RAISING RISK:

Field Testing of Genetically Engineered Crops in the United States

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EXECUTIVE SUMMARY

The technique of genetic engineering, particularly as applied to agriculture, is radical and new. Never before in the history of the planet have we been able to transfer genes across natural species barriers, creating unheard of combinations like tomatoes with fish genes, or even pigs with human genes. Contrary to assertions made by proponents of the technology, genetic engineering is not precise. Scientists cannot control the location where the gene is inserted into the host's genetic code, nor guarantee stable expression of the gene in the new genetically engineered organism. As a result, genetic engineering raises a host of ecological and human health risks that the U.S. Department of Agriculture (USDA), Environmental Protection Agency (EPA) and other regulatory agencies have not adequately addressed. Despite this, field experiments with genetically engineered crops are being conducted in the open environment on tens of thousands of acres across the United States with little oversight and public notification.

There are many potential risks associated with the release of genetically engineered plants into the open environment. For example, plants engineered to produce proteins with insecticidal properties may damage the soil or harm so-called non-target species, such as the monarch butterfly. Plants engineered to be virus-resistant can cause new viral strains to evolve or make existing viruses more severe. And if field experiments are not properly monitored, genetic pollution can result, putting farmers' livelihoods, public health and the environment at risk. Thus our environment is serving as the laboratory for widespread experimentation of genetically engineered organisms with profound risks that, once released, can never be recalled.

Field tests of genetically engineered crops are supposed to both determine the impact of the new crops on the environment and ascertain how well the plants function. However, USDA's oversight of field testing of genetically engineered crops has been inadequate from the start. An independent analysis by the General Accounting Office in 1988 roundly criticized shortcomings in the regulations, echoing calls by prominent microbiologists, ecologists, and others that certain decisions were "scientifically indefensible." USDA has continued to considerably weaken its oversight of the technology despite little empirical evidence on which to base such decisions. The agency has failed to require adequate data collection of field tests of genetically engineered crops, leading experts to conclude that this is a classic example of a "don't look, don't find" regulatory framework. And a recent examination of USDA's oversight by the National Academy of Sciences found serious shortcomings, saying the agency at times "lacked scientific rigor, balance, transparency" and chastised the agency for "inadequate expertise."

Key Report Findings

Raising Risk examines data regarding field tests of genetically engineered crops under USDA's jurisdiction. From 1987 through 2002 inclusive:

- USDA authorized 15,461 field releases of genetically engineered organisms on 39,660 field test sites spanning 482,226 acres.

- Twelve states and territories hosted more than 1,000 field test sites. They are Hawaii (4,566), Illinois (4,104), Iowa (3,831), Puerto Rico (2,957), California (1,709), Nebraska

(1,699), Pennsylvania (1,672), Minnesota (1,414), Indiana (1,256), Idaho (1,170), Texas (1,125), and Wisconsin (1,121).

- Ten states and territories hosted thirty or fewer field test sites. They are Nevada (0), New Hampshire (0), Vermont (0), Virgin Islands (4), Rhode Island (6), Alaska (8), West Virginia (13), Utah (19), Massachusetts (22), and New Mexico (25).

- The universities submitting the most requests to conduct field tests were Iowa State (103), University of Idaho (98), Rutgers (92), Stanford (62), University of Kentucky (62), University of Florida (57), Oregon State (56), Michigan State (53), North Carolina State (45), Cornell (35) and Purdue University (35).

- Monsanto submitted the most requests (3,309) to conduct field tests, or five times the number submitted by the next most active company. In a snapshot of the rapid industry consolidation among companies investing in genetically engineered crops, of the top ten institutions applying to conduct field tests in 1995, seven have now merged into two companies (Monsanto and DuPont).

- USDA generally has served as a rubber stamp for requests to conduct field tests. USDA has rejected only 3.5 percent of applications; USDA denied these requests for reasons such as incomplete applications or other minor paperwork errors.

- The percentage of field tests being conducted with introduced genes considered to be Confidential Business Information has increased nearly every year, from 0 percent in 1987 to more than 69 percent in 2002.

- USDA authorized 333 field test sites of genetically engineered wheat.

- USDA authorized 344 field test sites of crops engineered to produce pharmaceuticals, industrial chemicals, or other so-called biopharmaceuticals.

Recommendations

Although nearly 40,000 field tests of genetically engineered organisms have been authorized under USDA's system, USDA and other regulatory agencies have not adequately answered fundamental questions about genetic engineering and its implications for human health and the environment. Field tests of genetically engineered crops should proceed only under a thorough and comprehensive ecological framework designed to assess their full impact.

In order to make progress towards these goals, our leaders should enact a moratorium on the field testing and commercialization of genetically engineered foods and crops unless:

- independent safety testing demonstrates they have no harmful effects on human health or the environment;
- the public's right to know about field tests is improved and any products commercialized are labeled; and
- the biotechnology corporations that manufacture them are held accountable for any harm they may cause.

INTRODUCTION

The technique of genetic engineering is radical and new. The first recombinant deoxyribonucleic acid (DNA) molecules were generated at Stanford University in 1972.[1] Never before had scientists been able to isolate fragments of DNA from one organism and join it with DNA from a completely different organism. As scientists developed the techniques, they created unheard of combinations such as tomatoes with fish genes, potatoes with mouse genes, apples with chicken genes, and even pigs with human genes.[2] Contrary to assertions made by proponents of the technology, genetic engineering is not precise. Scientists cannot control the location where the gene is inserted into the host's genetic code, determine how many copies of the gene are inserted, nor guarantee stable expression of the gene in the new genetically engineered organism. As a result, genetic engineering raises a host of ecological and human health concerns that have not been adequately addressed.

A drug, even one with the potential benefit of saving countless lives, would be thoroughly tested for side effects and unintended consequences before being widely disseminated. We employ a precautionary approach to new drugs created in the laboratory, but with genetically engineered crops we throw caution to the wind. When the science of genetic engineering began in the early 1970s, the National Institutes of Health (NIH) stated that experiments involving release of genetically engineered organisms into the environment were too hazardous and should not be performed. Despite these early calls for precaution, a booming biotechnology industry soon turned its eyes to agriculture, and field experiments applying genetic engineering to plants began in the 1980s.

Field tests are plantings done by industry or an institution in the open environment primarily to determine whether or not an engineered seed successfully grows and expresses the desired trait. For example, if a company engineered a tomato with a flounder gene in order to withstand colder temperatures, that tomato would be field tested to see if the plant would grow and to determine if the engineered tomato could, in fact, withstand greater cold. These tests often just look at marketability and profitability, instead of the consequences to the environment and public health. These tests are asking all the wrong questions, and USDA is failing to look for the right answers.

Oversight of genetically engineered crops was largely in the hands of NIH through the first decade of development. As a result of a legal challenge from a public interest group,[3] President Reagan's White House established an interagency task force in April 1984 to study and coordinate the government's regulatory policy for products of genetic engineering. Many agencies were involved,[4] and the proposal for a Coordinated Framework for Regulation of Biotechnology was published on New Year's Eve 1984.[5] The Framework was the outline for how government agencies with oversight over genetic engineering would work together. Under the notice, agencies have complementary and often overlapping responsibilities for oversight of the technology.

While other reports have addressed some of the shortcomings of the framework with respect to the Environmental Protection Agency (EPA)[6] and the Food and Drug Administration (FDA),[7] this paper focuses on oversight at the Department of Agriculture (USDA) and documents the extent of field testing of genetically engineered crops across the United States, highlights the risks to the environment and public health, and details how USDA has allowed an enormous amount of experimentation to occur with inadequate oversight.

RISKS ASSOCIATED WITH FIELD TESTING

USDA and biotechnology companies allegedly initiate field tests of genetically engineered crops to answer questions not only about their commercial viability, but also about their safety for human health and the environment. USDA is charged with the task of monitoring field tests under its aegis for harmful effects, as genetically engineered crops still pose untold risks. Unfortunately, USDA has failed to properly monitor these field tests for adverse ecological or health effects or answer many of the outstanding questions about genetically engineered crops. Almost 40,000 field tests of these crops have produced little substantive, meaningful data about their safety and impact on beneficial insects, soil ecosystems, genetic diversity, neighboring farms growing conventional crops, and public health.

Impacts on beneficial insects and other species

Research regarding the potential impacts of corn genetically-engineered to produce a toxin derived from Bacillus thuringiensis (Bt) bacteria on monarch butterfly larvae is fairly well known as a result of media attention.[8] Yet arguably more striking than the news from John Losey and colleagues that higher mortality for monarch larvae was encountered with Bt corn plants than their conventional counterparts was how, when the article was published, proponents of the technology had such inadequate data with which to counter the findings. Monsanto had to admit that it had "not yet conducted its own research on Bt's impact on monarch butterflies."[9] This admission came despite years of field test experiments.

When a conference was hastily convened in November 1999 – organized and paid for in part by biotechnology companies[10] -- its attempt to conclude that risk to the monarch was minimal was justifiably pilloried as a "manipulation."[11] Ultimately, additional research confirmed the findings of Losey et al. that pollen from Bt corn was toxic to monarchs.[12] This meant that regulatory agencies had approved a variety of genetically engineered corn toxic to monarchs under field conditions. The National Academy of Sciences later wrote that monarchs may not have been so lucky if the variety in question had proved more popular with farmers, stating that "the outcome for monarchs would have been substantially different."[13]

Despite the high media profile of Losey's work, unfortunately far fewer people have heard about other research demonstrating adverse effects of genetically engineered crops on nontarget species. Giroux et al. reported that ladybugs, which prey on the Colorado potato beetle, consumed fewer potato beetle eggs when the potatoes had high levels of Bt toxin.[14] And in work conducted at the Swiss Federal Research Station for Agroecology and Agriculture, Hilbeck et al. reported that lacewing larvae reared on prey that were fed Bt-producing corn took longer to develop and had a strikingly elevated mortality rate.[15] Other studies have produced similar results, including research in Ohio on genetically engineered potatoes that found natural enemies reduced to such low levels that aphid outbreaks occurred.[16] The National Research Council asked in its 2000 report "whether such indirect effects will have a harmful effect on the agroecosystem."[17] Unfortunately, the question is being asked and studied far too late. As Hilbeck has stated: "We risk disrupting the regulatory mechanisms that naturally keep pests in check."[18]

Genetic pollution

A critical component of monitoring field experiments of genetically engineered crops is determining whether or not genetically engineered organisms spread their traits to other plants. However, USDA's

belief when it designed its policy was that "plants show no evidence of mechanisms to transfer genetic material directly from one organism to another."[19] USDA's scientifically inappropriate zeal to deregulate this technology about which so little is yet known is evidenced on this particular point by the recent discovery of an herbicide-tolerant canola plant that cross-pollinates with a related weed.[20] This could mean, among other results, that weeds will eventually emerge that are herbicide-resistant, requiring more toxic chemicals to get rid of them. USDA also is charged with determining the likelihood and range of pollen flow, but as a result of government complacency, in some cases it has been left up to activists around the world to gather information on this subject.[21] USDA has admitted that genetically engineered seeds may have moved outside of field test sites due to animal dispersal.[22] No published studies have examined the extent of the ecological consequences of this impact on natural populations.[23] Yet the potential for economic harm for farmers of genetic pollution are already real and severe.[24]

Case Study: Field Tests of Genetically Engineered Corn Contaminate Crops Intended for Human Consumption

ProdiGene, a Texas-based biotechnology company, is developing several varieties of genetically engineered corn that produce pharmaceutical and industrial-related compounds, including corn plants that produce trypsin (a protein used in the processing of insulin), oral vaccines, antibodies, and other enzymes for industrial uses. Although the company's products are mostly in the experimental stage and not available for commercial use, ProdiGene does have trial fields of some of these crops in several states.

In November 2002, USDA forced ProdiGene to destroy 500,000 bushels of soybeans in a Nebraska grain elevator. A farmer contracted by ProdiGene to grow corn engineered to produce a pig vaccine in 2001 planted conventional soybeans in the same field in 2002, but failed to remove "volunteer" corn plants that appeared in the field from the previous year's crop.

USDA disclosed that it had previously ordered ProdiGene to burn 155 acres of conventional corn in Iowa after learning that pollen from a field trial of genetically-engineered corn may have spread to nearby food corn in Pocahontas County.

According to Animal and Plant Health Inspection Service (APHIS) regulations, an application for a permit to conduct a field test of a genetically engineered crop must include "a detailed description of the proposed procedures…which will be used to prevent escape and dissemination of the regulated article at each of the intended destinations."[25] This is particularly important since many crops being field tested have not been approved for human consumption, and some never will, such as plants engineered to produce pharmaceutical proteins. But a review of environmental assessments offers many examples to demonstrate that, in fact, APHIS has not ensured that contamination is not taking place.[26] For example, APHIS concluded that cross-pollination of potato plants will not occur, yet "the nature or details of the documentation were not specified [and] no basis was given for the assurances of the applicant." Trials on genetically engineered squash and cantaloupe, which generally outcross and are insect pollinated, contained no requirement that flowers be removed from plants. APHIS accepted environmental assessments citing data on adequate isolation distances that are contradicted by scientific literature. As a result, one environmental assessment suggested that 400 meters is an adequate isolation distance for field tests of squash, despite research confirming viable hybrid progeny of wild and cultivated squash separated by 1,300 meters. The authors state clearly: "APHIS does not require applicants to determine the extent and frequency of pollen movement nor the effectiveness of border rows in limiting the transmission of pollen during field tests."

Many farmers are relying more on non-engineered crops that require strict segregation to meet specific market demands that pay a premium price. The contamination of their conventional or organic crops by pollen flow or seed dispersal from engineered plants could have serious financial implications. Stewart Wells of the National Farmers Union of Canada, for example, has stated that it may soon be impossible to certify canola as organic because no one will be able to guarantee that it does not contain genetically-engineered seeds. "If this continues, once wheat, barley, lentils and other crops are genetically-engineered, I won't have anything left to grow. For organic farmers and the hundreds of thousands of consumers who choose organic food, this is an extremely serious issue."[27] In the United Kingdom, the government recently announced that field experiments of genetically engineered corn would be halted for fear of genetic pollution of nearby organic farms.[28]

But the problem affects more than just organic growers. StarLink corn, for example, a variety approved only for animal feed and industrial use but not for human consumption, was nevertheless discovered in supermarket products.[29] The corn was never approved for human consumption because the corn produced a protein that exhibited six characteristics of known allergens. But not all farmers followed planting requirements,[30] and as a result all farmers were affected. The contamination of the corn supply with StarLink corn is largely to blame for the dramatic drop in U.S. corn exports: 6 percent overall, but as high as 30 percent for South Korea.[31] When government regulators learned that StarLink's manufacturer, Aventis, could not account for all of the 1999 seed sold that year, they simply believed the company when it assured the government "it was really an accounting problem."[32] Clearly the extent of contamination from field experiments (as well as commercial plantings) is unknown, and farmers are not being adequately protected from genetic pollution. Abroad, harvested field tests of Monsanto's genetically engineered sugar beet – not approved for human consumption – were mixed with other crops destined for food processing.[33]

Another startling example of genetic contamination was brought to light in the fall of 2001. Genetically engineered corn was discovered growing in Mexico despite a moratorium on commercial planting imposed by the government in 1998.[34] Mexico is the source of corn's greatest genetic diversity, and contamination of corn there could severely threaten biodiversity.[35] Sensing the seriousness of the issue, the biotechnology industry sought to do everything in its power to suppress the information before it was released and discredit it afterwards. One of the scientists who discovered the contamination was offered a research post by the director of a Mexican corporation if he withheld his paper, then told that "he knew where to find his children."[36] *Nature* eventually published an editorial note claiming that the journal "has concluded that the evidence available is not sufficient to justify the publication of the original paper."[37] This retraction was the result of a concerted effort by a public relations firm that, among other tactics, had used phony names in Internet postings.[38] The contamination of corn in Mexico appears to be part of an increasingly public strategy by the biotechnology industry, as stated by the executive director of the Canadian Seed Growers Association: "It's a hell of a thing to say that the way we win is don't give the consumer a choice, but that might be it."[39]

Pest resistance and "superweeds"

Plants engineered to kill insects are likely to hasten the creation of pesticide-resistant species, already a major problem.[40] Bt crops are engineered to produce a toxin derived from Bacillus thuringiensis (Bt) bacteria in every cell in an attempt to make them resistant to certain types of pests. Bt is one of a limited number of tools that organic farmers have and can use as a natural pesticide. As a spray, Bt can be applied sparingly because of its reliable efficacy; because it then breaks down very quickly, insects

are exposed only sporadically. Sporadic exposure means little or no resistance develops. The continual exposure to Bt toxin in genetically engineered Bt plants raises the likelihood that insects will quickly develop resistance to Bt. Thus far, the strategy to slow development of resistance has been to rely on high-dose Bt crops planted with a small "refuge" of non-genetically engineered crops. High doses counteract somewhat the resistance-promoting effect of continual exposure by minimizing the number of Bt-resistant survivors. Even with high-dose plants, however, resistant pests will multiply over generations, making it necessary to interplant "refuges" of non-Bt plants with susceptible insects. Interbreeding between resistant and susceptible "refuge" insects slows development of resistance in the general population. Unfortunately, the strategy is not being implemented properly.

First, although the strategy is predicated on high-dose crops, USDA has approved applications for Mycogen, Novartis, and DeKalb (now owned by Monsanto) for crops that produce only moderate doses.[41] A study published in 1999 raises concern that insects may develop resistance to moderate dose Bt corn, potentially undercutting the high-dose-plus-refuge strategy.[42]

Second, EPA has continued to strengthen its rules regarding refuge requirements because a growing body of research suggests that the original rules allow insects to develop resistance to Bt.[43] According to the new rules, no more than 80 percent of a field can be planted in Bt corn varieties, and in cotton-growing areas no more than 50 percent can be planted in Bt corn varieties. While this announcement is further admission of inadequacies in the initial oversight of the technology, farmers who use Bt can now only wait and see if irreparable damage has not already been done. A scientific advisory panel had recommended that EPA require refuge sizes of 50 percent for a recently approved variety of genetically engineered corn; however, the agency ignored this advice and sided with Monsanto, which had pushed for 20 percent.[44] It is also important to note that not all growers are complying with the refuge requirements. Research conducted by the biotechnology industry confirms that nearly 15 percent of growers failed to comply with the rules in 2002; the numbers are even lower in the Corn Belt.[45]

Another significant ecological concern posed by the introduction of genetically engineered crops is that genes designed to give crops a competitive advantage may be passed to related wild plants with which they interbreed, spawning new "superweeds." In fact, the current reliance on just a few broad-spectrum herbicides makes it likely that resistance will develop even faster. Already canola weeds resistant to three herbicides have been found in a field in northern Alberta, Canada.[46] And a recent scientific article reported that the physiological costs of this new trait are "negligible," suggesting that it may persist and spawn more troublesome weeds.[47] The few studies of the relative fitness of hybrids between genetically engineered crops and wild relatives show that they are not necessarily less fit than their wild parent.[48] This problem is particularly troubling in light of the pell-mell rush into international commercialization of these crops. Without regulatory oversight, genetically engineered plants will continue to hybridize with wild relatives and potentially create serious problems such as invasive species. The costs imposed on the United States by non-native species is already estimated at $123 billion annually.[49]

Recent research has revealed that weeds are beginning to develop resistance to Roundup herbicide. Weeds resistant to the herbicide have been discovered in at least Delaware, Maryland, California, Tennessee, Ohio, Kentucky, and Indiana. Although Monsanto claims this is not a significant problem, some scientists have a different opinion. One academic was recently quoted saying, "Long term what's going to have to happen is getting away from the continuous use of Roundup."[50]

Other risks associated with genetically engineered crops

Damage to Soil Ecosystems

Applying this unpredictable new science to agriculture presents other serious ecological risks. One profound but largely unexplored area is the damage genetically engineered crops may cause to soil ecosystems. Work published by Saxena et al. demonstrated that Bt toxin is released into the rhizosphere soil in root exudates from Bt corn.[51] They concluded that "there may be a risk that non-target insects and organisms in higher trophic levels could be affected by the toxin." In response to Saxena et al.'s research, the Biotechnology Industry Organization astoundingly claimed that, "It's hard to find anything here that's surprising."[52] If the news that a toxin retains its insecticidal properties for at least 234 days is not surprising, it is doubly troubling. Saxena's work is reinforced by Donegan and Seidler who state that "pesticidal proteins produced in transgenic plants can persist in soil and that binding of the proteins to soil particles can protect them from biotic degradation. We also found that plant genomic DNA in transgenic plants can persist in a field environment for several months."[53] In contrast to the laissez faire attitude of the Biotechnology Industry Organization, the authors point out that "it is crucial that risk assessment studies on the environmental use of transgenic plants consider the impacts on microbial communities. Research in this area has been quite limited, however, as demonstrated by the few available references." EPA admitted its lack of knowledge on this subject when it allowed Bt crops to continue to be grown but asked biotechnology companies to conduct studies on levels of the toxin in the soil.[54]

One important analysis of corporate research provided to the USDA on the impact of genetically engineered crops on soil ecosystems found both problems with the methodology as well as troubling results that speak clearly to the need for more independent research.[55] First, it was noted that "the vast majority of toxicity studies reported in USDA petitions for deregulation relied on appallingly few replicates." Second, it was revealed that "batches of earthworms that lived in the soil exposed to Bt cotton gained 29.5 percent less weight, on average, than the other earthworms." But the author notes that the company's study was fundamentally flawed, in that it was conducted with too few earthworms to arrive at statistically significant results. Through this (perhaps intentional) methodological flaw, the crucial question of whether Bt cotton harms earthworms was left unanswered, and the USDA seems in no hurry to obtain definitive results.

Virus Resistance

Biotechnology companies also are engineering crops to be virus resistant, raising several ecological concerns. Three main concerns are that new viral strains may arise, viral host ranges may broaden, or that existing viral diseases may become more severe. Schoelz and Wintermantel[56] and Greene and Allison[57] have both reported instances of viral recombination involving viral DNA inserted into transgenic plants. And concerns have been raised about the safety of one particular promoter – the cauliflower mosaic virus – used in nearly every genetically engineered plant either in commercialization or field trials. Scientists have raised concerns both that cauliflower mosaic virus is prone to viral recombination, as well as that its consumption carries risks for human health.[58]

Increased Chemical Use

It is estimated that pesticides harm society's interests to the extent of at least $100 billion per year.[59] Proponents of genetic engineering argue that the new technology reduces or eliminates the use of toxic farm chemicals, which are frequently manufactured by the same companies now touting genetically engineered crops. They claim that crops engineered for resistance to herbicides reduce the use of weed killers, and that pesticide-producing plants such as Bt displace chemical insecticide use. The reality is

that the technology may actually be used to perpetuate the pesticide era paradigm of agriculture rather than end it.

Some of the most common genetically engineered crops on the market today are so-called Roundup Ready®, meaning they are resistant to a herbicide for which safety has been an ongoing matter of dispute.[60] In an important analysis of Roundup Ready soybeans, the former Chair of the Board on Agriculture for the National Academy of Sciences found that genetically engineered soybeans "clearly require more herbicides than conventional soybeans, despite claims to the contrary."[61] The same report also notes that "Monsanto has manipulated comparative data on [Roundup Ready] and conventional soybean herbicide use in ways that fall between misleading and dishonest." Similar research published in 2000 found farmers using two to five times more herbicide with Roundup Ready soybeans compared to other popular weed management systems.[62]

Crops engineered to produce their own insecticides usually produce a toxin derived from Bacillus thuringiensis, or Bt. As described above, Bt is one of a limited number of tools that organic farmers have and can use as a natural pesticide. It also is used by many conventional growers. As a spray, Bt can be applied sparingly because of its reliable efficacy; it then breaks down very quickly. Genetically engineered Bt plants maintain a high and constant killing dose, however, raising the likelihood that insects will quickly develop resistance to Bt. This would mean that not only organic farmers, but all farmers would lose an effective tool for pest control. [63] The prospects for the long-term efficacy of Bt spray are further dimmed by the recent news concerning pests that actually adapt to use the insecticidal toxin in Bt crops as an energy source, a development that "radically undermines one of the key developments claimed for them" and "may be an even greater threat to organic farming than has been envisaged."[64]

REPORT FINDINGS

Introduction to data on field tests of genetically engineered organisms

Currently, thousands of field tests of genetically engineered organisms are taking place all over the United States. Genetically engineered crops pose untold risks to human health and the environment, and yet these experiments occur in the open environment with almost no precautions. Field tests are supposed to determine whether or not the desired effects achieved in a laboratory setting are replicable when grown in the field and to assess the potential environmental impacts of these crops. However, USDA has failed to properly monitor these field tests for adverse ecological or health effects or use these tests to answer many of the outstanding questions about the safety of genetically engineered crops.

