

Segregating Transgenic Grains: Results of a Survey among Country Elevators in South Dakota

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Abstract

Using responses from a mail survey conducted among 203 South Dakota grain elevator managers in 2002, we analyzed the degree to which the elevators were prepared to segregate non-transgenic from commodity grains. Only 17 and two percent reported having buyers inquire about segregated non-transgenic or identity preserved corn, and such soybeans, respectively. Among those handling corn (soybeans), 53 (58) percent were willing to participate in non-transgenic corn (soybean) markets at an average premium of 28 (37) cents per bushel. It appears that one in five elevators are able to participate in segregating non-transgenic and commodity grains without additional capital outlays.

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South Dakota's economy is heavily dependent upon agriculture, which in turn is reliant upon grain production. Therefore, an efficient and dynamic grain handling system able to adapt to changing market conditions is crucial for the state's economic vitality. Currently, South Dakota's grain handling system is geared to efficiently move large quantities of bulk commodities. By increasing its efficiency, the state's grain handling system has seen a decline in the number of commercial grain elevators and an improvement in transportation capabilities of existing facilities.

Since 1996, the use of genetically modified (GM) grains has become popular among agricultural producers in the United States in general, and South Dakota in particular. While "input-trait" grains are used for ease of management at the farm level and may have lower production costs than conventional grains, they do not provide direct benefits to consumers. Furthermore, the ability to alter the genetic structure of organisms does not necessarily come without risks to consumers and the environment, leading some groups and individuals to argue that the production of these transgenic crops has outpaced the relevant research. As a result of concerns about unknown potentially negative consequences of growing genetically engineered crops and the consumption of their products among humans and livestock, some consumers have been unwilling to purchase products containing ingredients from GM crops (Gaskell, 2000).

A number of countries restrict the importation of genetically modified organisms (GMOs), either through a labeling system or by disallowing products containing ingredients from GMOs beyond a certain tolerance threshold. The European Union (EU),

for example, implemented a mandatory labeling policy in 2000. Under this policy, food products containing one percent or more GM material must be labeled as such (Rousu, et al., 2002). These trends highlight the possibility of expanded market demand for non-transgenic grains and, therefore, the need to segregate non-transgenic grains from commodity grains (which may be commingled with transgenic grains) at the farm and elevator levels.

If the grain handling industry is not prepared to evolve with the changing market demand for segregated non-transgenic grains, producers and handlers may miss opportunities to capture possible premiums for segregated non-transgenic grains. Previous large capital investments made to enhance the grain handling system's efficiency notwithstanding, the current system is generally regarded as being not well-suited for handling many different types of grain segregated based on quality attributes.

In this paper, we assess the readiness of South Dakota grain elevators to segregate non-transgenic grains from commodity grains containing transgenic material. We also assess the elevators' ability to participate in segregating non-transgenic grain and identity preservation, should market demand for such grains develop.

Previous Work

To our knowledge, no study has assessed South Dakota grain elevators' ability to participate in segregating non-transgenic grains from their commodity counterparts, but a number of studies on segregation and IP systems have been conducted elsewhere. Lin (2002) analyzed several survey studies of Midwestern grain elevators gauging the market demand for non-commodity grains and estimating additional handling costs of segregating non-transgenic corn and soybeans. He found that the demand for segregated

non-transgenic corn and soybeans accounted for only one to two percent, and two to three percent, respectively, of U.S. production in 1999. Most of the demand for these two non-transgenic crops comes from Japan and the EU.

Although the non-transgenic corn and soybean markets remain relatively small, fear about transgenic contamination has led some U.S. processors to adopt a policy of not accepting transgenic corn varieties not approved by the EU. Grain segregating requires the presence of price premiums, which serve as compensation for the costs involved with segregating non-commodity grains over and above the costs incurred with handling conventional commodity corn. In 2000, price premiums to crop producers ranged from \$0.05 to \$0.10 per bushel of segregated non-transgenic corn, and from \$0.10 to \$0.15 per bushel of segregated non-transgenic soybeans (Lin, 2002). Premiums tended to increase with more restrictive tolerance thresholds, allowing buyers to accept with a greater degree of certainty that no genetically engineered product would be present.

