1999 HOUSE AGRICULTURE

HB 1385

1999 HOUSE STANDING COMMITTEE MINUTES

BILL/RESOLUTION NO. HB 1385

House Agriculture Committee

❑ Conference Committee

Hearing Date 1-28-99

Tape Number	Side A	Side B	Meter #
ONE HB 1385	x		39.4 to 53.8
		x	0.1 to 32.6
Committee Clerk Signature			

Minutes:

Summary of bill: Relates to grain and oilseed testing standards.

Rep Lemieux: (Testimony attached) I introduce HB 1385 in an effort to give the Public Service comm some authority over its Federal Grain inspection service. In the past few years the Federal Grain Inspection service has come up with a couple of tests that have cost the farmers in North Dakota quite a few million dollars. Whole grain testing in wheat for protein content and the Vomitoxin test in barley are two of these. They both have cost the North Dakota farmers literally millions of dollars because of their inaccuracies. There was a study done and it was pretty conclusive that there is a problem in the testing industry. One amendment I have is we place a mortratorium on vomitoxin testing in barley in the State.

Rep Pollert: Trouble is if you place a moritorium on vomitoxin testing is the grain trade going to bid on our grain.

Rep Lemieux: Would like to propose some amendments and basically what they do is remove all language currently in the bill and replace it with a moratorium on vomitoxin testing until equipment used can produce reliable results. I just have so much problem with a test that has a standard deviation of .5 and when you start discounts at .1. Industry needs to come in and explain to us how then justify the discounts there are imposed upon producers in the state of ND.

Rep Mueller: I have some trouble with a moratorium of removing all restrictions and tests.

Rep Lemieux: I'm sorry August Busch is not going to get anymore of my barley because I will grow something different. He sets the standards let him worry. I'm dropping a grenade in your lap I know have fun with it.

Rep Pollert: Trouble with a moratorium the grain trade just won't bid on your barley. This would have a detrimental effect on good low vomitoxin barley because it would all be feed barley.

Rep Lemieux: This wouldn't be a bad idea because maybe we could get someone to come down to this assembly and explain what it is they are doing as far as their discount are concerned. When they load cars out they probe the cars and do a test and they say it tests one way and then they send down and the maltsters take a test and its completly different. From the same can or truck load.

Jim DePuler: Willow City farmer, did an excellent job of testifying. raised 60,000 bushels of barley in 1997. Not afraid anymore. Knows that everytime you check for vomitoxin its different. Everyone seems to be afraid of the maltsters. Nobody cares. Theres no rhime or reason to the tests that we get. Had a meeting in Willow City with Bruce Hagen, PSC, another one from the Agr Department. No positive results.

Lance Gabee: ND Grain Growers Assoc. Support what ever will help the farmers get a better deal. Wonders if moratorium will do any good but need a solution.

Other's who testified in favor of bill;

Steve Rickenburger: Rep the Bottieanu County agent

Ron Selzer: Knox farmer for bill

Randall Nodland: Dakota Resource Council and Dunn County farmer. for bill

Steve Strege: ND Grain Growers assoc. for anything that helps the farmer get a better deal.

Rep Nowatzki: The standards seem to be to high for the technology we have to test this grain. Maybe we need to lower the standards until we have the technology to match it?

Committe action 2-4-99

Motion by Rep Berg for a DO NOT PASS second by Rep Brusegaard

Vote Total.. YES 15 NO 0 ABSENT 0

Motion carried

Carrier Rep Pollert

FISCAL NOTE

Bill/Resolution No.: HB 1385 Amendment to:

JAN 25 1999

Requested by Legislative Council Date of Request: 1-20-99

1. Please estimate the fiscal impact (in dollar amounts) of the above measure for state general or special funds, counties, cities, and school districts.

Narrative: It appears that HB 1385, as written, would require that the PSC monitor the procedures used by state locations (7) that are federally licensed to test grain for protein, moisture, etc. The Commission estimates that this work would require one FTE and a corresponding travel budget. The costs presented below are based on this understanding.

If this bill, on the other hand, intends that the Commission oversee testing procedures at all of the state's 460 grain elevators, at least two FTEs and a corresponding travel budget would be required (approximately double the costs presented below). This approach assumes that federally licensed laboratories would be hired to test samples drawn by state inspectors. The costs for these services would be approximately $50,000 per biennium.

If a state laboratory is established to conduct tests, the U.S. Department of Agriculture estimates that equipment costs would be about $250,000. An additional FTE would also be required to staff the facility.

2. State fiscal effect in dollar amounts:

	1997-99 Biennium		1999-2001 Biennium		2001-03 Biennium	
	General Fund	Special Funds	General Fund	Special Funds	General Fund	Special Funds
Revenues:	*-0-*	*-0-*	*-0-*	*-0-*	*-0-*	*-0-*
Expenditures:	*-0-*	*-0-*	*$120,000*	*-0-*	*$127,300*	*-0-*

3. What, if any, is the effect of this measure on the appropriation for your agency or department:

a. For rest of 1997-99 biennium: -0-
b. For the 1999-2001 biennium: $120,000
c. For the 2001-03 biennium: $127,300

4. County, City, and School District fiscal effect in dollar amounts: *No Effect*

1997-99 Biennium			1999-2001 Biennium			2001-03 Biennium		
Counties	Cities	School Districts	Counties	Cities	School Districts	Counties	Cities	School Districts
0	0	0	0	0	0	0	0	0

If additional space is needed, attach a supplemental sheet.