The field testing of genetically engineered crops is generally overseen by the Animal and Plant Health Inspection Service (APHIS), a division of the USDA. The primary and almost exclusive role of APHIS with respect to genetically engineered crops is to determine whether they are "plant pests" under the federal Plant Pest Act. The act defines a plant pest as anything that poses a risk or a threat to a plant. Genetically engineered plants are considered at risk of being plant pests if: (1) the donor organism from which the engineered gene comes from, (2) the recipient organism (usually a crop plant), or (3) the vector used for the genetic engineering is regulated as a plant pest. Thus, for example, if a gene from a group of organisms that are considered to be plant pests is introduced into a plant that is not considered a plant pest, APHIS would regulate the resulting plant as a potential plant pest. Based upon the results of field trials, however, those seeking to commercialize genetically engineered crops can petition for deregulation under the Plant Pest Act. The Department of Agriculture has never rejected a petition for deregulation. A more detailed explanation and analysis of the evolution of the regulations that APHIS has put forward are described later in this report.

Number of field releases and field sites

Two key concepts to understand in describing APHIS regulation of field experiments are "field releases" and "field sites." When an institution petitions APHIS to conduct a field experiment of a genetically engineered crop, it is asking to conduct a field release. But if the institution wants to conduct several experiments on the same crop in different locations, each location is called a field site. For example, Permit # 97-259-01 is for a particular variety of genetically engineered corn to be grown at field sites in Hawaii and Illinois, two distinct and dissimilar ecosystems, but it counts as one field release.

Between 1987 and 2002, APHIS received a total of 9,188 requests for field test releases, approving 8,571 of these applications (93 percent). Some applications (252) were withdrawn or voided; only 3.5 percent (327) were denied outright by USDA (see Appendix B). Through 1992, USDA only allowed field releases of genetically engineered organisms under a permitting procedure, but that was changed to allow tests of certain species under a streamlined notification system in 1993. In 1993, after six years of having 100 percent of the field test sites conducted under the permit system, 36 percent (323) were conducted under the notification system. By 1998, the percentage of field test sites under the notification procedure was more than 99 percent.

The number of field test sites conducted under notification drops slightly after 1998 for several reasons, including an increase in the field testing of novel crops. But the primary reason is that USDA has encouraged certain institutions field testing corn to apply under the permitting system rather than the notification system, because the agency claims to be very familiar with the tests and can process a large number of them together with less paperwork.[65] Institutions can combine several requests for field tests into one "comprehensive permit."

Table 1. Number of Field Test Sites Under Permit and Notification: 1987-2002

Year	Sites Under Notification	Sites Under Permit	Total Field Test Sites
1987		5	5
1988		16	16
1989		40	40
1990		81	81
1991		155	155
1992		381	381
1993	323	578	901
1994	1698	232	1930
1995	3639	212	3851
1996	2674	324	2998
1997	3217	583	3800
1998	5049	43	5092
1999	3883	1240	5123
2000	3473	1065	4538
2001	4315	1440	5755
2002	4868	123	4991

Over the same time period, APHIS authorized 39,660 field test sites under the same procedures (Table 1, Appendix A). These figures include a small number of organisms other than plants, such as genetically engineered microorganisms. In 1987, USDA acknowledged five field test sites, and in 1992 there were 381. In 2002, there were a total of 4,991 field test sites, a 13-fold increase over ten years. Between 1987 and 2002, 12 states and territories hosted more than 1,000 field test sites. Ten states and territories hosted 30 or fewer field test sites (Table 2). Refer to Appendix C for a breakdown of field test sites and field releases by state and territory.

Table 2. States/Territories with the Most and Fewest Field Test Sites: 1987-2002

State	# of field test sites
Hawaii	4566
Illinois	4104
Iowa	3831
Puerto Rico	2957
California	1709
Nebraska	1699
Pennsylvania	1672
Minnesota	1414
Indiana	1256
Idaho	1170
Texas	1125
Wisconsin	1121

State	# of field test sites
New Mexico	25
Massachusetts	22
Utah	19
West Virginia	13
Alaska	8
Rhode Island	6
Virgin Islands	4
Nevada	0
New Hampshire	0
Vermont	0

Genetically engineered crops in field release

Appendix D contains a list of all crops field tested in the United States. Overall, the most commonly tested crops are corn, soybean, potato, cotton and tomato. Several crops have just begun to be tested and have had less than five field releases since 1987, such as coffee, cranberry, plum, peppermint, and pineapple.

Table 3. Genetically Engineered Crops with More than 300 Field Releases since 1987

Crop	Total Field Releases
Corn	7717
Soybean	1429
Potato	1330
Cotton	1234
Tomato	562
Wheat	333

Acreage of field test sites

Information about the acreage of field tests in general, as well as field test acreage data by state, is difficult to ascertain because USDA does not make all such information publicly available. We filed a Freedom of Information Act request to obtain this data, and USDA did not respond with full information, merely providing information about many field trials with blank entries for acreage. Companies are successfully seeking to keep acreage information secret, claiming that knowledge of the size of the field trial indicates to a competitor how close an institution is to commercializing the crop. In addition, if a field test was authorized by USDA for 50 acres in five states, there is no way to know if each state had a ten acre test, if one state had a two acre test and the other four states had a twelve acre test, etc. For these reasons, this analysis does not include an overall estimate of the acreage of field trials by state. It is unfortunate that this information is not publicly available.

Table 4. Crops with Largest Amount of Acreage in Field Testing

Crop	Acreage
Corn	163,800
Cotton	133,512
Potato	116,343
Soybean	20,494
Canola	18,908
Tobacco	10,741
Rice	4,693
Alfalfa	4,376
Creeping bentgrass	2,269
Wheat	1,733
Beet	1,649
Tomato	1,201

Included in this report, however, are national numbers for the field tests that do provide acreage information. The crops that have been authorized to be field tested on the largest reported acreage are corn (163,800 acres), cotton (133,512 acres), potato (116,343 acres), and soybean (20,494 acres). A complete list of crops and the acreage on which they have been authorized to be planted can be found in Appendix E.

Consolidation of institutions requesting permits

There has been an alarming rapidity of concentration within the agricultural biotechnology industry. Included in Appendix F is a list of which institutions applied under either permit or notification procedures for field releases. From 1987 through 2002 inclusive, Monsanto (or a wholly-owned subsidiary) applied for the most permits / notifications every year. Since 1995, of the top 10 institutions applying for permits / notifications, seven have now merged into two companies: Monsanto and DuPont. In addition, the universities submitting the most requests for permits are Iowa State (103), University of Idaho (93), and Rutgers (92). Refer to Appendix F for a list of all institutions submitting applications since 1987.

Table 5. 16 Institutions Submitting the Most Applications for Permits or Notifications (1987-2002)

Institution	# Permit / Notification Applications	Institution	# Permit / Notification Applications
Monsanto	3309	Aventis	136
Pioneer	661	Scotts	106
AgrEvo	344	Iowa State University	103
Du Pont	325	University of Idaho	98
ARS	224	Dow	93
DeKalb	192	ProdiGene	93
Seminis Vegetable Seeds	182	Rutgers University	92
Calgene	176	DNA Plant Tech	91

The speed at which the industry has consolidated is evident from a closer examination of the major companies submitting requests for permits or notifications in 1995. In 1995, the institution submitting the largest number of requests was Monsanto, with 143. In 2000, Monsanto "merged" with Pharmacia & Upjohn to create a company called Pharmacia, with Monsanto remaining an autonomous subsidiary self-described as "one of the largest and fastest growing companies in the agricultural sector."[66] Monsanto is currently the world's second largest seed seller, and the world's third largest seller of agrochemicals.[67] Since 1995, Monsanto has bought the companies ranked 5th, 7th, 8th, and 9th in that year.[68] Also in 1995, the institution ranked 2nd with 98 requests was DuPont, currently the world's largest seed seller and the world's fourth largest seller of agrochemicals.[69] In 1999, DuPont merged with Pioneer Hi-Bred, creating what the DuPont CEO called, "the most powerful agricultural technology force in the world."[70] Pioneer Hi-Bred was ranked 3rd in 1995 in terms of companies submitting requests. The National Academy of Sciences recently warned that the "kinds of hazards associated with concentration of the seed industry might be paralleled by the hazards that occurred during concentration of the fertilizer industry."[71]

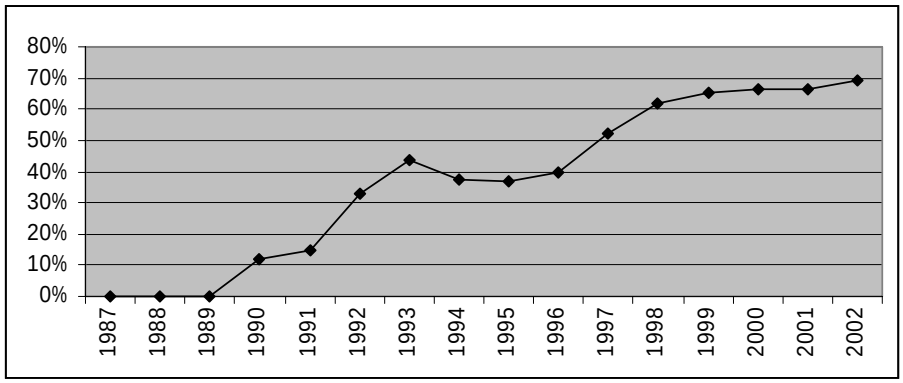
Frequency of permit denials

Between 1987 and 1993, when genetic engineering technology was in a greater stage of scientific ignorance than it is now, USDA did not reject a single permit application for a field test of a genetically engineered crop. The pattern of allowing nearly every request to go forward continues; through 2002, USDA has denied only 3.5 percent of applications for permits and / or notifications (see Appendix B).

According to APHIS, perhaps the only reason a submission is ever rejected is for minor paperwork violations, such as incomplete applications.[72] When asked to do so, USDA has ruled in every case that genetically engineered crops deserve a "Finding of No Significant Impact," a determination that the plant will not have a significant impact on the quality of the human environment nor will the plant pose a risk of becoming a plant pest. [73]

Confidential Business Information regarding introduced genes

Chart A. Percentage of Approved Field Releases Containing Genes Declared Confidential Business Information



Between 1987 and 1989, all field tests of genetically engineered organisms in USDA's database contain introduced genes that are all publicly disclosed. But from 1989 through 2002, the percentage of crops containing genes declared Confidential Business Information increased dramatically, from 0 percent in 1989 to more than 69 percent in 2002 (see Chart A above). It is not only private corporations that are failing to disclose critical information regarding field experiments. Universities also are shutting out the public from knowing what new creations are being introduced into the environment. One example of a commercial permit from DuPont, # 99-029-01, is for 18 release locations over 5,000 acres, yet several genes transferred to the host plant are not publicly available. We analyzed the results of 8,571 approved field releases between 1987 and 2002; the results are in Appendix G.

"Biopharming"

Since 1991, the Department of Agriculture has been approving field trials for crops that are engineered to produce pharmaceuticals, industrial chemicals, and other compounds not intended to enter the food supply. These crops are often termed "biopharm" crops because they create a new bridge between farming for human consumption and the pharmaceutical industry. Through 2002, UDSA authorized 344 field test sites for these crops. Although most field releases of these crops contain genes categorized as Confidential Business Information, some known examples include a blood clotter, an anti-nutrient, blood thinners, an abortion-inducing compound, industrial enzymes, and vaccines.[74] A list of all authorized field releases of "biopharm" crops is available in Appendix H.

Genetically Engineered Wheat

Although no varieties of genetically engineered wheat have been deregulated by USDA for human consumption, field trials have been conducted since 1994. Monsanto formally petitioned USDA for deregulation in December 2002; its petition will likely not be decided upon until late 2003 or early 2004. Countries around the world are making clear their reluctance to buy any genetically engineered wheat, and a recently completed economic analysis predicts significant economic harm if genetically engineered wheat is commercialized in the United States.[75] Some institutions initially refused to even

conduct field trials of genetically engineered wheat, concerned about pollen flow and seed stock contamination.[76] Nonetheless, a concerted lobbying effort by Monsanto and others has ensued, and a total of 333 field test sites of genetically engineered wheat have been authorized through 2002. A list of all authorized field releases of wheat is available in Appendix I.

Violations of Field Testing Regulations

It is no secret that institutions conducting field tests have violated USDA's regulations. This is known in part because of a report from President Clinton's Council on Environmental Quality and Office of Science and Technology Policy, where it is noted that, "From 1995 through 2000, APHIS recorded a total of 63 such compliance infractions."[77] In order to determine the extent to which institutions are complying with regulations, APHIS can either rely on the companies to report themselves or conduct inspections. We filed a Freedom of Information Act request to obtain the data on the rate at which field trials have been inspected. We were informed that no records on this subject were kept prior to the year 2000, thus the agency claimed it was incapable of providing any data on the rate of inspections prior to that date. The agency also, in its response, failed to provide any data post-2000. We remain in dialogue with the agency to obtain these data.

We also filed a separate Freedom of Information Act request to obtain information on the type of violations of the field testing regulations that have occurred and the agency's response. Nearly two years after filing this FOIA, USDA has only responded with the records of two compliance infractions. In one instance, cattle ate some leaves of plants being field tested. USDA responded by calling the company and asking what the company planned to do to prevent such an act in the future. In the other instance, the company planted a genetically engineered crop before it actually had approval from USDA. The agency responded by sending a letter.[78] We remain engaged in dialogue with the agency to receive a complete response to this FOIA as well. It is also important to note that EPA, which does share some responsibility in oversight for the field testing of certain genetically engineered plants, recently fined Pioneer Hi-Bred International and Mycogen Seeds for violating permit conditions.[79] Among other violations, the former had planted crops at an unapproved location and the latter failed to utilize trees as windbreaks.[80]

USDA'S OVERSIGHT OF GENETIC ENGINEERING

Regulation of genetic engineering at USDA: 1984 Proposal

USDA designed its regulatory framework for genetically engineered crops at USDA to support the biotechnology industry. The 1984 notice published by the Office of Science and Technology Policy (OSTP) made the goals of the Coordinated Framework clear: "[T]o enable a beneficial industry to proceed safely and efficiently…[it is] imperative that progress in biotechnology be encouraged."[81] The introduction emphasized that, "The U.S. also is committed to reducing barriers to trade in biotechnology."[82] In order for USDA (and all government agencies involved in the oversight of genetically engineered organisms) to accommodate the growth of this industry as a matter of policy, and defend it in matters of international trade, it was decided that no new laws or agencies were needed. The existing statutes, the policy stated, "seem adequate," while the regulatory authorities in place "appear to accommodate these new products."[83] Given the complexity of the science and the potential impacts of genetically engineered crops on human health, the environment, and the very structure of farming, one would have expected a great level of detail in oversight would be needed. Instead, USDA's "Statement of U.S. Department of Agriculture Policy for Regulating Biotechnology Processes and Products" is a vague eight-page document.

The proposal describes the mandate of the USDA as follows: "the Department is chartered to develop new markets."[84] Shortly following this exhortation, USDA gives a two paragraph "Regulatory Philosophy," in which it states "USDA anticipates that agriculture and forestry products developed by modern biotechnology will not differ fundamentally from conventional products." Thus the department's philosophy of "substantial equivalence" makes it a simultaneous regulator and promoter of a powerful new technology. It would be fifteen years before any Secretary of Agriculture would even acknowledge this problem.[85]

1986 Announcement of Policy

In 1986, USDA published both its final statement of policy under the Framework and also on the same day proposed new rules regarding oversight of field experiments of genetically engineered crops, basing its decisions on little empirical data and ignoring many problems that genetically engineered crops may cause.[86] The resulting scenario reflects a situation in which business interests are given a higher priority than the interests of the public.

USDA proposed "not to regulate an organism or product merely because of the process by which it was produced," thus exempting certain products from regulation.[87] The Office of Science and Technology Policy's introduction to the Framework "anticipated" that products would soon receive "exemption from any federal review."[88] While only five field tests in 1987 and 16 in 1988 went through USDA's permitting procedures, OSTP claimed that because "there is a substantial body of research indicating that such experiments are of low risk…not all experiments involving the environmental release of genetically engineered organisms require prior federal approval."[89] This claim, scientifically dubious at the time given the dearth of data, opened a huge loophole in oversight.

Several other exemptions were included in the Framework, including the transfer of foreign genetic material not believed to have an impact.[90] OSTP also sought comment on exemptions of new organisms produced by exchanging genetic material within the same genera through genetic engineering as opposed to other methods.[91] In sum, OSTP declared that "at the present time existing statutes seem adequate to deal with the emerging processes and products of modern biotechnology."[92]

USDA significantly changed its policy statement for the Framework from 1984 to 1986, making it more clear that the agency "considers products developed through biotechnological techniques as no different from those products resulting from research using conventional techniques," assuming proper protocols.[93] The agency makes the unsupportable assumption that in "most cases it is expected that they [genetically engineered crops] will be improved, and would therefore not pose any new threat to humans, other animal species, or to the environment."[94] Based on agency determinations, "genetically engineered organisms that are not plant pests or where there is no reason to believe such organisms are plant pests would not be regulated."[95] There are also provisions for "certificates of exemption" for products of genetic engineering, exemptions for certain microorganisms,[96] and as mentioned above the agency sought comments on exempting certain new organisms produced by intrageneric exchange.[97]

Knowing its regulations would "have a direct impact on the competitiveness of U.S. industry," USDA stressed the need to avoid having "inconsistent or unnecessary procedures."[98] USDA received 27 public comments on whether the existing framework could be applied to products of genetic engineering, and 52 percent (14 people) disagreed with the judgment of the USDA. Undaunted, the agency responded that the "existing authority is considered adequate at this time."[99] Only seven respondents discussed the issue of risk assessment or risk/benefit analysis of genetic engineering, including one who gave a warning against attempting to regulate the "hypothetical and imaginary 'potential' dangers" of recombinant DNA techniques.[100] It is interesting that in responding to comments on risk analysis that, for the first and only time, the agency mentions the need to consider ethical issues in agricultural biotechnology research. Many have questioned the commitment of USDA and others to a full exploration of the ethical dimension of genetic engineering.[101]

1986 Proposal on Plant Pests

In addition to USDA's revised Statement of Policy for the Coordinated Framework for Regulation of Biotechnology, on the same day USDA's Animal and Plant Health Inspection Service (APHIS) issued a proposed rule focused on regulations for field tests of genetically engineered products. Under the rule, monitoring requirements were inadequate and almost nonexistent. Comprehensive ecological tests that would enable scientists to assess fundamental questions about the properties of genetically engineered organisms were not required, and possible routes of gene escape such as genetically engineered plants interbreeding with wild relatives were largely discounted. The agency again demonstrated a failure to use its authority to properly regulate this new technology.

In the proposed rule, USDA laid out new requirements for permits for genetically engineered crops, including "that a written application for a permit should be submitted…at least 180 days in advance of the proposed introduction."[102] USDA later affirms its own guidelines by saying, "USDA believes that the 180 day time period required to process a permit application will not be an unreasonable delay in the marketing" of products produced through genetic engineering.[103] Monitoring reports were to be submitted only "as deemed necessary by the Deputy Administrator in order for Plant Protection and Quarantine, under certain circumstances…."[104] This was made easier for industry and researchers by

USDA's fallacious assumption that "[g]ene escape via a sexual transfer is not expected to occur and will not be considered."[105]

About 200 people responded to USDA in writing on its June 26, 1986 Federal Register notice, and the agency held one hearing in July and one in August on the proposed rule. Nearly all of the speakers at the hearings were representatives of industry, including Pioneer Hi-Bred, Agracetus, Calgene, and the Industrial Biotechnology Association. As an example of an industry's comments to the docket, Monsanto praised OSTP's failure to regulate products based on the production method, and the company urged expansions for certain exemptions.[106] In comments directed to EPA, Monsanto asked for a block of public information-sharing by recommending "that public meetings of the biotechnology Science Advisory Committee be held only if the nature of the research program and potential product can be maintained confidential…[I]t must be recognized that individual companies can be harmed by disclosure of the nature of their research as well as by disclosure of data."[107]

In comments directed at USDA, Monsanto asked the agency to deregulate all genetically engineered crops. The company declared that, "Logically, it would seem that the organisms produced by recombinant DNA methods should be exempted rather than those produced by classical techniques."[108] Monsanto criticized the agency for requiring too many experts to oversee the safety of research, claiming that committees "could soon result in an unwieldy size."[109] It also criticized the 180-day waiting period APHIS proposed before making a final decision on a regulated article, saying that it "is entirely too long in an age of rapid communication and electronic access to expertise worldwide. A maximum period of 45 days should be established."[110] Monsanto later states that:

> *With the exception of the 180-day period for APHIS review of plant pathogens, there is no clear definition of the time period required for review of proposals by the USDA. Such information is critical to timely research and development and seasonal field testing of agricultural biotechnology products. A time limit of 45 days should be incorporated into .407e, Review of Proposals.*[111]

1987 Final Rule on Plant Pests

On June 16, 1987, USDA published the final version of its changes to 7 CFR, Chapter III.[112] The substance of the document was not changed from the 1986 proposal, leaving the agency with an inadequate system of monitoring in place. In the rule, USDA capitulated to industry pressure and changed the time necessary to submit an application for release of a genetically engineered organism into the environment from 180 days in advance to 120.[113] Many definitions, such as "classical genetics," "genetic manipulation," "mutagen," "pathogen," and "regulated article," were changed or dropped to be more favorable to industry's concerns. And in the final rule, APHIS adds a new, unscientific term regarding substantial equivalence: "so close."[114] As a result of concerns about the rule, the House Energy and Commerce Committee's Subcommittee on Oversight and Investigations asked the General Accounting Office (GAO) to examine federal risk management policies and procedures applicable to field testing genetically engineered organisms. While USDA was proclaiming products of genetic engineering safe and barely regulating them, and industry was pushing them to do still less, GAO's report sharply criticized weaknesses in USDA's regulations.