A survey of 100 Midwest grain handling facilities conducted by Sparks Companies Inc. in 1999 reported that 11% and 8% of the respondents differentiated non-transgenic corn and soybeans, respectively (Lin, 2002). One and three percent of the respondents offered a premium for non-transgenic corn and soybeans, respectively. Price premiums varied widely depending on geographic location and intended end-use.

Another survey among 1,200 elevators throughout the United States indicated that 24% and 20% of the respondents planned to segregate non-transgenic corn and soybeans, respectively, for the 2000 harvest season. Further, the American Corn Growers Association polled 1,141 grain elevators in 10 Midwestern states in 2001, and found that over 30% of the elevators were either requiring or suggesting segregation at their facility.

In another survey conducted among 200 grain handlers by Illinois researchers in 1998, 90% of grain handlers indicated segregating high oil corn (HOC) or synchrony treated soybeans (STS), a non-biotech, herbicide-tolerant variety. Additional segregation costs (excluding purchasing premiums) incurred by the handling facilities amounted to \$0.06 per bushel for HOC and \$0.18 per bushel for STS. Average purchase premiums paid to producers in 1998 were \$0.12 for HOC and \$0.15 for STS soybeans (Lin, 2002).

Data and Methods

To assess the physical infrastructure of individual elevators and their managers' attitudes, we conducted a survey among managers of 203 grain elevators in South Dakota in March and April of 2002. The elevators were identified through, and updated from, a list provided by the South Dakota Public Utilities Commission (2002). We conducted the survey by mail, using a modified method proposed by Salant and Dillman (1994). In total, 82 (40%) usable questionnaires were received. Regional response rates varied from 33% in the North Central region to 47% in the Central and West River regions (Table 1). The number of responses from each region was sufficiently high to ensure the release of average regional results without compromising the confidentiality of individual elevators. Responses from the returned questionnaires were tabulated, and written comments were summarized by region for interpretation. A detailed description of methods and procedures is listed by Wilhelm (2003).

Results

Storage capacity information was available for only 159 of the 203 grain elevators operating in South Dakota in 2001 (Table 2). Among those, 25% were classified as large (with a storage capacity of more than 800 thousand bushels), 38% were of medium size

(from 400 to 800 th bu), and 37% were small (less than 400 th bu). All elevator size categories and all geographic regions of the state were well represented in this sample (Table 3).

For the state as a whole, the managers were either unsure or did not expect their own or other elevators to become dedicated to handling strictly non-transgenic or IP grains (Table 4). Only four percent of the respondents agreed, and 66% disagreed, that their elevators would be dedicated to handling strictly non-transgenic grains within five years. The remaining 30% of the managers were unsure about this statement. Ten percent of the respondents agreed that at least one of their competitors would be dedicated to non-transgenic grains within five years, while 45% did not agree with this statement. Similar responses were found among the managers about the possibility for elevators to be exclusively dedicated to handling IP grains.

Eleven to 14% of the elevator managers believed that the grain and oilseeds markets will be segregated into commodity and non-transgenic, or commodity and IP, markets within five years. In particular, 14% agreed, and 55% did not agree, that the U.S. corn market would be completely segregated into commodity and non-transgenic markets over the next five years. Similarly, 12% of respondents agreed, while 57% did not agree that the U.S. corn market would be completely segregated into commodity and IP markets over the next five years. Responses regarding the segmentation of U.S. markets for soybeans, winter wheat, and spring wheat were very similar to those for the corn market (Table 4).

These results highlight that grain elevator managers were aware about the uncertainty of the future direction of the market. About 11% to 14% of the elevator

managers felt that, over time, some form of market segregation will emerge for the corn, soybean, and winter and spring wheat markets. Respondents appeared unsure about whether future markets will be split into having either segregated commodity and non-transgenic grains, commodity and IP grains, or separate markets for commodity, non-transgenic, and IP crops.

Only three (4%) of the respondents handled non-transgenic corn separately. Two of these facilities were in the Northeast Region and the third was in the West River region. The average quantity of segregated corn handled by these elevators was 250 thousand bushels. One facility, located in the West River Region, performed a genetic test at the time of purchase and followed a practice of obtaining written assurance from the seller, stating that the grain was produced according to conditions prescribed in the contract. This elevator also cleaned loading and unloading equipment prior to handling the non-transgenic corn. In the other two cases, the elevators only obtained the sellers' verbal assurance. All three elevators maintained separate non-transgenic dedicated bins. The elevators did not disclose any premiums paid or received for non-transgenic corn.

