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The StarLink™ Situation

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Background

In mid September 2000, traces of the Aventis Bt corn event (marketed as StarLink™) were identified in taco shells manufactured by Kraft Foods and distributed through the fast food chain, Taco Bell. This occurrence represented a significant challenge to the existing grain production, handling, and processing sector since this biotech product was not approved for use in grain products for human consumption. Thus, a costly recall was required to remove the unapproved product from the marketplace. A second recall of taco shells found to contain traces of StarLink™ from Safeway food stores was announced on October 11, 2000.

Other corn processors and food manufacturers have become concerned about the presence of StarLink™ in raw products coming into their plants. In the October 16, 2000, *Wall Street Journal*, Gruma SA, a large Mexican corn miller, indicated that they would withdraw all yellow corn products from the market. Mission Foods, a large U.S. tortilla maker in the Southwest, is recalling all its taco shells, tortilla chips and other yellow corn products. Azteca, a joint venture company owned by Archer Daniels Midland and Gruma SA, would do likewise.

On October 16, ConAgra Foods, Inc. indicated that it had temporarily halted operations at its Atchinson, Kansas, mill because ConAgra feared this mill might have received the same type of genetically modified corn that sparked a nationwide recall of taco shells. A few days earlier, Safeway, Inc., Food Lion, Inc. and Shaw's Supermarkets, Inc. announced that they were pulling their private label taco shells from store shelves because the products were made by Mission Foods.

Also, on October 16, Archer-Daniels-Midland Co. and Cargill, Inc., said that their mills were using new testing kits to scan corn being bought from farmers. By October 18, several loads of corn and several rail cars of corn had been rejected at ADM facilities because of suspected presence of StarLink™ crop or StarLink™-contaminated crop.

The Kellogg Company shut down a plant over concerns about StarLink™ sometime late in the week ending on October 20. Also, on October 20, Tyson Foods was reported to have stopped feeding corn to chickens containing StarLink™ modified corn.

It is important to recognize that only the Aventis Bt event, not all Bt corn in general, is involved in this situation. The Aventis event has not received regulatory clearance for human consumption.

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The roots of the problem lie in the period 1995-99. Many new biotech products were being commercialized by the developing companies. Approval by domestic and foreign regulatory bodies was the final hurdle necessary before commercialization and was aggressively sought. Huge financial investments in the development of these products and the need to begin showing returns to stockholders were creating a sense of urgency. Intense competition among firms in the biotech industry to establish an early position in this new market created a "gold rush" like atmosphere among those with products close to introduction. Biotech firms placed a high premium on gaining rapid regulatory approval for these new products.

Registration

It was amidst this very competitive climate that EPA raised questions about StarLink's suitability for human consumption, thereby delaying its registration. The questions surrounded the slower digestibility of one protein and lack of data on whether that protein is an allergen. Urgency to establish a competitive position led AgrEvo to seek and accept a limited and conditional registration for StarLink™ in order to get their product launched into the new marketplace. Under the limited registration granted by EPA, the product could be only used for animal feed but would need to be kept out of the human consumption food channels. It was further agreed that (a) growers would sign a contract stating that the product would not be sold into food or export channels and (b) growers would adopt certain identity preservation practices—including isolation to prevent cross-pollination with other hybrids.

Although these measures were certain to be cumbersome and expensive, AgrEvo accepted them as a condition for partial registration. With the partial registration in hand it begin marketing efforts. The registration contained directions for use and warned of possible problems with the technology—

"DIRECTIONS FOR USE

"It is a violation of Federal Law to use this product in a manner inconsistent with its labeling. Keep out of lakes, ponds or streams. Do not contaminate water by cleaning of equipment or disposal of wastes. All field corn containing the plant-pesticide that is sold or distributed by Aventis CropScience USA LP or a cooperator or licensee of Aventis, must be accompanied by informational material that contains the following:

"StarLink™ corn contains a *Bacillus thuringiensis* subsp. *tolworthi* insecticidal protein, Cry9C and may only be used according to the instructions below for the control of the following insects:

European corn borer	*Ostrinia nubilalis* (Huber)
Southwestern corn borer	*Diatraea grandiosella* (Dyar)

"StarLink™ corn contains a *Bacillus thuringiensis* subsp. *tolworthi* insecticidal protein, Cry9C and may only be used according to the instructions below for the suppression of the following insects:

Black cut worm	*Agroris ipslon* (Hufnagel)
Common stalk borer	*Papaipema nebris* (Guen.)

"Do not use this corn until you have read the Bag Tag and the Grower's Guide.

"**Insect Resistant Management**: To protect this important technology, a structured non-*Bt* corn refuge must be planted in close proximity to your StarLink™ corn fields. Specifically, a structured refuge of non-*Bt* corn equal to at least 20% of the total corn acres must be planted. The refuge must be located within ½ mile of the StarLink™ field, unless you plan to use a foliar-applied insecticide for Corn borer control; then it must be planted within ¼ mile. Any insecticide treatment for Corn borer cannot include sprayable *Bt* products.

"**Seed Production Uses**: Seeds expressing the Cry9C protein should be planted at a maximum of 40,000 seeds per acre on the site. Any seeds, plants or plant materials in the StarLink™ field, or within 660 feet of the field that is not used for seed production should be destroyed or used domestically for animal feed or non-food industrial purposes. None of the seeds, plants or plant materials in the StarLink™ field, or within 660 feet of the field, may be used for food uses or may enter international commerce.

"**Feed or Non-food Industrial Uses**: Seeds expressing the Cry9C protein should be planted at a maximum of 40,000 seeds per acre on the site. Any seeds, plants or plant materials in the StarLink™ field, or within 660 feet of the field, should be used domestically for animal feed or non-food industrial purposes. None of the seeds, plants or plant materials in the StarLink™ plot, or within 660 feet of the field, may be used for food uses or may enter international commerce."

The registration also contained specific provisions for storage and disposal of the seed—

"STORAGE AND DISPOSAL

"**Seed Storage**: Store in a cool dry place separate from conventional corn seed.

"**Seed and Plant Disposal**" Any seeds, plants or plant materials in the StarLink™ field, or within 660 feet of the field, may be used domestically for animal feed or industrial purposes, or destroyed. None of the seeds, plants or plant materials in the StarLink™ field, or within 660 feet of the field, may be used for food uses or may enter international commerce.

"**Container Disposal**: Do not reuse bag. Discard bag in trash. Ensure that the bag is completely empty of seed before disposal."

Information made available to producers

The tag attached to each bag of seed apparently contained the following statements—

"PRODUCT USE STATEMENT

"Prior to planting, read AgrEvo's Grower's Guide for StarLink, Bt insect protection. This guide provides detailed information on product use, integrated pest management, and resistance management. If you have not received a copy, or want more information, call AgrEvo USA at (612) 997-4500.

"This hybrid produces a *Bacillus Thuringiensis* Cry9C protein that provides significant protection against European corn borer *(Ostrinia nubilalis)*. Routine insecticide applications should not be necessary under typical conditions to prevent yield loss caused by first- and second- generation infestations of this pest.

* StarLink is a trademark of AgrEvo GmbH."

"DESCRIPTION AND GUIDELINES

"Liberty Link: LIBERTY Resistant hybrids labeled with the LIBERTY LINK logo are virtually the same as non-LIBERTY LINK hybrids in all agronomic characteristics—except for one important difference. They are resistant to the herbicide glufosinate ammonium and are labeled for use with LIBERTY herbicides. LIBERTY LINK hybrids offer farmers greater herbicide selection by allowing direct applications of LIBERTY herbicide. Since LIBERTY herbicide provides broad spectrum weed control and a mode of action unlike any other herbicide, LIBERTY LINK corn will be an excellent choice for long term weed resistance management.