Date Prepared: *January 25, 1999*

Signed: Jon H Mielke

Typed Name: *Jon H. Mielke, Executive Secretary*

Department: *Public Service Commission*

Phone Number: *328-2400*

Prepared by the Legislative Council staff for
Representative Lemieux
January 26, 1999

PROPOSED AMENDMENTS TO HOUSE BILL NO. 1385

Page 1, line 1, after "A BILL" replace the remainder of the bill with "for an Act relating to federal grain and oilseed testing standards.

BE IT ENACTED BY THE LEGISLATIVE ASSEMBLY OF NORTH DAKOTA:

SECTION 1. Public service commission - Grain and oilseed testing standards - Public hearing. Before the United States department of agriculture federal grain inspection service institutes any new procedure for the testing of grain and oilseeds, the public service commission shall hold one or more hearings to allow public comment regarding the feasibility and desirability of the procedure. The commission shall schedule each hearing for a convenient date and at a convenient place and shall give notice of each hearing by publication in the daily newspapers of the state. The commission shall forward any testimony and documentary evidence obtained at the hearing, together with the commission's conclusions, to the administrator of the United States department of agriculture federal grain inspection service, the secretary of agriculture, and to each member of the North Dakota congressional delegation."

Renumber accordingly

Prepared by the Legislative Council staff for
Representative Lemieux
January 27, 1999

PROPOSED AMENDMENTS TO HOUSE BILL NO. 1385

Page 1, line 1, after "A BILL" replace the remainder of the bill with "for an Act to provide for a moratorium on vomitoxin testing; and to declare an emergency.

BE IT ENACTED BY THE LEGISLATIVE ASSEMBLY OF NORTH DAKOTA:

SECTION 1. Vomitoxin testing - Moratorium. As of the effective date of this Act, no test for vomitoxin [deoxynivalenol (DON)] may be required for the sale, storage, or shipment of any grain or oilseeds produced in this state or to establish the purchase price for any grain or oilseeds produced in this state. The public service commission shall lift the moratorium established by this section only upon determining that:

1. The equipment used for vomitoxin testing and the manner of vomitoxin testing produce reliable results; and

2. Scientific research unequivocally proves that the vomitoxin [deoxynivalenol (DON)] presents a serious and substantial public health threat.

SECTION 2. EMERGENCY. This Act is declared to be an emergency measure."

Renumber accordingly

Date: 2-4-99
Roll Call Vote #: 1

1999 HOUSE STANDING COMMITTEE ROLL CALL VOTES
BILL/RESOLUTION NO. 1385

House AGRICULTURE Committee

☐ Subcommittee on

or

☐ Conference Committee

Legislative Council Amendment Number

Action Taken Do not pass

Motion Made By Berg Seconded By Brusegaard

Representatives	Yes	No	Representatives	Yes	No
Eugene Nicholas, Chaiman	✓		Bob Stefonowicz	✓	
Dennis E. Johnson, Vice Chm	✓				
Thomas T. Brusegaard	✓				
Earl Rennerfeldt	✓				
Chet Pollert	✓				
Dennis J. Renner	✓				
Michael D. Brandenburg	✓				
Gil Herbel	✓				
Rick Berg	✓				
Myron Koppang	✓				
John M. Warner	✓				
Rod Froelich	✓				
Robert E. Nowatzki	✓				
Phillip Mueller	✓				

Total (Yes) 15 No 0

Absent

Floor Assignment Pollert

REPORT OF STANDING COMMITTEE

HB 1385: Agriculture Committee (Rep. Nicholas, Chairman) recommends **DO NOT PASS** (15 YEAS, 0 NAYS, 0 ABSENT AND NOT VOTING). HB 1385 was placed on the Eleventh order on the calendar.

1999 TESTIMONY

HB 1385

HB 1385

PRESENTED BY DOUG LEMIEUX

JANUARY 28, 1999

Chairman Nicholas and members of the House Ag Committee. For the records, my name is Doug Lemieux. I am a representative from District 9, Rolette County.

I introduced HB 1385 in an effort to empower the North Dakota Public Service Commission over the testing standards of grain and oil seeds purchased in North Dakota. The need for someone in North Dakota to have power over the Federal Grain Inspection Service, (FIGS), is that the last two tests the FGIS has come up with have cost North Dakota farmers millions. In the early 90's, FIGS initiated a whole grain protein test for HRSW. This test was not calibrated properly causing farmers and grain dealers millions and a class action lawsuit was initiated and is still in the courts. The latest test OK'd by FIGS is the vomitoxin test for malting barley. This test has a measurement in parts per million with a standard deviation of plus or minus .5. This means a sample of .3 DON or Vom could be either .0 to .8 if the test was consistent in the same sample. While I am not a scientist, the reports I will give you will clearly explain the inconsistencies of the vomitoxin test.

I have an amendment prepared to address the desires of many farmers in North Dakota.