Only one elevator (1%) located in the North Central Region, handled its 5,000 bushels of non-transgenic soybeans separately from conventional commodity soybeans. This elevator obtained a written assurance from the seller stating the soybeans were non-transgenic. The elevator also cleaned the relevant equipment and dedicated bins before handling the non-transgenic soybeans. Although the elevator paid a premium of 40 cents per bushel to the seller, it failed to receive any premium for the non-transgenic soybeans because no buyer willing to pay a premium for the non-transgenic soybeans could be

located in a timely manner, causing the elevator to discontinue the speculative position to avoid additional opportunity costs of unused storage space in the dedicated bin.

Only one elevator (1%), located in the Southeastern Region, participated in identity preservation during the year 2001, handling 200 thousand bushels of IP corn and paying a premium of 15 cents per bushel for the IP corn that year. However, the respondent chose not to disclose the premium received by the elevator for the IP corn. The grain at this elevator was tested at the time of purchase and its handling equipment and bins were cleaned thoroughly before filling the bins with the IP corn.

In total, 18 (22%) of the responding elevators conducted genetic tests on corn during 2001. These tests were performed to determine if the tested corn was free from the Cry9C protein.¹ Fifteen respondents performed lateral flow strip tests for Cry9C corn (Table 5). Six of these elevators performed the tests on-site using their own labor, while the remaining nine employed outside help to conduct the tests at an average cost of \$7.44 per test and an average turnaround time of 1.9 days. Three additional elevators employed the more sensitive PCR laboratory test at an average cost of \$10.00 per sample and an average turnaround time of about 2.3 days. None of the respondents conducted any genetic testing for soybeans at the time of the survey.

Table 6 provides insights into the degree to which the elevators' grain buyers had expressed interest in segregated non-transgenic grains. Only 14 (17%) and five (6%) of the respondents reported their buyers had shown interest in non-transgenic corn and soybeans, respectively. Even smaller numbers – three (4%) and two (2%) – of the

¹ Industry sources indicate that there are two major methods of performing genetic testing on corn and soybeans: a protein assay test (the “lateral flow strip test”), and the polymerase chain reaction (PCR) test. Lateral flow strip test kits are available for use at the elevator and are recommended for export shipment analysis. The PCR test is more sensitive in the detection of transgenic material and is conducted only in laboratories (Lin, et al., 2000).

elevators reported buyer interest in IP corn and soybeans, respectively. Most of these elevators were in the North Central, Northeast, and East Central regions of the state, and relatively close to the Minneapolis market. Because thus far no transgenic wheat variety has been released for commercial production and none is expected to be available in the near future, few buyers showed an interest in IP wheat. Only one elevator in the Northeast Region and one in the West River Region reported buyers' interest in IP wheat.

Table 7 lists the most commonly cited reasons for not handling non-transgenic or IP grains. Overall, concerns about efficient bin space utilization, and lack of a market or lack of a price premium were stated as the two most important reasons for not handling non-transgenic or IP grains. However, managers of large elevators handling corn cited bin space utilization and the risk of contamination of the specialty grains at the elevator as the two most common reasons for not handling non-transgenic or IP corn. On the other hand, managers of small elevators handling corn cited lack of premium and focus on supplying feed and ethanol plants as the two most common reasons for not handling non-transgenic and IP corn. Because large elevators tend to have large bins, dedicating one large bin to non-transgenic corn may run a high risk of underutilization of bin storage capacity. On the other hand, bins at small elevators tend to be of relatively small, and in many cases varying, size. Thus, dedicating a bin to non-transgenic corn at small elevators generally entails a lower risk of incurring a high opportunity cost of unused storage space in the dedicated bin than at a large elevator.

Table 8 lists the managers' willingness to consider handling segregated non-transgenic grains and the average expected premiums.² Among corn-handling elevators,

² More detailed data on managers' willingness and the expected premiums by region are reported by Qasmi, et al. (2003).