"Planting Recommendations: Clearly mark those fields which are planted to LIBERTY LINK hybrids to eliminate the possibility of herbicide application error. The application of LIBERTY herbicide to non-LIBERTY corn will result in crop injury and yield loss for which Garst cannot be held responsible. Management practices, other than expanded herbicide application options remain the same as those used with non-LIBERTY hybrid counterparts. If in the year following LIBERTY LINK corn, LIBERTY LINK soybeans are planted in the same field and should seeds from this LIBERTY LINK corn hybrid produce volunteer corn plants, it is important to note that these corn plants will not be controlled by an application of LIBERTY herbicide.
* LIBERTY and LIBERTY LINK are trademarks of AgrEvo GmbH."

"IMIDAZOLINONE TOLERANT
PRODUCT USE STATEMENT

"This hybrid contains a gene which makes it tolerant only to imidazolinone herbicides developed by American Cyanamid, such as Pursuit Plus*, Resolve*, Contour* and Lightning* herbicide. WARNING: The imidazolinone-tolerant gene will only safeguard this hybrid against applications of imidazolinone herbicides labeled for use on IMI-Corn. The imidazolinone-tolerant gene will NOT safeguard this hybrid against application of other herbicide chemistries labeled for use over-the-top of crops that have a different specified crop protection gene. Always read and follow herbicide label directions prior to use.

"ACCIDENTAL APPLICATION OF INCOMPATIBLE HERBICIDES TO THIS HYBRID COULD RESULT IN TOTAL CROP LOSS.

*Pursuit Plus, Resolve, Contour, Lightning and IMI-Corn are trademarks of American Cyanamid Co."

The reverse side of the seed order used by at least one of the selling firms contains the usual disclaimers of warranties, replanting commitment, return policy and provision for collection and dishonored checks. In addition, the provisions state—

"UNDER THIS PURCHASE AGREEMENT, CUSTOMER OR ANY USER MAY:

"Use this Hybrid Corn Seed, or any non-Hybrid Corn Seed found herein, for the purpose of producing grain for feeding **or processing**. (emphasis added)

UNDER THIS PURCHASE AGREEMENT, CUSTOMER OR ANY USER MAY NOT:

"Use any Hybrid Corn Seed, or non-Hybrid Corn Seed (parental line seed) which may be found herein, or any resultant plants therefrom, for any breeding, research, seed production, reverse engineering molecular or genetic analysis or any other purpose other than production of grain for feeding or processing.

"Sell, transfer, give or supply this Hybrid Corn Seed to any other person for any purpose."

Apparently, a form had been prepared under date of April, 2000, entitled "StarLink™ Bt Grower Agreement" which contained restrictions on use of corn produced from StarLink™ seed. However, it appears that not all producers were asked to or did sign the agreement. The key provisions of the agreement state—

> "In accepting StarLink™ corn, Grower agrees to direct the harvested grain and grain grown within 660 feet of the StarLink™ grain towards domestic feed (e.g. animal feed) and/or non-food industrial purposes. Grower agrees not to use this grain for food use or allow it to enter grain export channels. Grower further agrees to either feed the grain obtained from StarLink™ corn hybrids on-farm or sell it for domestic (animal) feed, industrial or non-food uses only. Possible domestic off-farm use of the grain includes selling it to feed mills, neighbors with livestock operations or elevators that supply U.S. livestock feed operations. Aventis CropScience will provide Grower with a list of elevators or grain buyers that can provide this type of usage, prior to planting and/or prior to harvest.
>
> "StarLink™ corn hybrids offer a new tool for insect resistance management since it contains a new and unique site of action. To protect this important technology, Grower agrees to plant a structured 20% non-Bt corn refuge either in or in close proximity to Grower's StarLink™ corn field. The refuge must be established within ½ mile of the StarLink™ corn crop if insecticide use is not planned for the refuge acres and within ¼ mile of the StarLink™ corn crop in areas of the corn belt where conventional insecticides have historically been used to control ECB and SWCB, and StarLink™ growers want the option to treat for these pests in the refuge acres. Any insecticide treatment cannot include sprayable Bt products.
>
> "I, the undersigned Grower, acknowledge that I have read and understand the terms and conditions of this Agreement and that I agree to them. I further understand that failure to comply with these terms and conditions will result in losing the opportunity to use this product in 2001."

A brochure, apparently prepared by Aventis, denoted as the "2000 U.S. Edition" states—

> "The Cry9C protein found in StarLink corn hybrids has undergone extensive laboratory and field testing for effect on the environment and its inhabitants. No adverse effects have been found on beneficial and nontarget organisms such as honeybees, earthworms, beetles and livestock.
>
> "The use of StarLink hybrids and any corn grown within 660 feet of StarLink hybrids is currently limited to domestic animal feed, industrial non-food, or seed production uses.
>
> "Grain from StarLink corn and any corn grown within 660 feet of StarLink hybrids cannot enter international trade until overseas approvals are granted. Grain can be processed as conventional grain for animal feed and industrial non-food uses in the United States."

<u>Emergence of problems</u>

The first hint of problems appeared in late 1998 and early1999. Activist groups in Europe and concerns among larger segments of the general public in many EU countries were creating a demand for food products that did not contain genetically modified germ plasm of any type. Registrations in Europe for various biotech products were slowed and, in some cases, not granted. Archer Daniels Midland (ADM) announced in mid April, 1999, that it would not accept GMO products at some of its processing plants. Although the announcement was made prior to the 1999 planting season, some corn had already been planted and virtually all seed purchases had been made.

Some StarLink™ producers had already purchased seed and in a few cases it was planted prior to the announcement. Although producers were beginning to become aware of potential problems in marketing biotech products, there was not a widespread comprehension of just how strong the EU resistance to these products was and how it would develop going forward. The European response was characterized by many as a trade issue that was designed to keep U.S. products out of the EU. While this may have been the case initially, supermarket chains and food manufacturers were becoming less willing to sell products with biotech ingredients. These mixed signals to producers were difficult to interpret and there was not a great deal of time before crops had to be planted. In short, a large number of farmers planted those biotech products approved in the U.S. Some chose to plant StarLink™, which was approved in the U.S. only for non-food uses.

The issue was raised once again in August of 1999 when ADM requested that (where possible) non-biotech grain be segregated so that it would be possible to meet market demands for GMO-free food products in EU and other nations demanding them. At that time other processors announced that they would attempt to take biotech products that were approved in EU, but requested that non-EU approved products including StarLink™ be identified for non-food and non-export uses as livestock feed. While many producers did comply, the appearance of 1999 crop StarLink™ in the human food channel indicates that it had not occurred in all cases. The issue of cross-pollination may have been a major source of the problem.

The large carryover of 1999 crop corn along with the rapid movement of 1999 crop corn (held in farm storage under CCC loan) into elevators just prior to the 2000 harvest is also part of the problem. Elevator managers had no reason to believe that these deliveries of 1999 crop corn contained the EPA unapproved product. Many were unaware that any event had less than full domestic approval. This makes it likely that some corn containing StarLink™ has inadvertently entered elevators in those regions where it was grown in 1999. It is also possible that corn harvested adjacent to fields of StarLink™ corn could have been cross pollinated.

