STAFF PAPER

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Impact of Changes in U.S. Grain Standards on Discounts for Insects in Stored Grain[1]

Abstract:

The Federal Grain Inspection Service changed U.S. grain standards in 1988. Insect discounts given at country elevators and at terminal elevators were analyzed to determine impacts of the new standards. Insect discounts influence grain quality by affecting insect control decisions by producers and country elevator managers.

Key Words: Grain Inspection, Insect Discounts, Wheat, Farm Storage, Elevator Storage

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Impact of Changes in U.S. Grain Standards on Discounts for Insects in Stored Grain

In recent years, complaints have been voiced by grain processors and foreign buyers concerning the quality of U.S. grain. In May, 1988, the Federal Grain Inspection Service (FGIS) put into place new grading standards in an attempt to encourage the market to more accurately reflect the quality of grain in the market. Specifically, the FGIS recognized insect damaged kernels (IDK) as a separate quality factor. They also reduced the number of live insects allowed from a minimum of 5 per 100 gram sample to 1 per sample before designating a lot as infested.

Stored grain insects can cause severe damage if not controlled. Reed et al. (1989b), in one instance, found that insects had reduced a bin of sound wheat to sample grade within 6 months. Another study by Reed et al. (1989a) found that insect discounts resulted in 0.67 cents being lost for every bushel of farm-stored wheat examined. This study also found that 5.4% of all samples collected from farm storage exceeded the FDA defect action level of 32 insect-damaged kernels per 100 grams of wheat. This implies that 5.4% of farm-stored wheat could have been considered unfit for human consumption under FDA regulations.

The purpose of this study is to measure the impact of the changes in the FGIS grain standards on insect discounts levied on producers by country elevators and on country elevators by terminal elevators. This paper compares farm insect discounts and

country elevator insect discounts prior to and following the changes in the U.S. grain standard. Because discounts provide incentives for maintaining grain quality, these comparisons show if changing grain standards result in increased incentives for high quality grain in the marketing system. If insect discounts reflect grain quality, then discounts for insect problems should pass from the processor through the marketing chain to the level at which infestation was allowed to occur.

Data Collection

Six elevators from north central Kansas were chosen for this study. All six elevators were under the same management and, therefore, all had discount policies that were administered in a similar manner. The elevators were comparable in structure and size and similar in terms of equipment used to move grain.

This study focuses on hard red winter wheat stored on farms and at elevators from 1985 to 1989. Insect discounts were separated from the total discount in order to measure the impact of changes in the 1988 FGIS standards on the discount schedules of country and terminal elevators. Infestation was assumed to have originally occurred while the wheat was being stored on the farm. Reed et al. (1988) found that only 2% of all Kansas country elevators sample for insects at harvest. Infestation can occur in elevator-stored grain, but management techniques, detection devices, and structural differences in bins make such

infestation less likely. A study by Reed et al. (1989b) indicated that far more insect-infested samples are found in farm-stored grain than in elevator-stored grain.

Scale receipts for loads of wheat delivered to country elevators by producers were collected from each of the six elevators. Receipts covered a 5 year period (1985-1989), excluding those dated June 1 through July 31, during the harvest period. Systematic selection of every fifth receipt for farm-stored wheat resulted in 1231 loads for study.

The data were then analyzed to determine if insect discounts were levied. The frequency of insect discounts, the size of discounts in cents per bushel, and the percent discount were all determined. Insect discounts levied on farm managers and elevator managers were calculated. Farm insect discounts were levied by the country elevator in the form of a percent reduction in price based on the number of insects present in a grain sample. To put the percent discount on a cent per bushel basis, the percent discount was multiplied by the price the wheat received when sold. If the sale price was not recorded, the percent discount was multiplied by the mid-month price reported in a local newspaper.

Insect discounts levied against country elevators at terminal elevators were determined through inspection of rail receipts over a 4 year period (1986-1989). All wheat shipments were considered because farm-stored grain cannot be identified at this point in the marketing chain. Data were recorded for the

first, every third, and then the last rail receipt systematically selected for each day on which cars were loaded. In this way, 2014 cars were selected for study.

