



The Impact of Biotechnology on the Vegetable Industry

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Biotechnology...

Broad Sense

"The use of technologies based on living systems to develop commercial processes and products."

Agricultural Biotechnology, 1987, Board on Agriculture, National Research Council

Examples of Biotechnology in the *Broad Sense*...

- **recombinant DNA methodology**
- **gene transfer**
- **embryo manipulation and transfer**
- **cell culture**
- **plant regeneration**
- **monoclonal antibodies**
- **bioprocess engineering**

Biotechnology...

Narrow Sense

Use of recombinant DNA methods to genetically alter or genetically characterize a living organism; genetic engineering.

Examples of Biotechnology in the *Narrow* Sense...

- **recombinant DNA methodology**
- **addition of genes to an organism**
- **regulating genes already in an organism**
- **using DNA profiles to identify an organism**
- **using DNA profiles to augment conventional breeding techniques**

Applications in Crop Improvement...

- **FlavrSavr® tomatoes**
- **Engineered virus resistance (squash, cucumbers)**
- **Bt production in plants (tomatoes, cotton)**
- **Inhibited ripening (tomatoes)**
- **Altered flower color (petunia, roses, tobacco)**
- **Herbicide resistance (many)**

Applications in Tomato Improvement...

- **FlavrSavr® tomatoes; slow softening**
- **High lycopene fruit**
- **Delayed/Inhibited ripening**
- **Elevated soluble solids**



Status of Certain Recombinant Products

Lab **Field Testing** **Selling** **Public Acceptance**

Humulin®



**FlavrSavr®
Tomatoes**



Bt crops



**Virus
resistance**



**Delayed
ripening
crops**



Some of the Issues...

- **Product Safety**
- **Regulatory Approval**
- **Product Labelling**
- **Ethical Issues**
- **Consumer Acceptance**

Regulation...

"HHS Secretary Louis W. Sullivan, M.D., today announced a policy that will improve the variety of the U. S. food supply by promoting the development through biotechnology of new foods that are safe for consumers."

HHS News, 26 May 1992

Great Expectations...

"Store-bought tomatoes that taste home-grown, fruit trees resistant to the cold, pest-free crops without applying pesticides are just a few of the many improvements consumers will see."

HHS News, 26 May 1992

Regulation...

"It is anticipated that many substances currently being introduced into plant varieties will not require pre-market approval by FDA."

HHS News, 26 May 1992

Regulation...

"The questions companies must resolve while developing foods from new plant varieties include:

- **Has concentration of any naturally occurring toxicants been increased?**
- **Has an allergen new to the plant been introduced?**
- **Have the levels of important nutrients changed?**
- **Have new substances been introduced into food that raise safety questions?**
- **What are the environmental effects?**
- **Have the genetic material and its "expression products" been well characterized?**
- **Have accepted, established scientific practices been followed?."**

HHS News, 26 May 1992

Consumer Acceptance???

"Well-known Chefs Boycott Biotech"

The Packer, August 1, 1992

**"Campbell Soup Says No to Biotechnology
Tomato"**

Houston Chronicle, January 11, 1993