Where this corn is not owned by the producer who planted StarLink™, the neighboring producer would have no reliable way to know that cross pollination had occurred. Absent any knowledge that it should be segregated for use in feeding, the grain would be commingled with other grain on farm or placed in commercial storage. In either case it would eventually be delivered to the elevator by a neighbor who was unaware that he or she was delivering corn containing StarLink™.

At the beginning of the 2000 planting season, Aventis had not yet received EPA registration for all uses. It marketed StarLink™ once again under the limited registration for non food uses. There is, however, evidence that the contracts with growers were not properly executed in a significant number of cases. In other cases, growers may not have been given information on growing and handling limitations.

Actions taken by Aventis

Under date of September 29, 2000, growers received the following letter from Aventis CropScience, announcing an arrangement with the Commodity Credit Corporation to purchase "…all StarLink™ corn (including all buffer corn grown within 660 feet of the StarLink™ corn) which you do not intend to feed on the farm"—

> "As you are aware from the StarLink™ Stewardship Program, StarLink™ corn is not approved for use in food for human consumption or for the export market. Concerns have been raised concerning the way in which StarLink™ corn is being sold.
>
> "In order to ensure that this corn is properly sold, Aventis CropScience has reached an arrangement with the United States Department of Agriculture (USDA) to purchase directly from you all StarLink™ corn (including all buffer corn grown within 660 feet of the StarLink™ corn) which you do not intend to feed on farm.
>
> "Under this offer, Commodity Credit Corporation (CCC) will pay a price equal to the October 2, 2000 CCC posted county price plus $0.25 per bushel for all StarLink™ corn and buffer corn not fed on farm. CCC will be reimbursed by Aventis for this purchase. For any StarLink™ corn and buffer corn fed on you farm, Aventis will pay you a $0.25/bushel premium. You must notify Aventis by calling 888-283-6847 (888-Aventis) by midnight, October 6, 2000 of how you plan on disposing of your StarLink™ corn.
>
> "The corn you sell to CCC will either: (1) be stored on your farm under CCC seal if storage is available at a pro-rated storage rate of $0.025/bushel/month; or (2) delivered directly to a CCC-approved location in your area. CCC-approved delivery locations will most likely be feedlots or plants which use corn for industrial purposes. Aventis will be responsible for trucking charges for this delivery. After acceptance and payment of the purchase price or premium, confetti or some other identity agent will be added to the corn.
>
> "This offer extends to all of your 2000 StarLink™ corn crop that is still growing in your field, or which is stored on your farm. It also extends to all 1999 StarLink™ corn crop which you may still have on your farm. This offer does not extend to corn that has already been removed from your farm."

In early October, 2000, after personal contact with growers, Aventis mailed to those who were listed as purchasers of the StarLink™ seed the following notice—

> "Seed Company records indicate that you have purchased StarLink™ corn seed which contains Cry9C Bt. As you are aware from the StarLink™ Stewardship Program, this corn is not approved for use in food for human consumption or for the export market.
>
> "Please find attached a letter which describes an agreement between Aventis CropScience and the United States Department of Agriculture relating to StarLink™ corn. It is important that you carefully read this letter and respond to Aventis by phone as described in the letter.
>
> "An Aventis CropScience representative or agent will be visiting you on your farm by October 8th to review the program set forth in the letter.
>
> "We understand this is not what you expected when you purchased StarLink™ corn and we apologize for this inconvenience in the middle of harvest. We are committed to seeing that you are treated equitably and making this as simple a process as possible."

Under date of October 13, 2000, Aventis CropScience further advised affected growers of options on disposal of the targeted corn with a deadline of October 20, 2000 for response. The letter read as follows—

"Recently, you received a letter from Aventis CropScience regarding the StarLink™ Enhanced Stewardship program. This program is being implemented to ensure StarLink™ corn will be used for the intended purposes and to provide an incentive to growers who participate in this program. As indicated in this letter, StarLink™ planted corn and all other corn grown within a buffer zone of 660 feet of a StarLink™ planted field should be used only for domestic animal feed or domestic non-food industrial purposes. You have received information about these requirements and the program both through the letter from Aventis and through a visit to your farm by an Aventis employee who gathered information about your production of StarLink™ corn.

"The StarLink™ Stewardship program has been further enhanced to provide additional flexibility in the handling and marketing of your StarLink™ corn. There are <u>three</u> program options to select from and the details of the options are outlined on the attached program documentation. Also, attached is the program option commitment form that is required to verify your participation. Please review the program options, complete the attached commitment form and return the form to Aventis by Friday, October 20, 2000."

The letter contained an outline of the options available which stated as follows—

"Program Options:

"1. Farmer can elect to participate in the SES Program and to feed all or part of his StarLink™ corn on-farm. For the StarLink™ corn fed on farm, the farmer will receive from Aventis a $0.25 per bushel premium. Farmer does not receive any reimbursement for freight and/or storage.

"<u>Program Requirements</u>: An agent or representative of CCC/Aventis will make an on-farm visit and physically identify (placard) StarLink™ corn storage facilities and will estimate the total bushels in each storage facility. When grain from the facility is completely fed, farmer informs CCC/Aventis, and an agent or representative of CCC/Aventis makes on-farm visit to confirm facility is empty. Upon confirmation, farmer is paid $0.25 per estimated bushel of StarLink™ corn fed. Deadline for all StarLink™ corn to be fed is May 1, 2001.

"2. Farmer can elect to participate in the SES Program and to market all or part of his StarLink™ corn to a *StarLink™ Logistics Approved Destination*. For that portion of the StarLink™ corn so marketed, the farmer will receive from Aventis a $0.25 per bushel premium. In the event additional transport distance is involved (i.e. beyond that farmer would have normally incurred) to deliver StarLink™ corn to a confirmed *StarLink™ Logistics Approved Destination*, farmer may be eligible for reimbursement of the additional freight expenses (see program requirements below). Farmer does not receive any reimbursement for storage.

"<u>Program Requirements</u>: In order to receive the $0.25 per bushel premium, farmer must furnish StarLink™ Logistics with acceptable documentation regarding transport and delivery to approved destination. The premium will be paid on StarLink™ corn bushels actually delivered (as per scale tickets) and verified upon 'cross-check' with StarLink™ Logistics database to confirm that bushels delivered correspond to acres/bushels of StarLink™ corn grown/harvested by farmer (includes buffer, if applicable). Deadline for grain to be marketed is May 1, 2001. In order to receive reimbursement for any additional freight expense that may have been incurred, prior approval of delivery site by StarLink™ Logistics is required. For information concerning the approval process call StarLink™ Logistics at 1-866-785-8665.

"3. Farmer can elect to participate in the SES Program and to sell all or part of his StarLink™ corn to CCC. For StarLink™ corn sold to CCC, farmer will receive the October 2, 2000 Posted County Price (PCP) in the county in which the grain was produced, plus the $0.25 per bushel premium. CCC/Aventis (or agent) will arrange and pay for proper disposal of corn from origin (field and/or storage facility). If requested by CCC and agreed to by the farmer, farmer may use on-farm storage for StarLink™ corn, in which case farmer will be reimbursed for storage.

"Program Requirements: Farmer will enter into a Purchase Contract with CCC. Farmer will receive 'advance' payment from CCC (90% of Oct. 2 PCP for bin storage or 70% of Oct. 2 PCP for ground storage.) CCC/Aventis agent will make on-farm visit to physically identify (placard) StarLink™ storage facilities (in case of on-farm storage on behalf of CCC) and to estimate bushels. After movement of grain, a final settlement (reconciliation) will be done by a CCC/Aventis agent taking into account the following: actual delivered weight/bushels, the $0.25 per bushel premium due, storage payments (if applicable), corn check-off, destination discounts from #2 yellow corn, etc., and after reconciliation is completed farmer will receive from Aventis the final settlement balance due to him.