29% of the managers were familiar with segregating non-transgenic corn and 53% indicated being willing to consider participating in such a system for an average premium of at least 28 cents per bushel. The North Central, Northeast, East Central, and Southeast are the four top corn-producing regions of South Dakota (Qasmi and Wilhelm, 2002). In these regions, 42% to 72% of elevator managers were willing to consider handling segregated non-transgenic corn for a premium of 23 to 30 cents per bushel. Among soybean-handling elevators, 30% of the managers were familiar with the segregation of non-transgenic soybeans and 58% indicated being willing to consider handling these specialty soybeans for an average premium of 37 cents per bushel. In the top four soybean-producing regions (North Central, Northeast, East Central, and Southeast), 31% to 73% of elevator managers were willing to consider segregating non-transgenic soybeans at a price premium varying from 30 to 50 cents per bushel. Among elevators handling wheat, 47% of the managers were familiar with grain segregation and willing to consider segregating non-transgenic wheat if the associated premiums were at least 38 cents per bushel. In the case of the top four wheat-producing (West River, North Central, Northeast, and Central) regions, 40% to 67% of elevator managers were willing to consider segregating wheat for a premium ranging from 29 to 53 cents per bushel.

As in the case of commodity grains, the costs of handling specialty grains are volume-dependent. Hence, the desired premiums for different segregated non-transgenic grains reported by elevator managers must be viewed as rough estimates. The cost of segregating grains and accompanying premiums will decrease as the market demand for non-transgenic grains increases or the quantity of segregated grain handled by an elevator

increases. The availability of farmer-owned storage for specialty grains may also influence the feasibility of handling segregated non-transgenic grains at the elevator.

An elevator can handle a non-transgenic grain segregated from its commodity counterpart only if its infrastructure – consisting of legs, a conveyer system, and storage facilities – can accommodate handling and storing a number of different types of grains. In terms of handling, most South Dakota grain elevators use a self-cleaning conveyer system. Regarding storage, an elevator will not be able to store non-transgenic grain segregated from its commodity counterpart if the elevator’s storage facility cannot be divided into separate units. For example, an elevator handling two crops (e.g. corn and soybeans) would need a facility with four separate storage units to handle both non-transgenic and commodity varieties of each grain type. In some cases, the elevator may adopt two-tier segregation for corn, requiring an additional storage unit at the facility.³ We assume that the ability to divide the storage facility into four or preferably five separate units suggests that the elevator is equipped to segregate non-transgenic from commodity corn and soybeans without significant additional capital investment.

Table 9 lists the elevators’ capability to be divided into separate storage units.⁴ A total of 29% of the managers, accounting for 27% of the state’s storage capacity, reported that their elevators can be divided into at least four separate storage units. This ability ranged from eight percent in the East Central Region to 40% in the West River Region and 46% in the North Central Region. Statewide, 17% of the managers, accounting for

³ Two-tier segregation refers to a system that keeps GM-free non-transgenic corn separate from non-transgenic corn that may contain certain EU-approved GM material up to a certain threshold level. Both non-transgenic varieties are also kept segregated from conventional commodity corn. If a two-tier segregation system is used for corn, a facility also handling non-transgenic soybeans segregated from commodity soybeans must consist of at least five separable storage units.

⁴ More detailed data on elevators’ ability to divide into storage units are reported by Qasmi, et al. (2003).

20% of the state's total storage capacity, reported that their facilities could be divided into five separate storage units. In the East Central Region, eight percent of elevators were able to divide their storage facilities into at least five units, versus 27% in the West River region, and 31% in the North Central Region. Thus, 17% of the elevators in South Dakota, representing 20% of the total storage capacity in the state, would be able to participate in segmenting non-transgenic grains from their commodity counterparts without a large capital outlay.

Summary and Conclusions

We analyzed the degree to which South Dakota grain elevators are prepared to segregate non-transgenic grains from commodity grains, should a sizeable demand for such grains develop. Data were collected by way of a mail survey conducted among all 203 grain elevator managers whose elevators operated in South Dakota in 2002. In total, 82 usable questionnaires were received, representing 40% of all South Dakota elevators. The respondents were distributed relatively evenly across the state.

