Comparing Relative Risk of Producing Malting Barley

Steven Edwardson
Executive Administrator
North Dakota Barley Council
West Fargo, North Dakota

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Overview

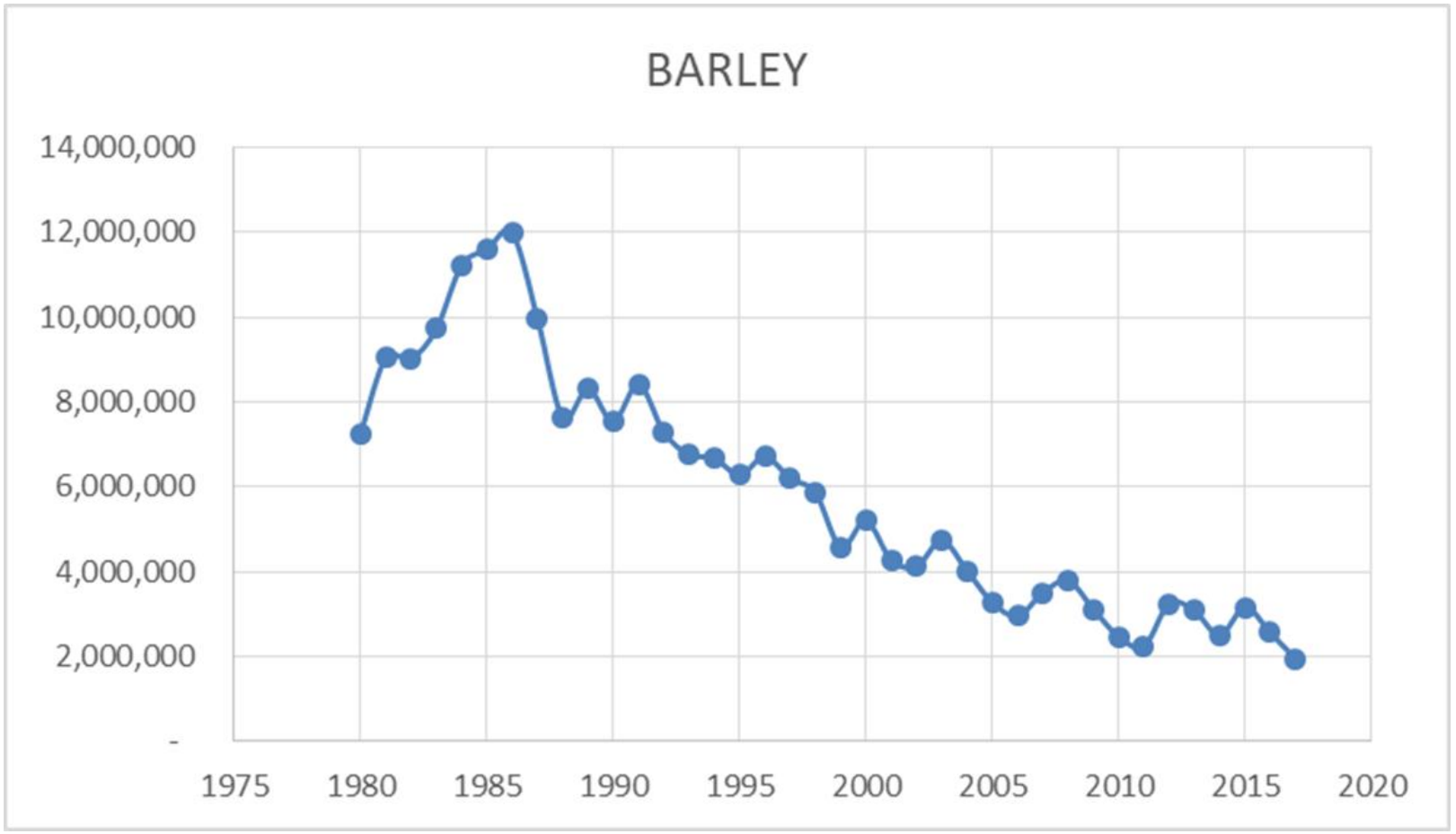
- TRENDS
  - Review malt barley production and market trends in the U. S.
- FACTORS
  - Outline the factors growers utilize in crop enterprise selection.
- RISK
  - Identify and quantify risks of producing malting barley in comparison with other crops.
- SHIFT
  - Outline the shift from purchasing malting barley as a commodity to procuring it as an ingredient.
- OUTLOOK
  - Summarize the outlook for U. S. barley production.