"4. Farmer can elect not to participate in the SES Program and to market his StarLink™ corn to a *USDA Approved Destination* without assistance from Aventis/ StarLink™ Logistics. Farmer does not receive the $0.25 per bushel premium or any reimbursement for freight and/or storage.

"Note: Aventis will send a letter to those farmers who elect not to participate in the SES Program (i) confirming that the farmer has elected not to participate, (ii) informing the farmer that he will not receive any premium/freight/storage from Aventis, (iii) reminding the farmer of his obligation to deliver StarLink™ corn to a *USDA Approved Destination*, (iv) advising farmer that, as part of its voluntary agreement with federal regulators, Aventis will provide the federal agencies with information concerning grower participation in the SES program."

The letter also contained a "Program Commitment Form" for a producer to complete and return—

"1. ð Option 1. Farmer can elect to participate in the SES Program and to feed all or part of his StarLink™ corn on-farm. For the StarLink™ corn fed on farm, the farmer will receive from Aventis a $0.25 per bushel premium. Farmer does not receive any reimbursement for freight and/or storage.

Approximate number of bushels: _____

"2. ð Option 2. Farmer can elect to participate in the SES Program and to market all or part of his StarLink™ corn to a *StarLinkÔ Logistics Approved Destination*. For that portion of the StarLink™ corn so marketed, the farmer will receive from Aventis a $0.25 per bushel premium. In the event additional transport distance is involved (i.e. beyond that farmer would have normally incurred) to deliver StarLink™ corn to a confirmed *StarLinkÔ Logistics Approved Destination*, farmer may be eligible for reimbursement of the additional freight expenses. Farmer does not receive any reimbursement for storage.

Approximate number of bushels: _____

"3. ð Option 3. Farmer can elect to participate in the SES Program and to sell all or part of his StarLink™ corn to CCC. For that portion of the StarLink™ corn sold to CCC, farmer will receive the October 2, 2000 Posted County Price (PCP) in the county in which the grain was produced plus the $0.25 per bushel premium. CCC/ACS (or agent) will arrange and pay for proper disposition of corn from origin (field and/or storage facility). If requested by CCC and

agreed by farmer, farmer may temporarily store StarLink™ corn, in which case farmer will be reimbursed for storage.

Approximate number of bushels: _____

"4. ð I do not plan to participate in the Aventis Enhanced Stewardship Program and understand that I forfeit all benefits of the program."

On October 18, an Aventis representative agreed to waive the October 20 deadline for a response.

Cancellation of registration

On October 12, 2000, the EPA announced that Aventis was "canceling the registration of StarLink corn." The full text of the announcement was a follows—

"At the strong urging of the Environmental Protection Agency, Aventis is announcing today that they are canceling the registration of StarLink corn. This means that StarLink corn can no longer be planted for any agricultural purpose. Today's agreement will ensure that in the future no new StarLink corn will be grown and none will find its way into processed foods like taco shells.

"The voluntary agreement represents far and away the fastest tool available to EPA for quickly removing StarLink corn from being planted for any agricultural uses. This action will ensure the full protection of public health and continued consumer confidence in the food supply.

"EPA does not have any evidence that food containing StarLink corn will cause any allergic reaction in people, and the agency believes the risks, if any, are extremely low. However, because Aventis was responsible for ensuring that StarLink corn only be used in animal feed, and that responsibility clearly was not met, today's action was necessary. The remaining StarLink corn must be used only for animal feed or industrial uses until existing stocks are depleted.

"EPA commends both Kraft Food and Safeway for the quick response they have taken to remove from sale taco shells suspected in containing StarLink corn."

Scope of the problem

Information on the Aventis website as late as October 2000, requested that growers who had not signed contracts sign and return them. However, at that late date there was little that could be done to change the isolation practices or prevent the inadvertent commingling of the StarLink™ grain with other grain on farm. In a few cases, Iowa elevator managers have reported that farmers have come forward to tell them that loads of StarLink™ corn have been inadvertently dumped in the elevator. The *New York Times* reported on October 14, 2000, that some in the grain trade estimate that 267 U.S. elevators may have had StarLink™ dumped and commingled into their inventories. The actual number could grow depending on how much contamination from inadvertent harvest time new crop deliveries, old crop 1999 deliveries and cross-pollinated grain was delivered in the August-October period.

The scope of the problem is related to (a) the number of acres of StarLink™ planted, (b) the geographic distribution of the acres planted, (c) the proximity of the StarLink™ acres to fields of other fully approved hybrids planted within a geographic area and (d) the adequacy of

information provided to StarLink™ producers and farmers growing corn on adjacent land about the limitations on growing and marketing StarLink™. The number of acres and geographic distribution are known but the latter two are not as clear.

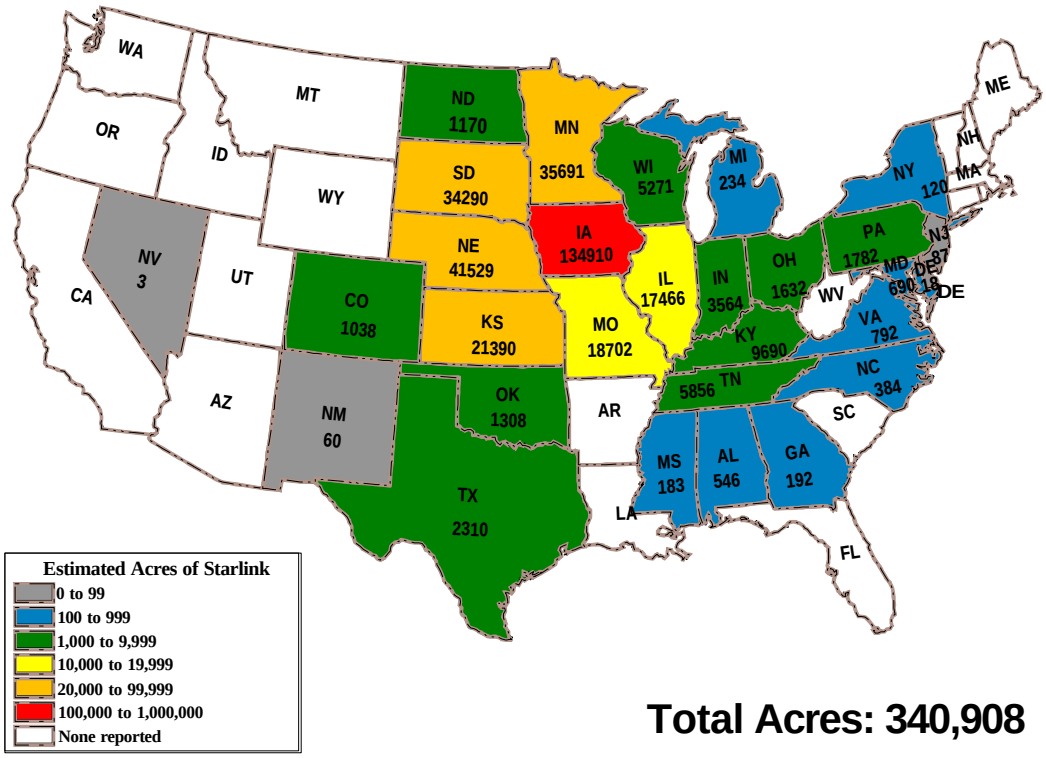
The National Corn Growers Association has listed 29 hybrids sold by 11 seed companies which had been approved for using the StarLink™ technology—