Public Service Commission
State of North Dakota

State Capitol - 600 E. Boulevard
Bismarck, North Dakota 58505-0480
e-mail: msmail.sab@oracle.psc.state.nd
TDD 800-366-6888
Fax 701-328-2410
Phone 701-328-2400

COMMISSIONERS

Leo M. Reinbold
President
Bruce Hagen
Susan E. Wefald

Executive Secretary
Jon H. Mielke

February 13, 1998

Dr. Michael P. Davis
American Malting Barley Association, Inc.
740 N. Plankinton, Ave. – Suite 830
Milwaukee, WI 53280

Dear Dr. Davis:

We have received many calls from barley producers who are concerned with the reliability and accuracy of vomitoxin tests and price discounts that are being applied based on the outcomes of these tests. We would like to work with your industry to discuss these problems and to develop mutually beneficial solutions.

It appears that several issues are contributing to the problem. Initially, there are several different tests available to check for vomitoxin in barley. Sample sizes and procedures vary and so do end results. Given the minute amount of toxins being checked for and the fact that it is not evenly distributed within samples, even running the same test on subparts of a single sample can yield vastly different results. We would like to work with industry and federal inspection personnel to develop a consensus on acceptable sampling techniques, tests, and procedures.

It would be advantageous for everyone if purchasing standards were adjusted to reflect the capabilities of available testing methodologies and if everyone agreed to use these standards. It is inherently unfair to apply price discounts based on test results that are known to have very low confidence levels. We believe that we must work together to develop accurate and reliable tests and for industry to purchase grain based on the results of those tests.

Another concern involves acceptable levels of vomitoxin in malting barley. We are certainly not experts in this field, but it may be beneficial if your industry conducted tests to determine what effects minute amounts of vomitoxin have on beer. Determining, for example, that levels below three parts per million have no effect on beer would have a huge impact on your industry and the farmers that you depend on to grow barley.

It is our hope that your industry is willing to work with barley promotional groups, federal inspection services, our congressional delegation, and us to further define these

problems and to pursue possible solutions. We will contact you within the next few weeks to discuss this matter further.

Sincerely,

Bruce Hagen, Commissioner
N.D. Public Service Commission

Roger Johnson, Commissioner
N.D. Department Agriculture

cc: Senator Byron Dorgan
Senator Kent Conrad
Congressman Earl Pomeroy
Governor Edward Shafer
Federal Grain Inspection Service
North Dakota Barley Council
North Dakota Grain Dealers Association
North Dakota Grain Growers Association
North Dakota Farmers Union
North Dakota Farm Bureau

January 27, 1999

North Dakota House Agriculture Committee
State Capitol
Bismarck, N.D. 58505

Dear Honorable State Representatives:

It is with deep concern for the future of the malting barley industry in the state of North Dakota, that I write to you regarding the issue of DON testing for the purposes of establishing a market price for malting barley. DON (deoxynivalenol) is the scientific term use for vomitoxin which is the result of barley, wheat or durum being infected by the fungus disease, Fusarium Head Blight (FHB), at flowering stage during the growing season. It is a well known fact that FHB has been devastating to farm producers and the economy of N.D. due to excessively wet seasons since 1993. Prior to this time, FHB and vomitoxin were not recognized as being a significant problem in malting barley.

During the past six years, tests to determine levels of DON in barley samples offered for sale as malting, have been developed by companies in the grain sampling and testing industry. These tests determine the level in parts per million of DON in the barley sample and are being used to discount market prices paid for malting barley. Malting barley producers and grain elevators have recognized that these DON tests are highly variable and inconsistent, even when the same samples are submitted multiple times.

In 1998, complaints by malting barley producers and grain elevators alike, rose to a level that USDA's Grain Inspection, Packers & Stockyards Administration (GIPSA), decided to aggressively pursue a study for better sampling and testing methods of DON on malting barley. Results of this study were released in July 1998. Please refer to GIPSA's reports entitled: Barley DON Variability Study Executive Summary, DON Barley Study Variation Associated with Sample Size and news release from the N.D. Barley Council dated July 21, 1998, Barley DON Testing Results Released. In essence this study substantiates what barley producers and grain elevators have been experiencing in recent years, sample size and sampling method have limited effect on variability of DON test results for barley.

North Dakota is the #1 producer of barley in the U.S. Bottineau County is the #2 producer of barley in North Dakota. For 1997, conservative estimates of the loss in income to barley producers in Bottineau County due to DON discounts was over $827,000. Not including costs of DON tests to farmers and elevators that are highly variable. Economic generator principles indicate that new wealth generated by farm commodities turns 7-9 times in our communities. In these lean economic times for agriculture, North Dakota cannot afford to lose the new wealth generated by its farm producers. Barley acreage has been dropping dramatically in North Dakota since the widespread invasion of FHB. Agricultural researchers have been working hard to develop new resistant lines of barley, wheat and durum to FHB, but this takes time. Until new resistant varieties are developed, this industry can hardly afford to base its pricing structure on highly inconsistent tests. If this continues, I am deeply concerned that the malting barley industry may be lost to the state of North Dakota.

