

INDUSTRY OVERVIEW

Seeds and pesticides are farm inputs upon which farmers rely. Their traits and performance packages can mean the difference between a successful season and crop failure.

SEEDS

Historically, farmers, researchers, and commercial enterprises developed new seed varieties through cross-fertilization. In the 1990s, seed companies began to develop seeds that had been genetically modified to contain certain desirable traits, such as tolerance to herbicides or resistance to certain insects.

PESTICIDES

Pesticides are chemicals used to kill or control a “pest” — a disease, weed, insect, or other unwanted organism. Agrichemical manufacturers create, market, and sell these crop protection products. In general, agrichemical manufacturers sell to distributors that then sell to retail outlets across the country. In some cases, however, these operations are integrated.

HISTORICAL CONTEXT

Consolidation pressures in the seed and pesticide industry significantly increased following the 1980 Supreme Court decision that genetically modified seeds

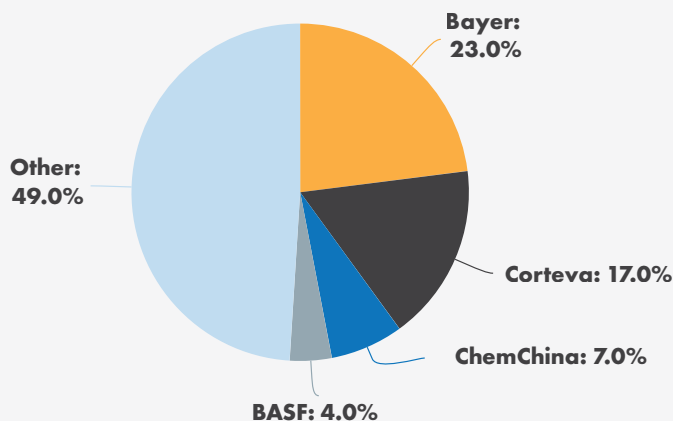
could receive patent protection. This ruling incentivized major biotech companies to enter the seed market and consolidate patent portfolios, leading to an explosion of biotechnology acquisitions in the seed market that transformed the seed and pesticide industries.

Between the 1980s and the early 2000s, the predecessor firms to today’s “Big Four” acquired the vast majority of conventional and hybrid seed-breeding companies. By 2002, large chemical or multinational corporations had acquired 95% of patents originally held by seed or small ag-biotech firms. Simultaneously, dominant firms moved to control market channels — aggressively acquiring many privately owned branded seed marketing and distribution channels.

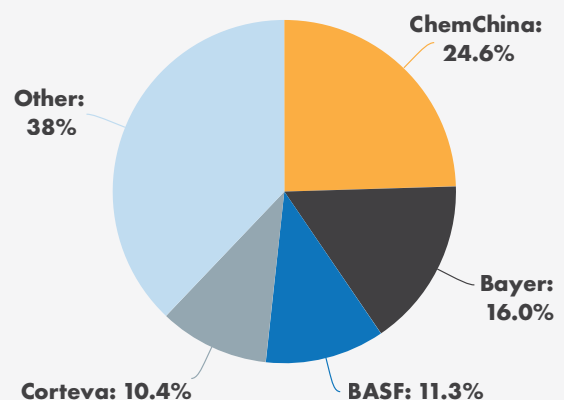
In the late 2010s, a series of mergers and acquisitions further consolidated power over biological farm inputs into the “Big Four:” Dow and Dupont merged and spun off an agriculture-focused firm named Corteva, ChemChina acquired Syngenta, and Bayer acquired Monsanto. Additionally, Bayer divested some of Monsanto’s seed divisions to BASF. When the dust had settled, Bayer, Corteva, and ChemChina became the agriculture biotechnology industry’s undisputed global leaders, with BASF as an additional significant player.

Global Seed and Pesticide Concentration

GLOBAL SEED CR4: 51%

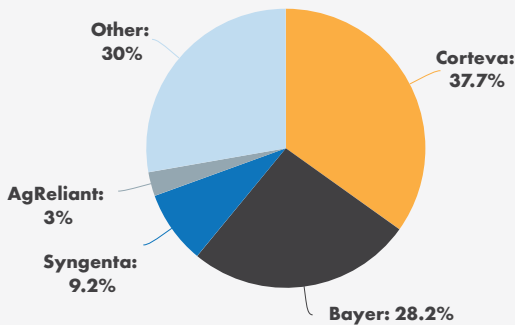


GLOBAL AGRICHEMICAL CR4: 62%

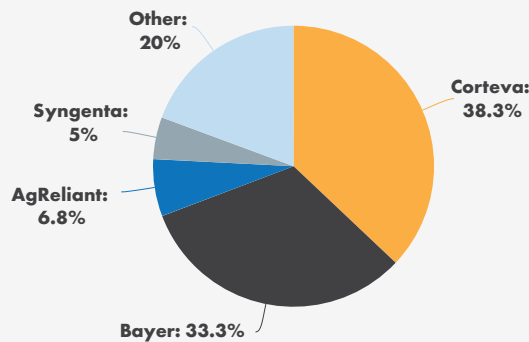


U.S. Seed Concentration

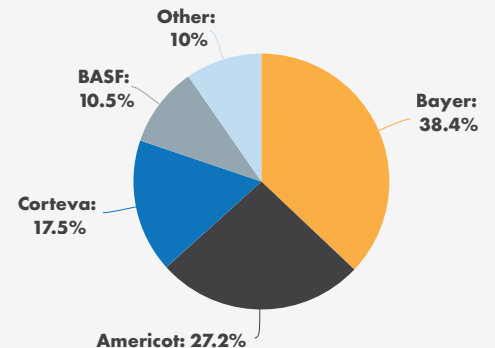
SOYBEAN SEED CR4: 70%



CORN SEED CR4: 80%



COTTON SEED CR4: 90%



DIGGING DEEPER

INTELLECTUAL PROPERTY

The “Big Four” now control such a significant portion of transgenic seed patents that they have multiple ways of exercising exclusionary power. They can not only handicap the efforts of independent competitors to market their products, but they can also restrict access to the patent-walled technologies and cultivars needed to develop products in the first place.

TYING, BUNDLING, AND EXCLUSIVE DEALING

The commercialization of full patent-protected transgenic seeds in the 1990s created another avenue for the largest seed-chemical firms to consolidate market control: tying, bundling, and exclusive dealing. Firms began bundling patented GMO seeds with pesticides engineered to be compatible, compelling farmers to purchase both as a package.

BIG DATA

Since the mid-2010s, the “Big Four” have shifted to leverage their control over transgenic traits, transgenic seeds, and crop protection chemicals more effectively. Instead of selling seeds bundled with an herbicide,

the dominant incumbents have begun selling broader visions of thriving fields by increasingly selling data-driven input recommendations by platforms linked to the companies. This has given seed companies unprecedented access to information about farmers’ operations and profitability while giving farmers no access to performance metrics. Farmers are now left to negotiate for inputs from a position of deep information asymmetry.

WHAT THIS MEANS FOR FARMERS AND THEIR COMMUNITIES

Seed prices for genetically modified seeds have risen sharply in recent decades – far outpacing any other farm input. Consolidation has also led to less research and development expenditure, as reduced competition has decreased pressure on dominant companies to innovate. Finally, as the “Big Four” aggressively move to protect their IP rights, conventional and organic independent breeders alike increasingly have restricted access to plant genetics – reducing the diversity of seed and weakening our food security.