Brand	*Hybrid*	*Maturity*
AgriBioTech, Inc.	HT7707Bt	112
AgriPro Seeds, Inc.	8309GLS/Bt/LL	116
AgriPro Seeds, Inc.	9630Bt/LL	113
AgriPro Seeds, Inc.	8773BLT	99
Bo-Jac Seed Company	353SL	108
Cenex/Croplan Genetics	562Bt/LL	105
Cenex/Croplan Genetics	692Bt/LL	112
Cenex/Croplan Genetics	D5862Bt/LL	87
Curry Seed Co.	EX979	113
Curry Seed Co.	7891	113
Curry Seed Co.	EX869	109
Curry Seed Co.	EX944	106
Fred Gutwein & Sons Inc.	2529Bt/LL	110
Garst	8773BLT	99
Garst	8342GLS/LL	114
Garst	8366Bt/LL	113
Garst	8309Bt/LL	116
Garst	8896BLT	90
Garst	8692BLT	104
Garst	8600BLT	107
Garst	8585GLS/BLT	108
Garst	8481BLT	112
Garst	8539BLT	110
Hoegemeyer Hybrids, Inc.	6SL532Bt	111
Hoegemeyer Hybrids, Inc.	7SL 199Bt	114
Hoegemeyer Hybrids, Inc.	5SL 894Bt	108
Legend Seeds, Inc.	8905Bt	105
NC+ Hybrids	4709MBL	112
Sieben Hybrids	3710SL	111

The states involved are shown in Figure 1 along with the estimated number of acres of StarLink™ planted in the state.

The distribution of acres within the Midwest is shown in Figure 2 (see Appendix for larger maps). Iowa had the largest concentration of StarLink™ planted in the 2000 crop year with approximately 135,000 acres. Although the heaviest concentration of production is in the southwestern quadrant of the state, there are a few counties elsewhere in the state with significant acreages. Apparently, the marketing efforts were focused on parts of the state where there is heavy feeding demand. However, this is helpful only if corn produced from StarLink™ seed and the corn harvested from the pollen isolation buffer rows are segregated from non-StarLink™ inventories. There is reason to believe that this was not done in a significant number of fields.

Figure 1. Estimated Acres of StarLink Corn



Source: Http://www.us.cropscience.aventis.com/AventisUS/CropScience/ (October 12, 2000).

Effects on the origination elevators

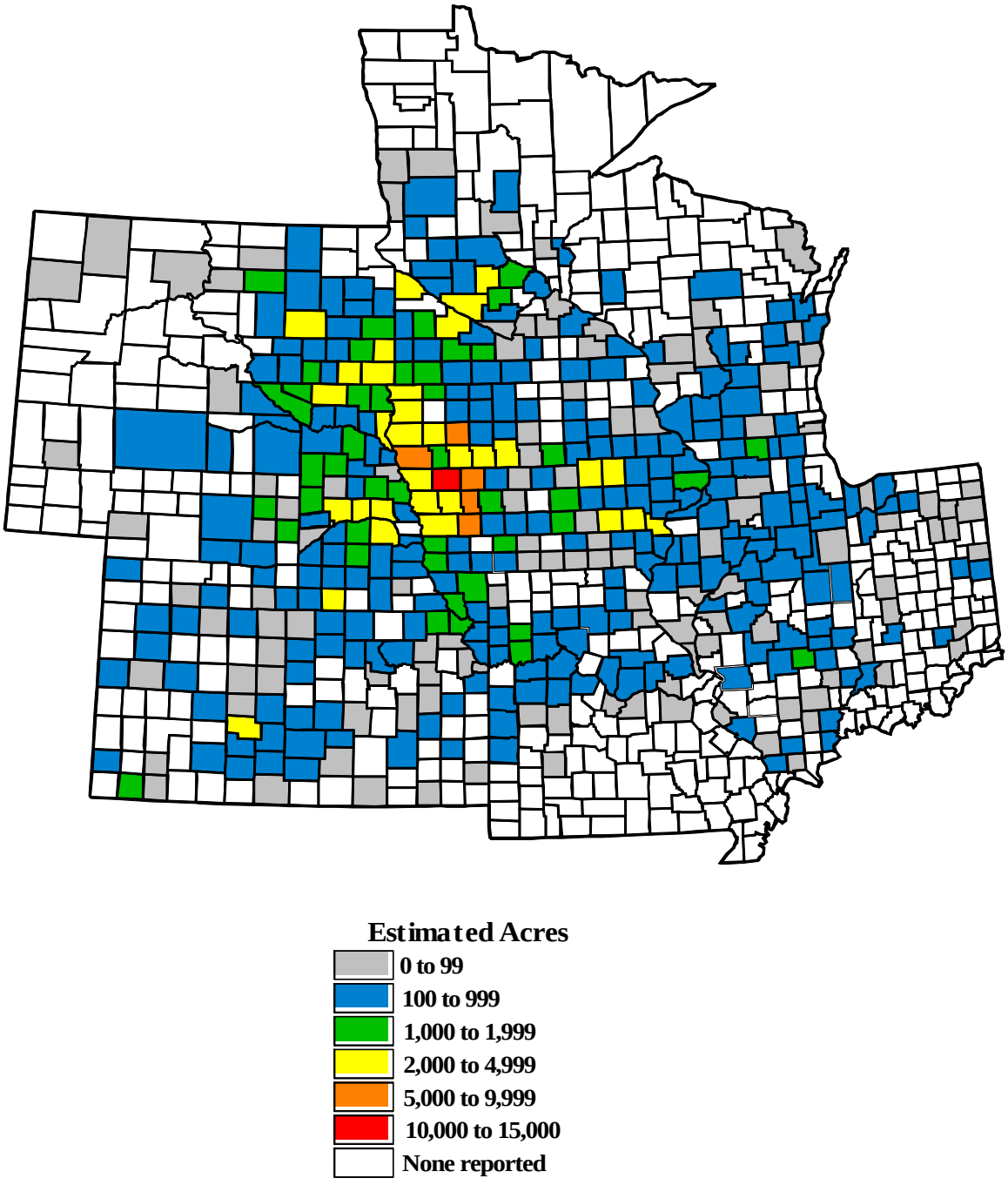
The operational burden of handling low level mixed lots falls primarily on the grain handling industry in the form of StarLink™ grain received at harvest, before the issue surfaced, and mixed in large storages. Overall, StarLink™ accounted for 0.5% of U.S. corn production, but 1.1% in Iowa and an estimated 9.1% in the highest production county (not including any pollination effects). Grain not yet delivered or already fed presumably is not creating future risk if producers adhere to one of the marketing programs. Cross-pollinated grain may be less easily identified and sequestered.

According to the EPA, any presence of StarLink™ in grain that is destined for human consumption is unacceptable.

The elevators receiving grain directly from the farm (origination elevators) in areas where StarLink™ was grown will face numerous problems from the commingling that has already occurred. Even relatively small quantities of StarLink™ grain (or grain cross-pollinated with

Figure 2. Estimated Acres of StarLink Corn

In Midwest states of South Dakota, Nebraska, Kansas, Minnesota, Iowa,Missouri, Wisconsin, Illinois, and Indiana; based on seed ordered



Source: Http://www.us.cropscience.aventis.com/AventisUS/CropScience/ (October 12, 2000).