GAO report sharply criticizes USDA regulations

GAO faulted USDA for failing to adequately regulate genetic engineering, emphasizing that the agency had based its regulations on insufficient data. As a result of the biotechnology framework, GAO pointed

out, "Some organisms are not subject to regulation due to differences in legislative mandates and risk management policies. …[Thus] USDA [is] exempting certain categories of organisms from regulatory scrutiny prior to developing scientific information on the behavior of these organisms in the environment."[115] Commenting on a February 1, 1988 draft report, USDA wrote to GAO on March 18 that its exemptions were justified by their "limited nature."[116] GAO's response in June was clear: "the scientific basis for exempting from review certain genetically engineered organisms released into the environment has not yet been established."[117] GAO's methodology did not even examine the full range of flaws in USDA's oversight. GAO points out, for example, that, "As scientists have recognized, the problems that might be associated with large-scale introductions of genetically engineered organisms may differ from those of small-scale testing, which was the focus of our review."[118]

In attempting to explain the adequacy of its regulations for genetically engineered organisms in response to criticism by the GAO and others, USDA says that it narrowed the scope of the exemptions for certain microorganisms in the final rule. It should be noted that this exemption was not a trivial one. One professor of microbiology, who testified on behalf of the American Society for Microbiology at congressional hearings, stated that it was "**scientifically indefensible**."[119] USDA's claims that its final rule conforms to the recommendation of critics to narrow the exemption were simply not true. As GAO explained, "We find no evidence of a narrowing of the exemption in USDA's final rule…[T]he scope of the exemption remained unchanged."[120]

The shortcomings of the USDA policy are only part of the picture. A more fundamental failure was the narrow focus on the evaluation of the genetically engineered organisms' plant pest risk, rather than a more comprehensive approach to assessing all risks the plants posed. In so doing, "USDA is not requesting sufficient information from the applicant to assess an organism's behavior in the environment and its potential ecological risk."[121] Or, as stated elsewhere, "no meaningful environmental data are being collected in the vast majority of the trials…The only questions being asked relate to the agronomic performance of the genetically modified plants, and the unwanted re-emergence of engineered plants in the following seasons, so-called volunteer plants."[122] The agency responded by pointing out that an examination of environmental effects is required under the National Environmental Policy Act (NEPA). A few years later, USDA would propose excluding permitting and acknowledgement of notifications for field releases of genetically engineered organisms from the requirement to prepare environmental assessments or environmental impact statements under NEPA.[123]

Changes in 1990s to USDA regulatory oversight

In March 1993, after operating under a system of permits for less than six years, APHIS announced it was allowing certain crops to be grown without permitting.[124] Instead, institutions simply notified APHIS of their intention to conduct a field test because APHIS felt they had enough data to conclude these plants posed little or no ecological risk. APHIS exempted six plant species – corn, cotton, potato, soybean, tobacco, and tomato – as well as any "additional plant species that BBEP* has determined may be safely introduced."[125] The streamlined notification application was carefully worded to only ask, for example, if the plant would "[e]ncode substances that are known or likely to be toxic to non-target organisms known or likely to feed or live on the plant species."[126] This wording ignores ecological impacts on species like monarch larvae that feed on nearby species like milkweed, and it fails to examine impacts on the soil, which are only recently being adequately explored.[127] In addition, even beyond Monsanto's hopes just a few years previous, APHIS would now have only 30 days to respond to a notification for environmental release.[128]

In a study produced in 1995, Joy Bergelson, an ecological geneticist at the University of Chicago, and Colin Purrington, now an evolutionary biologist at Swarthmore College, examined the seven genetically engineered crops approved by USDA for commercialization at that time. Their conclusion was that USDA was basing its decisions on critically flawed data.[129] They also said the petitions relied in large part on unsupportable claims. Also in 1995, a report published in Bio/Technology surveyed all publicly available data from every field test.[130] In reviewing the 85 most recent reports of field trials, the authors note that none mentioned experiments to assess weediness, zero (of the 19) reports on virus-resistant crops mentioned experiments measuring the production of new virus strains, and none of the reports on Bt crops mentioned experiments on the likelihood of adverse impacts on nontarget insects.

Despite this, APHIS again proposed to "simplify procedures for the introduction of certain genetically engineered organisms."[131] USDA claimed that 87 percent of all field trials were already being conducted under the simplified regulatory requirements.[132] APHIS felt that "petitions can and should be reviewed in a more streamlined manner,"[133] and set a goal that "about 99 percent" of tests would be conducted under a simplified notification procedure that required even less study than before.[134] To do so, APHIS would deregulate a new set of crops. Because APHIS did not have a way to describe these new crops, the agency created a new term, "antecedent organism."[135] This was an organism that had already received non-regulated status and thus would serve as a reference for comparison. This meant that as long as the new plant was "closely related," a vague term not defined but explained through one specific example, it was a candidate for non-regulated status. [136] USDA cited its experience at that time, having "approved, in whole or in part, eight petitions for a determination of nonregulated status."[137] This statement is inaccurate. According to USDA records, at the time sixteen crops were no longer regulated.[138] Regardless, independent scientists criticized the extension of deregulation as "beyond all reason."[139]

When the new final rule was published on May 2, 1997, USDA made more scientifically unsupportable decisions to further erode basic environmental safeguards.[140] USDA eroded field testing requirements, simplified procedures for further determinations of non-regulated status, and reduced oversight of virus-resistant plants. In responding to criticism that the agency had not yet obtained any hard data that would allow it to assess specific environmental impacts, USDA admitted that "it is true that the majority of field trials of regulated articles have been conducted in the last two years."[141] Regardless, USDA still felt that with this paucity of data it could conclude that "there has been no reason to believe that any hypothetical 'long-term' impacts have arisen or are likely or foreseeable as a consequence of the conduct of any field trial in accordance with this final rule."[142] So with very little data to support such a decision, the agency shrugged off concerns with similar language a critic had used some years before (see note 100) and called two years of testing 'long-term'.

With regard to virus resistant crops, USDA simultaneously concludes that more research is needed regarding the risks of virus resistant plants, yet states it is highly unlikely that there will be any new viruses as a result of field testing.[143] The desire for more research should be self-evident; its own report concluded that, "More research is needed…to assess the environmental and agricultural risks that might be presented by the commercialization of transgenic virus-resistant crops."[144] The results were something of a fait accompli, as USDA wrote about the time when "eventually, approval is sought to grow the regulated articles under routine agricultural conditions…(i.e., when a petition is submitted to APHIS for a determination of nonregulated status)."[145]

Among USDA's final responses to comments on its 1995 notice were the proposed simplifications on reporting requirements. Several people had commented that field requirements should be strengthened, but the agency felt that "no evidence in support of such a view was provided."[146] From the government's perspective, to even "consider potential long term environmental effects…would be an exercise in speculation."[147] The evidence that USDA should strengthen field testing requirements is in the lack of evidence of safety. A comprehensive literature review published in December 2000 on the potential impacts of genetically engineered crops concluded that key experiments are still lacking.[148] USDA's regulations are a classic example of a "don't look, don't find" mentality. Through the year 2002 there have been nearly 40,000 open air field experiments of genetically engineered organisms under USDA's system. Yet because of the agency's inadequate oversight, it has failed to undertake basic, fundamental explorations into the impact of genetically engineered organisms on human health, the environment, and a range of social and economic areas.

Recent developments regarding USDA regulatory oversight

In February 2002, the National Academy of Sciences released a new report that severely criticized USDA's handling of the regulation of genetically engineered crops.[149] In part, the report undermined USDA's deregulation decisions, stating that one "cannot presently judge whether extensive commercialization of transgenics…will significantly perturb agroecosystems because of major gaps in our knowledge of these systems."[150] While USDA and biotechnology companies continue to state that there have been no significant adverse environmental impacts from this technology, the National Academy calls that claim "nonscientific. There has been no environmental monitoring of these transgenic crops, so any effects that might have occurred could not have been detected."[151]

The report goes on to call oversight by USDA at times "scientifically inadequate" and chastises the agency for "inadequate expertise."[152] Elsewhere it states that APHIS's analysis "lacked scientific rigor, balance, and transparency."[153] The report faults the agency for allowing plants with allergenic properties to be grown under notification.[154] The report even makes it clear that there is no formal system in place to determine if small-scale field trials are at all relevant to the evaluation of impacts of large-scale commercial plantings.[155]

Despite this clear statement from some of the nation's leading scientists that the status quo at USDA was not acceptable, the next statement from the federal government on the issue of field testing was again a step backward for the public. In August 2002, the Office of Science and Technology Policy (OSTP) incredibly claimed that existing field test requirements have been adequate while admitting that the likelihood of contamination "may…increase." [156] But instead of proposing a plan to prevent genetic pollution, the government's solution is to approve it. OSTP directs USDA to produce new rules that would allow contamination. USDA has not yet proposed such a policy. OSTP does direct the agency to propose these new regulations under the recently enacted Plant Protection Act, which supercedes the Plant Pest Act. However, USDA's and APHIS's regulations under the Plant Pest Act remain in effect until the agency proposes new regulations under its new authority.

In March 2003, USDA proposed new rules for the field testing of plants engineered to produce pharmaceuticals or industrial compounds.[157] While the announcement does make some needed improvements, and is thus a much needed admission that oversight has been inadequate for some time, it falls short in many areas. The new rules increase the buffer zones to one-half mile for tassel-bagged and open-pollinated corn, respectively, but they still fail to clearly prohibit the cultivation of food / feed crops on sites where biopharmaceutical plants were grown the previous year, leaving open

the possibility of volunteer biopharm plants contaminating the food supply. The rules continue to allow biotechnology companies to use food crops for these experiments and do nothing to address the problem of extreme secrecy surrounding these tests. A coalition of environmental and consumer groups filed a 60 Day Notice Letter with USDA to address many of the shortcomings in its policy.[158]

Finally, USDA received a petition from Monsanto in December 2002 for the deregulation of genetically engineered wheat. Although Monsanto has claimed that it will not introduce this product commercially until certain thresholds are met, such as consumer acceptance and a system of segregation, it appears the company is moving forward regardless. International opposition to genetically engineered wheat has been and continues to be quite strong. A recent analysis also indicates the U.S. wheat industry will lose 30 percent to 50 percent of its business with foreign markets for spring wheat if Monsanto releases its controversial genetically modified wheat in the next few years.[159] As a result, farm groups recently filed a petition with USDA to prevent economic, environmental or social damage resulting from the deregulation of Monsanto's genetically engineered wheat.[160]

It is important to point out the distinction between oversight in the field testing stage versus oversight of genetically engineered crops grown commercially. Institutions petition USDA for deregulation with information gathered from field tests when seeking to grow a food crop commercially, a separate part of the process for commercialization that is not the focus of this paper. APHIS has never rejected a petition for deregulated status, and in every case when asked to do so, it has found that genetically engineered crops do not have a significant impact on the environment.[161]

CONCLUSION AND RECOMMENDATIONS

The lax regulation of genetically engineered organisms at USDA is predicated upon the scientifically dubious notion that genetically engineered plants are no different than traditionally bred plants. The agency has supported and encouraged the development of this technology with minimal oversight, thus acting as an outspoken proponent of a technology that it is supposed to regulate dispassionately and objectively. Damage caused by genetic engineering to the environment may already be severe, including disruption of soil communities, damage to non-target organisms, genetic pollution and biodiversity loss, and the perpetuation of heavy pesticide use by – in part – destroying the efficacy of Bt for use in farming and creating crops dependent on the application of synthetic chemicals. The impact of the technology on farmers and society in general has not been fully explored, nor has there been a full debate about the ethical dimension of genetic engineering. Other agencies, too, share part of the blame, and there needs to be a comprehensive restructuring of the regulations for genetically engineered foods and crops at all the major agencies involved in oversight. But as explained in this paper, USDA has rubber-stamped nearly every application for genetically engineered field tests without a full understanding of the risks involved nor a full exploration of alternatives.

Consumer awareness and concern about the issue of genetic engineering has been higher abroad than in the United States thus far. However, as a result of incidents like the StarLink debacle and increased attention from public interest groups and the media, scrutiny and concern are on the rise among American consumers. As people learn more about the risks of genetically engineered foods, they look to the USDA and other agencies for sufficient regulation and oversight to ensure a safe food supply with environmental protections. Thus far, by essentially automatically approving permits, USDA has not been playing an adequate regulatory role. The U.S. regulatory system must operate in a way that places public health and environmental protection as paramount considerations.

Accordingly, regulators should enact a moratorium on the field testing and commercialization of genetically engineered foods and crops unless:

- ↓ **Independent safety testing demonstrates genetically engineered crops have no harmful effects on human health or the environment.**

Genetically engineered products have not been properly tested for human health or environmental impact, nor have their social and ethical dimensions been adequately explored. USDA should discontinue field tests of genetically engineered crops until a thorough and comprehensive ecological framework is established to assess their full impact. The tests conducted thus far have largely failed to answer basic, fundamental questions about the safety of growing genetically engineered crops in the open environment. Allowing experimentation under the same lax regulations will continue to provide little substantive data and only serve to endanger the environment and farmers' livelihoods.

Genetic engineering is a new technology and carries with it new risks. USDA must immediately abandon the notion of substantial equivalence. This means that environmental assessments should be evaluated with the fundamental understanding that each new crop / gene combination is different and may present different risks. No crops should be approved until long-term, independently reviewed studies assess the range of ecological risks. This includes protocols for evaluating the risks of creating new

plant viruses, the nontarget effects of plant-pesticides, as well as weediness potential and gene flow. There should be no open air planting of crops engineered to produce industrial chemicals or pharmaceutical proteins, nor should these types of combinations ever occur in food plants.

- ↓ **The public's right to know about field tests is improved and any products commercialized are labeled**.

USDA should make all information about field tests available to the public online in an easily navigable way. Currently, no information about tests conducted before June 1987 is available, and data about tests conducted since are parsimonious and organized in a way that is difficult to maneuver. Data should include the locations and size of all field tests, and all results should be made public. Any products commercialized after rigorous safety testing should be clearly labeled.

- ↓ **The biotechnology corporations that manufacture genetically engineered foods are held responsible for any harm.**

Biotechnology companies should be held financially liable for adverse impacts caused by genetically engineered products, such as contamination of farms not planted with genetically engineered crops, genetic pollution, and adverse effects on soil ecosystems, non-target organisms, and human health. Already, taxpayers, rather than the institutions that created the problems in the first place, have born the financial burden of mistakes made. This is unacceptable. For example, taxpayers paid to buy back contaminated seed after the StarLink contamination episode, and USDA gave ProdiGene a $3.5 million, no-interest loan to pay for purchase of the contaminated soybeans in Nebraska and the related fine. USDA should develop the regulatory structure necessary to rigorously evaluate the impact of genetically engineered crops and determine liability for adverse consequences. Currently, only about 3 percent of USDA's budget looks at the environmental impact of genetic engineering.

METHOLOGICAL NOTES

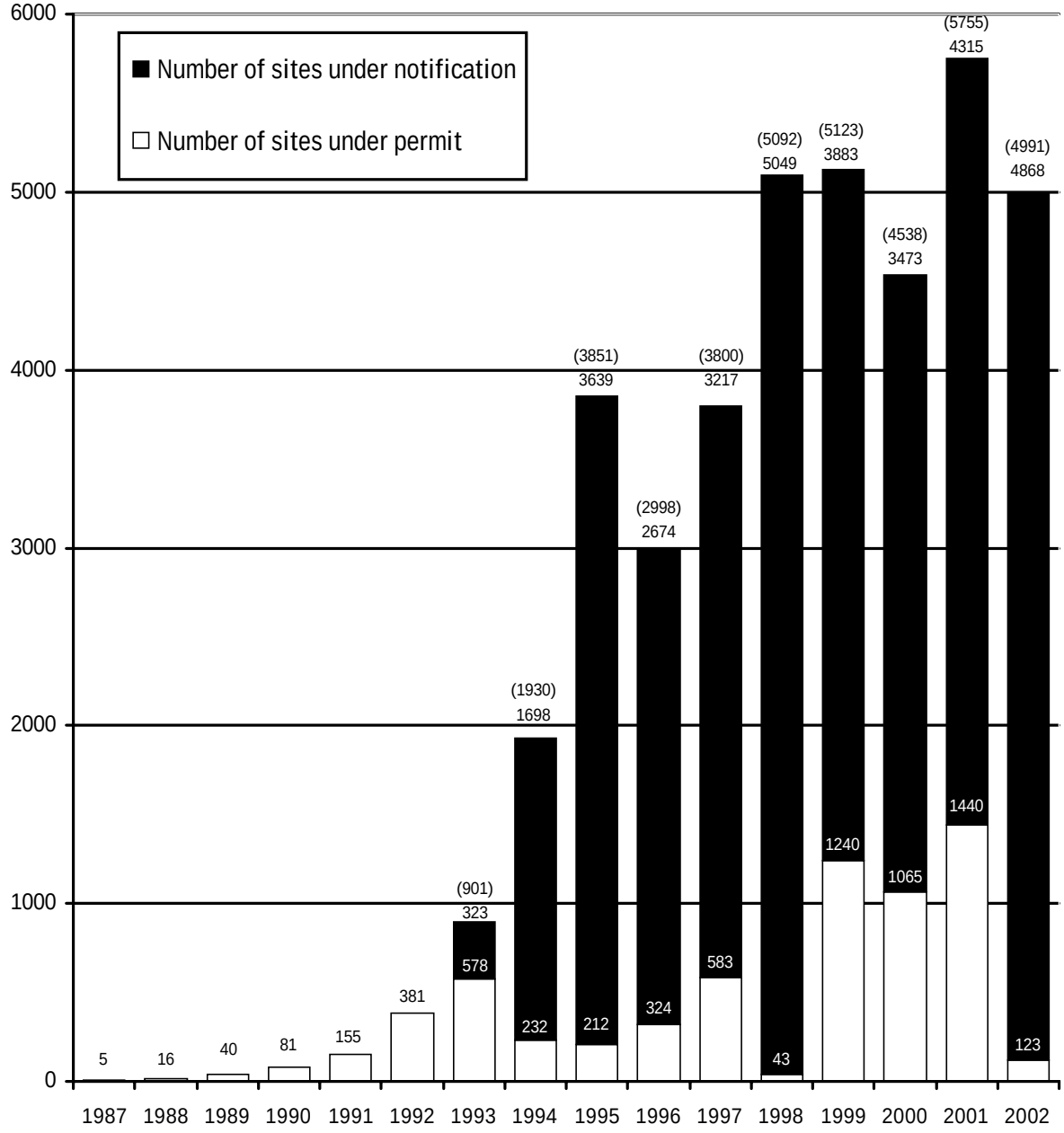
The raw data for this report was provided by Information Systems for Biotechnology (ISB) at Virginia Tech, which handles the data for the Department of Agriculture. ISB was helpful in all respects in providing information, running specialized data searches, and answering questions. There are minor data discrepancies in the data provided, which ISB explained it could "do nothing about," including the fact the Puerto Rico was noted as having half (.5) of a field trial, as well as a difference of 2.5 field test sites between data provided in two different databases. These discrepancies are minor and do not affect the findings of this report.

APPENDIX A:

Number of Field Test Sites, Ranked by State or Territory (1987-2002)

Rank	State	Number of Field Test Sites
1	Hawaii	4566
2	Illinois	4104
3	Iowa	3831
4	Puerto Rico	2957
5	California	1709
6	Nebraska	1699
7	Pennsylvania	1672
8	Minnesota	1414
9	Indiana	1256
10	Idaho	1170
11	Texas	1125
12	Wisconsin	1121
13	Georgia	876
14	Mississippi	782
15	Florida	773
16	Michigan	681
17	North Dakota	669
18	North Carolina	657
19	Missouri	603
20	Arkansas	552
21	Ohio	524
22	Oregon	515
23	Washington	514
24	Kansas	480
25	Louisiana	479
26	Tennessee	471
27	Maryland	437
28	Arizona	432
29	South Dakota	386
30	Delaware	376
31	Maine	375
32	Alabama	364
33	South Carolina	332
34	New York	273
35	Colorado	255
35	Montana	255
37	Kentucky	230
38	New Jersey	192
39	Virginia	191
40	Connecticut	138
41	Oklahoma	91
42	Wyoming	36
43	New Mexico	25
44	Massachusetts	22
45	Utah	19
46	West Virginia	13
47	Alaska	8
48	Rhode Island	6
49	Virgin Islands	4
50	Nevada	0
50	New Hampshire	0
50	Vermont	0
	TOTAL	39,660

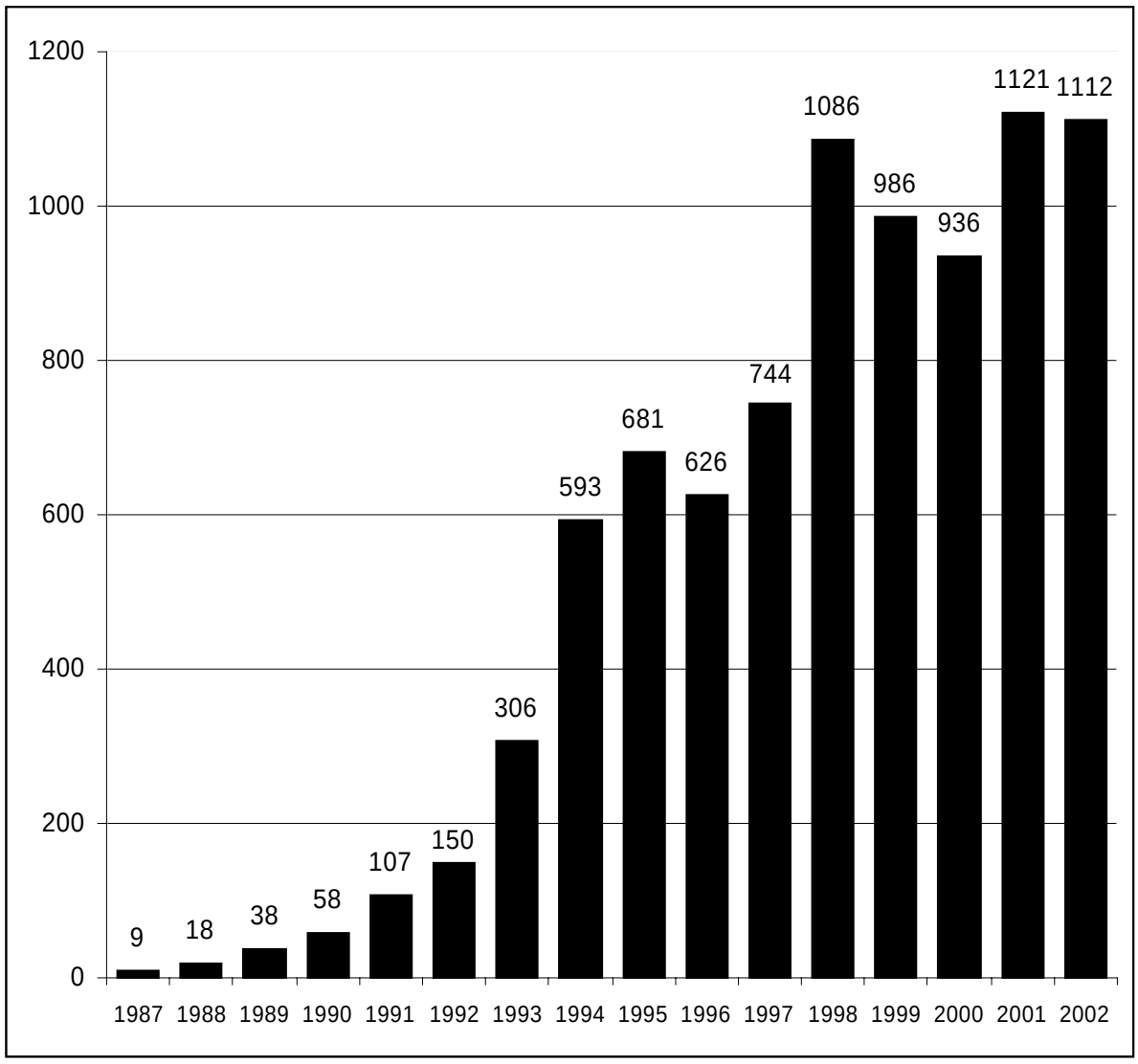
Field Test Sites, 1987-2002



(Numbers in parentheses indicate the total sites under permit or notification each year)

APPENDIX B:

Number of Permits and Notifications Approved by Year: 1987-2002



Total Permit Applications and Results (1987-2002)