Although only four percent of the managers expected their elevators would be dedicated to handling only non-transgenic or IP grains within the next five years, over twice as many respondents expected that a competing elevator would do so within five years. This suggests that while elevator managers feel this type of market segmentation may play a role in grain markets in the near future, they are reluctant to be early adopters. Approximately one-third of the managers were unsure if U.S. markets for corn, soybeans, and wheat would be completely segregated into commodity, non-transgenic, and IP markets within five years. At time of the survey in 2001, very few elevators in South Dakota actually handled non-transgenic grains. Only three respondents (4%) handled

non-transgenic corn and one (1%) indicated handling non-transgenic soybeans. During the same year, only one respondent (1%) participated in IP grains. One in five elevator managers in the state reported having tested corn for transgenic material, and none of the respondents conducted any genetic testing for soybeans in 2001.

If coordinated non-transgenic segregation or IP systems are to be implemented on a large scale, buyers must be willing to pay premiums for non-transgenic or IP grains. Less than one in five respondents (17%) reported having buyers inquire about segregated non-transgenic or IP corn, perhaps influenced by the StarLink™ incident. The number of buyers interested in non-transgenic or IP soybeans was much lower. Only five (6%) and two (2%) of the respondents reported their buyers had shown interest in non-transgenic or IP soybeans. Nevertheless, the inquiries indicate a potential for the emergence of a limited demand for non-transgenic and IP grains.

Among the respondents handling corn, 29% stated being familiar with the non-transgenic corn market and 53% indicated their willingness to consider participating in such a system at an average premium of 28 cents per bushel. Among the soybean-handling respondents, 30 % were familiar with the non-transgenic soybeans market and 58% were willing to consider participation in such a market at an average premium of 37 cents per bushel.

At present, no transgenic wheat variety has been released for commercial production, and it is not expected to be available in the near future. Given the controversy surrounding transgenic wheat, it is therefore somewhat surprising that 47% of the managers whose elevators handled wheat were willing to handle segregated non-

transgenic wheat at an average premium of 38 cents per bushel if and when transgenic wheat varieties would be released for commercial production.

Elevators must have a physical infrastructure adaptable to segregating different types of grain to be able to participate in segregating non-transgenic grains. Roughly one in five grain elevators in South Dakota can participate in segregating non-transgenic grains from their commodity counterparts without additional capital outlays if market demands for these grains will develop in the future. While the demand for non-transgenic grains will likely be only for a small portion of the total grain demand, the South Dakota grain handling industry appears ready to meet the demand for segregated non-transgenic grains, should a sizable demand for such grains develop.

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Table 1. Distribution of Responding Elevators and Capacity Information

Region	Total Number of Elevators	Responding Elevators		Average Responding Elevator Capacity	Average Non- Responding Elevator Capacity	Other Non- Responding Elevators ^a
		(number)	(%)	(1,000 bu.)	(1,000 bu.)	(number)
1. North Central	39	13	33	799	637	9
2. Northeast	33	14	42	833	427	7
3. Central	19	9	47	826	789	4
4. East Central	38	13	34	787	615	6
5. Southeast	42	18	43	904	505	8
6. West River	32	15	47	389	704	10
SD	203	82	40	605	741	44

^a Capacity information not available.

Table 2. Number of Grain Elevators in South Dakota, by Size, 2001

Region/State	Small (< 400 th bu)	Medium (400-800 th bu)	Large (> 800 th bu)	Total ^a	Other Elevators ^b
1. North Central	11	12	7	30	9
2. Northeast	9	11	6	26	7
3. Central	5	4	6	15	4
4. East Central	9	15	8	32	6
5. Southeast	15	11	8	34	8
6. West River	10	8	4	22	10
SD	59 (37.1%)	61 (38.4%)	39 (24.5%)	159 (100%)	44

^aElevators with known capacity information

^bCapacity information for these elevators not available

Source: South Dakota Public Utilities Commission (2002).