Sincerely,

Tim Semler

Tim Semler, Extension Agent-Bottineau County

NORTH DAKOTA BARLEY COUNCIL

505 40th Street Southwest, Suite E.
Fargo, ND 58103-1184

Barley DON Testing Results Released

For Immediate Release

Tuesday, July 21, 1998

Contact: John F. Mittleider
North Dakota Barley Council
(701) 239-7200

Lance Gaebe
North Dakota Grain Growers
(701) 222-2216

[***Fargo***]— Sample size and sampling method have limited effect on variability of DON (deoxynivalenol) test results for barley. That's the conclusion of extensive testing conducted by the U.S. Department of Agriculture's Grain Inspection, Packers & Stockyards Administration (GIPSA).

Three primary conclusions were drawn from the study. First, increasing sample size does not appear to significantly decrease variability of test results. Second, the sample selection method does not appear to cause generally greater variability among DON measurements. And third, no single source of variation was identified that will significantly reduce variability of DON measurement in an easy and cost effective manner.

"The study results disproved myths related to DON testing of barley," says John Mittleider, Executive Administrator of the North Dakota Barley Council. "We now have thorough scientific evidence that sample collection method and the testing of larger samples have limited effect on the variability of test results. Much of the variability appears to be associated directly with the technology."

Lance Gaebe, Executive Director of the North Dakota Grain Growers Association, feels that today's technology is not adequate to meet the needs of the marketplace. "Buyers and sellers alike demand technology which yields highly repeatable results. Unfortunately, those demands cannot be achieved with today's technology."

According to the final report, the variability among individual test results is related to the concentration of DON in the lot. Using official inspection, observed test results between 0.1 to 1.1 PPM would not be unreasonable for a lot containing 0.6 PPM DON. For a lot with 4.0 PPM, a reasonable range for test results may be 3.0 to 5.0 PPM. Since measurement variability appears to be the greatest source of variability, one of the few alternatives to significantly improve the variability of test results is to make multiple independent measurements on a lot and average the results. "Unfortunately, that will double or triple the cost of the test," according to Gaebe. DON tests currently average $25-30.

There are three primary sources of variability in measurements from analytical tests, according to GIPSA: 1) the sample, 2) sample preparation, and 3) the analytical method. "Results of the study show conclusively that little variability was associated with the sample," says Mittleider. "Since dividing, grinding, mixing and dissemination of the samples was conducted by the same agency, variation resulting from sample preparation should be minimal. One would surmise the majority of variation in test results is a reflection of the analytical methods used in the study."

The GIPSA-approved test kits Neogen Veratox and Romer FluoroQuant, in addition to gas chromatography and HPLC, were utilized to test for DON levels. No single detection method appeared to provide more repeatable test results.

Over 2,400 tests were conducted on nearly 500 barley samples ranging from 0.5 to 5.0 PPM DON. Samples of at least 1/2 pound should be submitted for testing and should be randomly selected from a load or lot to insure as accurate a test as possible.

The study was supported by the North Dakota Barley Council and GIPSA. Other cooperators assisting with the study included the Grand Forks Grain Inspection Department, North Dakota Grain Growers Association, North Dakota Grain Dealers Association, North Dakota State University, Neogen Corporation, and Romer Labs.

Sample Name	Test Location	Vomitoxin Reading
JD 1A	Grand Forks	4,1
1B	West Fargo	3,3
1C	Devils Lake	3.2
KN 2A	Minot	10.4
2B	Devils Lake	10.9
2C	Minot	10.0
RK 3A	Minot	10.8
3B	Grand Forks	9.3
3C	Devils Lake	10.6
LN 4A	Minot	3.0
4B	Grand Forks	5.6
4C	West Fargo	1.8
AK 5A	Minot	.3
5B	West Fargo	.06
5C	Minot	1.0
SK 6A	Devils Lake	1.9
6B	Devils Lake	1.5
6C	Devils Lake	2.3

Six samples of barley from coffee can to two gallon size were split three times and sent for testing at different locations except for sample 6. Sample 6 was split three times and sent to the same test location. All vomitoxin results over 5 parts per million are estimates. This explains consistency at the higher levels. The bigger variations are at the lower levels.The question is: "If variation is inconsistent at a coffee can size sample how can testing be reliable for a rail car load?"

Rep. Eugene Nicholas
Honorable members
of the House Ag
Committee:

Hello, my name is Jerome Anderson and I'm a farmer from Mountrail County. The original draft of this bill was brought to the attention of Representative Gene Nicholas by Curt Trulson, Louie Custer, Marshall Craft and myself. In the last 6 months we've had the opportunity to express our concerns and expose the inequities of foreign trade to some pretty influential people. We've had the opportunity to speak personally with Secretary of Agriculture Dan Glickman, Deputy USSTR Peter Scher, President Clinton's Cheif of Staff, Erskin Bowles, the heads of FDA, EPA, FGIS and our congressional staff in Washington. Through dialouge with these people , we've come to the conclusion that our federal trade laws are being ignored for fear of foreign trade retaliation. In my mind it's a moral outrage to lose one producer in this state if, by enforcing existing laws it can be prevented. Contrary to popular belief, farmers in this state are not expendable. It's totally unacceptable to integrate North American agriculture in the name of free trade while other segments of the economy are granted special treatment.

Wheat producers in this state need this fund to defend themselves from illegal and unfair trade. Our USSTR is now in negotiations and threatening retaliations with the Europeans over bananna exports to Europe. An assistant USSTR was quoted as saying "without enforcing our existing trade laws, global integration will lead to local disintegration." This statement holds true not only for the bananna industry but especially for the wheat industry.