Year	Received	Approved in Same Year as Submitted	Approved in Subsequent Year	Denied	Withdrawn	Voided	Pending
1987	9	9	8562	0	0	0	0
1988	18	18	8544	0	0	0	0
1989	38	38	8506	0	0	0	0
1990	58	58	8448	0	0	0	0
1991	107	107	8341	0	0	0	0
1992	161	150	8191	0	11	0	0
1993	374	306	7885	0	68	0	0
1994	608	593	7292	6	9	0	0
1995	706	681	6611	2	18	5	0
1996	654	626	5985	8	20	0	0
1997	808	744	5241	33	28	3	0
1998	1206	1086	4155	108	10	2	0
1999	1061	986	3169	46	23	6	0
2000	1012	936	2233	57	16	1	2
2001	1189	1121	1112	39	20	2	7
2002	1179	1112	0	28	10	0	29
Total	9,188	8,571	n/a	327	233	19	38

APPENDIX C:

Field Test Sites, Releases and Crops Tested by State or Territory: 1987-2002

ALABAMA

Number of field releases	208
Number of field test sites	364

Plants Tested	Number of field releases
Cotton	88
Corn	42
Soybean	32
Potato	8
Canola	8
Xanthomonas	6
Tomato	5
Creeping bentgrass	4
Sweet potato	4
Pseudomonas	3
Pseudomonas syringae	2
St. Augustine grass	2
Pea	1
Peanut	1
Pseudomonas putida	1
Xanthomonas campestris	1

ALASKA

Number of field releases	6
Number of field test sites	8

Plants Tested	Number of field releases
Potato	4
Lettuce	1
Rice	1

ARIZONA

Number of field releases	219
Number of field test sites	432

Plants Tested	Number of field releases
Cotton	105
Corn	24
Wheat	22
Canola	20
Melon	15
Lettuce	11
Beet	10
Creeping bentgrass	3
Tobacco	3
Alfalfa	2
Rice	1
Tomato	1
Pink bollworm	1
Squash	1

ARKANSAS

Number of field releases	237
Number of field test sites	552

Plants Tested	Number of field releases
Soybean	97
Cotton	81
Rice	30
Corn	25
Wheat	4

CALIFORNIA

Number of field releases	999
Number of field test sites	1709

Plants Tested	Number of field releases
Tomato	270
Corn	133
Melon	76
Rice	62
Lettuce	56
Cotton	55
Canola	47
Potato	40
Strawberry	31
Alfalfa	29
Beet	25
Squash	24
Grape	17
Wheat	14
Brassica oleracea	13
Walnut	12
Sunflower	11
Apple	10
Cucumber	10
Pea	9
Pepper	8
Petunia	6
Creeping bentgrass	4
Tobacco	4
St. Augustine grass	4
Carrot	4
Persimmon	4
Watermelon	4
Barley	3
Pelargonium	3
Rubus idaeus	3
Soybean	2
Onion	2
Pseudomonas	1
Pseudomonas syringae	1
Chrysanthemum	1
Cichorium intybus	1

COLORADO

Number of field releases	143
Number of field test sites	255

Plants Tested	Number of field releases
Corn	47
Potato	26
Beet	22
Canola	20
Wheat	20
Alfalfa	3
Creeping bentgrass	3
Sunflower	2

CONNECTICUT

Number of field releases	185
Number of field test sites	138

Plants Tested	Number of field releases
Corn	174
Soybean	3
Rhododendron	3
Cryphonectria parasitica	2
Potato	1
Alfalfa	1
Creeping bentgrass	1

DELAWARE

Number of field releases	199
Number of field test sites	376

Plants Tested	Number of field releases
Corn	144
Soybean	43
Potato	3
Creeping bentgrass	3
Tomato	2
Tobacco	2
Cotton	1
Squash	1

FLORIDA

Number of field releases	562
Number of field test sites	773

Plants Tested	Number of field releases
Corn	200
Tomato	137
Potato	88
Cotton	26
Soybean	20
Tobacco	10
Sugarcane	10
Canola	7
Melon	7
Petunia	6
St. Augustine grass	6
Rice	5
Lettuce	4
Pepper	4
Carrot	4
Squash	3
Watermelon	3
Xanthomonas	3
Creeping bentgrass	2
Pea	2
Chrysanthemum	2
Peanut	2
Wheat	1
Strawberry	1
Grape	1
Pelargonium	1
Xanthomonas campestris	1
Citrus viroid III	1
Grapefruit	1
Metaseiulus occidentalis	1
Papaya	1
Paspalum notatum	1
TMV	1

GEORGIA

Number of field releases	311
Number of field test sites	876

Plants Tested	Number of field releases
Cotton	80
Corn	48
Soybean	25
Canola	25
Melon	25
Pea	20
Peanut	20
Squash	18
Tomato	11
Cucumber	9
Tobacco	7
Sweetgum	5
St. Augustine grass	4
Creeping bentgrass	4
Lettuce	3
Alfalfa	2
Potato	1
Watermelon	1
Bermudagrass	1
Fusarium moniliforme	1
Poplar	1

HAWAII

Number of field releases	1418
Number of field test sites	4566

Plants Tested	Number of field releases
Corn	1314
Soybean	25
Rice	15
Wheat	14
Papaya	11
Cotton	7
Sunflower	6
Tobacco	5
Tomato	4
Coffee	3
Dendrobium	3
Barley	2
Pea	1
Peanut	1
Lettuce	1
Potato	1
Sugarcane	1
Apple	1
Anthurium andreanum	1
Pine	1
Pineapple	1

IDAHO

Number of field releases	457
Number of field test sites	1170

Plants Tested	Number of field releases
Potato	257
Corn	49
Wheat	44
Beet	34
Alfalfa	24
Canola	20
Pea	13
Barley	12
Tomato	1
Creeping bentgrass	1
Carrot	1
Kentucky bluegrass	1

ILLINOIS

Number of field releases	1278
Number of field test sites	4104

Plants Tested	Number of field releases
Corn	991
Soybean	161
Tomato	23
Tobacco	18
Wheat	14
Creeping bentgrass	9
Arab. Thaliana	8
Canola	7
Fusarium graminearum	7
Belladonna	6
Potato	5
Alfalfa	4
Cotton	4
Petunia	3
Barley	2
Carrot	2
Rice	2
Beet	1
Melon	1
Squash	1
Fusarium moniliforme	1
Xanthomonas	1
Pelargonium	1
Xanthomonas campestris	1
Arabidopsis	1
Clavibacter	1
Fusarium sporotrichioides	1
Sunflower	1
Xanthomonas campestris pv. Vesicatoria	1

INDIANA

Number of field releases	570
Number of field test sites	1256

Plants Tested	Number of field releases
Corn	416
Soybean	89
Tomato	30
Alfalfa	14
Wheat	6
Creeping bentgrass	4
Fusarium graminearum	3
Potato	3
Sunflower	3
Canola	1
Festuca arundinacea	1

IOWA

Number of field releases	1014
Number of field test sites	3831

Plants Tested	Number of field releases
Corn	822
Soybean	147
Alfalfa	23
Creeping bentgrass	4
Tobacco	4
Canola	2
Beet	2
Poplar	2
Sunflower	2
Fusarium moniliforme	1
Clavibacter	1
Pseudomonas	1
Pseudomonas syringae	1
Clavibacter xyli	1
Oat	1

KANSAS

Number of field releases	181
Number of field test sites	480

Plants Tested	Number of field releases
Corn	147
Soybean	17
Wheat	12
Alfalfa	2
Creeping bentgrass	2
Tobacco	1

KENTUCKY

Number of field releases	136
Number of field test sites	230

Plants Tested	Number of field releases
Tobacco	59
Corn	35
Soybean	25
TMV	6
Creeping bentgrass	5
Poplar	2
Alfalfa	1
Tomato	1
Potato	1
TEV	1

LOUISIANA

Number of field releases	198
Number of field test sites	479

Plants Tested	Number of field releases
Cotton	71
Rice	56
Soybean	20
Sugarcane	19
Corn	16
Aspergillus flavus	5
Tobacco	3
Strawberry	3
St. Augustine grass	2
Potato	1
Petunia	1
Sweet potato	1

MAINE

Number of field releases	143
Number of field test sites	375

Plants Tested	Number of field releases
Potato	142
Cotton	1

MARYLAND

Number of field releases	288
Number of field test sites	437

Plants Tested	Number of field releases
Corn	165
Soybean	84
Potato	9
Tomato	7
Clavibacter	7
Creeping bentgrass	6
Cotton	3
Squash	3
Gladiolus	2
Tobacco	1
Clavibacter xyli	1

MASSACHUSETTS

Number of field releases	11
Number of field test sites	22

Plants Tested	Number of field releases
Creeping bentgrass	6
Potato	4
Corn	1

MICHIGAN

Number of field releases	281
Number of field test sites	681

Plants Tested	Number of field releases
Corn	102
Potato	61
Soybean	29
Melon	24
Beet	16
Canola	11
Squash	9
Creeping bentgrass	8
Tomato	6
Cucumber	6
Alfalfa	3
Poplar	2
Watermelon	2
Carrot	1
Amelanchier laevis	1

MINNESOTA

Number of field releases	502
Number of field test sites	1414

Plants Tested	Number of field releases
Corn	321
Potato	48
Soybean	36
Beet	34
Wheat	24
Canola	17
Alfalfa	9
Poplar	3
Sunflower	3
Creeping bentgrass	2
Clavibacter	1
Petunia	1
Barley	1
Pea	1
CBI	1

MISSISSIPPI

Number of field releases	351
Number of field test sites	782

Plants Tested	Number of field releases
Cotton	209
Soybean	69
Corn	40
Rice	17
Tobacco	5
Aspergillus flavus	5
Strawberry	3
St. Augustine grass	2
Poplar	1

MISSOURI

Number of field releases	289
Number of field test sites	603

Plants Tested	Number of field releases
Corn	186
Soybean	50
Cotton	27
Rice	9
Creeping bentgrass	5
Potato	4
Tomato	3
Alfalfa	2
Poplar	1
Arab. Thaliana	1
Populus deltoides	1

MONTANA

Number of field releases	104
Number of field test sites	255

Plants Tested	Number of field releases
Wheat	43
Potato	34
Beet	15
Canola	5
Creeping bentgrass	2
Alfalfa	2
Barley	2
Corn	1

NEBRASKA

Number of field releases	540
Number of field test sites	1699

Plants Tested	Number of field releases
Corn	425
Soybean	39
Potato	25
Beet	17
Wheat	12
Creeping bentgrass	5
Alfalfa	5
Clavibacter	4
St. Augustine grass	2
Sunflower	2
Canola	1
Melon	1
Squash	1
Clavibacter xyli	1

NEW JERSEY

Number of field releases	159
Number of field test sites	192

Plants Tested	Number of field releases
Creeping bentgrass	81
Kentucky bluegrass	19
Corn	15
Bermudagrass	9
Potato	8
Eggplant	7
Soybean	6
Squash	3
Tobacco	3
Perennial ryegrass	3
Poa pratensis X Poa arachnifera	2
Poplar	1
Lettuce	1
Heterorhabditis bacteriophora	1

NEW MEXICO

Number of field releases	24
Number of field test sites	25

Plants Tested	Number of field releases
Potato	14
Corn	4
Soybean	2
Cotton	2
Alfalfa	1
Onion	1

NEW YORK

Number of field releases	198
Number of field test sites	273

Plants Tested	Number of field releases
Potato	46
Corn	45
Tomato	20
Grape	20
Melon	13
Squash	11
Apple	11
Alfalfa	8
Creeping bentgrass	8
Petunia	5
Cucumber	3
Brassica oleracea	3
Cucurbita texana	2
Poplar	1
Pelargonium	1
Papaya	1

NORTH CAROLINA

Number of field releases	303
Number of field test sites	657

Plants Tested	Number of field releases
Corn	104
Cotton	74
Tobacco	56
Soybean	23
Potato	8
Squash	5
Arab. Thaliana	5
Creeping bentgrass	4
St. Augustine grass	4
Tomato	3
Wheat	3
Canola	3
TMV	3
Brassica rapa	3
Festuca arundinacea	2
Clary	2
Poplar	1

NORTH DAKOTA

Number of field releases	229
Number of field test sites	669

Plants Tested	Number of field releases
Potato	81
Wheat	36
Beet	36
Canola	29
Corn	25
Sunflower	11
Soybean	5
Barley	4
Cotton	1
Alfalfa	1

OHIO

Number of field releases	291
Number of field test sites	524

Plants Tested	Number of field releases
Corn	164
Soybean	35
Creeping bentgrass	33
Kentucky bluegrass	14
Potato	9
Petunia	9
Tomato	8
St. Augustine grass	7
Pelargonium	4
Alfalfa	2
Poa pratensis X Poa arachnifera	2
Beet	1
Squash	1
Arab. Thaliana	1
Melon	1

OKLAHOMA

Number of field releases	66
Number of field test sites	91

Plants Tested	Number of field releases
Corn	21
Cotton	14
Alfalfa	8
Festuca arundinacea	6
Pea	3
Peanut	3
Russian wildrye	3
Soybean	2
Wheat	2
Tobacco	2
Potato	1
Squash	1

OREGON

Number of field releases	276
Number of field test sites	515

Plants Tested	Number of field releases
Potato	79
Beet	47
Creeping bentgrass	31
Poplar	30
Melon	14
Kentucky bluegrass	12
Tomato	10
Corn	8
Wheat	8
Apple	8
Strawberry	7
Rubus idaeus	6
Alfalfa	4
Pea	3
Pear	3
Poa pratensis X Poa arachnifera	2
Canola	2
Squash	1
Petunia	1

PENNSYLVANIA

Number of field releases	159
Number of field test sites	1672

Plants Tested	Number of field releases
Corn	110
Soybean	13
Alfalfa	11
Potato	8
Tobacco	6
Kentucky bluegrass	4
Creeping bentgrass	3
Poa pratensis X Poa arachnifera	3
Squash	1

PUERTO RICO

Number of field releases	1047
Number of field test sites	2957

Plants Tested	Number of field releases
Corn	751
Soybean	195
Cotton	79
Rice	13
Tomato	8
Papaya	1

RHODE ISLAND

Number of field releases	6
Number of field test sites	6

Plants Tested	Number of field releases
Creeping bentgrass	3
Potato	2
Velvet bentgrass	1

SOUTH CAROLINA

Number of field releases	157
Number of field test sites	332

Plants Tested	Number of field releases
Cotton	66
Pine	17
Soybean	12
Sweetgum	11
Poplar	10
Canola	8
Tobacco	7
Populus deltoides	7
Potato	5
Squash	3
Sweet potato	3
Creeping bentgrass	2
St. Augustine grass	2
Corn	1
Tomato	1
Arab. Thaliana	1
Chrysanthemum	1

SOUTH DAKOTA

Number of field releases	167
Number of field test sites	386

Plants Tested	Number of field releases
Corn	127
Wheat	18
Soybean	13
Sunflower	3
Canola	2
Alfalfa	2
Potato	1
Beet	1

TENNESSEE

Number of field releases	227
Number of field test sites	471

Plants Tested	Number of field releases
Corn	122
Cotton	54
Soybean	40
Tobacco	6
Canola	1
Alfalfa	1
Squash	1
Rice	1
Wheat	1

TEXAS

Number of field releases	372
Number of field test sites	1125

Plants Tested	Number of field releases
Cotton	167
Corn	105
Rice	22
Soybean	14
Sugarcane	11
Melon	9
Alfalfa	6
Squash	6
Potato	5
St. Augustine grass	5
Grape	4
Grapefruit	4
Canola	3
Beet	3
Tobacco	2
Brassica oleracea	2
Tomato	1
Onion	1
Carrot	1
Citrus sinensis X Poncirus trifoliata	1

UTAH

Number of field releases	15
Number of field test sites	19

Plants Tested	Number of field releases
Alfalfa	4
Kentucky bluegrass	4
Poa pratensis X Poa arachnifera	3
Nicotania attenuata	3
Beet	1

VIRGIN ISLANDS

Number of field releases	6
Number of field test sites	4

Plants Tested	Number of field releases
Papaya	2
Cassava	2
Potato	1
Sweet potato	1

VIRGINIA

Number of field releases	113
Number of field test sites	191

Plants Tested	Number of field releases
Tobacco	28
Corn	25
Potato	16
Soybean	15
Cotton	11
Creeping bentgrass	5
Tomato	4
Poplar	4
Squash	3
Alfalfa	1
Beet	1

WASHINGTON

Number of field releases	245
Number of field test sites	514

Plants Tested	Number of field releases
Potato	102
Wheat	34
Creeping bentgrass	16
Alfalfa	14
Barley	12
Apple	10
Corn	9
Grape	9
Pea	8
Poplar	7
Beet	7
Canola	6
Rubus idaeus	3
Pear	3
Cephalosporium gramineum	2
Tobacco	1
Pepper	1
Peppermint	1

WEST VIRGINIA

Number of field releases	14
Number of field test sites	13

Plants Tested	Number of field releases
Plum	3
Potato	2
Apple	2
Pea	2
Pear	2
Cryphonectria parasitica	2
Poplar	1

WISCONSIN

Number of field releases	534
Number of field test sites	1121

Plants Tested	Number of field releases
Corn	208
Potato	176
Soybean	41
Alfalfa	37
Pseudomonas	12
Pseudomonas syringae	9
Cotton	8
Creeping bentgrass	7
Canola	7
Tomato	6
Rhizobium	4
Poplar	3
Beet	3
Tobacco	3
Rhizobium leguminosarum	3
Rhizobium etli	2
Onion	1
Barrelclover	1
Cranberry	1
Rhizobium fredii	1
Spruce	1

WYOMING

Number of field releases	20
Number of field test sites	36

Plants Tested	Number of field releases
Beet	15
Corn	2
Alfalfa	1
Canola	1
Wheat	1

NATIONAL TOTALS

Number of field releases	15,461
Number of field test sites	39,660
Total estimated acreage	482,225.74

Plants Tested	Number of field releases
Alfalfa	227
Amelanchier laevis	1
Anthurium andreanum	1
Apple	42
Arab. thaliana	16
Arabidopsis	1
Aspergillus flavus	10
Barley	38
Barrelclover	1
Beet	291
Belladonna	6
Bermudagrass	10
Brassica oleracea	18
Brassica rapa	3
Canola	253
Carrot	13
Cassava	2
CBI	1
Cephalosporium gramineum	2
Chrysanthemum	4
Cichorium intybus	1
Citrus sinensis X Poncirus trifoliata	1
Citrus viroid III	1
Clary	2
Clavibacter	14
Clavibacter xyli	3
Coffee	3
Corn	7717
Cotton	1234
Cranberry	1
Creeping bentgrass	276
Cryphonectria parasitica	4
Cucumber	28
Cucurbita texana	2
Dendrobium	3
E. coli	0
Eggplant	7
Festuca arundinacea	9

Plants Tested	Number of field releases
Fusarium graminearum	10
Fusarium moniliforme	3
Fusarium sporotrichioides	1
Gladiolus	2
Grape	51
Grapefruit	5
Heterorhabditis bacteriophora	1
Kentucky bluegrass	54
Lettuce	77
Melon	186
Metaseiulus occidentalis	1
Nicotania attenuata	3
Oat	1
Onion	5
Papaya	16
Paspalum notatum	1
Pea	63
Peanut	27
Pear	8
Pelargonium	10
Pepper	13
Peppermint	1
Perennial ryegrass	3
Persimmon	4
Petunia	32
Pine	18
Pineapple	1
Pink bollworm	1
Plum	3
Poa pratensis X Poa arachnifera	12
Poplar	70
Populus deltoides	8
Potato	1330
Pseudomonas	17
Pseudomonas putida	1
Pseudomonas syringae	13
Rhizobium	4
Rhizobium etli	2
Rhizobium fredii	1
Rhizobium leguminosarum	3
Rhizobium meliloti	0
Rhododendron	3
Rice	234
Rubus idaeus	12
Russian wildrye	3

Plants Tested	Number of field releases
Soybean	1429
Spruce	1
Squash	97
St. Augustine grass	40
Strawberry	45
Sugarcane	41
Sunflower	44
Sweet potato	9
Sweetgum	16
TEV	1
TMV	10
Tobacco	236
Tomato	562
Velvet bentgrass	1
Walnut	12
Watermelon	10
Wheat	333
Xanthomonas	10
Xanthomonas campestris	3
Xanthomonas campestris pv. vesicatoria	1
TOTAL	15,461

APPENDIX D:

Authorized Field Releases by Crop and State or Territory (1987-2002)

Crop	AK	AL	AR	AZ	CA	CO	CT	DE	FL	GA	HI	IA	ID	IL	IN	KS
Alfalfa				2	29	3	1			2		23	24	4	14	2
Amelanchier laevis																
Anthurium andreanum											1					
Apple					10						1					
Arab. thaliana														8		
Arabidopsis														1		
Aspergillus flavus																
Barley					3						2		12	2		
Barrelclover																
Beet				10	25	22						2	34	1		
Belladonna														6		
Bermudagrass										1						
Brassica oleracea					13											
Brassica rapa																
Canola		8		20	47	20			7	25		2	20	7	1	
Carrot					4				4				1	2		
Cassava																
CBI																
Cephalosporium gramineum																
Chrysanthemum					1				2							
Cichorium intybus					1											
Citrus sinensis X Poncirus trifoliata																
Citrus viroid III									1							
Clary																
Clavibacter												1		1		
Clavibacter xyli												1				
Coffee											3					
Corn		42	25	24	133	47	174	144	200	48	1314	822	49	991	416	147
Cotton		88	81	105	55			1	26	80	7			4		
Cranberry																
Creeping bentgrass		4		3	4	3	1	3	2	4		4	1	9	4	2
Cryphonectria parasitica							2									
Cucumber					10					9						

Crop	AK	AL	AR	AZ	CA	CO	CT	DE	FL	GA	HI	IA	ID	IL	IN	KS
Cucurbita texana																
Dendrobium											3					
E. coli																
Eggplant																
Festuca arundinacea															1	
Fusarium graminearum														7	3	
Fusarium moniliforme										1		1		1		
Fusarium sporotrichioides														1		
Gladiolus																
Grape					17				1							
Grapefruit									1							
Heterorhabditis bacteriophora																
Kentucky bluegrass													1			
Lettuce	1			11	56				4	3	1					
Melon				15	76				7	25				1		
Metaseiulus occidentalis									1							
Nicotania attenuata																
Oat												1				
Onion					2											
Papaya									1		11					
Paspalum notatum									1							
Pea		1			9				2	20	1		13			
Peanut		1							2	20	1					
Pear																
Pelargonium					3				1					1		
Pepper					8				4							
Peppermint																
Perennial ryegrass																
Persimmon					4											
Petunia					6				6					3		
Pine											1					
Pineapple											1					
Pink bollworm				1												
Plum																
Poa pratensis X Poa arachnifera																
Poplar										1		2				
Populus deltoides																
Potato	4	8			40	26	1	3	88	1	1		257	5	3	
Pseudomonas		3			1							1				

Crop	AK	AL	AR	AZ	CA	CO	CT	DE	FL	GA	HI	IA	ID	IL	IN	KS
Pseudomonas putida		1														
Pseudomonas syringae		2			1							1				
Rhizobium																
Rhizobium etli																
Rhizobium fredii																
Rhizobium leguminosarum																
Rhizobium meliloti																
Rhododendron							3									
Rice	1		30	1	62				5		15			2		
Rubus idaeus					3											
Russian wildrye																
Soybean		32	97		2		3	43	20	25	25	147		161	89	17
Spruce																
Squash				1	24			1	3	18				1		
St. Augustine grass		2			4				6	4						
Strawberry					31				1							
Sugarcane									10		1					
Sunflower					11	2					6	2		1	3	
Sweet potato		4														
Sweetgum										5						
TEV																
TMV									1							
Tobacco				3	4			2	10	7	5	4		18		1
Tomato		5		1	270			2	137	11	4		1	23	30	
Velvet bentgrass																
Walnut					12											
Watermelon					4				3	1						
Wheat			4	22	14	20			1		14		44	14	6	12
Xanthomonas		6							3					1		
Xanthomonas campestris		1							1					1		
Xanthomonas campestris pv. vesicatoria														1		