StarLink™) mixed with other hybrids can cause the lot to test positive. The ability of the elevator to ship grain to normal markets will hinge on the results of testing done by processors and exporters. Even those elevators where little of the StarLink™ corn was grown may have received some small quantity and face the risk of a positive test result.

Processors have already begun testing inbound grain delivered to their facilities. These tests are immunoassay tests specific to the proteins found only in StarLink™. The tests take about 10 minutes to perform (not including sample subdivision and grinding) and indicate the presence or absence of the StarLink™ specific protein. Presently, the detection limit reported by the manufacturer is 0.25% (l kernel in 4000). Testing at the processing plant in this manner adds extra expense and can leave loads that test positive out of position for their best use. For example, a train load originating in Western Iowa that tests positive at a Cedar Rapids processing plant will have moved from a heavy livestock production area into one where there may be less opportunity to move it into livestock channels. Beyond that, over time an excess of grain legally useable only for use as livestock feed can be expected to accumulate in the areas where processing plants operate.

The major problem in market channels will be sampling. An example will illustrate: If a corn lot contains 0.25% StarLink™ kernels, there will be about 2,275 kernels (7 of which will be StarLink™) in the typical 2 lb. elevator sample and about 13,000 kernels (33 StarLink™) in the typical 10 lb. official inspection sample. The natural tendency of grain graders is to divide large samples before doing any preparation such as grinding. It is certain in this process that some subdivisions will have more and some will have fewer GM kernels. The 400-kernel portions with more than 1 GM kernel will still test positive; the ones with less (0) will be negative.

—The elevator must take large samples and grind the entire sample before dividing.
—The lower the percentage of StarLink™ in the lot, the *higher* the risk of missing (false negative).

Elevators and buyers in low concentration areas may face greater risks and problems with conflicting tests than those in areas where levels are likely high enough to produce a positive result for nearly every possible subsample. Harvesting and handling operations have the potential to create inadvertent mixing in the 0.1-0.5% concentration levels, so equipment cleanout and careful inventory control will be more critical in this situation than in cases where tolerances apply.

The question has not arisen in previous non-GMO programs because generally testing was to confirm what was already managed to be GM-free grain rather than to identify randomly occurring low-level lots of uncontrolled grain. The latter situation is much more typical of mycotoxin outbreaks than specialty marketing programs.

Other problems for elevators include the contracts that they have written with processors and exporters who will no longer be able to accept commingled lots of corn. In order to fill these contracts it will be necessary for the elevator to locate and purchase inventories from other non commingled sources. Accomplishing this will almost certainly involve added costs for

transportation and most likely price differences in what the StarLink™ can be purchased for and what it costs to purchase the non StarLink™ grain required to fill the contract.

Railroad contracts for hauling grain from an elevator are an additional potential problem area. Freight contracts require that a certain number of trainloads be delivered from the elevator and delivered to a processor or exporter destination. If there is no acceptable grain to ship from the contract origin elevators, the elevators may be in a position of having to "buy out" any trips remaining on the contract. Both of these contract related problems could easily add more costs than can be covered by the gross margins the elevator can earn.

Ethanol as a potential use

On October 9, 2000, the Corn Refiners Association, Inc. (CRA) announced the following on using StarLink™ corn or StarLink™ contaminated corn for ethanol production—

> "On September 29, the U.S. Department of Agriculture announced it would purchase StarLink corn from farm producers, with reimbursement of costs to be provided by Aventis CropSciences. According to the Department this measure was taken to 'prevent the current crop of StarLink corn from being used in processed foods.'
>
> "StarLink corn is fully approved in the U.S. for animal feed use and non-food industrial use. While neither USDA nor Aventis specified ethanol production in statements on acceptable markets, recent press reports have indicated that ethanol production may be an outlet for some of the purchased StarLink corn.
>
> "Ethanol is produced by CRA members concurrent with, and in the same facilities as, food production. Because StarLink corn is not approved for use in food production, directing it to their facilities is a violation of the U.S. government registration for the product. CRA members provide corn gluten feed to domestic and export markets from only these facilities.
>
> "Beyond this prohibition on food use of StarLink, this variety (and others not approved for European import) has appeared on a negative list of varieties from U.S. corn wet millers since its introduction in 1998.
>
> "A limited number of corn dry-mills may be in a position to utilize StarLink corn for ethanol production. These mills do not produce food products and provide coproduct feeds only to domestic, and geographically limited, feed markets. The Department of Agriculture and private entities assisting in their purchase program have full information concerning the locations of these facilities.
>
> "Irrespective of end-use, all outlets for purchased StarLink corn must be individually approved by the U.S. Department of Agriculture before delivery. On Friday, October 6, the Department told CRA and other grain processing and handling Associations it has not confirmed any ethanol facilities as approved destinations for StarLink corn."

Agreement reached with Aventis by Iowa Attorney General

On October 19, Iowa Attorney General Tom Miller announced that an agreement had been reached with Aventis CropScience on several pending issues. That agreement involved the following assurances from Aventis representatives—

- "Aventis's top priority is to control and segregate StarLink™ corn. The company is seeking to keep the corn out of the grain marketing system, except for moving corn to 'approved delivery sites' that can accept the corn and keep it completely segregated from other grain. Aventis has a list of approved delivery sites in the U.S., including 51 in Iowa. Aventis agrees to provide farmers with names of approved delivery sites in their areas.

- "Aventis, with the USDA, has established the SES or StarLink™ Enhanced Stewardship Program under which farmers who grew the crop are encouraged to enter agreements for the grain to be purchased at a premium of 25 cents per bushel over the October 2, 2000, posted county price. Under the SES program, producers are urged to store the corn on their farms until further notice. Aventis will pay costs for storage and shipping to approved sites.

- "Aventis said it will extend the October 20 deadline it formerly had set for farmers to decide to participate in the SES program. Aventis also agreed that farmers who participate in the SES Program are not waiving any rights to recover additional damages they may have incurred as a result of growing StarLink™ corn. 'Farmers have more time, and they don't have to give up any rights to participate in this program, Aventus told us today,' Miller said.

- "Other corn commingled with StarLink™ corn and stored on the farm is not included in the SES Program. However, Aventis will pay storage and transportation costs associated with delivering the grain to an approved delivery location.

- "Growers who can verify to Aventis that they grew corn within 660 feet of StarLink™ corn ('buffer growers') will be eligible to participate in the SES program for grain grown in the buffer strip and still stored on their farm. The EPA license for StarLink™ specified that a 660-foot buffer strip was necessary at any StarLink™ field to prevent StarLink™ from spreading its genes to other varieties of corn during pollination. 'We don't believe most producers were aware of this requirement,' Miller said.

- "Aventis will work with grain elevators that receive StarLink™ corn to assure that both StarLink™ and commingled StarLink™ corn are directed to appropriate approved delivery points. Aventis will pay for additional transportation, demurrage, and testing costs incurred by a grain elevator because of the commingled corn. Aventis said it will 'work with' grain elevators to address problems related to discounts in value for StarLink™ and commingled grain delivered to an approved delivery site."

The announcement also indicated that unresolved issues remain—

"'There are difficult issues still to be resolve,' Miller said, 'especially the likely discounted value of commingled grain and grain already in the distribution system. We have a long way to go to sort out all of those issues. Mr. Wichtrich [representing Aventis CropScience] said his company would continue working with us and those who are affected by StarLink™ corn problems. I told Mr. Wichtrich that it is unfair for farmers and elevators or others to be stuck with the consequences of problems they did not create.'

