

History of Agricultural Biotechnology

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1. Early Foundations (Pre-20th Century)

Period	Milestones	Significance
Ancient & Classical Agriculture	- Selection of wild plants for desirable traits (e.g., larger seed size, sweeter fruit). - Early grafting and vegetative propagation (e.g., fruit trees).	First informal “biotechnological” interventions—human-directed evolution.
Middle Ages – 1800s	- Systematic seed selection in grain crops. - Development of hybrid varieties through controlled cross-pollination (e.g., maize).	Laid groundwork for understanding inheritance and hybrid vigor.

2. The Genetic Revolution (1900-1970)

Decade	Key Discoveries & Technologies	Impact on Agriculture
1900s	<i>Mendelian genetics</i> rediscovered (1900).	Provided a scientific basis for trait inheritance.
1910-1930	Development of <i>hybrid corn</i> (C.H. Pederson, 1914) and <i>dwarf wheat</i> (Norman Borlaug, 1960s).	Demonstrated heterosis (hybrid vigor) and yield gains.
1940-1950	DNA structure (Watson & Crick, 1953). Bacterial genetics (e.g., plasmids, transduction).	Opened the door to molecular manipulation of genes.
1960-1970	Recombinant DNA technology (Cohen & Boyer, 1973). First <i>gene transfer</i> experiments in bacteria.	Set the stage for moving specific genes into plants.

3. First Generation Transgenic Crops (1970-1995)

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Year	Event	Details
1973	Cohen & Boyer develop plasmid-based gene cloning.	Basis for plant transformation vectors.
1977	<i>Agrobacterium tumefaciens</i> identified as natural gene-transfer agent.	Became the primary tool for inserting DNA into dicots.
1980	First successful <i>plant</i> transformation (tobacco) using <i>Agrobacterium</i> (Horsch et al.).	Proof-of-concept for plant genetic engineering.
1983	Development of <i>biolistic</i> (gene-gun) method (Klein et al.).	Enabled transformation of monocots (e.g., corn, rice).
1992	Commercial release of Flavr Savr tomato (USA).	First FDA-approved genetically engineered food.
1994	Introduction of Bt cotton (Australia) and Bt corn (USA).	Insect-resistant crops using <i>Bacillus thuringiensis</i> toxin genes.
1995	Roundup Ready soybean (glyphosate-resistant) launched (Monsanto).	Herbicide-tolerant trait quickly adopted worldwide.

Key Takeaways (1970-1995)

- Two main transformation methods: *Agrobacterium* (dicots) and *biolistics* (monocots).
- Early commercial traits: insect resistance (Bt) and herbicide tolerance (glyphosate).
- Rapid regulatory and public acceptance challenges emerged.

4. Expansion & Diversification (1996-2008)

| Trait | Representative Crops | Year(s) | Notable Outcomes | |-----|