Crop	KY	LA	MA	MD	ME	MI	MN	MO	MP	MS	MT	NC	ND	NE	NJ	NM
Alfalfa	1					3	9	2			2		1	5		1
Amelanchier laevis						1										
Anthurium andreanum																
Apple																
Arab. thaliana								1				5				
Arabidopsis																
Aspergillus flavus		5								5						
Barley							1				2		4			
Barrelclover																
Beet						16	34				15		36	17		
Belladonna																
Bermudagrass															9	
Brassica oleracea																
Brassica rapa												3				
Canola						11	17				5	3	29	1		
Carrot						1										
Cassava																
CBI							1									
Cephalosporium gramineum																
Chrysanthemum																
Cichorium intybus																
Citrus sinensis X Poncirus trifoliata																
Citrus viroid III																
Clary												2				
Clavibacter				7			1							4		
Clavibacter xyli				1										1		
Coffee																
Corn	35	16	1	165		102	321	186	3	40	1	104	25	425	15	4
Cotton		71		3	1			27		209		74	1			2
Cranberry																
Creeping bentgrass	5		6	6		8	2	5			2	4		5	81	
Cryphonectria parasitica																
Cucumber						6										
Cucurbita texana																
Dendrobium																
E. coli																
Eggplant															7	
Festuca arundinacea												2				

Crop	KY	LA	MA	MD	ME	MI	MN	MO	MP	MS	MT	NC	ND	NE	NJ	NM
Fusarium graminearum																
Fusarium moniliforme																
Fusarium sporotrichioides																
Gladiolus				2												
Grape																
Grapefruit																
Heterorhabditis bacteriophora															1	
Kentucky bluegrass															19	
Lettuce															1	
Melon						24								1		
Metaseiulus occidentalis																
Nicotania attenuata																
Oat																
Onion																1
Papaya																
Paspalum notatum																
Pea							1									
Peanut																
Pear																
Pelargonium																
Pepper																
Peppermint																
Perennial ryegrass															3	
Persimmon																
Petunia		1					1									
Pine																
Pineapple																
Pink bollworm																
Plum																
Poa pratensis X Poa arachnifera															2	
Poplar	2					2	3	1		1		1			1	
Populus deltoides								1								
Potato	1	1	4	9	142	61	48	4			34	8	81	25	8	14
Pseudomonas																
Pseudomonas putida																
Pseudomonas syringae																
Rhizobium																
Rhizobium etli																
Rhizobium fredii																

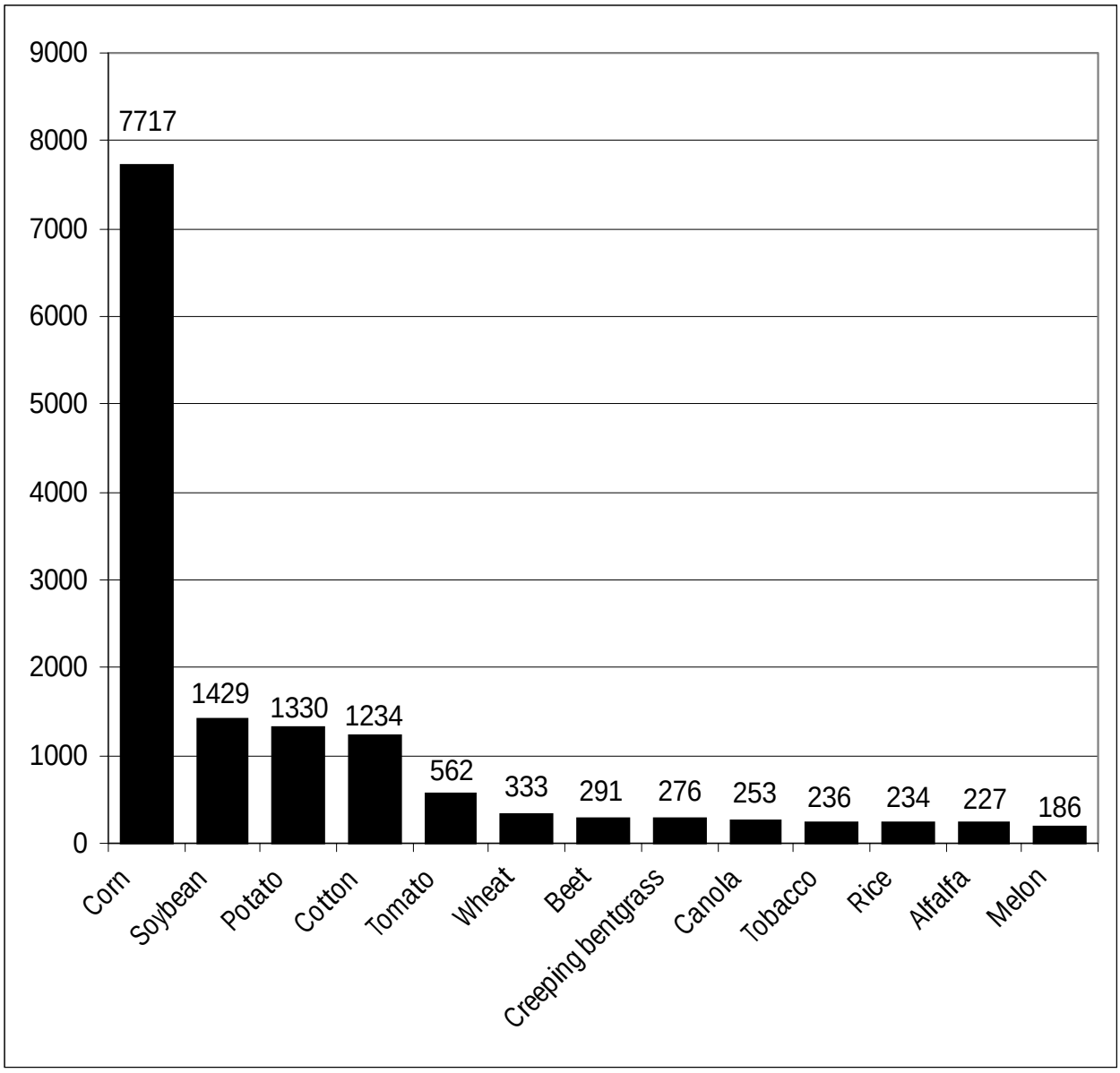
Crop	KY	LA	MA	MD	ME	MI	MN	MO	MP	MS	MT	NC	ND	NE	NJ	NM
Rhizobium leguminosarum																
Rhizobium meliloti																
Rhododendron																
Rice		56						9		17						
Rubus idaeus																
Russian wildrye																
Soybean	25	20		84		29	36	50		69		23	5	39	6	2
Spruce																
Squash				3		9						5		1	3	
St. Augustine grass		2								2		4		2		
Strawberry		3								3						
Sugarcane		19														
Sunflower							3						11	2		
Sweet potato		1														
Sweetgum																
TEV	1															
TMV	6											3				
Tobacco	59	3		1						5		56			3	
Tomato	1			7		6		3				3				
Velvet bentgrass																
Walnut																
Watermelon						2										
Wheat							24				43	3	36	12		
Xanthomonas																
Xanthomonas campestris																
Xanthomonas campestris pv. vesicatoria																

Crop	NY	OH	OK	OR	PA	PR	RI	SC	SD	TN	TX	UT	VA	VI	WA	WI	WV	WY
Alfalfa	8	2	8	4	11				2	1	6	4	1		14	37		1
Amelanchier laevis																		
Anthurium andreanum																		
Apple	11			8											10		2	
Arab. thaliana		1						1										
Arabidopsis																		
Aspergillus flavus																		
Barley															12			
Barrelclover																1		
Beet		1		47					1		3	1	1		7	3		15
Belladonna																		
Bermudagrass																		
Brassica oleracea	3										2							
Brassica rapa																		
Canola				2				8	2	1	3				6	7		1
Carrot											1							
Cassava														2				
CBI																		
Cephalosporium gramineum															2			
Chrysanthemum								1										
Cichorium intybus																		
Citrus sinensis X Poncirus trifoliata											1							
Citrus viroid III																		
Clary																		
Clavibacter																		
Clavibacter xyli																		
Coffee																		
Corn	45	164	21	8	110	751		1	127	122	105		25		9	208		2
Cotton			14			79		66		54	167		11			8		
Cranberry																1		
Creeping bentgrass	8	33		31	3		3	2					5		16	7		
Cryphonectria parasitica																	2	
Cucumber	3																	
Cucurbita texana	2																	
Dendrobium																		
E. coli																		
Eggplant																		
Festuca arundinacea			6															

Crop	NY	OH	OK	OR	PA	PR	RI	SC	SD	TN	TX	UT	VA	VI	WA	WI	WV	WY
Fusarium graminearum																		
Fusarium moniliforme																		
Fusarium sporotrichioides																		
Gladiolus																		
Grape	20										4				9			
Grapefruit											4							
Heterorhabditis bacteriophora																		
Kentucky bluegrass		14		12	4							4						
Lettuce																		
Melon	13	1		14							9							
Metaseiulus occidentalis																		
Nicotania attenuata												3						
Oat																		
Onion											1					1		
Papaya	1					1								2				
Paspalum notatum																		
Pea			3	3											8		2	
Peanut			3															
Pear				3											3		2	
Pelargonium	1	4																
Pepper															1			
Peppermint															1			
Perennial ryegrass																		
Persimmon																		
Petunia	5	9		1														
Pine								17										
Pineapple																		
Pink bollworm																		
Plum																	3	
Poa pratensis X Poa arachnifera		2		2	3							3						
Poplar	1			30				10					4		7	3	1	
Populus deltoides								7										
Potato	46	9	1	79	8		2	5	1		5		16	1	102	176	2	
Pseudomonas																12		
Pseudomonas putida																		
Pseudomonas syringae																9		
Rhizobium																4		
Rhizobium etli																2		
Rhizobium fredii																1		

Crop	NY	OH	OK	OR	PA	PR	RI	SC	SD	TN	TX	UT	VA	VI	WA	WI	WV	WY
Rhizobium leguminosarum																3		
Rhizobium meliloti																		
Rhododendron																		
Rice						13				1	22							
Rubus idaeus				6											3			
Russian wildrye			3															
Soybean		35	2		13	195		12	13	40	14		15			41		
Spruce																1		
Squash	11	1	1	1	1			3		1	6		3					
St. Augustine grass		7						2			5							
Strawberry				7														
Sugarcane											11							
Sunflower									3									
Sweet potato								3						1				
Sweetgum								11										
TEV																		
TMV																		
Tobacco			2		6			7		6	2		28		1	3		
Tomato	20	8		10		8		1			1		4			6		
Velvet bentgrass							1											
Walnut																		
Watermelon																		
Wheat			2	8					18	1					34			1
Xanthomonas																		
Xanthomonas campestris																		
Xanthomonas campestris pv. vesicatoria																		

Crops with the Most Authorized Field Releases (1987-2002)



APPENDIX E:

Acreage of Crops Field Tested (1987-2002)

Crop	Acreage
Alfalfa	4,376
Amelanchier laevis	0
Anthurium andreanum	1
Apple	99
Arab. thaliana	2
Arabidopsis	0
Aspergillus flavus	0
Barley	33
Barrelclover	4
Beet	1,649
Belladonna	1
Bermudagrass	3
Brassica oleracea	9
Brassica rapa	1
Canola	18,908
Carrot	6
Cassava	1
CBI	1
Cephalosporium gramineum	0
Chrysanthemum	4
Cichorium intybus	0
Citrus sinensis X Poncirus trifoliata	0
Citrus viroid III	0
Clary	0
Clavibacter	0
Clavibacter xyli	0
Coffee	0
Corn	163,800

Crop	Acreage
Cotton	133,512
Cranberry	0
Creeping bentgrass	2,269
Cryphonectria parasitica	2
Cucumber	63
Cucumber, Squash	5
Cucurbita texana, Squash	1
Dendrobium	3
E. coli	0
Eggplant	2
Eucalyptus grandis	0
Festuca arundinacea	2
Fusarium graminearum	0
Fusarium graminearum, Fusarium sporotrichioides	0
Fusarium moniliforme	0
Gladiolus	1
Grape	192
Grapefruit	1
Heterorhabditis bacteriophora	0
Kentucky bluegrass	534
Lettuce	166
Lettuce, Tomato	0
Marigold	2
Melon	319
Melon, Squash	3
Melon, Squash, Tomato	0
Metaseiulus occidentalis	34
Nicotania attenuata	3

Crop	Acreage
Oat	0
Onion	2
Papaya	6
Paspalum notatum	1
Pea	29
Peanut	14
Pear	17
Pelargonium	14
Pepper	2
Peppermint	0
Perennial ryegrass	1
Persimmon	4
Petunia	42
Pine	4
Pineapple	0
Pink bollworm	3
Plum	1
Poa pratensis X Poa arachnifera	140
Poplar	90
Poplar, Spruce	0
Populus deltoides	18
Potato	116,343
Pseudomonas	0
Pseudomonas putida	0
Pseudomonas syringae	9
Rhizobium	0
Rhizobium etli, Rhizobium leguminosarum	0
Rhizobium etli, Rhizobium leguminosarum, Rhizobium	0
Rhizobium fredii, Rhizobium leguminosarum	0
Rhododendron	0
Rice	4,693
Rubus idaeus	2
Russian wildrye	1
Safflower	1
Sorghum	1
Soybean	20,494
Squash	110
St. Augustine grass	130
Strawberry	13
Sugarcane	26
Sunflower	202
Sweet potato	10
Sweetgum	21
TEV	0
TMV	70
Tobacco	10,741
Tomato	1,201
Velvet bentgrass	1
Walnut	15
Watermelon	8
Wheat	1,733
Xanthomonas	0
Xanthomonas campestris	0
Xanthomonas campestris pv. vesicatoria	0
TOTAL	482,226

APPENDIX F:

Permits and Notifications by Institution and Year: 1987-2002

Institution	1987
Calgene	4
Du Pont	2
Monsanto	2
Crop Genetics	1

Institution	1988
Monsanto	5
Calgene	3
Agrigenetics	2
Du Pont	2
Sandoz	2
Agracetus	1
Crop Genetics	1
Iowa State U	1
Rohm and Haas	1

Institution	1989
Monsanto	14
Calgene	5
Upjohn	4
Northrup King	3
Iowa State U	2
ARS	1
Auburn U	1
BioTechnica	1
Ciba-Geigy	1
Crop Genetics	1
New York State Exp Stn	1
Pioneer	1
Rohm and Haas	1
U of California / Davis	1
U of Kentucky	1

Institution	1990
Monsanto	14
Calgene	9
Upjohn	7
ARS	6
Crop Genetics	2
DeKalb	2
U of Kentucky	2
Amoco	1
BioTechnica	1
Canners Seed	1
Ciba-Geigy	1
DNA Plant Tech	1
Du Pont	1
Frito Lay	1
Louisiana State U	1
New York State Exp Stn	1
North Carolina State U	1
Pennsylvania State U	1
Pioneer	1
U of California / Davis	1
U of Wisconsin	1
U of Wisconsin / Madison	1
Washington State U	1

Institution	1991
Monsanto	20
Calgene	17
Pioneer	10
Frito Lay	9
Upjohn	5
ARS	4
DNA Plant Tech	4
Ciba-Geigy	3
Du Pont	3
Auburn U	2
Campbell	2
Holdens	2
U of California / Davis	2
Agrigenetics	1
Amoco	1
Applied Starch Tech	1
Biosource	1
BioTechnica	1
Cargill	1
Crop Genetics	1
DeKalb	1
Dow	1
Garst	1
Harris Moran	1
Louisiana State U	1
Montana State U	1
New York State Exp Stn	1
North Carolina State U	1
Northrup King	1
PetoSeed	1
Rogers NK	1
Rohm and Haas	1
U of Florida	1
U of Hawaii / Manoa	1
U of Idaho	1
U of Kentucky	1
U of Wisconsin	1

Institution	1992
Monsanto	41
Pioneer	19
Upjohn	13
Calgene	12
ARS	11
DeKalb	7
Frito Lay	5
Northrup King	5
Holdens	4
Ciba-Geigy	3
PetoSeed	3
Campbell	2
Cargill	2
DNA Plant Tech	2
Hoechst-Roussel	2
ICI	2
InterMountain Canola	2
North Carolina State U	2
Rogers NK	2
Washington State U	2
AgriPro	1
Agritope	1
American Cyanamid	1
Amoco	1
Auburn U	1
Connecticut Ag Exp Stn	1
Cornell U	1
Crop Genetics	1
Harris Moran	1
Heinz	1
Louisiana State U	1
Michigan State U	1
Montana State U	1
New York State Exp Stn	1
Noble Foundation	1
Purdue U	1
Stine Seeds	1
U of Arizona	1
U of Idaho	1
U of Wisconsin / Madison	1

Institution	1993
Monsanto	109
Pioneer	35
Upjohn	28
Du Pont	19
Calgene	15
DeKalb	10
North Carolina State U	10
ARS	9
Ciba-Geigy	9
Northrup King	9
DNA Plant Tech	8
Dairyland Seeds	6
Michigan State U	6
Cargill	5
Delta and Pine Land	5
Frito Lay	5
Hoechst-Roussel	5
New York State Exp Stn	5
AgriPro	3
Agritope	3
American Cyanamid	3
Heinz	3
Holdens	3
ICI	3
Miles	3
U of Idaho	3
U of Kentucky	3
AgrEvo	2
Asgrow	2
Campbell	2
FFR Cooperative	2
Interstate Payco Seed	2
Land O Lakes	2
Louisiana State U	2
Noble Foundation	2
North Dakota State U	2
PanAmerican Seed	2
PetoSeed	2
R J Reynolds	2
U of California / Berkeley	2
U of California / Davis	2
U of Florida	2
U of Wisconsin	2
Agracetus	1
Amer Crystal Sugar	1
Amoco	1
Betaseed	1
Dow	1
Harris Moran	1
InterMountain Canola	1
Jacob Hartz	1
Midwest Oilseeds	1
Mississippi State U	1
Mycogen	1
Purdue U	1
Rogers NK	1
U of Hawaii / Manoa	1
U of Wisconsin / Madison	1
Virginia Tech	1
Washington U	1

Institution	1994
Monsanto	141
Du Pont	93
Pioneer	63
DeKalb	28
Upjohn	28
Calgene	22
Frito Lay	15
DNA Plant Tech	13
Northrup King	13
PetoSeed	13
AgrEvo	12
Asgrow	11
Delta and Pine Land	11
Agracetus	7
North Carolina State U	7
ARS	6
Hunt-Wesson	6
Ciba-Geigy	5
Holdens	5
Michigan State U	5
New York State Exp Stn	5
U of California	5
U of Wisconsin	5
Zeneca	5
Agritope	4
ICI	4
Purdue U	4
U of Florida	4
U of Kentucky	4
Betaseed	3
Dairyland Seeds	3
Mycogen	3
R J Reynolds	3
Rogers	3
U of Idaho	3
All-Tex Seed	2
American Cyanamid	2
Cargill	2
Cornell U	2
Harris Moran	2
Jacob Hartz	2
Rutgers U	2
U of Chicago	2
AgriPro	1
Amer Crystal Sugar	1
Barham Seeds	1
Brownfield Seed	1
Campbell	1
Chembred	1
Connecticut Ag Exp Stn	1
Dow	1
Dunn	1
FFR Cooperative	1
Great Lakes Hybrids	1
Heinz	1
InterMountain Canola	1
Interstate Payco Seed	1
Limagrain	1
Noble Foundation	1
North Dakota State U	1
Ohio State U	1
Rogers NK	1
Seedco	1
U of California / Davis	1
U of Georgia	1
U of Washington	1
U of Wisconsin / Madison	1
Union Camp	1
United Agri Products	1
Van den Bergh Foods	1
VanderHave	1
Washington State U	1
Williams Seed	1

Institution	1995
Monsanto	143
Du Pont	98
Pioneer	65
Northrup King	47
AgrEvo	29
DeKalb	29
Asgrow	24
Agracetus	20
Calgene	19
ARS	17
Delta and Pine Land	15
Holdens	14
DNA Plant Tech	13
Ciba-Geigy	11
PetoSeed	11
Cargill	10
Frito Lay	8
Betaseed	6
North Carolina State U	6
Purdue U	6
Great Lakes Hybrids	5
Hunt-Wesson	5
Michigan State U	5
U of Florida	5
U of Idaho	5
Cornell U	4
New York State Exp Stn	4
Rutgers U	4
Agritope	3
Campbell	3
ICI	3
Mycogen	3
NC+ Hybrids	3
Rogers	3
U of California	3
U of Kentucky	3
Zeneca	3
American Cyanamid	2
Dow	2
Genetic Enterprises	2
Golden Harvest Seeds	2
Harris Moran	2
InterMountain Canola	2
Iowa State U	2
Jacob Hartz	2
Louisiana State U	2
New York State U / Albany	2
Oregon State U	2
PanAmerican Seed	2
Southern Illinois U	2
U of Wisconsin	2
Amer Crystal Sugar	1
Auburn U	1
Bejo	1
Dairyland Seeds	1
Dry Creek	1
Gargiulo	1
Heinz	1
Interstate Payco Seed	1
Nestle	1
New Mexico State U	1
North Dakota State U	1
Ohio State U	1
Plant Science Research	1
R J Reynolds	1
Texas A&M	1
U of California / Davis	1
U of Chicago	1
U of Hawaii	1
U of Minnesota	1
U of Wisconsin / Madison	1
United Agri Products	1
VanderHave	1
Washington State U	1

Institution	1996
Monsanto	102
Pioneer	85
DeKalb	45
Asgrow	29
Agracetus	25
PetoSeed	21
AgrEvo	19
Du Pont	18
ARS	17
Calgene	15
Zeneca	13
Ciba-Geigy	12
U of Chicago	12
Frito Lay	11
Limagrain	11
Cargill	10
Michigan State U	10
Northrup King	10
Holdens	8
Purdue U	7
Rogers	7
Delta and Pine Land	6
DNA Plant Tech	6
NC+ Hybrids	6
Seminis Vegetable Seeds	6
WyFFels Hybrids	6
Betaseed	5
Cornell U	5
Golden Harvest Seeds	5
North Carolina State U	5
U of Florida	5
Washington State U	5
Agritope	4
Becks Superior Hybrids	4
Great Lakes Hybrids	4
Sandoz	4
Southern Illinois U	4
U of Georgia	4
U of Idaho	4
Boyce Thompson Institute	3
Harris Moran	3
ICI	3
Louisiana State U	3
Mycogen	3
Plant Genetics	3
Rutgers U	3
U of Kentucky	3
BHN Research	2
Biosource	2
Campbell	2
Crows	2
Hilleshog	2
ICI Garst	2
Noble Foundation	2
Oregon State U	2
PanAmerican Seed	2
Plant Genetic Systems	2
Sanford Scientific	2
Sunseeds	2
Texas Tech U	2
U of Illinois	2
U of Minnesota	2
U of Wisconsin / Madison	2
VanderHave	2
Amer Crystal Sugar	1
American Cyanamid	1
American Takii	1
Applied Phytologics	1
Boswell	1
Connecticut Ag Exp Stn	1
Coors Brewing	1
FFR Cooperative	1
Genetic Enterprises	1
Iowa State U	1
New Mexico State U	1
New York State U / Albany	1
Plant Science Research	1
Tilak Raj Sawheny	1
Tuskegee U	1
U of Arizona	1
U of California	1
U of California / Davis	1
U of North Carolina	1
U of Wisconsin	1
Union Camp	1

