

# Biodiversity and Biotech:

## STRENGTH IN DIVERSITY

For 10,000 years, humans have been deliberately, and sometimes unconsciously, modifying crops and breeding animals for selected beneficial traits. From the coasts of Britain to the interior of Africa, many of these have adapted to very specific environmental conditions. Efforts to improve these breeds by importing semen from superior animals sometimes backfire, resulting in cross breeds less resistant to internal parasites native to a particular region, or unable to withstand the onslaught of pests such as blood-sucking insects. Genetic uniformity in livestock also reduces the natural variability that allows animals to adapt to changing environments. Fortunately, technology is allowing researchers to begin stockpiling these precious genetic resources by conserving the germplasm of species.

—Elise LeQuire

Ever heard the saying “Don’t put all your eggs in one basket”? If everything is together, one piece of bad luck would wipe your supply out.

Nature does not put all its eggs in one basket. High and low, far and wide, you find a mind-blowing assortment of biological diversity in all forms, levels, and combinations of life. Biodiversity includes ecosystem diversity, species diversity, and genetic diversity.

Biological diversity is about more than plants, animals, and microorganisms and their ecosystems—it is also about people and our need for food security, medicines, fresh air and water, shelter, and a clean and healthy environment in which to live.

How does biodiversity figure in with discussions on biotech-derived organisms?

- Some people worry that GM plants and animals will overrun habitats.
- Current biotech crops are helping to preserve the environment:
  - Higher yielding crops means less land has to be cleared for farming and grazing.
  - GM plants, animals, and microbes can clean and preserve the land, air, and water.
- Scientists can draw from the biodiversity present in the wide genetic pool to

develop stronger strains of organisms. They are as eager as conservationists to set up and maintain germplasm banks full of genetic information from all kinds of species to enable discovery and development of improved plants and animals.

Biotech projects can sound so cool: Trees that can leach nuclear contaminants from the ground. Salmon that grow faster to supply people’s rising appetite for fish. Sheep that produce a substance in their milk that body armor can be made of. Cotton plants that can figuratively shrug their shoulders and say “bug off!” to the insects that normally can ruin a crop. It’s easy to forget that all (and many, many more biotech products) have to fit into the big, wide world.

Before biotech microbes, animals, and plants can be let out of the lab, we want to know exactly what they will affect. The government regulates these products very closely to make sure they don’t become like the plants and animals imported into other ecosystems (sometimes accidentally) that have had unwanted effects.

Humans are the biggest threat to biological diversity. We disturb land where plants, animals, and microbes live. We clear forests





## Entwined for Life

to farm. We plunk down subdivisions in deserts. And on and on. Genetic modification offers two ways to use the environment more wisely.

One way is to clean up an environment that has been polluted. The *Dehalococcoides ethenogenes* microbe is already helping to clean chlorinated solvents, previously considered safe, from contaminated soils. By sequencing the genome of the *D. ethenogenes* bacterium, scientists are closer to understanding how it works and developing a genetically modified version to clean other toxic residues.

Another way to preserve the earth is to harvest more from the crops we plant. Biotechnology can change plants' genomes to increase their yield per acre.

Peter Raven, director of the Missouri Botanical Gardens, has written that "nothing is more destructive to biodiversity than widespread, low-yield traditional methods of agriculture, and it is highly misleading to romanticize [it] as if all were in harmony before there were so many of us that agriculture was intensified."

He goes on: "The development of GM crops, with precisely determined character-

istics that make them survive well in the extremely diverse places that they are grown promises major increases in productivity and a greatly enhanced ability to improve biodiversity" (agbioworld.org).

Many of the soybean products, corn products, and papayas we eat come from plants that have been engineered to fight off insects, disease, or viruses (often using the same ingredient that organic farmers use, a naturally occurring virus called Bt that wards off pests).

Biologists think that in nature, plants, animals, and microbes are often strengthened by the integration of genes from related organisms. Biotechnologists know it is vital to maintain a pool of "wild" genes to draw from when it comes to improving organisms.

Researchers are mapping many organisms' genomes and setting up gene banks of plant and animal life so that the genetic information will be preserved.

Whether through working with the genes of plants, animals, and microbes or deciphering the links among a habitat's organisms, the fields of biotechnology and biodiversity will remain entwined.

—Joene Hendry

### MORE SPECIES THAN WE KNEW

Scientists are always searching for new organisms. Some have traits that can be used for specific applications in agriculture, material science, and medicine. While exploring a remote area of the Foja Mountains in Indonesia early this year, scientists from the United States, Australia, and Indonesia found what they believe are never-before-seen species of more than 20 frogs; four butterflies; five palms; a bird; and possibly the largest-flowered rhododendron on record. Biotechnology scientists find it helpful to map the genomes of as many species as they can. The information can help protect species and might offer genes useful to other organisms. <http://www.msnbc.msn.com/id/11114156/>

Is biotechnology good or bad for biodiversity?