutions, and farm organizations to advance the research and development of MAS technology, as part of a more integrated approach to sustainable agricultural practices in the 21st century.

FET calls upon the governments of the world, the life sciences industry, farmers organizations, food processors, distributors, and retailers to benchmark a reasonable phase-out of all existing GM crops, in order to reduce the risk of contamination of seed varieties whose traits might prove beneficial in MAS development.

FET further calls on governments to enact and enforce strict liability laws to hold life science companies financially accountable for cross- contamination that aversely affects non-GM farmers, gardeners, and consumers.

FET calls on government to break the monopoly that a handful of global life science companies enjoy over the world's seed stocks, end patent protection on seed varieties and traits, and open the way to "open source" access to, and sharing of, genetic information and MAS seed varieties to promote cooperative MAS programs and best practices around the world.

FET calls on government and civil society to establish and fund more extensive programs designed to preserve agricultural biodiversity, including the expansion of existing seed banks and the creation of new facilities, to ensure the availability of a rich pool of traits for use in MAS research and development.