Institution	1997
Monsanto	208
Pioneer	122
Plant Genetic Systems	44
Du Pont	36
AgrEvo	33
DeKalb	27
Calgene	24
Seminis Vegetable Seeds	22
Novartis Seeds	19
ARS	16
Cargill	13
Agritope	11
Asgrow	10
Harris Moran	10
DNA Plant Tech	9
Limagrain	9
Mycogen	9
Oregon State U	8
Stanford U	7
U of California / Davis	7
U of Idaho	7
Agracetus	6
U of Kentucky	6
Betaseed	5
Biosource	4
Delta and Pine Land	4
Frito Lay	4
GenApps	4
Iowa State U	4
NC+ Hybrids	4
Purdue U	4
Rhone-Poulenc	4
Rutgers U	4
Southern Illinois U	4
U of Georgia	4
U of Wisconsin / Madison	4
WyFFels Hybrids	4
Auburn U	3
BHN Research	3
Garst	3
Great Lakes Hybrids	3
Michigan State U	3
North Carolina State U	3
ProdiGene	3
Stine Biotechnology	3
Texas A&M	3
U of Chicago	3
U of Florida	3
U of Minnesota	3
Zeneca	3
American Takii	2
Applied Phytologics	2
Campbell	2
Cornell U	2
Dry Creek	2
Holdens	2
ICI Garst	2
Plant Sciences	2
Pure Seed Testing	2
Sunseeds	2
Tuskegee U	2
U of California / Berkeley	2
U of Hawaii	2
Washington State U	2
Amer Crystal Sugar	1
American Cyanamid	1
Boswell	1
Dow	1
Gargiulo	1
Golden Harvest Seeds	1
Louisiana State U	1
New Mexico State U	1
North Carolina Dept of Agr	1
North Dakota State U	1
Ohio State U	1
Sanford Scientific	1
U of Arizona	1
U of California / Kearney	1
U of Hawaii / Manoa	1
U of Wisconsin	1
VanderHave	1
West Virginia U	1
Western Ag Research	1
Weyerhaeuser	1
Yoder Brothers	1

Institution	1998
Monsanto	293
AgrEvo	209
Pioneer	157
DeKalb	41
Du Pont	37
Novartis Seeds	31
Seminis Vegetable Seeds	26
ARS	25
Calgene	25
Iowa State U	21
U of Idaho	19
Cargill	16
Harris Moran	14
Rutgers U	13
Agritope	12
Mycogen	12
Stine Biotechnology	12
DNA Plant Tech	11
Betaseed	10
Oregon State U	10
Zeneca	10
Garst	9
Limagrain	9
GenApps	8
Rhone-Poulenc	8
Scotts	7
Texas A&M	7
U of Kentucky	7
Cornell U	6
Michigan State U	6
ProdiGene	6
Asgrow	5
Purdue U	5
Texas Tech U	5
U of Arizona	5
U of Chicago	5
U of Minnesota	5
U of Wisconsin	5
Golden Harvest Seeds	4
Louisiana State U	4
Stanford U	4
Tuskegee U	4
U of Florida	4
U of Illinois	4
Coors Brewing	3
NC+ Hybrids	3
New Mexico State U	3
North Carolina State U	3
U of Georgia	3
U of Hawaii	3
Union Camp	3
Washington State U	3
AgraTech Seeds	2
American Takii	2
Auburn U	2
BHN Research	2
Biosource	2
Lipton	2
Michigan Tech U	2
Plant Genetics	2
Southern Illinois U	2
U of California/Davis	2
United States Sugar	2
Westvaco	2
American Cyanamid	1
Applied Phytologics	1
Boyce Thompson Institute	1
Cook C Rutgers U	1
Dairyland Seeds	1
Dow	1
Great Lakes Hybrids	1
Hunt-Wesson	1
Illinois U	1
Montana State U	1
New York State Exp Stn	1
Noble Foundation	1
Ohio State U	1
Pebble Ridge Vineyards	1
Sanford Scientific	1
Sunseeds	1
Thermo Trilogy	1
U of California	1
U of Nebraska	1
Virginia Tech	1
Western Ag Research	1
W-L Research	1

Institution	1999
Monsanto	424
Pioneer	63
Seminis Vegetable Seeds	57
AgrEvo	40
ProdiGene	25
Stine Biotechnology	22
U of Idaho	22
Iowa State U	21
ARS	20
Rhone-Poulenc	19
U of Kentucky	16
Harris Moran	15
Rutgers U	15
Agritope	14
Mycogen	14
U of California / Davis	13
Stanford U	12
Zeneca	12
Cook C Rutgers U	11
U of Florida	11
Novartis Seeds	10
Oregon State U	10
Westvaco	10
Cornell U	9
DNA Plant Tech	9
Du Pont	9
U of Minnesota	7
Applied Phytologics	6
Dow	6
AgriVitis	5
Boyce Thompson Institute	5
Calgene	5
Cargill	5
Louisiana State U	5
Montana State U	5
Ohio State U	5
Scotts	5
U of California	5
U of Hawaii / Manoa	5
CropTech	4
Southern Illinois U	4
Texas Tech U	4
U of Chicago	4
U of Georgia	4
United States Sugar	4
BHN Research	3
Garst	3
Limagrain	3
New Mexico State U	3
New York State U / Geneseo	3
Texas A&M	3
U of Hawaii	3
U of North Carolina	3
American Takii	2
Betaseed	2
DeKalb	2
Dry Creek	2
Golden Harvest Seeds	2
International Paper	2
New York State U / Albany	2
Noble Foundation	2
North Dakota State U	2
Purdue U	2
Washington State U	2
Agracetus	1
BioKyowa	1
Biosource	1
Cal West Seeds	1
Colorado State U	1
Heinz	1
Lipton	1
North Carolina State U	1
Pennsylvania State U	1
Plant Sciences	1
Tuskegee U	1
U of California / Berkeley	1
U of California / San Diego	1
U of Illinois	1
U of Nebraska	1
U of South Carolina	1
U of Washington	1
U of Wisconsin	1
W-L Research	1

Institution	2000
Monsanto	463
Aventis	56
Seminis Vegetable Seeds	41
ARS	33
Dow	26
ProdiGene	24
Rutgers U	24
Stanford U	23
Stine Biotechnology	22
Novartis Seeds	19
Scotts	17
Iowa State U	16
Pioneer	15
Oregon State U	13
U of Idaho	13
DNA Plant Tech	12
Zeneca	11
Betaseed	10
Westvaco	10
U of Florida	9
Agritope	8
CBI	8
Washington State U	7
Applied Phytologics	6
BHN Research	6
Harris Moran	6
ExSeed Genetics	5
U of North Carolina	5
Cargill	4
GenApps	4
Limagrain	4
Texas Tech U	4
U of Georgia	4
U of Kentucky	4
Colorado State U	3
Cornell U	3
CropTech	3
Duke U	3
Montana State U	3
New Mexico State U	3
U of Arizona	3
U of Connecticut	3
U of Minnesota	3
Anton Caratan & Son	2
Du Pont	2
Integrated Plant Genetics	2
Louisiana State U	2
Michigan Tech U	2
New York State U / Geneseo	2
Noble Foundation	2
Ohio State U	2
U of California	2
U of Nebraska / Lincoln	2
U of Rhode Island	2
U of Wisconsin	2
Virginia Tech	2
APHIS	1
Ball Helix	1
Bowdoin C	1
Cal West Seeds	1
Demegen	1
Dry Creek	1
International Paper	1
Large Scale Biology	1
Lipton	1
Michigan State U	1
Mississippi State U	1
New York State U / Albany	1
North Carolina State U	1
Plant Sciences	1
R J Reynolds	1
SemBioSys Genetics	1
Southern Illinois U	1
Southern Piedmont AREC	1
Syngenta	1
U of California / Davis	1
U of California / Riverside	1
U of Chicago	1
U of Illinois	1
U of Nebraska	1
Wilson Genetics	1
W-L Research	1
Wright State U	1

Institution	2001
Monsanto	623
Aventis	43
Syngenta	38
ARS	36
Dow	31
ProdiGene	28
Scotts	21
Rutgers U	20
Seminis Vegetable Seeds	20
Pioneer	16
Stine Biotechnology	16
Vector Tobacco	15
Iowa State U	14
Michigan State U	14
Stanford U	14
U of Idaho	13
ExSeed Genetics	12
Betaseed	11
AgReliant Genetics	10
Westvaco	10
U of Georgia	9
Louisiana State U	8
Texas Tech U	8
U of Arizona	8
U of Kentucky	7
Applied Phytologics	6
CBI	6
CropTech	6
U of Florida	6
BHN Research	5
Forage Genetics International	5
Harris Moran	5
Noble Foundation	5
New York State U / Geneseo	4
Oregon State U	4
U of Illinois	4
U of Nebraska / Lincoln	4
U of Wisconsin	4
ArborGen	3
BASF	3
Cargill	3
DNA Plant Tech	3
Exelixis	3
Hawaii Agriculture Research Ctr	3
North Carolina State U	3
U of California	3
U of Connecticut	3
U of Rhode Island	3
United Agri Products	3
Washington State U	3
APHIS	2
Cornell U	2
Duke U	2
Goertzen Seed Research	2
Max Planck Ins Chem Ecology	2
Montana State U	2
Purdue U	2
Texas A&M	2
U of California / Berkeley	2
U of Chicago	2
U of Minnesota	2
U of Virgin Islands	2
Boyce Thompson Institute	1
Cal West Seeds	1
Colorado State U	1
Demegen	1
Du Pont	1
Garst	1
GenApps	1
Horan Bros. Agri. Enterprises	1
Interstate Payco Seed	1
Kansas State U	1
Large Scale Biology	1
Mendel Biotechnology	1
R J Reynolds	1
Southern Piedmont AREC	1
U of California / Davis	1
U of Hawaii	1
U of North Carolina	1
U of Puerto Rico	1
United States Sugar	1
Zeneca	1

Institution	2002
Monsanto	703
Scotts	56
Aventis	37
Syngenta	35
ARS	23
Dow	23
Iowa State U	21
Biogemma	15
BASF	13
U of Nebraska / Lincoln	13
CBI	11
ArborGen	10
BHN Research	10
Seminis Vegetable Seeds	10
U of Arizona	10
Bayer CropScience	9
Pioneer	9
Betaseed	7
Oregon State U	7
ProdiGene	7
Rutgers U	7
Stine Biotechnology	7
U of California	7
U of Florida	7
U of Idaho	7
Vector Tobacco	7
Hawaii Agriculture Research Ce	5
Kansas State U	5
U of Kentucky	5
Louisiana State U	4
Montana State U	4
Noble Foundation	4
U of Georgia	4
Cameron Nursery	3
CropTech	3
Harris Moran	3
Purdue U	3
U of California / San Diego	3
U of Illinois	3
U of Wisconsin	3
Ventria Bioscience	3
Abbott and Cobb	2
Garst	2
Meristem Therapeutics	2
Michigan State U	2
North Carolina State U	2
Pennsylvania State U	2
PlantGenix, Inc.	2
Southern Piedmont AREC	2
Stanford U	2
Texas A&M	2
Texas Agricultural Exp Stn	2
Texas Tech U	2
U of Missouri	2
U of Tennessee	2
AgraTech Seeds	1
AgReliant Genetics	1
Arcadia Biosciences	1
Arizona State U	1
Boyce Thompson Institute	1
Cal West Seeds	1
Cold Spring Harbor Lab	1
Cornell U	1
Dry Creek	1
Emlay and Associates	1
Forage Genetics International	1
Goertzen Seed Research	1
Interstate Payco Seed	1
Max Planck Ins Chem Ecology	1
Mendel Biotechnology	1
North Dakota State U	1
Ohio State U	1
Targeted Growth, Inc.	1
U of California / Berkeley	1
U of Hawaii	1
U of Virgin Islands	1
U of Wisconsin / Madison	1
Virginia Tech	1
Washington State U	1
Westvaco	1

APPENDIX G:

Percentage of Approved Field Releases Containing Confidential Business Information (CBI): 1987-2002

Year	Total Number of Permits Approved	Number with CBI	% Permits Containing CBI
1987	9	0	0%
1988	18	0	0%
1989	38	0	0%
1990	58	7	12%
1991	107	16	15%
1992	150	49	33%
1993	306	133	43%
1994	593	222	37%
1995	681	250	37%
1996	626	250	40%
1997	744	387	52%
1998	1086	673	62%
1999	986	643	65%
2000	936	621	66%
2001	1121	746	67%
2002	1112	769	69%
Total	8571	4766	56%

APPENDIX H:

Applications for Field Releases of "Biopharm" Crops: 1987-2002

Institution	Crop	Application Received	Status	Permit / Notification Issued	Effective	Phenotype(s)	Release Location(s)	Acreage	Begin release	End release
Meristem Therapeutics	Corn	5/21/02	Issued	06/05/02		Pharmaceutical proteins produced	KY	1		
ProdiGene	Corn	4/23/02	Acknowledged		05/23/02	Novel protein produced	NE	5	04/23/02	04/15/03
U of Kentucky	Tobacco	4/18/02	Issued	05/09/02		Pharmaceutical proteins produced	KY	0.2		
Meristem Therapeutics	Corn	4/18/02	Issued	05/21/02		Pharmaceutical proteins produced	VA	5		
Emlay and Associates	Safflower	4/9/02	Acknowledged		05/09/02	Novel protein produced	ND	1	05/03/02	09/30/02
ProdiGene	Corn	3/22/02	Acknowledged		04/21/02	Novel protein produced	IL, MN, NE, TX		04/23/02	04/15/03
ProdiGene	Corn	3/22/02	Acknowledged		04/21/02	Novel protein produced	IL, NE		04/23/02	12/31/03
ProdiGene	Corn	3/22/02	Acknowledged		04/21/02	Novel protein produced	IL, NE		04/23/02	12/31/02
ProdiGene	Corn	3/22/02	Acknowledged		04/21/02	Novel protein produced	IL, NE, SD		04/23/02	04/15/03
ProdiGene	Corn	3/22/02	Acknowledged		04/21/02	Novel protein produced	NE		04/23/02	12/31/02
CropTech	Tobacco	3/21/02	Issued	05/07/02		Pharmaceutical proteins produced	SC, VA	0.5		
Dow	Corn	3/12/02	Issued	06/07/02		Pharmaceutical proteins produced	AZ, CA			
Pioneer	Corn	1/23/02	Issued	04/10/02		Altered maturing; Fertility altered; Increased stalk strength; Ear mold resistant; Phosphinothricin tolerant; Coleopteran resistant; Lepidopteran resistant; Visual marker; Increased transformation frequency; Industrial enzyme produced; Novel protein produced; Animal feed quality improved; Fumonisin degradation	CA, DE, GA, IA, IL, IN, KS, MD, MI, MN, MO, NC, ND, NE, NY, OH, PA, PR, SD, TN, TX, WI	508		
Pioneer	Soybean	1/23/02	Issued	04/10/02		Fungal susceptibility; Sclerotinia resistant; Increased transformation frequency; Novel protein produced; Animal feed quality improved; Yield increased	DE, IA, IL, MD, MI, MN, OH, PR	182		
ProdiGene	Corn	11/20/01	Acknowledged		12/20/01	Novel protein produced	HI		12/26/01	04/30/02
Hawaii Agriculture Research Ce	Sugarcane	11/2/01	Issued	01/11/02		Pharmaceutical proteins produced	HI	0.5		
Monsanto	Corn	9/14/01	Issued	01/11/02		Pharmaceutical proteins produced	HI	9		

Institution	Crop	Application Received	Status	Permit / Notification Issued	Effective	Phenotype(s)	Release Location(s)	Acreage	Begin release	End release
ProdiGene	Corn	8/17/01	Acknowledged		09/16/01	Novel protein produced	FL		09/01/01	04/30/02
Dow	Corn	7/31/01	Issued	10/23/01		Pharmaceutical proteins produced	HI	7.9		
Applied Phytologics	Rice	7/25/01	Issued			Novel protein produced; Pharmaceutical proteins produced	HI			
ProdiGene	Corn	7/13/01	Acknowledged		08/12/01	Novel protein produced	HI		11/15/01	03/20/02
ProdiGene	Corn	7/13/01	Acknowledged		08/12/01	Novel protein produced	HI		11/15/01	03/20/02
ProdiGene	Corn	7/13/01	Acknowledged		08/12/01	Novel protein produced	HI		11/15/01	03/20/02
ProdiGene	Corn	7/12/01	Acknowledged		07/22/01	Novel protein produced	FL			
ProdiGene	Corn	7/9/01	Issued	10/05/01		Pharmaceutical proteins produced	FL			
ProdiGene	Corn	7/9/01	Acknowledged		08/08/01	Novel protein produced	FL		09/01/01	04/30/02
ProdiGene	Corn	7/6/01	Issued	11/13/01		Pharmaceutical proteins produced	HI	0.4		
Iowa State U	Corn	5/2/01	Issued	06/14/01		Pharmaceutical proteins produced	IA	0.2		
ProdiGene	Corn	4/24/01	Issued	07/12/01		Pharmaceutical proteins produced	HI	1		
CropTech	Tobacco	3/15/01	Issued	05/11/01		Pharmaceutical proteins produced	VA			
CropTech	Tobacco	3/15/01	Issued	05/11/01		Pharmaceutical proteins produced	VA			
Large Scale Biology	TMV	2/27/01	Issued	04/25/01		Pharmaceutical proteins produced	KY			
Horan Bros. Agri. Enterprises	Corn	2/26/01	Issued	04/25/01		Pharmaceutical proteins produced	IA	33.2		
ProdiGene	Corn	2/14/01	Acknowledged		03/16/01	Novel protein produced	NE	0.12	05/10/01	10/15/01
ProdiGene	Corn	2/14/01	Acknowledged		03/16/01	Novel protein produced	NE	0.06	05/10/01	10/15/01
ProdiGene	Corn	2/14/01	Acknowledged		03/16/01	Novel protein produced	NE	0.54	05/10/01	10/15/01
ProdiGene	Corn	2/14/01	Acknowledged		03/16/01	Novel protein produced	NE	0.36	05/10/01	10/15/01
ProdiGene	Corn	2/14/01	Acknowledged		03/16/01	Novel protein produced	NE	0.75	05/10/01	10/15/01
ProdiGene	Corn	2/14/01	Acknowledged		03/16/01	Novel protein produced	NE	0.15	05/10/01	10/15/01
ProdiGene	Corn	2/14/01	Acknowledged		03/16/01	Novel protein produced	NE	0.12	05/10/01	10/15/01
ProdiGene	Corn	2/1/01	Acknowledged		03/03/01	Novel protein produced	TX	0.5	03/15/01	07/20/01
Applied Phytologics	Rice	1/29/01	Issued	04/19/01		Novel protein produced; Pharmaceutical proteins produced	CA	100		
ProdiGene	Corn	1/23/01	Issued	05/08/01		Pharmaceutical proteins produced	NE	53.5		
ProdiGene	Corn	1/23/01	Issued	05/08/01		Pharmaceutical proteins produced	NE	0.25		
Pioneer	Corn	1/22/01	Issued	04/13/01		Altered maturing; Fertility altered; Fumonisin degradation; Increased stalk strength; Yield increased; Ear mold resistant; Phosphinothricin tolerant; Lepidopteran resistant; Industrial enzyme & Novel protein produced; Animal feed quality improved	AL, CA, CO, DE, FL, GA, IA, IL, IN, KS, KY, LA, MD, MI, MN, MO, NC, ND, NE, OH, OK, PA, PR, SD, TN, TX, WI			

Institution	Crop	Application Received	Status	Permit / Notification Issued	Effective	Phenotype(s)	Release Location(s)	Acreage	Begin release	End release
Pioneer	Corn	1/22/01	Issued	04/13/01		Yield increased; Ear mold resistant; Phosphinothricin tolerant; Coleopteran resistant; Lepidopteran resistant; Industrial enzyme produced; Novel protein produced; Visual marker; Animal feed quality improved	HI			
ProdiGene	Corn	1/16/01	Issued	04/17/01		Pharmaceutical proteins produced	IA, KS, TX	10		
ProdiGene	Corn	1/16/01	Issued	04/19/01		Pharmaceutical proteins produced	NE	0.7		
ProdiGene	Corn	1/16/01	Issued	04/19/01		Pharmaceutical proteins produced	NE	0.25		
ProdiGene	Corn	1/12/01	Acknowledged		02/11/01	Novel protein produced	MN	1	04/15/01	10/31/01
ProdiGene	Corn	1/12/01	Acknowledged		02/11/01	Novel protein produced	MN	1	04/15/01	10/31/01
Monsanto	Corn	12/28/00	Issued	03/21/01		Pharmaceutical proteins produced	CA, MO, WA, WI	33.4		
Monsanto	Corn	12/28/00	Issued	03/21/01		Pharmaceutical proteins produced	CA, MO, WA, WI	32		
Washington State U	Barley	11/29/00	Issued	03/22/01		Pharmaceutical proteins produced	WA	3		
ProdiGene	Corn	8/15/00	Acknowledged		09/14/00	Novel protein produced	FL	0.25	10/01/00	04/15/01
Applied Phytologics	Wheat	8/15/00	Issued	10/10/00		Novel protein produced	HI			
Applied Phytologics	Barley	8/15/00	Issued	10/10/00		Novel protein produced	HI			
ProdiGene	Corn	8/15/00	Acknowledged		09/14/00	Novel protein produced	PR	0.06	11/15/00	03/30/01
ProdiGene	Corn	8/15/00	Acknowledged		09/14/00	Novel protein produced	PR	0.06	11/15/00	03/30/01
ProdiGene	Corn	8/15/00	Acknowledged		09/14/00	Novel protein produced	PR	0.07	11/15/00	03/30/01
ProdiGene	Corn	8/11/00	Acknowledged		09/10/00	Novel protein produced	PR	0.33	11/15/00	03/30/01
ProdiGene	Corn	8/8/00	Acknowledged		09/07/00	Novel protein produced	HI	1	10/01/00	09/30/01
ProdiGene	Corn	8/8/00	Issued	11/03/00		Pharmaceutical proteins produced	PR			
Applied Phytologics	Rice	8/4/00	Issued	10/06/00		Novel protein produced	HI			
Monsanto	Corn	7/25/00	Issued	12/01/00		Pharmaceutical proteins produced	HI	15		
Monsanto	Corn	7/21/00	Issued	11/03/00		Pharmaceutical proteins produced	FL, PR	15		
Monsanto	Corn	7/21/00	Issued	11/03/00		Pharmaceutical proteins produced	FL, PR	15		
Monsanto	Corn	7/21/00	Issued	11/03/00		Pharmaceutical proteins produced	HI	15		
ProdiGene	Corn	7/21/00	Issued	10/13/00		Pharmaceutical proteins produced	HI	0.1		
ProdiGene	Corn	7/13/00	Issued	08/23/00		Novel protein produced	FL	0.5		
ProdiGene	Corn	7/10/00	Acknowledged		08/09/00	Novel protein produced	FL	13	09/01/00	03/15/01
ProdiGene	Corn	5/1/00	Issued	07/14/00		Pharmaceutical proteins produced	HI			
ProdiGene	Corn	5/1/00	Acknowledged		05/31/00	Novel protein produced	HI	0.15	07/25/00	11/30/00
ProdiGene	Corn	4/18/00	Acknowledged		05/18/00	Novel protein produced	NE	10	05/20/00	10/15/00
ProdiGene	Corn	3/13/00	Issued	05/26/00		Pharmaceutical proteins produced	NE	2		