Barley Planting Trends

- U. S. barley growers have been planting barley at a declining rate since the mid 1980's.
- Acreage peaked in the mid 1980's at approximately 12 million acres.
- In recent years, acreage trends have been in the range of 2 to 3 million acres.
- Production area declined at a rate of 310,000 acres per year from 1988 – 2010.

U. S. Barley Acreage Trends

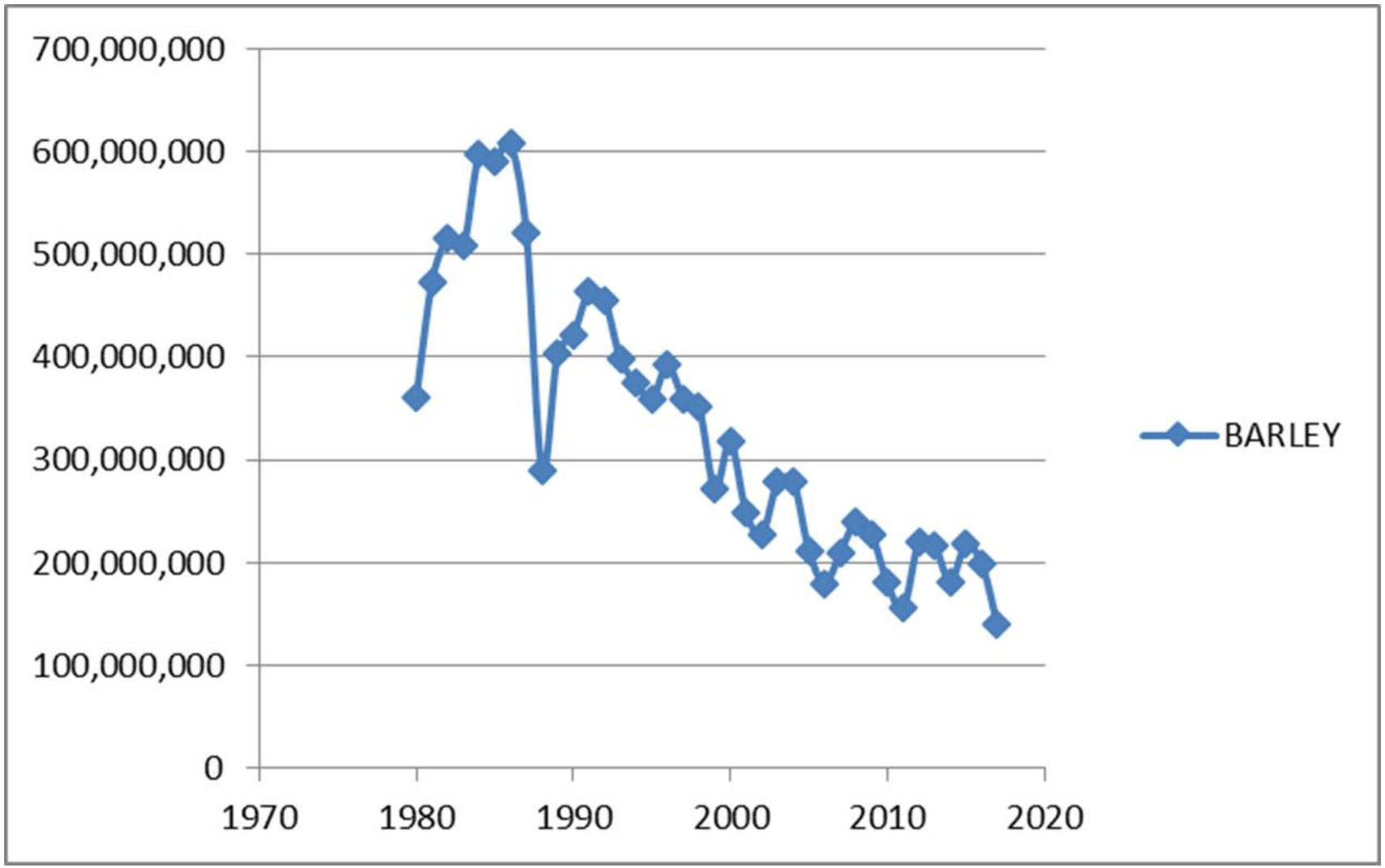
Barley area harvested (acres) in the U. S. from 1980 through 2017. Data Source: USDA National Ag Statistics Service.