Insect discounts received by country elevators were calculated based on the factors "damage" and "other discounts" recorded on the rail receipts. "Other discounts" result from the presence of live insects or insect-produced odor. Grain damage results from both molds and insects. Reed et al. (1989b) found that insect-free wheat averaged a damage factor of 3.5% while in elevator storage. This is the percent damage caused by mold. Damage from insect presence was estimated by subtracting 3.5 from the recorded factor "damage". Estimated insect damage discount (¢/bu) was then determined by comparing the estimated insect damage factor against a discount schedule from a large regional grain company. Total insect discount (¢/bu) is the sum of the estimated insect damage discount and the "other discounts" recorded for insects.

Analysis

Table 1 shows the mean discount levied on producers and country elevators plus the standard deviation and sample size prior to and following the May 1,1988 standard changes in U.S. wheat standards. This table also shows the percent of the samples that received discounts and the average size of the discount. Tests were conducted using pair-wise comparison, with two tail t-tests for large sample sizes at the 0.05 level of

Table 1

Farmer Discounts and Elevator Discounts
prior to and following May, 1988

Item	Farm Disc.	Elev. Disc.
	Prior to May, 1988	
Mean (¢/Bu)	0.4491	0.5907
Std. Deviation	3.4781	1.8099
Sample Size	1030	1516
% Loads Disc	6.1000	19.4000
% Discount	0.1700	
Std. Deviation	1.2830	
	Following May, 1988	
Mean (¢/Bu)	3.6060	0.0423
Std. Deviation	17.5963	0.4155
Sample Size	201	496
% Loads Disc	18.9000	2.0000
% Discount	0.9801	
Std. Deviation	4.6989	

significance (Ott 1984). Resulting t values for each comparison are provided in the body of the text.

The mean farm discount increased significantly ($t = -2.534$) from 0.45 to 3.61 ¢/bu after the change in the grain standards. Farm discount is determined based upon a percentage reduction in price assigned by the country elevator for the number of insects present in a sample. This percentage is based on the discount policy of the elevator and would be expected to change, if the discount schedule for insects changed. The mean percentage discount assigned for insect presence increased significantly

(t = -2.455) from 0.17% to 0.98% following the change in the FGIS standards.

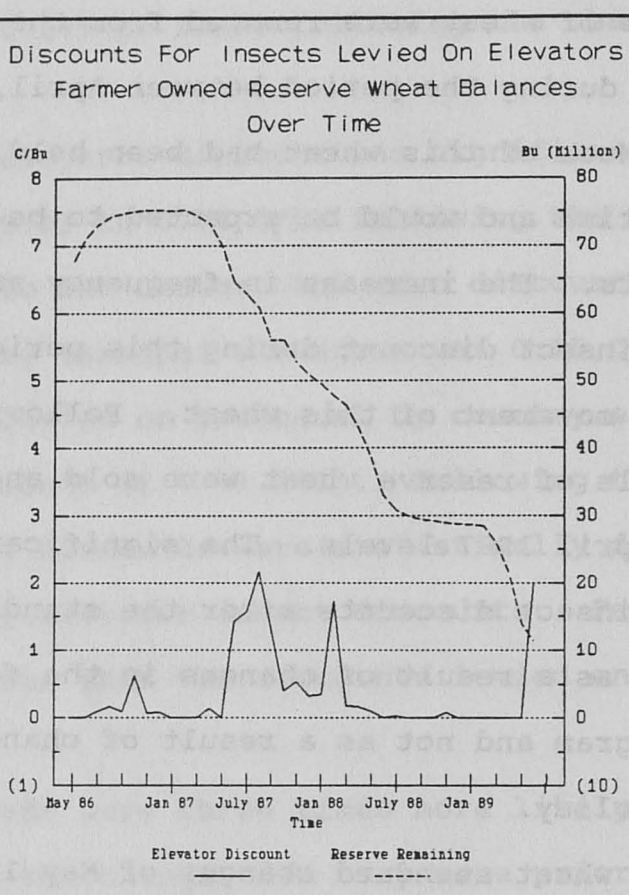
Mean country elevator discount was significantly reduced (t = 10.950) from 0.59 to 0.04 ¢/bu following the change in the standards. Prior to the change, the mean discount levied on country elevators by terminal elevators was 0.15 ¢/bu higher than the mean discount levied on producers by country elevators, but this was nonsignificant (t = -1.201). Following the standard change, farm insect discounts were statistically different (t = 2.871) from country elevator insect discounts. Farm discounts were 3.56 ¢/bu higher than the discounts levied on country elevators.