Table 3. Responding Elevators by Region and Storage Capacity, in Number of Elevators

Region/State	Small (< 400 th bu)	Medium (400-800 th bu)	Large (> 800 th bu)	Total
1. North Central	2	8	3	13
2. Northeast	2	7	5	14
3. Central	3	3	3	9
4. East Central	3	6	4	13
5. Southeast	5	6	7	18
6. West River	9	6	-	15
SD (No.)	22 (27%)	36 (44%)	24 (29%)	82 (100%)

Table 4. Elevator Managers' Opinions on Selected Segmentation Issues

Statement	Strgly Disagree (%)	Disagree (%)	Not Sure (%)	Agree (%)	Strongly Agree (%)
My elevator will be dedicated to strictly non-GM grains within 5 years.	29	37	30	4	0
At least one of my competitors will be dedicated to non-GM grains within 5 years.	12	33	45	9	1
My elevator will be dedicated to Identity-Preserved (IP) grains within 5 years.	22	40	34	4	0
At least one of my competitors will be dedicated to IP grains within 5 years.	11	34	45	10	0
U.S. corn markets will be completely segregated into commodity and non-GM corn over the next 5 years.	15	40	30	13	1
U.S. corn markets will be completely segregated into commodity and IP corn over the next 5 years.	11	46	30	11	1
U.S. soybean markets will be completely segregated into commodity and non-GM soybeans over the next 5 years.	15	43	29	12	1
U.S. soybean markets will be completely segregated into commodity and IP soybeans over the next 5 years.	12	44	33	10	1
U.S. winter wheat markets will be completely segregated into commodity & non-GM winter wheat over the next 5 years.	12	38	38	11	1
U.S. winter wheat markets will be completely segregated into commodity and IP winter wheat over the next 5 years.	12	39	38	10	1
U.S. spring wheat markets will be completely segregated into commodity spring wheat and non-GM spring wheat over the next 5 years.	11	35	40	12	1
U.S. spring wheat markets will be completely segregated into commodity and IP spring wheat over the next 5 years.	11	34	44	10	1

Table 5. Elevators Involved in Genetic Testing of Corn for Starlink in 2001

Region	Strip Test (On-site)	Strip Test (Outside Help)			PCR Test (Outside Help)		
	No. of Elevators	No. of Elevators	Avg. Cost per Sample	Turnaround Time (days)	No. of Elevators	Avg. Cost per Sample	Turnaround Time (days)
NC	-	-	-	-	1	\$6.00	3
NE	1	6	\$8.00	2	-	-	-
Cent.	-	1	\$8.00	2	-	-	-
EC	2	-	-	-	2	\$12	2
SE	2	1	\$5.00	1	-	-	-
W. River	1	1	\$6.00	2	-	-	-
SD	6	9	\$7.44	1.89	3	\$10.00	2.33

Table 6. Buyers Interest in Non-Transgenic and IP Grains

Buyers Inquiries in South Dakota for:	Corn		Soybeans		Wheat	
	(No.)	(%)	(No.)	(%)	(No.)	(%)
Non-GM Grain	14	17	5	6	-	-
IP Grain	3	4	2	2	1	1

Table 7. Reasons Cited by Elevators for Not Participating in Segmentation

	Non-GM Corn	IP Corn	Non-GM Soybeans	IP Soybeans	IP Wheat
Number of Respondents ^a	73	75	66	67	57
<u>Cited Reasons for Not Participating:</u>					
Bin Space Utilization	42%	41%	41%	31%	39%
Lack of Market/Premium	38%	29%	26%	34%	26%
Risk of Contamination	32%	28%	20%	21%	19%
Testing Inconvenience	18%	9%	9%	9%	9%
Availability	12%	12%	8%	7%	18%
Time	14%	15%	8%	7%	4%
Mainly Sell to Feed/Ethanol	15%	11%	2%	0%	0%
Transportation	4%	4%	3%	4%	2%

^a South Dakota elevators handling the grain but not participating in segmentation.

Table 8. Elevator Managers Willing to Consider Non-Transgenic Grain Segregation and the Desired Premiums in 2001

Elevators Handling:	Total Number of Respondents (No.)	Respondents Familiar With Segregation (%)	Respondents Willing to Consider Segregation (%)	Avg. Desired Premium to Consider Segregation (Cents/bu)
Corn	76	28.9	52.6	28
Soybeans	67	29.9	58.2	37
Wheat	58	46.6	46.6	38

Table 9. Elevators Capable of Segmenting Facilities, 2002

Elevators with:	Elevators with Separable Storage Units		Total Capacity at Elevators with Separable Storage Units	
	(No.)	(%)	(mil bu)	(%)
≥ 4 Separable Units	24	29	17.0	27
≥ 5 Separable Units	14	17	12.6	20