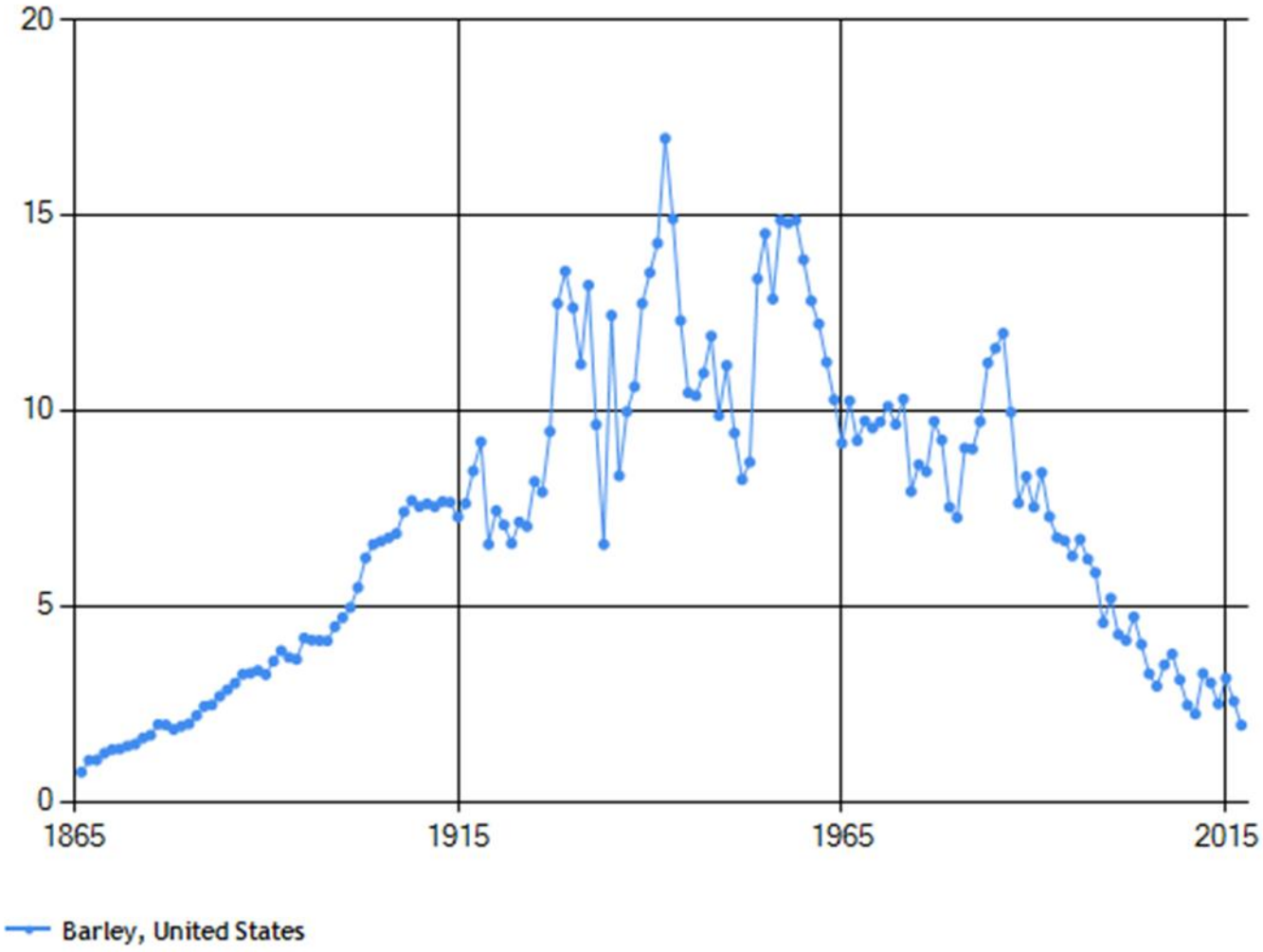
Barley Production Trends

- Likewise, barley production has decreased in the U. S. since the 1980's.
- Production peaked at approximately 600 million bushels in 1986.
- Today, production is the area of 150 to 200 million bushels.