With the reluctance of our federal people to look out for our best interests we've concluded it's now time for us North Dakota producers to take care of ourselves. We're not asking for any general fund money, subsidies, grants, or donations of any sort. This bill is unique. It's not often you'll find an industry asking to be taxed. We're asking for a 2 mill increase on our wheat checkoff to build a fund to finance initial investigations and pursue legal trade actions if warranted.

The exact language we would have liked in the bill is :

"To establish a fund to finance investigations and legal expenses for pursuing International Trade Actions for the Spring Wheat and Durum Industries, when it is determined by the wheat industry of ND that it's economy has been adversely impacted by unfair trade.

The fund shall build and maintain a minimum balance of ($2,000,000) two million dollars.

The funding for the bill shall come from an additional 2 mill checkoff to be collected and administered by the North Dakota Wheat Commision.

The first ($500,000) per year collected from the 2 mill checkoff shall be ear-marked to build and maintain this fund. Any additional funds collected from the additional 2 mills shall be put into the general fund of the North Dakota

Wheat Commision with emphasis on administration and continuance of this fund."

The introduced bill (1399) would amend and reenact section 4-28-07 of the North Dakota Century Code to amend line 1 a to read 10 mills rather than 8 mills and add paragraph 4 which reads "The commision may use the amount raised by the rwo mills of the ten mill levy provided for in this section to support the commissions involvment in trade issues"

The North Dakota Wheat Commision met on January 15, 1999 and passed a motion that read "The North Dakota Wheat Commision moved to support an increase in the check off of 2 tenths of a cent to a total of 1 cent, with a maximum of $500,000 per year of the increase being dedicated to establishing a budget line item for a trade issue fund".

The introduced bill doesn't mandate that the 2 mill increase will be used totally for trade issues. Talking with Allen Lee, the commisions president, I was assured action would be taken as soon as this bill is passed. I will support the bill as introduced and would also support it if it was amended to ear-mark the 2 mill increase for a trade action fund. Thank you, and I am looking forward to the testimony of other producers.

Barley DON Variability Study

Executive Summary

Background

Since 1993, infection of northern wheat and barley crops by fusarium fungi has been a continual problem. DON is one of the milder toxins produced by fusarium species of fungi that flourish during rainy growing seasons. The fungus that produces DON can cause post-production and flavor problems in beer.

Test kits used in the Official Inspection System are subjected to extensive testing to ensure they meet requirements established by USDA's Grain Inspection, Packers and Stockyards Administration. Two test kits have been approved for use in the Official Inspection System--Neogen's Veratox DON Test Kit which uses antibody technology and Romer's FluoroQuant DON Test Kit which uses absorbance and fluorescence technology. These test kits demonstrated the capability to detect DON in barley, malted barley, corn, oats, and wheat in the range of 0.5 to 5.0 parts per million (ppm). A part per million, in this case, would be one part DON for every one million parts of barley sample.

Most maltsters and brewers conduct their own testing of the malting barley they purchase, and some will reject barley containing measurable levels of DON. GIPSA reports quantitative DON measurements between 0.5 and 5.0 ppm. Otherwise results are reported as less than 0.5 or greater than 5.0 ppm.

After the 1997 harvest, producers in central North Dakota raised concerns about the high degree of variability in DON test results and the adverse economic impact of DON discounts on producers. In response to the concerns of variability, GIPSA participated in several informational/educational meetings to provide barley producers, grain handlers, and grain inspection quality control personnel with information about proper sampling and testing methodology.

To further address the sampling variability issue, GIPSA participated in a cooperative effort to determine if DON analysis variability could be reduced. Variability of measurements from an analytical process can be attributable to three primary sources: 1) the sample, 2) sample preparation, and 3) the analytical method. Sample variation can usually be reduced by increasing sample size. Sample preparation variability can be reduced by grinding the sample to a finer particle size or extracting a larger subsample. Analytical variability can be reduced by improving the methodology or increasing the number of replicates tested. A

study was designed to evaluate the contributions to test variability from these sources. The study was conducted in collaboration with North Dakota State University, the North Dakota Barley Council, North Dakota Grain Dealers Association, Neogen Corporation, Romer Labs, Grand Forks Grain Inspection, and the USDA, Agricultural Research Service and concluded in June.

Goals of the Study

The goals of the study focused on possible causes of variability in DON test results. Hopefully, the study would lead to recommendations on ways to reduce this variability. Specifically, the study had three primary goals.

- investigate precision improvements from increasing the sample size,
- investigate precision improvements from improved sample selection methods, and
- investigate sources of variability in DON measurements.

Currently, the GIPSA directive specifies that a minimum of 200 grams of barley must be submitted to the official system to obtain a DON measurement. Unofficial samples can be of any size large enough to make a measurement. If variability among samples is a significant source of variation, increasing the sample size can improve precision.

Submitted samples can be obtained in any fashion from a truck lot. Submitted samples are not taken under the supervision of official inspection personnel. When DON in a truck lot is not uniformly distributed, the method of sample selection can influence the variability test results.

The process of making a DON measurement on a sample has many steps. Some steps may offer the opportunity to introduce variability. Identifying sources may offer potential for improving the process or making adjustments to the process that can lead to less variability in DON estimates.