Farm wheat loads were three times more likely to receive a discount following the change than they were prior to the change. On the elevator side, wheat rail cars were nine times less likely to receive a discount after the change than before.

Figure 1 supports this finding. It shows the average monthly discount levied on producers, average monthly discount levied on country elevators, and positions of wheat held in the farmer-owned reserve over a 4-year period. Insect discounts are levied more frequently and the size of the mean discount levied on producers becomes larger 2 months prior to the standard change in May. More discounts and larger discounts are levied on country elevators in the period between April, 1987 and February, 1988 than in any other period (Figure 1). Frequency and size of discounts prior to and following this period were similar.

Large volumes of wheat were removed from the farmer-owned reserve in Kansas during the period between April, 1987 and February, 1988. Much of this wheat had been held in storage for a long period of time and would be expected to be more heavily infested by insects. The increase in frequency and size of country elevator insect discount during this period may be attributed to the movement of this wheat. Following February 1988, fewer bushels of reserve wheat were sold and discounts returned to pre-April 1987 levels. The significant lowering of country elevator insect discounts after the standards change probably occurred as a result of changes in the farmer-owned reserve wheat program and not as a result of changes in terminal elevator insect policy.

Prior to the wheat standard changes of May 1988, the difference between insect discounts levied on farm managers by country elevators and insect discounts levied on country elevators by terminal elevators was statistically insignificant. This provides evidence that insect discounts were passed back from the terminal through the country elevator to the farm. Country elevators were passing back the costs they faced as a result of receiving insect damaged grain. Reed et al. (1988) found the mean discount for infested wheat was 5.3 ¢/bu, whereas the estimated cost to the elevator for turning and fumigating the grain was 4.6 ¢/bu. They concluded that elevator managers reduced the price of infested wheat just enough to cover the extra cost of treatments.


Discounts For Insects Levied On Elevators
Farmer Owned Reserve Wheat Balances
Over Time
C/Bu
Bu (Million)
8
7
6
5
4
3
2
1
0
(1)
80
70
60
50
40
30
20
10
0
(10)
May 86
Jan 87
July 87
Jan 88
July 88
Jan 89
Time
Elevator Discount
Reserve Remaining

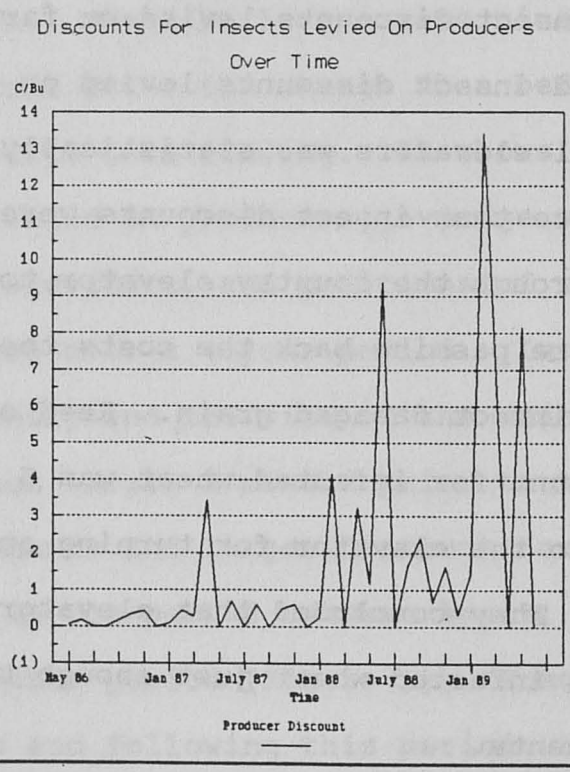

Discounts For Insects Levied On Producers
Over Time
C/Bu
14
13
12
11
10
9
8
7
6
5
4
3
2
1
0
(1)
May 86
Jan 87
July 87
Jan 88
July 88
Jan 89
Time
Producer Discount