Institution	Crop	Application Received	Status	Permit / Notification Issued	Effective	Phenotype(s)	Release Location(s)	Acreage	Begin release	End release
CropTech	Tobacco	3/10/00	Issued	04/19/00		Pharmaceutical proteins produced	VA			
CropTech	Tobacco	3/10/00	Issued	04/19/00		Pharmaceutical proteins produced	VA			
Applied Phytologics	Rice	3/9/00	Issued	05/15/00		Pharmaceutical proteins produced; Novel protein produced	CA	7		
ProdiGene	Corn	3/7/00	Issued	05/01/00		Pharmaceutical proteins produced	IA	40		
ProdiGene	Corn	3/7/00	Issued	04/26/00		Pharmaceutical proteins produced	NE			
ProdiGene	Corn	3/7/00	Acknowledged		04/06/00	Novel protein produced	NE	21.2	05/07/00	10/15/00
ProdiGene	Corn	3/7/00	Acknowledged		04/06/00	Novel protein produced	NE	4.12	05/07/00	10/15/00
ProdiGene	Corn	3/7/00	Acknowledged			Novel protein produced	NE	0.1	05/07/00	10/15/00
ProdiGene	Corn	2/29/00	Acknowledged		03/30/00	Novel protein produced	NE	1.46	05/07/00	10/15/00
Applied Phytologics	Wheat	2/28/00	Issued	05/04/00		Novel protein produced; Nutritional quality altered	ID	3		
Applied Phytologics	Barley	2/23/00	Issued	04/18/00		Novel protein produced	ID	3		
Large Scale Biology	TMV	2/18/00	Issued	05/01/00		Pharmaceutical proteins produced	KY			
ProdiGene	Corn	2/18/00	Acknowledged		03/19/00	Novel protein produced	TX	2	03/15/00	07/20/00
ProdiGene	Corn	2/18/00	Acknowledged		03/19/00	Novel protein produced	TX	25	01/25/00	02/05/00
Pioneer	Corn	1/21/00	Issued	03/31/00		Altered maturing; Yield increased; Ear mold resistant; Smut resistant; Cyanamide tolerance; Phosphinothricin tolerant; Coleopteran resistant; Lepidopteran resistant; Industrial enzyme produced; Novel protein produced; Animal feed quality improved; Fumonisin degradation	CA, DE, GA, HI, IA, IL, IN, KS, MD, MI, MN, MO, NC, ND, NE, PA, PR, SD, TN, TX, WI			
Pioneer	Soybean	1/21/00	Issued	03/31/00		Altered maturing; Yield increased; Ear mold resistant; Cyanamide tolerant; Phosphinothricin tolerant; Coleopteran resistant; Lepidopteran resistant; Industrial enzyme produced; Novel protein produced; Animal feed quality improved; Fumonisin degradation	DE, HI, IA, IL, IN, MD, MI, MN, MO, NE, NJ, OH, PA, PR, TN, TX, WI			
Pioneer	Soybean	1/21/00	Issued	03/30/00		Altered maturing; Yield increased; Ear mold resistant; Cyanamide tolerant; Phosphinothricin tolerant; Coleopteran resistant; Lepidopteran resistant; Industrial enzyme produced; Novel protein produced; Animal feed quality improved; Fumonisin degradation	HI			

Institution	Crop	Application Received	Status	Permit / Notification Issued	Effective	Phenotype(s)	Release Location(s)	Acreage	Begin release	End release
Pioneer	Corn	1/21/00	Issued	03/30/00		Altered maturing; Yield increased; Ear mold resistant; Smut resistant; Cyanamide tolerant; Phosphinothricin tolerant; Coleopteran resistant; Lepidopteran resistant; Industrial enzyme produced; Novel protein produced; Animal feed quality improved; Fumonisin degradation	HI			
ProdiGene	Corn	12/9/99	Issued	02/22/00		Pharmaceutical proteins produced	HI			
ProdiGene	Corn	12/6/99	Acknowledged		01/05/00	Novel protein produced	HI	12.2	03/01/00	07/15/00
ProdiGene	Corn	12/6/99	Acknowledged		01/05/00	Antibody produced	HI	0.13	01/06/00	03/31/00
ProdiGene	Corn	11/3/99	Issued	11/18/99		Pharmaceutical proteins produced	FL			
ProdiGene	Corn	10/29/99	Acknowledged		11/28/99	Novel protein produced	FL	20	11/18/99	03/30/00
Pioneer	Corn	10/21/99	Acknowledged		11/20/99	Visual marker; Novel protein produced; Phosphinothricin tolerant	HI		11/20/99	11/20/00
Pioneer	Corn	10/21/99	Acknowledged		11/20/99	Visual marker; Novel protein produced; Phosphinothricin tolerant	PR	10	11/20/99	11/20/00
ProdiGene	Corn	10/6/99	Issued	11/18/99		Pharmaceutical proteins produced	PR			
ProdiGene	Corn	10/6/99	Issued	11/18/99		Pharmaceutical proteins produced	PR	0.2		
ProdiGene	Corn	10/5/99	Acknowledged		11/04/99	Novel protein produced	HI	0.25	11/01/99	03/01/00
ProdiGene	Corn	10/1/99	Acknowledged		10/31/99	Novel protein produced	PR	0.35	11/25/99	03/20/00
Applied Phytologics	Rice	9/29/99	Issued	10/28/99		Pharmaceutical proteins produced	HI			
Applied Phytologics	Rice	9/29/99	Issued	10/28/99		Pharmaceutical proteins produced	HI			
ProdiGene	Corn	9/28/99	Acknowledged		10/28/99	Novel protein produced	PR	0.16	11/25/99	03/20/00
ProdiGene	Corn	9/28/99	Acknowledged		10/28/99	Novel protein produced	PR	0.013	11/25/99	03/20/00
ProdiGene	Corn	9/28/99	Acknowledged		10/28/99	Antibody produced	PR	0.33	11/15/99	03/20/00
ProdiGene	Corn	9/28/99	Acknowledged		10/28/99	Novel protein produced	PR	0.28	11/25/99	03/20/00
ProdiGene	Corn	5/25/99	Acknowledged		06/24/99	Novel protein produced	TX	15	06/15/99	11/30/99
Iowa State U	Corn	4/16/99	Acknowledged		05/16/99	Novel protein produced	IA		06/06/99	03/01/00
Monsanto	Soybean	3/15/99	Acknowledged		04/14/99	Industrial enzyme produced	AR, MD, WI	6	04/01/99	04/01/00
ProdiGene	Corn	2/24/99	Acknowledged		03/26/99	Novel protein produced	IA, NE	4	05/01/99	10/15/99
ProdiGene	Corn	2/24/99	Acknowledged		03/26/99	Novel protein produced	NE	0.2	05/01/99	10/15/99
ProdiGene	Corn	2/24/99	Acknowledged		03/26/99	Novel protein produced	NE	0.2	05/01/99	10/15/99
ProdiGene	Corn	2/24/99	Acknowledged		03/26/99	Novel protein produced	NE	2	05/01/99	10/15/99
ProdiGene	Corn	2/24/99	Acknowledged		03/26/99	Novel protein produced	NE	0.05	05/01/99	10/15/99
ProdiGene	Corn	2/24/99	Acknowledged		03/26/99	Novel protein produced	NE	12	05/01/99	10/15/99

Institution	Crop	Application Received	Status	Permit / Notification Issued	Effective	Phenotype(s)	Release Location(s)	Acreage	Begin release	End release
ProdiGene	Corn	2/24/99	Acknowledged		03/26/99	Novel protein produced	PR	0.6	03/12/99	06/25/99
Agracetus	Corn	2/19/99	Issued	04/14/99		Pharmaceutical proteins produced	IA, IN, WI	24		
Biosource	TMV	2/17/99	Issued	04/30/99		Pharmaceutical proteins produced	KY	32		
CropTech	Tobacco	2/10/99	Issued	03/08/99		Pharmaceutical proteins produced	VA	0.4		
CropTech	Tobacco	2/10/99	Issued	03/08/99		Pharmaceutical proteins produced	VA	0.4		
ProdiGene	Corn	2/3/99	Issued	03/04/99		Pharmaceutical proteins produced	IA			
ProdiGene	Corn	2/3/99	Issued	03/03/99		Pharmaceutical proteins produced	IA			
ProdiGene	Corn	2/3/99	Issued	03/03/99		Novel protein produced	IA			
ProdiGene	Corn	12/22/98	Acknowledged		01/21/99	Novel protein produced	PR	0.1	02/20/99	05/15/99
Monsanto	Corn	10/1/98	Issued	02/03/99		Pharmaceutical proteins produced	FL, TX	10		
Monsanto	Corn	10/1/98	Issued	02/04/99		Pharmaceutical proteins produced	HI	1		
ProdiGene	Corn	9/30/98	Acknowledged		10/30/98	Novel protein produced	PR	0.35	11/01/98	04/30/98
ProdiGene	Corn	9/30/98	Acknowledged		10/30/98	Novel protein produced	PR	0.35	11/01/98	04/30/99
ProdiGene	Corn	9/14/98	Issued	11/25/98		Pharmaceutical proteins produced	PR			
Biosource	TEV	4/30/98	Issued	07/15/98		Pharmaceutical proteins produced	KY	0.25		
Limagrain	Corn	4/27/98	Issued	06/10/98		Pharmaceutical proteins produced	IA, IL	0.5		
Limagrain	Corn	4/27/98	Issued	06/12/98		Pharmaceutical proteins produced	IL	0.25		
Limagrain	Corn	4/27/98	Issued	06/12/98		Pharmaceutical proteins produced	IN	0.5		
Limagrain	Corn	4/27/98	Issued	06/12/98		Pharmaceutical proteins produced	IN	0.2		
ProdiGene	Corn	3/26/98	Acknowledged		04/25/98	Novel protein produced	NE	4	05/01/98	10/15/98
Monsanto	Corn	3/9/98	Acknowledged		04/08/98	Antibody produced	HI	6	04/10/98	04/10/99
Monsanto	Corn	3/9/98	Acknowledged		04/08/98	Antibody produced	IA, ID, IN, KS, NE, OH, WI	204	04/10/98	04/10/99
Biosource	TMV	3/1/98	Issued	04/24/98		Pharmaceutical proteins produced	KY	30		
Applied Phytologics	Rice	1/8/98	Issued	02/25/98		Pharmaceutical proteins produced	CA			
Applied Phytologics	Rice	12/29/97	Issued	02/25/98		Pharmaceutical proteins produced	CA			
ProdiGene	Tomato	10/28/97	Issued	01/29/98		Pharmaceutical proteins produced	TX	1		
Biosource	TMV	10/24/97	Issued	11/18/97		Pharmaceutical proteins produced	FL	1.5		
ProdiGene	Corn	9/10/97	Acknowledged		10/10/97	Novel protein produced	PR	0.2	10/09/97	03/01/98
Agracetus	Corn	6/13/97	Acknowledged		07/13/97	Antibody produced	TX	1	07/11/97	07/11/98
Agracetus	Corn	5/28/97	Acknowledged		06/27/97	Antibody produced	IN, KS, MO, OH, OK	5	06/23/97	06/23/98
Agracetus	Corn	4/23/97	Acknowledged		05/23/97	Antibody produced	IA, IN, WI	5.25	05/22/97	05/22/98
ProdiGene	Corn	4/8/97	Acknowledged		05/08/97	Novel protein produced	NE	5	05/01/97	10/31/97
U of Wisconsin / Madison	Alfalfa	2/21/97	Issued	04/23/97		Industrial enzymes produced	WI			
Biosource	TMV	2/14/97	Issued	04/22/97		Pharmaceutical proteins produced	KY	6		

Institution	Crop	Application Received	Status	Permit / Notification Issued	Effective	Phenotype(s)	Release Location(s)	Acreage	Begin release	End release
Applied Phytologics	Rice	12/20/96	Issued	03/31/97		Pharmaceutical proteins produced	CA			
Agracetus	Corn	11/12/96	Acknowledged		12/12/96	Antibody produced	PR	3	12/15/96	12/15/97
Agracetus	Corn	11/12/96	Acknowledged		12/12/96	Antibody produced	PR	3	12/15/96	12/12/97
Agracetus	Soybean	10/3/96	Acknowledged		11/02/96	Industrial enzyme produced	WI	0.2	11/04/96	11/04/97
Pioneer	Canola	8/2/96	Issued	09/17/96		Pharmaceutical proteins produced	CA			
Agracetus	Soybean	7/16/96	Acknowledged		08/15/96	Antibody produced; Novel protein produced	WI	0.1	08/15/96	08/16/97
Agracetus	Soybean	7/16/96	Acknowledged		08/15/96	Industrial enzyme produced	WI	0.1	08/15/96	08/15/97
Biosource	Tobacco	7/2/96	Acknowledged		08/01/96	Novel protein produced	KY	20	07/27/96	10/31/01
Agracetus	Soybean	6/20/96	Acknowledged		07/20/96	Antibody produced	PR	1	07/18/96	07/18/97
Agracetus	Soybean	4/22/96	Acknowledged		05/22/96	Antibody produced	AR, IL, MD	0.3	05/20/96	05/20/97
Agracetus	Soybean	4/22/96	Acknowledged		05/22/96	Industrial enzyme produced	AR, IL, MD, WI	0.3	05/20/96	05/20/97
Agracetus	Soybean	4/22/96	Acknowledged		05/22/96	Antibody produced	MD	0.1	05/20/96	05/20/97
Agracetus	Corn	4/4/96	Acknowledged		05/04/96	Antibody produced	IA, MD, WI	14	05/01/96	05/01/97
Agracetus	Corn	4/4/96	Acknowledged		05/04/96	Antibody produced	WI	1	05/01/96	05/01/97
Pioneer	Corn	3/19/96	Acknowledged		04/18/96	Novel protein produced	IA	3	05/01/96	09/15/96
Pioneer	Corn	3/19/96	Acknowledged		04/18/96	Novel protein produced	IL	3	04/25/96	09/20/96
Pioneer	Corn	3/19/96	Acknowledged		04/18/96	Novel protein produced	WA	3	04/20/96	08/25/96
Biosource	TMV	2/20/96	Issued	06/04/96		Pharmaceutical proteins produced	KY			
Agracetus	Corn	12/6/95	Acknowledged		01/05/96	Antibody produced	HI	1	01/08/95	01/08/96
Pioneer	Corn	12/1/95	Acknowledged		12/31/95	Novel protein produced	PR	6		
Pioneer	Corn	10/11/95	Acknowledged		11/10/95	Novel protein produced	HI	6	11/01/95	09/28/96
Agracetus	Soybean	9/26/95	Acknowledged		10/26/95	Antibody produced	PR	1	10/25/95	10/25/96
Agracetus	Corn	9/13/95	Acknowledged		10/13/95	Antibody produced	PR	2	10/15/95	10/15/96
Agracetus	Soybean	4/11/95	Acknowledged		05/11/95	Antibody produced	WI	1	05/01/95	12/01/95
Agracetus	Corn	4/3/95	Acknowledged		05/03/95	Antibody produced	IA, MI, WI	3	05/01/95	12/01/95
Agracetus	Soybean	4/3/95	Acknowledged		05/03/95	Antibody produced	WI	1	05/01/95	12/01/95
Agracetus	Corn	4/3/95	Acknowledged		05/03/95	Antibody produced	WI	1	05/01/95	12/01/95
Agracetus	Soybean	4/3/95	Acknowledged		05/03/95	Antibody produced	WI	1	05/01/95	12/01/95
Agracetus	Soybean	3/15/95	Acknowledged		04/14/95	Antibody produced	WI	0.1	04/10/95	04/10/96
Agracetus	Soybean	3/15/95	Acknowledged		04/14/95	Antibody produced	WI	0.1	04/10/95	04/10/96
R J Reynolds	TMV	2/10/95	Issued	06/09/95		Pharmaceutical proteins produced	NC			
Pioneer	Corn	1/26/95	Acknowledged		02/25/95	Novel protein produced	HI	22.5	03/01/95	06/01/95
Pioneer	Corn	1/26/95	Acknowledged		02/25/95	Novel protein produced	IA	24	05/01/95	09/01/95
Pioneer	Corn	1/26/95	Acknowledged		02/25/95	Novel protein produced	IL	2	05/01/95	09/01/95

Institution	Crop	Application Received	Status	Permit / Notification Issued	Effective	Phenotype(s)	Release Location(s)	Acreage	Begin release	End release
Pioneer	Corn	1/26/95	Acknowledged		02/25/95	Novel protein produced	NE	2	05/01/95	09/01/95
Pioneer	Corn	1/26/95	Acknowledged		02/25/95	Novel protein produced	TX	2	03/01/95	07/01/95
Agracetus	Soybean	1/19/95	Acknowledged		02/18/95	Industrial enzyme produced	PR	0.1	02/01/95	02/01/97
U of Wisconsin	Alfalfa	12/28/94	Issued	04/12/95		Industrial enzyme produced	OR, WI			
Agracetus	Soybean	10/6/94	Acknowledged		11/05/94	Antibody produced	AR, MD, PR	0.5	11/10/94	11/10/96
Agracetus	Corn	10/6/94	Acknowledged		11/05/94	Antibody produced	PR, WI	0.3	11/10/94	11/10/96
Agracetus	Soybean	9/14/94	Acknowledged		10/14/94	Antibody produced	AR, MD, PR	5	10/16/94	10/16/96
Agracetus	Soybean	5/16/94	Acknowledged		06/15/94	Industrial enzyme produced	MD	0.5	06/01/94	12/01/94
Agracetus	Soybean	11/17/93	Acknowledged		12/17/93	Industrial enzyme produced	PR	0.1	01/01/94	03/31/94
U of Wisconsin	Alfalfa	3/29/93	Issued	06/04/93		Industrial enzyme produced	WI			
Cargill	Canola	2/17/93	Issued	05/04/93		Industrial enzymes produced	CO, IL			
Noble Foundation	Alfalfa	7/1/92	Issued	10/10/92		Pharmaceutical proteins produced	OK			
Biosource	TMV	1/7/91	Issued	05/01/91		Pharmaceutical proteins produced	NC			

APPENDIX I:

Applications for Field Releases of Genetically Engineered Wheat: 1987-2002

Institution	Crop	Application Received	Application Status	Issued	Effective	Release Location(s)	Acreage	Begin release	End release
U of Tennessee	Wheat	12/24/02	Issued	4/16/03		TN	2		
ARS	Wheat	10/15/02	Acknowledged		1/14/02	CA	0.5	11/01/02	06/30/03
Monsanto	Wheat	09/20/02	Acknowledged		10/20/02	CA	10	09/19/02	09/19/03
U of Idaho	Wheat	09/09/02	Acknowledged		10/09/02	ID	0.5	10/20/02	09/15/03
Goertzen Seed Research	Wheat	09/05/02	Acknowledged		10/05/02	KS	1	09/01/02	08/31/03
U of Idaho	Wheat	09/09/02	Acknowledged		09/19/02	ID	0.5	10/20/02	09/15/03
Monsanto	Wheat	08/19/02	Acknowledged		09/18/02	KS, NE	20	09/13/02	09/13/03
Monsanto	Wheat	08/08/02	Acknowledged		09/07/02	HI	5	09/01/02	09/01/03
Kansas State U	Wheat	04/23/02	Acknowledged		05/23/02	KS	0.5	10/15/02	10/15/03
Monsanto	Wheat	04/03/02	Acknowledged		05/03/02	MT	9	04/26/02	04/26/03
U of Nebraska/Lincoln	Wheat	03/29/02	Acknowledged		04/28/02	NE	1	03/10/02	08/15/02
U of Nebraska/Lincoln	Wheat	03/29/02	Acknowledged		04/28/02	NE	1	03/10/02	08/15/02
U of Nebraska/Lincoln	Wheat	03/29/02	Acknowledged		04/28/02	NE	1	03/01/02	08/15/02
Ventria Bioscience	Wheat	03/28/02	Acknowledged		04/27/02	MT	1.5	04/29/02	04/30/03
Monsanto	Wheat	03/18/02	Acknowledged		04/17/02	MN	4	04/13/02	04/13/03
Syngenta	Wheat	03/15/02	Acknowledged		04/14/02	MN	12	04/14/02	04/14/03
ARS	Wheat	03/12/02	Acknowledged		04/11/02	ID	0.5	04/11/02	09/30/02
Monsanto	Wheat	03/01/02	Acknowledged		03/31/02	ID	10	03/29/02	03/29/03
Monsanto	Wheat	03/01/02	Acknowledged		03/31/02	CO	10	03/29/02	03/29/03
Monsanto	Wheat	02/20/02	Acknowledged		03/22/02	ID	3	03/17/02	03/17/03
Monsanto	Wheat	02/20/02	Acknowledged		03/22/02	MT, WA	27	03/16/02	03/16/03
Monsanto	Wheat	02/20/02	Acknowledged		03/22/02	ND	14	03/20/02	03/20/03
Monsanto	Wheat	02/15/02	Acknowledged		03/17/02	ND	10	03/14/02	03/14/03
Monsanto	Wheat	02/15/02	Acknowledged		03/17/02	SD	7	03/13/02	03/13/03
Monsanto	Wheat	02/15/02	Acknowledged		03/17/02	WA	3	03/13/02	03/13/03
Monsanto	Wheat	02/15/02	Acknowledged		03/17/02	MN	12	03/13/02	03/13/03
Montana State U	Wheat	02/13/02	Acknowledged		03/15/02	MT	1	05/01/02	09/15/02

Institution	Crop	Application Received	Application Status	Issued	Effective	Release Location(s)	Acreage	Begin release	End release
Montana State U	Wheat	02/13/02	Acknowledged		03/15/02	MT	1	04/01/02	09/15/02
Montana State U	Wheat	02/13/02	Acknowledged		03/15/02	MT	1	04/01/02	09/15/02
Montana State U	Wheat	02/13/02	Acknowledged		03/15/02	MT	1	04/01/02	09/15/02
U of Nebraska/Lincoln	Wheat	02/08/02	Acknowledged		03/10/02	NE	1	03/10/02	08/15/02
U of Nebraska/Lincoln	Wheat	02/08/02	Acknowledged		03/10/02	NE	1	03/10/02	08/15/02
Monsanto	Wheat	02/01/02	Acknowledged		03/03/02	MT	20	02/20/02	02/20/03
Monsanto	Wheat	01/22/02	Acknowledged		02/21/02	ND	114	02/20/02	02/20/03
U of Nebraska/Lincoln	Wheat	01/22/02	Acknowledged		02/21/02	NE	1	03/01/02	08/15/02
Monsanto	Wheat	01/22/02	Acknowledged		02/21/02	CO, KS, NE, WY	50	02/20/02	02/20/03
Monsanto	Wheat	01/22/02	Acknowledged		02/21/02	MN	10	02/20/02	02/20/03
Monsanto	Wheat	01/22/02	Acknowledged		02/21/02	SD	10	02/20/02	02/20/03
Monsanto	Wheat	01/18/02	Acknowledged		02/17/02	WA	6	02/15/02	02/15/03
Monsanto	Wheat	01/09/02	Acknowledged		02/08/02	CO	1	02/07/02	02/07/03
U of Nebraska/Lincoln	Wheat	01/04/02	Acknowledged		02/03/02	NE	1	03/01/02	08/15/02
Monsanto	Wheat	12/19/01	Acknowledged		01/18/02	ID	15	01/16/02	01/16/03
Monsanto	Wheat	12/18/01	Acknowledged		01/17/02	WA	13	01/13/02	01/13/03
Monsanto	Wheat	12/14/01	Acknowledged		01/13/02	OR	8	01/12/02	01/12/03
ARS	Wheat	10/16/01	Acknowledged		11/15/01	CA	1	11/01/01	05/31/02
ARS	Wheat	10/16/01	Acknowledged		11/15/01	CA	1	11/01/01	05/31/02
Goertzen Seed Research	Wheat	10/05/01	Acknowledged		11/04/01	KS	1	09/01/01	08/31/02
U of Idaho	Wheat	09/20/01	Acknowledged		10/20/01	ID	0.5	10/20/01	08/01/02
U of Idaho	Wheat	09/20/01	Acknowledged		10/20/01	ID	0.5	10/20/01	08/30/02
U of Idaho	Wheat	09/20/01	Acknowledged		10/20/01	ID	0.5	10/20/01	08/30/02
Applied Phytologics	Wheat	09/18/01	Acknowledged		10/18/01	HI	0.25	10/16/01	10/15/02
Monsanto	Wheat	08/24/01	Acknowledged		09/23/01	CA	4	09/22/01	09/22/02
Monsanto	Wheat	08/24/01	Acknowledged		09/23/01	HI	5	09/22/01	09/22/02
Monsanto	Wheat	08/22/01	Acknowledged		09/21/01	CA	200	09/21/01	09/21/02
Goertzen Seed Research	Wheat	08/17/01	Acknowledged		09/16/01	CO	1	09/01/01	08/31/02
Kansas State U	Wheat	07/24/01	Acknowledged		08/23/01	KS		09/01/01	08/01/02
ARS	Wheat	03/29/01	Acknowledged		04/28/01	MN	1	04/15/01	10/01/01
ARS	Wheat	03/28/01	Acknowledged		04/27/01	CA	0.5	04/10/01	10/01/01
ARS	Wheat	03/28/01	Acknowledged		04/27/01	ID	1	04/14/01	04/14/02
ARS	Wheat	03/16/01	Acknowledged		04/15/01	ID	0.5	04/14/01	09/30/01
Montana State U	Wheat	03/15/01	Acknowledged		04/14/01	MT	1	05/01/01	09/15/01