Summary of Findings

Effect of Sample Size

The study involved obtaining large bulk samples from each of six lots with DON levels between 0.5 and 5.0 ppm. From these large bulk samples, 16 test samples of 100 grams, 16 test samples of 800 grams, and 16 test samples of 7000 grams were obtained. A single DON measurement was made on each of the test samples.

If sample size is a significant source of variability, the variability among the 7000 gram test samples should be significantly less than the variability of the smaller test samples. The data in this study did not show a significant decrease in variability among the 7000 gram test samples when compared to the variability of the smaller test samples. The variability among measurements is likely influenced more from sources other than the variability among test samples of barley kernels.

Effect of Sampling Method

Sample selection methods can have an impact on measurements from a lot when non-uniformity occurs within the lot. Following good sampling practices will provide representative samples from a lot, even when non-uniformity occurs. However, with submitted samples, good sampling practices are not always assured. To investigate the effect of sample selection method, two alternative sample selection methods, other than the official probe sample selection method, were studied. One alternative sample selection method was to take five samples with a coffee can from different places on the surface of the lot and to take five samples with a coffee can from the tailgate of the truck while the lot was being unloaded.

The second alternative method was to probe the truck using an approved probe pattern, but to keep the individual probe samples separate. The individual probe samples represented different areas of the truck lot.

Samples were also taken using official procedures. Ten truck lots were included in the study and ten official probe samples were obtained from each truck.

When comparing the variability of the alternative procedures with the variability of the official procedure, no general pattern of differences in variability was observed. The truck lots selected for this study apparently were relatively uniform in the distribution of DON. Non-uniformity in lots may exist, but was not a major problem in the ten truck lots selected for this study.

Sources of Variation

Ten official probe samples were taken from each of the ten truck lots. Each of the ten samples from each lot were ground. Two subsamples were taken from each ground sample. Duplicate DON measurements were made on one of the two subsamples. Some information is available on variability among duplicate measurements on a subsample, among subsamples from a ground sample, and among samples from a lot.

From the data, no single source is clearly the dominant source of variation. This observation may imply that the variation among measurements is not caused by a single source within the process of making a DON measurement. Variation may be the cumulative result of many steps in the process and may not be consistent from lot to lot.

Conclusions

Increasing the sample size does not appear to significantly decrease sampling variability. This does not mean that sample size is unimportant. For some sufficiently small sample, size would become a significant factor. The recommendation is to continue with the sample size required by GIPSA directive, which is a minimum of 200 grams and preferably larger. The effect of smaller sample sizes is unknown, but larger sample sizes do not appear to appreciably improve precision.

The sample selection method does not appear to cause generally greater variability among DON measurements. Most truck lots (in this study) seem to have fairly uniform distributions of DON. However, good sampling practices are always recommended. Good sampling practices will provide representative samples, regardless of the uniformity of the lot and the constituent being measured.

No single source of variation has been identified that will significantly reduce variability of DON measurements in an easy and cost effective manner. The variability is likely influenced by many sources in the DON measurement process. The observed variability could be generally attributed to the general state of the technology which is continually being improved. The available technology for rapid testing of DON is somewhat limited and only a few choices exist. The market demands for highly repeatable results may not be achieved with the current technology.

The variability among individual test results is related to the concentration of DON in the lot. For example, using official inspection, a lot with 0.6 ppm, observing test results between 0.1 to 1.1 ppm would not be unreasonable. For a lot with 4.0 ppm, a reasonable range for test results may be 3.0 to 5.0 ppm.

Generally, just as sampling variability should decrease by taking larger samples, the measurement variability can be reduced by averaging multiple independent measurements. Since measurement variability appears to be the greatest source of variability, one of the few alternatives to significantly improve the variability of test results is to make multiple independent measurements on a lot and average the results. Unfortunately, averaging multiple measurements is a more costly service.

For GIPSA to certify a single average from multiple measurements, a policy change would be required.

As with any measurement system, any deviation from correct and consistent operating procedures will likely increase the variability of a system. Strict adherence to uniform procedures will help to produce the minimum variability for that technology. GIPSA has developed a comprehensive training program for the personnel conducting DON tests in the official system. As a means of minimizing the variability in the current commercial system, GIPSA can provide DON training to anyone interested in producing more uniform results.

Contact the **Technical Services Division of GIPSA** at **816-891-0401** for a copy of the analytical results of the study and for more information about GIPSA training programs.

DON BARLEY STUDY[1]

Variation Associated with Sample Size

Sample size should only affect the variability of measurements - not the average. The sample average estimates the lot average, regardless of sample size. The following table gives the sample averages and standard deviations for 0.1Kg, 0.8Kg, and 7Kg sample sizes. These statistics are for measurements made at Grand Forks Grain Inspection Agency (GFGI) using the Neogen Veratox test kit and at Romer Labs using the FluoroQuant test kit. Each statistic is based on 16 samples of each size. Some statistical differences are observed among the averages for some samples.

Based on sampling theory, the standard deviation for the 0.1Kg size should be over eight times greater than the 7Kg size. No consistent statistical differences in standard deviation are observed among sample sizes. Variability among measurements is influenced from a number of sources including sample size, sample preparation, analytical method, and concentration in the lot. For these six lots, sample size appears to be a small source of variability relative to the other sources of variability.