"Aventis also said it will provide test kits or testing at no charge to producers, elevators, or others. Aventis says the testing can determine if grain is StarLink™ corn or commingled with StarLink™ corn…"

Further Aventis concessions

On October 20, 2000, in a letter to Keith Pitts of USDA, John Wichtrich, vice president of commercial operations for Aventis CropScience agreed to several more conditions relative to the StarLink™ matter:

> "1. The October 20, 2000, deadline set for farmers to decide to participate in the StarLink Enhanced Stewardship Program (SES) has been extended, as has the May 1, 2001 deadline for on-farm feeding within the SES Program. Discussion continues to establish new deadlines.
>
> "2. Farmers who participate in the SES Program are not waiving any rights to recover any additional damages they may have incurred as a result of growing StarLink corn.
>
> "3. Within the SES Program, Aventis will provide logistical support, including transportation costs, storage, demurrage, etc. for commingled corn stored on the farm that is subsequently delivered to an approved location. However, the $0.25 per bushel incentive or Logistics Service Fee will be payable only for the actual StarLink corn and buffer corn contained within the commingled lot. This is consistent with the agreement reached between Aventis and the USDA, FDA and EPA on September 29, 2000.
>
> "4. Growers who can verify to Aventis that they grew corn within 660 feet of StarLink corn (buffer growers) will be eligible to participate in the SES Program regarding the corn grown in the buffer strip as long as the above-referenced corn is contained and/or fed on-farm. Aventis will pay the storage and transportation costs associated with delivering the grain to an "approved delivery location."
>
> "5. If grain elevators received StarLink corn, Aventis will work with them to assure that both StarLink and commingled StarLink corn are directed to appropriate approved delivery points. Aventis will pay for additional transportation, demurrage, and testing costs incurred by the grain elevator in directing the above-referenced grain to approved channels. Aventis will work with grain elevators to address problems related to discounts in value for StarLink and StarLink commingled grain delivered to an approved delivery site.
>
> "6. Aventis will make the sites on the "approved delivery site" list available on a case-by-case basis and as necessary to assist delivery of StarLink corn to those sites.
>
> "7. Aventis will provide test kits at no charge to growers and elevators who request them, in those cases where there is a demonstrated need for testing."

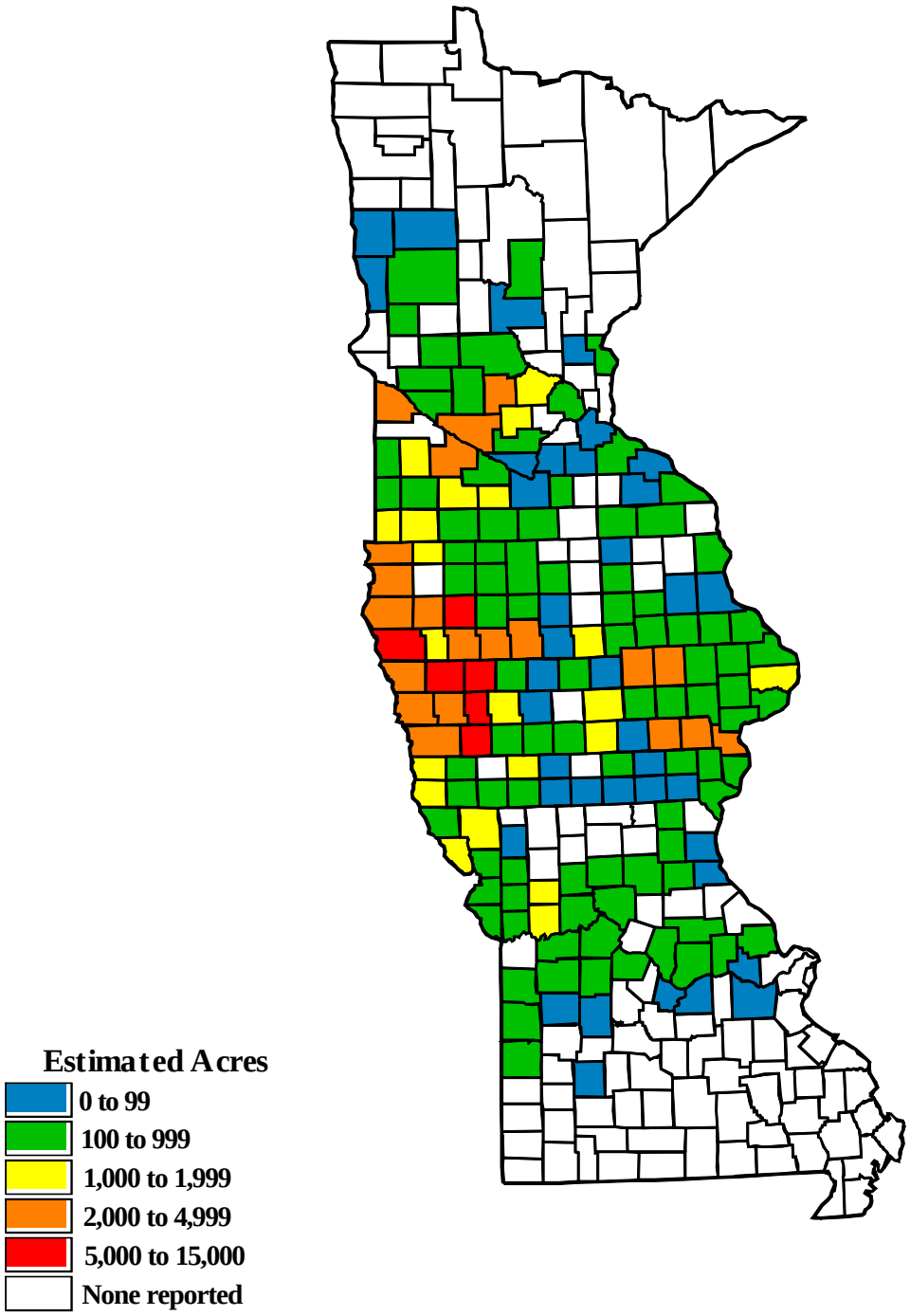
The letter recites that the agreement was reached on October 18 as an amendment to the "StarLink [sic] Enhanced Stewardship Program."

Conclusions

An obvious conclusion from this saga is that approval of a crop variety for one use but not another is fraught with peril unless steps are taken to insure identity preservation. Such was not done in this instance. The consequence is substantial economic costs, most of which are borne at least initially by low-margin participants in the food chain—producers and elevators.