Figure 1

Several studies of discounts and farmer practices were carried out before the grain standards changed in 1988. Anderson et al. (1990) found that discounts received by producers prior to the grain standards changes were not consistent enough nor large enough to be a substantial encouragement to producers to incur large costs to control insect infestations in stored grain. Reed (1988) reported that 9 out of every 10 elevator managers accepted weevil-infested grain. Of the elevators that did accept infested grain, 10% reported not discounting and 75% reported discounts of 5 cents/bu or less. Prior to May, 1988, the costs of preventing insects at the farm were not justified by the benefit received in the form of reduced discounts at the elevator.

The changes in the grain standards appear to have altered this situation. Farm insect discounts were increased 3.16 ¢/bu on average, while elevator insect discounts were decreased 0.55 ¢/bu on average. Reduction of insect discounts levied on country elevators by terminal elevators is attributed to fluctuations in farmer-owned reserve wheat over the period of study. Further more, producers' average discount for insects increased by 0.81 percentage points. This increase could only have resulted from changes in the discounting policy of the country elevators studied.

Discounts that country elevators receive from terminal elevators can differ from those producers receive from country elevators. A process termed blending allows a country elevator to receive a higher average price than would be received if the

grain had been sold in segregated lots by "hiding" small quantities of inferior quality grain. In good crop years, elevators store large quantities of high quality grain. Small quantities of insect-damaged grain can be effectively sold by blending it into the larger, high quality grain mass. Tolerance levels present in the discounting schedule allow this blended grain to be sold without discount at a marketing point further down the chain. Used properly, blending allows country elevators to avoid receiving the same insect discounts from terminal elevators that they levied on producers. In this analysis, farm insect discounts did not include wheat receipts from harvest. Segregating farm-stored wheat receipts results in a higher mean farm insect discount, because farm-stored wheat is most likely to have insect related problems. Segregating farm-stored wheat receipts exaggerates the difference between insect discounts levied on producers and those levied on country elevators.

Higher farm insect discounts identified in this study could have occurred for several reasons. The most plausible reason is rigidity at the farm level. Producers and elevator managers knew of the FGIS changes well in advance of their implementation. Country elevators with large volumes of grain and blending capabilities were able to quickly adjust. However, producers were not able to quickly adjust because of physical and capital constraints. Farm storage bins are generally not as good as elevator storage bins in protecting grain against infestation during long-term storage (Reed et al. 1989b). Farm managers

store relatively small quantities of grain and usually have less ability to blend grain. Capital constraints prevent the adaptation of new insect-prevention technology. Because they were not able to adjust, farm managers were more affected by the grain standard changes.

Conclusions

This study shows that farm insect discounts are 3.57 ¢/bu higher than insect discounts for selected country elevators. This difference could provide the stimulus for farm managers to increase their use of insect prevention methods or could reduce the amount of wheat stored on the farm.

In time, farmer managers are expected to make necessary adjustments that will lower the average insect discount they receive. This should cause farm insect discounts to converge toward the level of country elevator insect discounts. Remaining differences between country elevator and farm discounts should reflect the cost of insect control and blending at the elevator. Farm responsiveness to discounts and competition among country elevators should remove all remaining significant differences.

The purpose of the changes in the FGIS standards was to improve the quality of U.S. grain in the marketing channel. At the farm level, changes in the grain standards appear to have resulted in a substantial increase in the cost of insect discounts in wheat. This is expected to accelerate the adoption of insect prevention methods, raising the quality of wheat

entering the market from farm storage. Additional research is needed to examine the impacts of the grain standard changes over a broader range of elevators than those evaluated in this case study. Additional research is also needed to measure the extent to which farm managers adjust to higher insect discounts and to determine the kind of adjustments made, e.g. implementation of new storage practices at the farm level.

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