Some differences in sample size standard deviations are observed. For example, lots 3 and 6 for the GFGI data have standard deviation estimates sufficiently different that statistical differences would be declared. However, these differences are not consistent with variability due to sample size. The differences are probably attributable to other sources.

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Table 1. Sample Size Effect On DON Measurements

			GFGI Veratox		Romer FluoroQuant	
Lot	Size	N	Avg.	Std.	Avg.	Std.
01	0.1Kg	16	1.03	0.28	0.80	0.18
01	0.8Kg	16	0.79	0.27	0.81	0.10
01	7Kg	16	0.99	0.27	0.99	0.15
02	0.1Kg	16	0.05	0.08	0.00	0.00
02	0.8Kg	16	0.06	0.11	0.00	0.00
02	7Kg	16	0.08	0.12	0.00	0.00
03	0.1Kg	16	1.97	0.45	2.14	0.39
03	0.8Kg	16	1.74	0.28	2.02	0.28
03	7Kg	16	2.28	0.57	2.49	0.26
04	0.1Kg	16	0.63	0.25	0.41	0.21
04	0.8Kg	16	0.57	0.25	0.39	0.14
04	7Kg	16	0.65	0.25	0.54	0.16
05	0.1Kg	16	3.84	0.43	5.36	0.37
05	0.8Kg	16	3.54	0.44	5.50	0.63
05	7Kg	16	4.18	0.45	6.31	0.79
06	0.1Kg	16	2.19	0.37	3.30	0.40
06	0.8Kg	16	2.09	0.52	3.41	0.39
06	7Kg	16	2.53	0.28	3.74	0.30

Variations Associated with Official vs Unofficial Sampling

Ten truck lots were sampled with a coffee can and with a probe. Each truck had ten coffee can samples taken from different places in the truck. In addition, ten probe samples were taken from each truck using the recommended probe patterns.

Table 2 summarizes DON measurements for the ten coffee can samples and ten probe samples from each truck.

Table 2. DON Results Of Coffee Can vs Probe Samples

	GFGI Coffee Can		GFGI Probe	
Lot	Avg.	Std.	Avg.	Std.
03	1.79	0.32	1.64	0.29
04	0.92	0.14	0.66	0.33
05	1.04	0.33	0.86	0.44
06	4.77	0.33	4.35	0.81
07	1.11	0.46	0.94	0.30
08	1.97	1.01	1.95	0.31
09	2.93	0.71	2.82	0.42
10	3.63	0.61	3.51	0.84
11	4.77	0.97	4.96	0.66
12	0.68	0.33	0.62	0.25

Data were collected from the probe samples with a slightly different data collection design. Two subsamples were taken from each ground sample. On one of the subsamples, two measurements were made. The other subsample had only one measurement made. This produced 30 measurements on each lot. Replicated measurements will be used to provide some information on sources of variability.

Only one measurement was made on each coffee can sample. Since multiple measurements were made on the probe samples, computing standard deviations on the probe sample measurements without regard to the data collection design could weight some sources of variability more than others. To make the probe standard deviation estimates comparable to the coffee can estimates, adjustments were made to provide probe standard deviation estimates as if only one subsample and one measurement per subsample were made.

The first five coffee can samples from each load were taken from the top of the truck lot and the second five coffee can samples were taken from the tailgate during unloading of the truck lot. Table 3 gives the statistics comparing top versus tailgate coffee can samples.

Table 3. DON Results Of Coffee Can Top vs Tailgate

	GFGI Top		GFGI Tailgate	
Lot	Avg.	Std.	Avg.	Std.
03	1.56	0.18	2.02	0.28
04	0.84	0.11	1.00	0.12
05	1.06	0.36	1.02	0.35
06	4.76	0.47	4.78	0.15
07	1.20	0.65	1.02	0.19
08	1.26	0.82	2.68	0.61
09	2.78	0.69	3.08	0.77
10	3.38	0.61	3.88	0.56
11	5.30	0.80	4.24	0.88
12	0.50	0.12	0.86	0.39

Other Sources of Variation

The nature of the Veratox test kit, in combination with the way the data were collected, inadvertently confused the variation of the test kit with the variation of the samples. The estimates for sources of variation from Romer Labs will provide better estimates of the relative importance of the sources of variation.

The data collection design on the probe samples allows the examination of sources of variability. Table 4 gives measures of variability called variance components. A variance is the square of a standard deviation. The table gives variability in terms of variance. Variance components try to isolate the amount of variability attributable to different sources. Table 4 can be used to see which sources of variation are relatively the most important for each lot.

The greatest source of variation is not consistent for all lots. This suggests that variation in measurements is a product of many sources in the system.

Table 4. Relative Importance Of Sources Of Variation
As Measured By FluoroQuant At Romer Labs

Lot	Avg.	Sample	Subsample	Replicate
03	2.32	0.0500	0.0020	0.0120
04	0.90	0.0032	0.0005	0.0100
05	1.34	0.0144	0.0170	0.0090
06	7.44	0.1482	0.1920	0.1080
07	1.10	0.0000	0.0180	0.0250
08	3.28	0.0991	0.0328	0.0155
09	4.43	0.0058	0.1527	0.0205
10	6.01	0.0625	0.1050	0.2390
11	9.45	0.1284	0.1517	0.1575
12	0.89	0.0354	0.0000	0.0175

For lot 09, variation among subsamples was the greatest source of variation (0.1527); variation among replicated measures on a subsample sample was the next greatest source of variation (0.0205); and variation among samples was the lowest source of variation (0.0058).