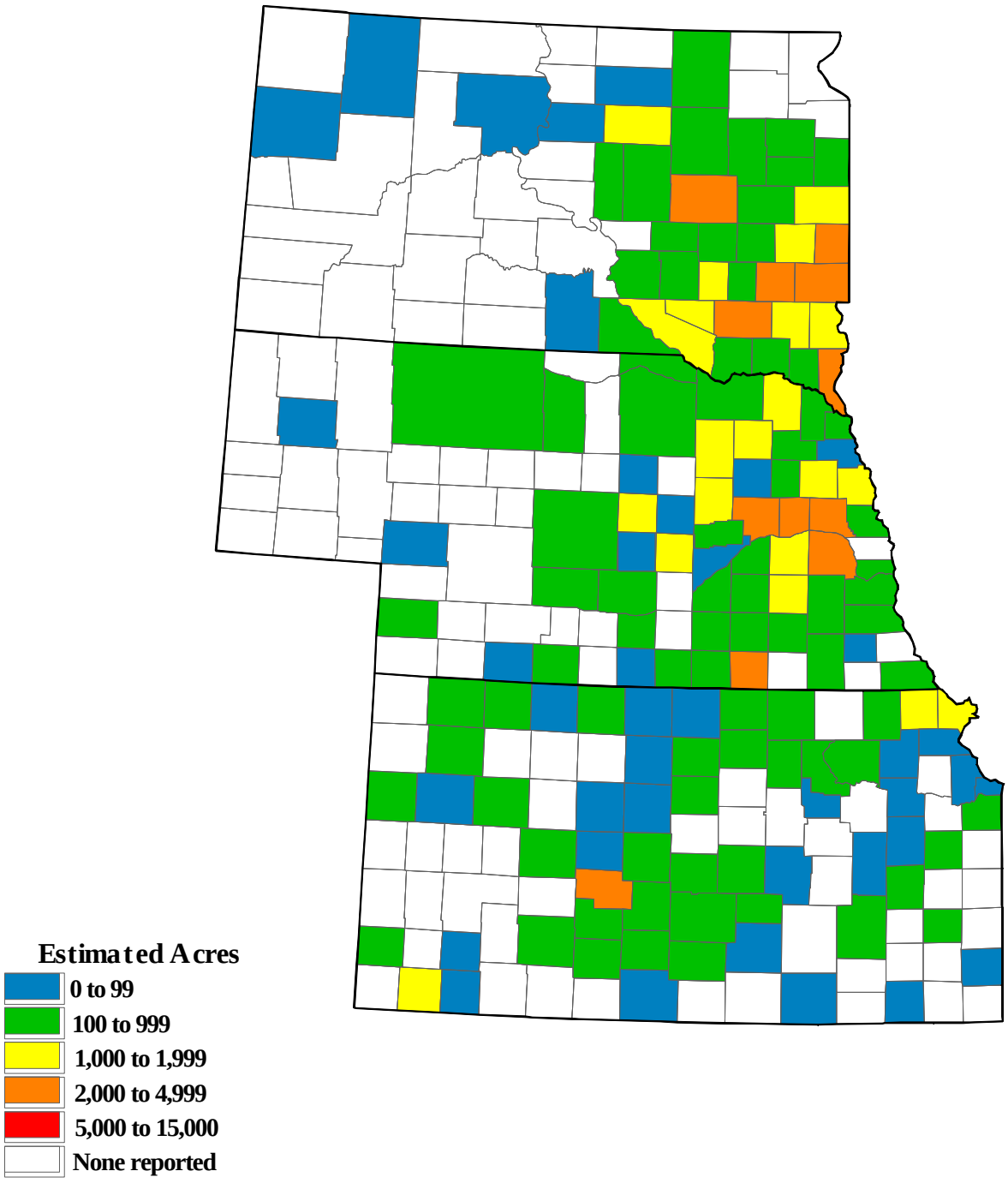
The major lesson which should be learned from this event is that regulators should, in general, not approve varieties for one use but not another unless the system is prepared to carry out the necessary segregation.

Estimated Acres of StarLink Corn
In Midwest States of Minnesota, Iowa and Missouri
based on seed ordered



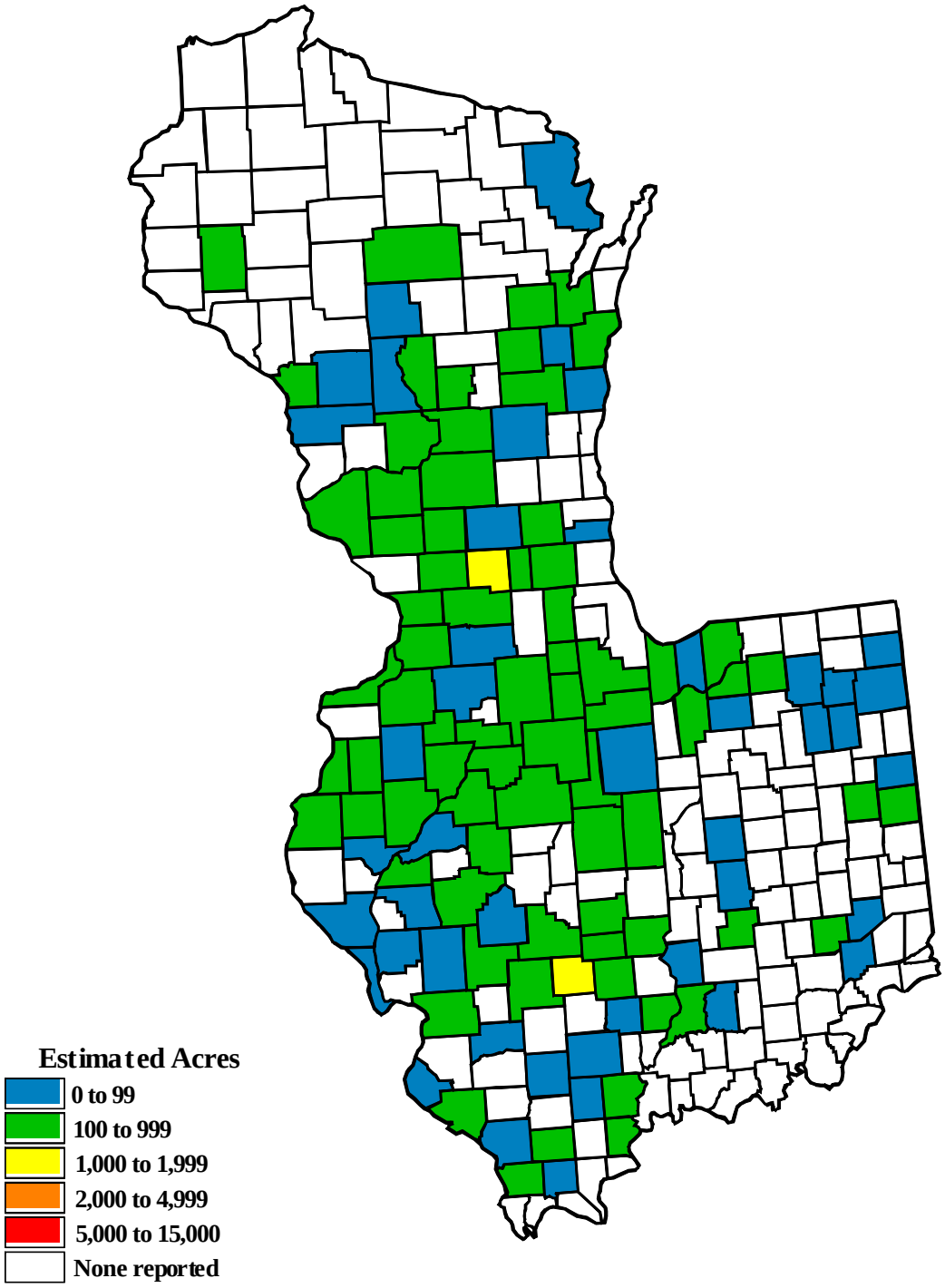
Source: Http://www.us.cropscience.aventis.com/AventisUS/CropScience/ (October 12, 2000).

Estimated Acres of StarLink Corn
In Midwest States of South Dakota, Nebraska and Kansas based on seed ordered



Source: Http://www.us.cropscience.aventis.com/AventisUS/CropScience/ (October 12, 2000).

Estimated Acres of StarLink Corn
In Midwest States of Wisconsin, Illinois and Indiana
based on seed ordered



Source: Http://www.us.cropscience.aventis.com/AventisUS/CropScience/ (October 12, 2000).