U. S. Barley Production (Bushels) 1980 – 2016. USDA National Ag. Statistics Service.



U. S. Barley Acres Harvested (in Millions of Acres)
Period: 1866 – 2017
Source: USDA-ERS



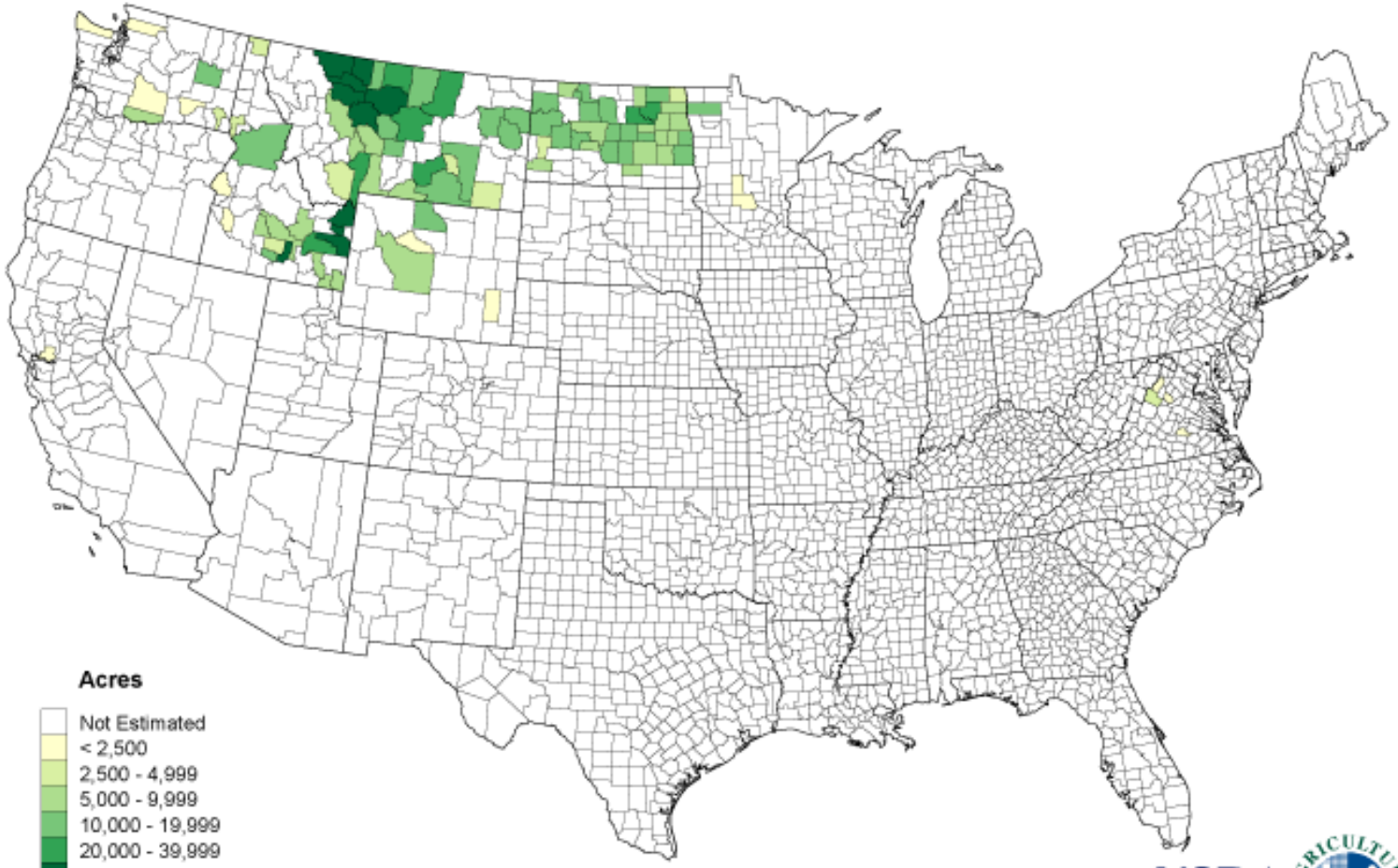
Barley Acreage Trends for National Barley Growers Association Member States