Additional Analyses

Portions of each sample were sent to Neogen Corp., Romer Labs, North Dakota State University (NDSU), and the Technical Services Division (TSD). Table 5 gives the averages of the tests on the probe samples for GFGI, Neogen, Romer, NDSU, and TSD. Neogen ran each test twice using the Veratox test kit and the table gives the results of each test separately. Romer ran the samples using high performance liquid chromatography (HPLC) and FluoroQuant test kit. NDSU ran the samples using gas chromatography (GC). TSD ran the samples by HPLC.

Table 5. Average Among Probes Samples

LOT	GFGI Veratox	Neogen Corp. Veratox	Veratox	Romer Labs HPLC	Fluor.	NDSU GC	TSD HPLC
03	1.64	2.29	2.31	2.35	2.32	2.18	2.10
04	0.66	1.11	1.10	1.14	0.90	1.10	1.01
05	0.86	1.61	1.63	1.51	1.34	1.52	1.22
06	4.35	8.51	8.79	7.52	7.44	7.20	5.67
07	0.94	1.50	1.57	1.36	1.10	1.49	1.08
08	1.95	3.01	3.09	3.37	3.28	3.00	2.93
09	2.82	3.94	3.94	4.93	4.43	3.83	3.55
10	3.51	6.44	6.34	6.08	6.01	5.89	4.54
11	4.96	6.89	7.30	9.70	9.45	8.23	5.55
12	0.62	1.25	1.29	1.09	0.89	0.88	1.00

Table 6 gives standard deviation estimates for the probe sample data. As in Table 2, the standard deviations estimate the situation where only one subsample and one measurement per subsample are made.

Table 6. Standard Deviation Estimates Among Probe Sample Results

LOT	GFGI Veratox	Neogen Corp. Veratox	Veratox	Romer Labs HPLC	Fluor.	NDSU GC	TSD HPLC
03	0.29	0.45	0.45	0.29	0.25	0.33	0.37
04	0.33	0.26	0.20	0.09	0.12	0.25	0.12
05	0.44	0.24	0.21	0.15	0.20	0.15	0.23
06	0.81	2.38	2.68	0.65	0.67	0.61	0.59
07	0.30	0.32	0.27	0.16	0.20	0.39	0.14
08	0.31	0.22	0.30	0.26	0.38	0.41	0.45
09	0.42	0.61	0.40	0.44	0.42	0.76	0.52
10	0.84	1.46	1.36	0.72	0.64	0.59	0.60
11	0.66	1.45	1.75	0.77	0.66	0.84	0.83
12	0.25	0.18	0.25	0.14	0.23	0.12	0.19

Another aspect of the study was to look at variability among individual probes from a truck. One probe from each point in an official probe pattern was kept separate and analyzed at Neogen and NDSU. Table 7 gives averages of the probe results and Table 8 gives the standard deviations of the probe results.

Table 7. Average Of Individual Probe Results

Lot	Neogen Corp. Veratox	Veratox	NDSU GC	GC
03	1.96	2.20	1.98	1.96
04	1.13	0.94	1.04	1.07
05	1.13	1.32	1.38	1.48
06	7.91	6.93	7.22	7.13
07	1.28	1.46	1.60	1.76
08	3.49	3.11	3.59	3.77
09	4.01	4.02	3.90	4.02
10	5.32	7.11	5.27	5.27
11	8.53	8.91	8.43	7.44
12	1.29	1.21	0.45	0.44

Table 8. Standard Deviation Of Individual Probe Results

Lot	Neogen Corp. Veratox	Veratox	NDSU GC	GC
03	0.24	0.20	0.25	0.35
04	0.13	0.15	0.28	0.12
05	0.08	0.15	0.27	0.13
06	0.81	0.70	0.16	0.28
07	0.33	0.44	0.55	0.59
08	0.32	0.20	0.18	0.19
09	0.40	0.75	0.44	0.18
10	0.24	0.96	0.72	0.92
11	0.91	1.34	0.77	0.67
12	0.08	0.06	0.03	0.10

Official procedures of DON measurements specify a sample that has had the dockage removed. Dockage is primarily non-barley material removed with a Carter-Day Dockage Tester. Dockage is defined as the combination of three separations from the dockage tester. The riddle separation is material that is larger than barley. Material passing through the bottom sieve (TBS) is smaller than barley. The air separation is material lighter than barley.

Dockage separations were kept from four samples. These separations were analyzed at TSD using HPLC. Table 9 gives the results of these tests.

Table 9. DON Results On Dockage Separations

Lot	Sample Avg.	Dockage		
		Riddle	TBS	Air
03	2.10	3.8	0.9	9.2
06	5.67	9.7	2.6	26.8
09	3.55	11.0	5.9	18.7
12	1.00	0.7	0.5	3.5

The dockage has generally higher levels of DON than the grain.