Institution	Crop	Application Received	Application Status	Issued	Effective	Release Location(s)	Acreage	Begin release	End release
ARS	Wheat	03/14/01	Acknowledged		04/13/01	CA	1	04/10/01	10/01/01
ARS	Wheat	03/14/01	Acknowledged		04/13/01	ID	1	04/14/01	04/14/02
Applied Phytologics	Wheat	03/08/01	Acknowledged		04/07/01	ID	1	04/09/01	04/08/02
Monsanto	Wheat	03/07/01	Acknowledged		04/06/01	MN	2	04/04/01	04/04/02
Monsanto	Wheat	02/28/01	Acknowledged		03/30/01	ND	2	03/29/01	03/29/02
Monsanto	Wheat	02/22/01	Acknowledged		03/24/01	MN, ND, SD	14	03/23/01	03/23/02
Monsanto	Wheat	02/22/01	Acknowledged		03/24/01	CO	2	03/23/01	03/23/02
Monsanto	Wheat	02/15/01	Acknowledged		03/17/01	MN	5	03/11/01	03/11/02
Monsanto	Wheat	02/15/01	Acknowledged		03/17/01	MT, ND, SD, WA	8	03/11/01	03/11/02
Monsanto	Wheat	02/15/01	Acknowledged		03/17/01	WA	20	03/15/01	03/15/02
Monsanto	Wheat	02/15/01	Acknowledged		03/17/01	WA	2	03/15/01	03/15/02
Monsanto	Wheat	02/09/01	Acknowledged		03/11/01	ID, MN, ND, SD	4	03/08/01	03/08/02
Monsanto	Wheat	02/09/01	Acknowledged		03/11/01	ID, MN, ND, SD	4	03/08/01	03/08/02
Monsanto	Wheat	02/06/01	Acknowledged		03/08/01	ID, WA	25	03/07/01	03/07/02
Monsanto	Wheat	02/06/01	Acknowledged		03/08/01	MT, WA	12	03/07/01	03/07/02
Syngenta	Wheat	02/02/01	Acknowledged		03/04/01	MN	0.5	03/02/01	03/02/02
Monsanto	Wheat	01/25/01	Acknowledged		02/24/01	MT	15	02/22/01	02/22/02
Monsanto	Wheat	01/24/01	Acknowledged		02/23/01	WA	6	02/22/01	02/22/02
Monsanto	Wheat	01/24/01	Acknowledged		02/23/01	WA	12	02/21/01	02/21/02
Monsanto	Wheat	01/24/01	Acknowledged		02/23/01	MN	7	02/21/01	02/21/02
Monsanto	Wheat	01/24/01	Acknowledged		02/23/01	MT	10	02/21/01	02/21/02
Monsanto	Wheat	01/24/01	Acknowledged		02/23/01	SD	40	02/21/01	02/21/02
Montana State U	Wheat	01/23/01	Acknowledged		02/22/01	MT	1	05/01/01	09/15/01
Monsanto	Wheat	01/22/01	Acknowledged		02/21/01	ND	40	02/17/01	02/17/02
Monsanto	Wheat	01/22/01	Acknowledged		02/21/01	ND	5	02/17/01	02/17/02
Monsanto	Wheat	01/22/01	Acknowledged		02/21/01	ND	5	02/17/01	02/17/02
Monsanto	Wheat	01/22/01	Acknowledged		02/21/01	ND	15	02/17/01	02/17/02
Monsanto	Wheat	01/22/01	Acknowledged		02/21/01	ND	15	02/17/01	02/17/02
Monsanto	Wheat	01/22/01	Acknowledged		02/21/01	ND	5	02/17/01	02/17/02
Monsanto	Wheat	01/22/01	Acknowledged		02/21/01	ND	20	02/17/01	02/17/02
Monsanto	Wheat	01/17/01	Acknowledged		02/16/01	WA	5	02/08/01	02/08/02
Monsanto	Wheat	01/17/01	Acknowledged		02/16/01	SD	15	02/14/01	02/14/02
Monsanto	Wheat	01/17/01	Acknowledged		02/16/01	OR	10	02/08/01	02/08/02
Monsanto	Wheat	01/16/01	Acknowledged		02/15/01	ID	5	02/08/01	02/08/02

Institution	Crop	Application Received	Application Status	Issued	Effective	Release Location(s)	Acreage	Begin release	End release
Monsanto	Wheat	01/16/01	Acknowledged		02/15/01	WA	5	02/08/01	02/08/02
Monsanto	Wheat	01/16/01	Acknowledged		02/15/01	FL, ID, WA	25	02/09/01	02/09/02
Monsanto	Wheat	01/16/01	Acknowledged		02/15/01	MT	10	02/09/01	02/09/02
Monsanto	Wheat	01/16/01	Acknowledged		02/15/01	MT	15	02/09/01	02/09/02
Monsanto	Wheat	01/16/01	Acknowledged		02/15/01	ND	5	02/10/01	02/10/02
Monsanto	Wheat	01/16/01	Acknowledged		02/15/01	ID	5	02/08/01	02/08/02
Monsanto	Wheat	01/16/01	Acknowledged		02/15/01	OR	5	02/09/01	02/09/02
Monsanto	Wheat	01/16/01	Acknowledged		02/15/01	SD	5	02/09/01	02/09/02
Monsanto	Wheat	01/16/01	Acknowledged		02/15/01	MT	5	02/09/01	02/09/02
Syngenta	Wheat	11/14/00	Acknowledged		12/14/00	NC	0.2	12/01/00	12/01/01
Monsanto	Wheat	10/25/00	Acknowledged		11/24/00	NE	5	11/23/00	11/23/01
Monsanto	Wheat	10/23/00	Acknowledged			HI	3	11/19/00	11/19/01
Monsanto	Wheat	09/18/00	Acknowledged		10/18/00	AZ, CA, ID	6	10/14/00	10/14/01
Monsanto	Wheat	08/30/00	Acknowledged		09/29/00	WA	5	09/28/00	09/28/01
U of Idaho	Wheat	08/25/00	Acknowledged		09/24/00	ID	0.5	09/30/00	08/15/01
U of Idaho	Wheat	08/25/00	Acknowledged		09/24/00	ID	0.5	09/30/00	08/15/01
U of Idaho	Wheat	08/25/00	Acknowledged		09/24/00	ID	0.5	09/30/00	08/01/01
Monsanto	Wheat	08/23/00	Acknowledged		09/22/00	AZ	5	09/09/00	09/09/01
Monsanto	Wheat	08/21/00	Acknowledged		09/20/00	CO, ID, KS, OK, WA	7	09/16/00	09/16/01
Monsanto	Wheat	08/18/00	Acknowledged		09/17/00	WA	5	09/16/00	09/16/01
Monsanto	Wheat	08/18/00	Acknowledged			KS	5	09/16/00	09/16/01
Monsanto	Wheat	08/18/00	Acknowledged			KS	5	09/16/00	09/16/01
Monsanto	Wheat	08/18/00	Acknowledged			OK	10	09/16/00	09/16/01
Applied Phytologics	Wheat	08/15/00	Issued	10/10/00		HI			
Monsanto	Wheat	08/09/00	Acknowledged		09/08/00	IL	2	09/07/00	09/07/01
Cargill	Wheat	08/04/00	Acknowledged		09/03/00	CO	1	09/04/00	08/31/01
Monsanto	Wheat	07/17/00	Acknowledged			HI	6	08/12/00	08/12/01
Monsanto	Wheat	07/17/00	Acknowledged			HI	2	08/12/00	08/12/01
Monsanto	Wheat	07/13/00	Acknowledged			HI	2	08/11/00	08/11/01
Monsanto	Wheat	07/13/00	Acknowledged			HI	2	08/11/00	08/11/01
Monsanto	Wheat	07/13/00	Acknowledged			AZ, HI	14	08/11/00	08/11/01
ARS	Wheat	04/14/00	Acknowledged		05/14/00	ID	0.5	05/01/00	05/01/01
Montana State U	Wheat	03/28/00	Acknowledged		04/27/00	MT	1	04/15/00	09/15/00

Institution	Crop	Application Received	Application Status	Issued	Effective	Release Location(s)	Acreage	Begin release	End release
Novartis Seeds	Wheat	03/14/00	Acknowledged		04/13/00	MN	0.5	04/01/00	04/01/01
Montana State U	Wheat	03/09/00	Acknowledged		04/08/00	MT	1	05/01/00	09/15/00
Monsanto	Wheat	03/07/00	Acknowledged		04/06/00	MT	1	04/05/00	04/05/01
Monsanto	Wheat	03/02/00	Acknowledged			MN, ND, WA	20	03/31/00	03/31/01
Applied Phytologics	Wheat	02/28/00	Issued	5/04/00		ID	3		
Monsanto	Wheat	02/28/00	Acknowledged		03/29/00	ID	20	03/25/00	03/24/01
Monsanto	Wheat	02/28/00	Acknowledged		03/29/00	ND	10	02/24/00	02/23/01
Monsanto	Wheat	02/28/00	Acknowledged		03/29/00	ND	10	02/24/00	02/23/01
Monsanto	Wheat	02/23/00	Acknowledged		03/24/00	ID	5	02/22/00	02/21/01
Monsanto	Wheat	02/23/00	Acknowledged		03/24/00	ND	10	02/22/00	02/21/01
Monsanto	Wheat	02/23/00	Acknowledged		03/24/00	ND	5	02/22/00	02/21/01
Monsanto	Wheat	02/23/00	Acknowledged		03/24/00	ND	15	02/22/00	02/21/01
Monsanto	Wheat	02/23/00	Acknowledged		03/24/00	MT	20	02/22/00	02/21/01
Monsanto	Wheat	02/23/00	Acknowledged		03/24/00	CO	5	02/22/00	02/21/01
Monsanto	Wheat	02/22/00	Acknowledged		03/23/00	MN, OR	10	02/17/00	03/16/01
Monsanto	Wheat	02/22/00	Acknowledged		03/23/00	ND	5	02/16/00	03/15/01
Monsanto	Wheat	02/16/00	Acknowledged		03/17/00	KS	5	02/15/00	02/14/01
Monsanto	Wheat	02/15/00	Acknowledged		03/16/00	MT	6	02/14/00	02/13/01
Monsanto	Wheat	02/15/00	Acknowledged		03/16/00	ID	4	02/14/00	02/13/01
Monsanto	Wheat	02/15/00	Acknowledged			MN	6	02/14/00	02/13/01
Montana State U	Wheat	02/11/00	Acknowledged		03/12/00	MT	0.1	05/01/00	09/15/00
Monsanto	Wheat	02/10/00	Acknowledged		03/11/00	WA	5	02/09/00	02/08/01
Monsanto	Wheat	02/10/00	Acknowledged		03/11/00	MT	5	02/09/00	02/08/01
Monsanto	Wheat	02/10/00	Acknowledged		03/11/00	SD	10	02/09/00	02/08/01
Monsanto	Wheat	02/09/00	Acknowledged		03/10/00	ND	5	02/08/00	02/07/01
Monsanto	Wheat	02/09/00	Acknowledged		03/10/00	ND	5	02/08/00	02/07/01
Monsanto	Wheat	02/09/00	Acknowledged		03/10/00	OR, WA	20	02/08/00	02/07/01
Monsanto	Wheat	02/09/00	Acknowledged		03/10/00	WA	5	02/08/00	02/07/01
Monsanto	Wheat	02/09/00	Acknowledged		03/10/00	OR	5	02/08/00	02/07/01
Monsanto	Wheat	02/08/00	Acknowledged		03/09/00	SD	10	02/07/00	02/06/01
Monsanto	Wheat	02/08/00	Acknowledged		03/09/00	WA	5	02/07/00	02/06/01
Monsanto	Wheat	02/08/00	Acknowledged		03/09/00	WA	5	02/07/00	02/06/01
Monsanto	Wheat	02/08/00	Acknowledged		03/09/00	SD	5	02/07/00	02/06/01
Monsanto	Wheat	02/08/00	Acknowledged		03/09/00	ID, WA	15	02/07/00	02/06/01

Institution	Crop	Application Received	Application Status	Issued	Effective	Release Location(s)	Acreage	Begin release	End release
Monsanto	Wheat	02/08/00	Acknowledged		03/09/00	MT	15	02/07/00	02/06/01
Monsanto	Wheat	02/07/00	Acknowledged		03/08/00	ND	3	02/04/00	02/03/01
Monsanto	Wheat	02/07/00	Acknowledged		03/08/00	MT, ND	6	02/04/00	02/03/01
Monsanto	Wheat	02/03/00	Acknowledged		03/04/00	SD	3	02/02/00	02/01/01
Monsanto	Wheat	02/03/00	Acknowledged		03/04/00	CO	3	02/02/00	02/01/01
Monsanto	Wheat	01/05/00	Acknowledged		02/04/00	CO	2	01/04/00	01/03/01
Novartis Seeds	Wheat	12/02/99	Acknowledged		01/01/00	NC	0.2	01/03/00	01/03/01
Novartis Seeds	Wheat	12/02/99	Acknowledged		01/01/00	NC	0.2	01/03/00	01/03/01
Monsanto	Wheat	09/23/99	Acknowledged		10/23/99	CA, HI	8	10/21/99	10/20/00
Monsanto	Wheat	09/23/99	Acknowledged		10/23/99	CA, HI	8	10/21/99	10/20/00
Monsanto	Wheat	09/16/99	Acknowledged		10/16/99	AZ	1	10/14/99	10/13/00
Monsanto	Wheat	09/16/99	Acknowledged		10/16/99	AZ	1	10/14/99	10/13/00
Monsanto	Wheat	09/13/99	Acknowledged		10/13/99	AZ	1.5	10/10/99	10/09/00
Monsanto	Wheat	09/13/99	Acknowledged		10/13/99	AZ	1.5	10/10/99	10/09/00
Monsanto	Wheat	09/08/99	Acknowledged		10/08/99	AZ	2	10/07/99	10/06/00
Monsanto	Wheat	09/08/99	Acknowledged		10/08/99	AZ	2	10/07/99	10/06/00
Monsanto	Wheat	09/08/99	Acknowledged		10/08/99	AZ	2	10/07/99	10/06/00
Monsanto	Wheat	09/08/99	Acknowledged		10/08/99	CO, MT, WA	3	10/07/99	10/06/00
Monsanto	Wheat	09/08/99	Acknowledged		10/08/99	AZ	4	10/07/99	10/06/00
U of Idaho	Wheat	07/29/99	Acknowledged		08/28/99	ID	1	09/01/99	08/01/00
U of Idaho	Wheat	07/29/99	Acknowledged		08/28/99	ID	1	09/01/99	08/01/00
U of Idaho	Wheat	07/29/99	Acknowledged		08/28/99	ID	1	09/01/99	08/01/00
Monsanto	Wheat	05/10/99	Acknowledged		06/09/99	IL, IN	2	06/06/99	06/05/00
Monsanto	Wheat	05/06/99	Acknowledged		06/05/99	IL, IN	2	06/02/99	06/01/00
Monsanto	Wheat	04/15/99	Acknowledged		05/15/99	MT	2	04/30/99	04/29/00
Montana State U	Wheat	04/05/99	Acknowledged		05/05/99	MT		04/15/99	09/15/99
Monsanto	Wheat	04/05/99	Acknowledged		05/05/99	CA		04/30/99	04/29/00
Monsanto	Wheat	04/02/99	Acknowledged		05/02/99	MT	1.5	04/25/99	04/24/00
Monsanto	Wheat	04/02/99	Acknowledged		05/02/99	MT	1.5	04/25/99	04/25/00
Monsanto	Wheat	03/05/99	Acknowledged		04/04/99	ND, SD, WA	15	03/31/99	03/30/00
Monsanto	Wheat	03/05/99	Acknowledged		04/04/99	ND, SD, WA	15	04/01/99	03/31/00
Monsanto	Wheat	02/25/99	Acknowledged		03/27/99	MN, MT, ND, OR, SD, WA	50	03/25/99	03/24/00
Montana State U	Wheat	02/19/99	Acknowledged		03/21/99	MT		04/15/99	09/15/99
Monsanto	Wheat	02/17/99	Acknowledged		03/19/99	ID, MT, ND, OR	14	03/16/99	03/15/00

Institution	Crop	Application Received	Application Status	Issued	Effective	Release Location(s)	Acreage	Begin release	End release
Montana State U	Wheat	02/17/99	Acknowledged		03/19/99	MT	0.1	05/15/99	09/15/99
Monsanto	Wheat	02/16/99	Acknowledged		03/18/99	IL, IN	2	03/13/99	03/13/00
Monsanto	Wheat	02/16/99	Acknowledged		03/18/99	IL, IN	2	03/13/99	03/13/00
Montana State U	Wheat	02/10/99	Acknowledged		03/12/99	MT	0.1	05/15/99	09/15/99
Monsanto	Wheat	02/08/99	Acknowledged		03/10/99	CO, ID, MT, ND, SD, WA	24	03/07/99	03/06/00
Monsanto	Wheat	02/08/99	Acknowledged		03/10/99	CO	3	03/07/99	03/06/00
Monsanto	Wheat	02/08/99	Acknowledged		03/10/99	CO	3	03/07/99	03/06/00
Monsanto	Wheat	02/08/99	Acknowledged		03/10/99	CO, ID, MT, ND, SD, WA	32	03/07/99	03/06/00
Novartis Seeds	Wheat	01/11/99	Acknowledged		02/10/99	AR	0.1	02/12/99	02/12/00
Monsanto	Wheat	10/14/98	Acknowledged		11/13/98	AZ	2	11/12/98	11/12/99
Monsanto	Wheat	10/14/98	Acknowledged		11/13/98	AZ	2	11/12/98	11/12/99
Monsanto	Wheat	09/18/98	Acknowledged		10/18/98	CA, HI	4	10/17/98	10/17/99
Monsanto	Wheat	09/18/98	Acknowledged		10/18/98	CA, HI	4	10/17/98	10/17/99
Monsanto	Wheat	08/17/98	Acknowledged		09/16/98	IL, IN	2	09/13/98	09/13/99
Monsanto	Wheat	08/12/98	Acknowledged		09/11/98	KS, NE	2	09/08/98	09/08/99
U of Idaho	Wheat	08/03/98	Acknowledged		09/02/98	ID	1	09/01/98	08/01/99
U of Idaho	Wheat	08/03/98	Acknowledged		09/02/98	ID	1	09/01/98	08/01/99
U of Idaho	Wheat	08/03/98	Acknowledged		09/02/98	ID	1	09/01/98	08/01/99
ARS	Wheat	06/02/98	Acknowledged		07/02/98	NE	2	10/01/98	07/10/99
Montana State U	Wheat	03/31/98	Acknowledged		04/30/98	MT	0.1	05/15/98	09/15/98
Monsanto	Wheat	03/16/98	Acknowledged		04/15/98	MN	1.5	04/13/98	04/13/99
Monsanto	Wheat	03/16/98	Acknowledged		04/15/98	IL	1.5	04/12/98	04/12/99
Monsanto	Wheat	03/16/98	Acknowledged		04/15/98	ID	1.5	04/13/98	04/13/99
Novartis Seeds	Wheat	03/02/98	Acknowledged		04/01/98	AR	0.1	03/30/98	03/30/99
Monsanto	Wheat	02/04/98	Acknowledged		03/06/98	CO	3	03/05/98	03/05/99
Monsanto	Wheat	02/04/98	Acknowledged		03/06/98	CO, MT, ND, WA	12	03/05/98	03/05/99
Monsanto	Wheat	02/02/98	Acknowledged		03/04/98	CO	3	02/28/98	02/28/99
Monsanto	Wheat	01/30/98	Acknowledged		03/01/98	CO, MN, MT, ND, WA	15	02/28/98	02/28/99
Monsanto	Wheat	10/16/97	Acknowledged		11/15/97	AZ	3	10/21/97	10/21/98
Monsanto	Wheat	10/16/97	Acknowledged		11/15/97	AZ	3	10/21/97	10/21/98
Monsanto	Wheat	10/16/97	Acknowledged		11/15/97	AZ	3	10/21/97	10/21/98
Monsanto	Wheat	10/16/97	Acknowledged		11/15/97	AZ	3	10/21/97	10/21/98
Monsanto	Wheat	10/02/97	Acknowledged		11/01/97	AZ	3	11/01/97	11/01/98
Monsanto	Wheat	09/30/97	Acknowledged		10/30/97	IL, IN	4	10/27/97	10/27/98

Institution	Crop	Application Received	Application Status	Issued	Effective	Release Location(s)	Acreage	Begin release	End release
Novartis Seeds	Wheat	08/26/97	Acknowledged		09/25/97	AR		09/25/97	09/25/97
Novartis Seeds	Wheat	08/26/97	Acknowledged		09/25/97	AR		09/25/97	09/25/97
U of Idaho	Wheat	07/01/97	Acknowledged		07/31/97	ID	1	09/01/97	08/01/98
U of Idaho	Wheat	07/01/97	Acknowledged		07/31/97	ID	1	09/01/97	08/01/98
U of Idaho	Wheat	07/01/97	Acknowledged		07/31/97	ID	1	09/01/97	08/01/98
Monsanto	Wheat	12/11/96	Issued	03/18/97		IL, MN	1		
Monsanto	Wheat	12/31/96	Issued	03/10/97		IL, MN			
Monsanto	Wheat	12/02/96	Issued	01/13/97		CO, WA	1		
U of Idaho	Wheat	07/25/96	Issued	09/11/96		ID			
Monsanto	Wheat	06/28/96	Issued	07/29/96		AZ			
Monsanto	Wheat	06/14/96	Issued	08/29/96		AZ			
Monsanto	Wheat	01/19/96	Issued	04/23/96		MN, WA			
ARS	Wheat	01/19/96	Issued	04/23/96		MN			
ARS	Wheat	01/19/96	Issued	02/15/96		MN			
Monsanto	Wheat	01/17/96	Issued	03/11/96		IL			
ARS	Wheat	07/17/95	Issued	09/18/95		AZ			
Monsanto	Wheat	02/14/95	Issued	06/28/95		KS	0.15		
Monsanto	Wheat	01/10/95	Issued	05/04/95		IL	2.4		
Monsanto	Wheat	01/10/95	Issued	04/07/95		IL, MT	2.4		
Monsanto	Wheat	08/09/94	Issued	10/27/94		AZ	1.5		
AgrEvo	Wheat	02/23/94	Issued	06/06/94		IL, ND	2		
Monsanto	Wheat	01/24/94	Issued	05/26/94		MT	1		

End Notes

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