Area Planted (Acres)							Percent Change From
STATE	**2012**	**2013**	**2014**	**2015**	**2016**	**2017**	**2016 to 2017**
Idaho	610,000	650,000	600,000	610,000	600,000	530,000	-12%
Maryland	60,000	75,000	70,000	50,000	50,000	50,000	0%
Minnesota	115,000	90,000	75,000	135,000	95,000	80,000	-16%
Montana	900,000	990,000	920,000	990,000	990,000	770,000	-22%
North Dakota	1,060,000	760,000	620,000	1,120,000	740,000	520,000	-30%
Oregon	56,000	63,000	50,000	49,000	45,000	47,000	4%
Washington	185,000	205,000	115,000	115,000	110,000	95,000	-14%
	2,986,000	2,833,000	2,450,000	3,069,000	2,630,000	2,092,000	
United States:	3,637,000	3,528,000	3,031,000	3,623,000	3,059,000	2,481,000	-19%
Minnesota % of U. S.:	3%	3%	2%	4%	3%	3%	
North Dakota % of U. S.:	29%	22%	20%	31%	24%	21%	
NBGA % of U. S. Acres	82%	80%	81%	85%	86%	84%	

The Shift to Corn and Soybeans

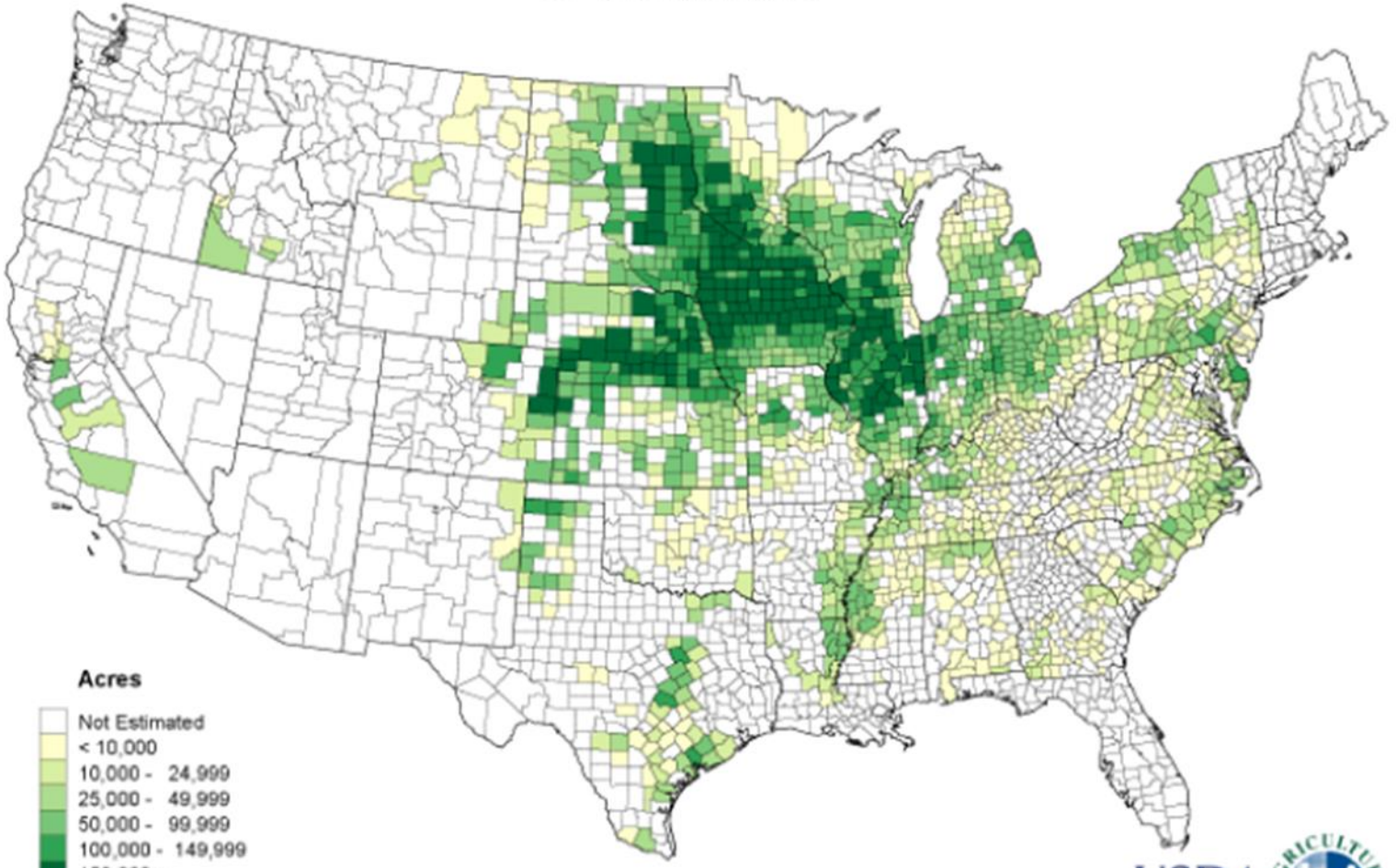
- U. S. farmers shifted their crop production systems from wheat and barley to more corn and soybeans.
- New production regions in the northern plains (e. g. North Dakota) provided farmers with new crop enterprise opportunities in corn and soybeans.
- Easier production, less storage time, market risk management tools, faster inventory turning rates, and prompt payment on delivery impacted the shift from malting barley to corn and soybeans.

Barley 2017
Planted Acres by County
for Selected States



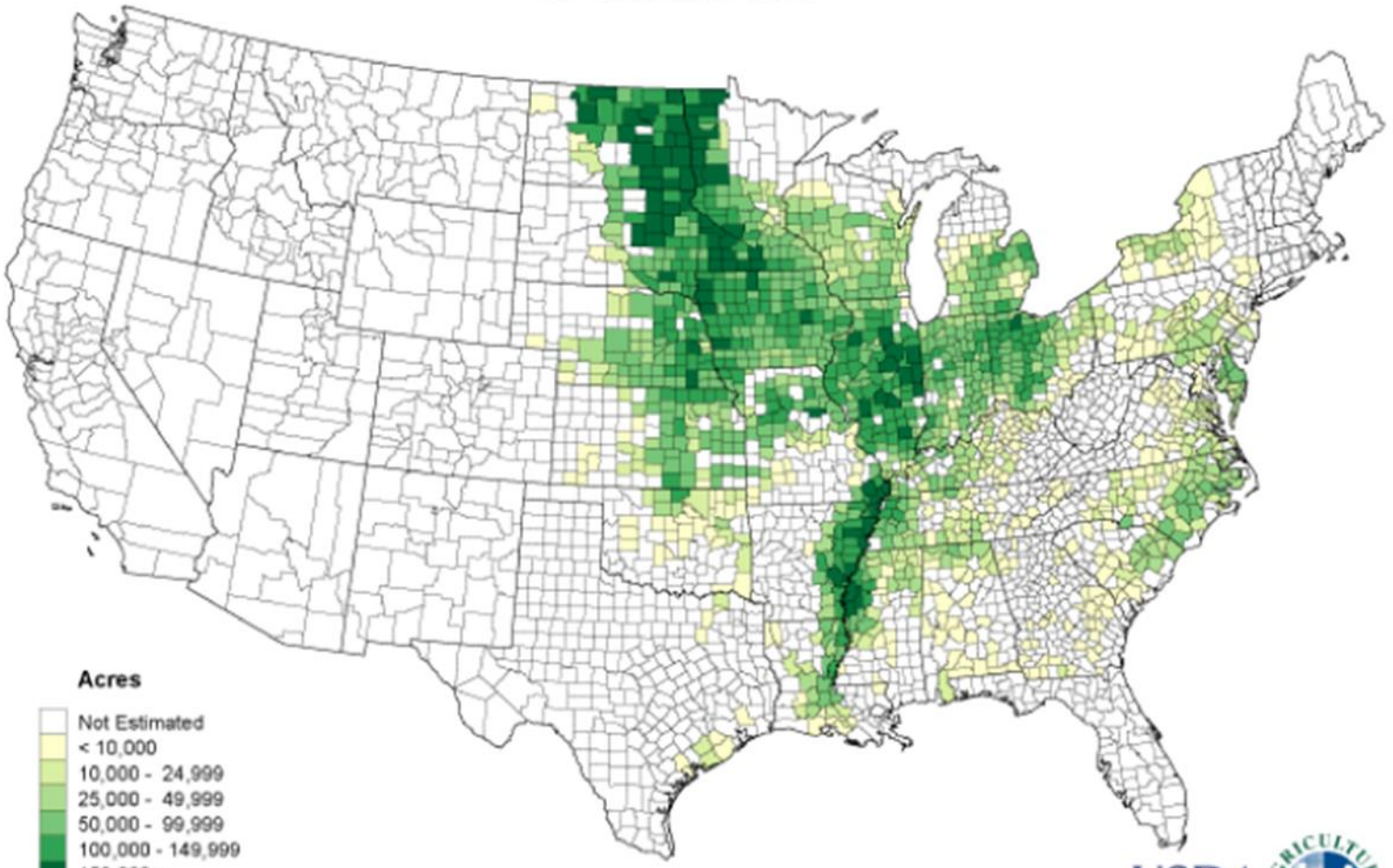
U.S. Department of Agriculture, National Agricultural Statistics Service

Corn for All Purposes 2016
Planted Acres by County
for Selected States



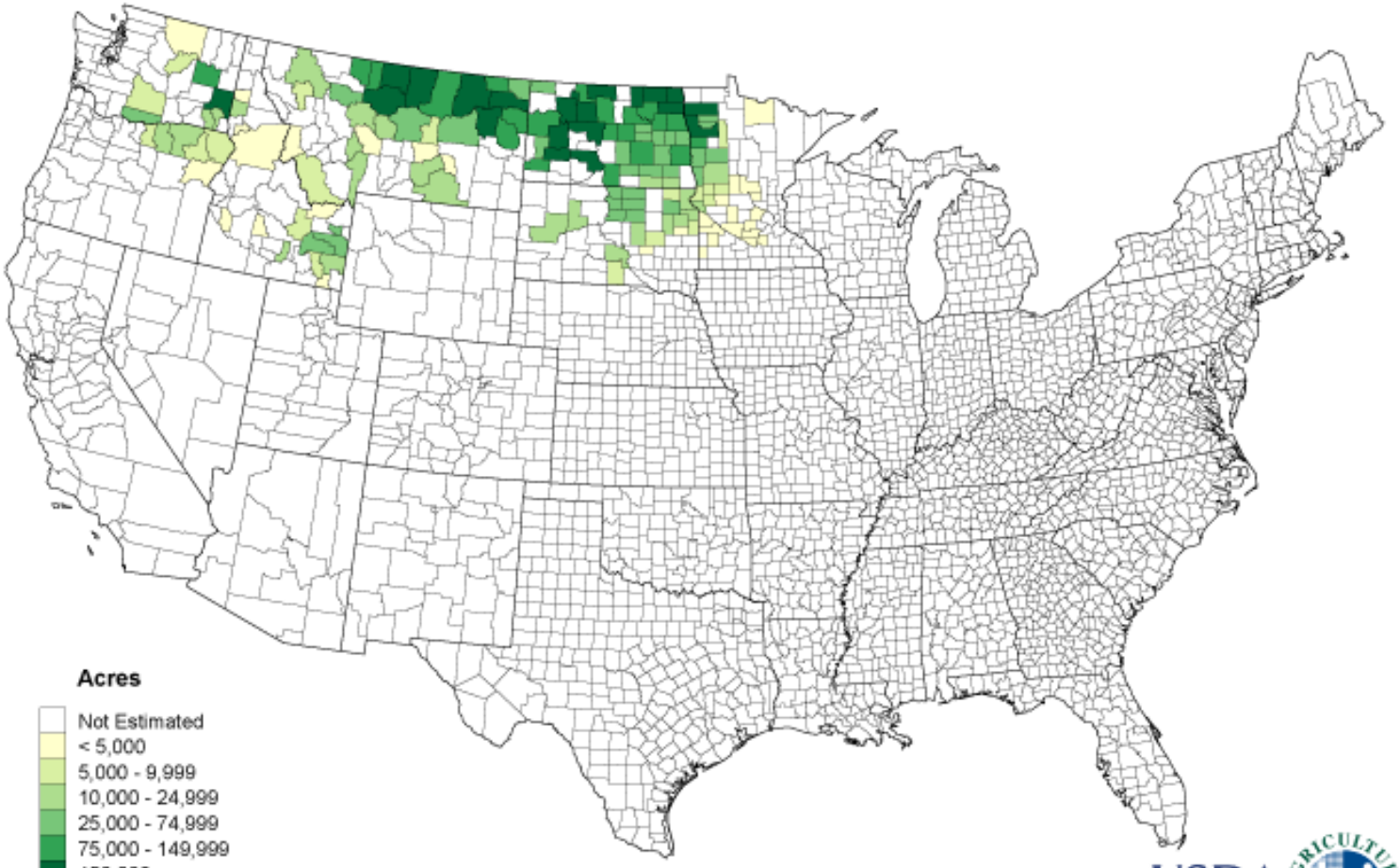
U.S. Department of Agriculture, National Agricultural Statistics Service

Soybeans 2016
Planted Acres by County
for Selected States



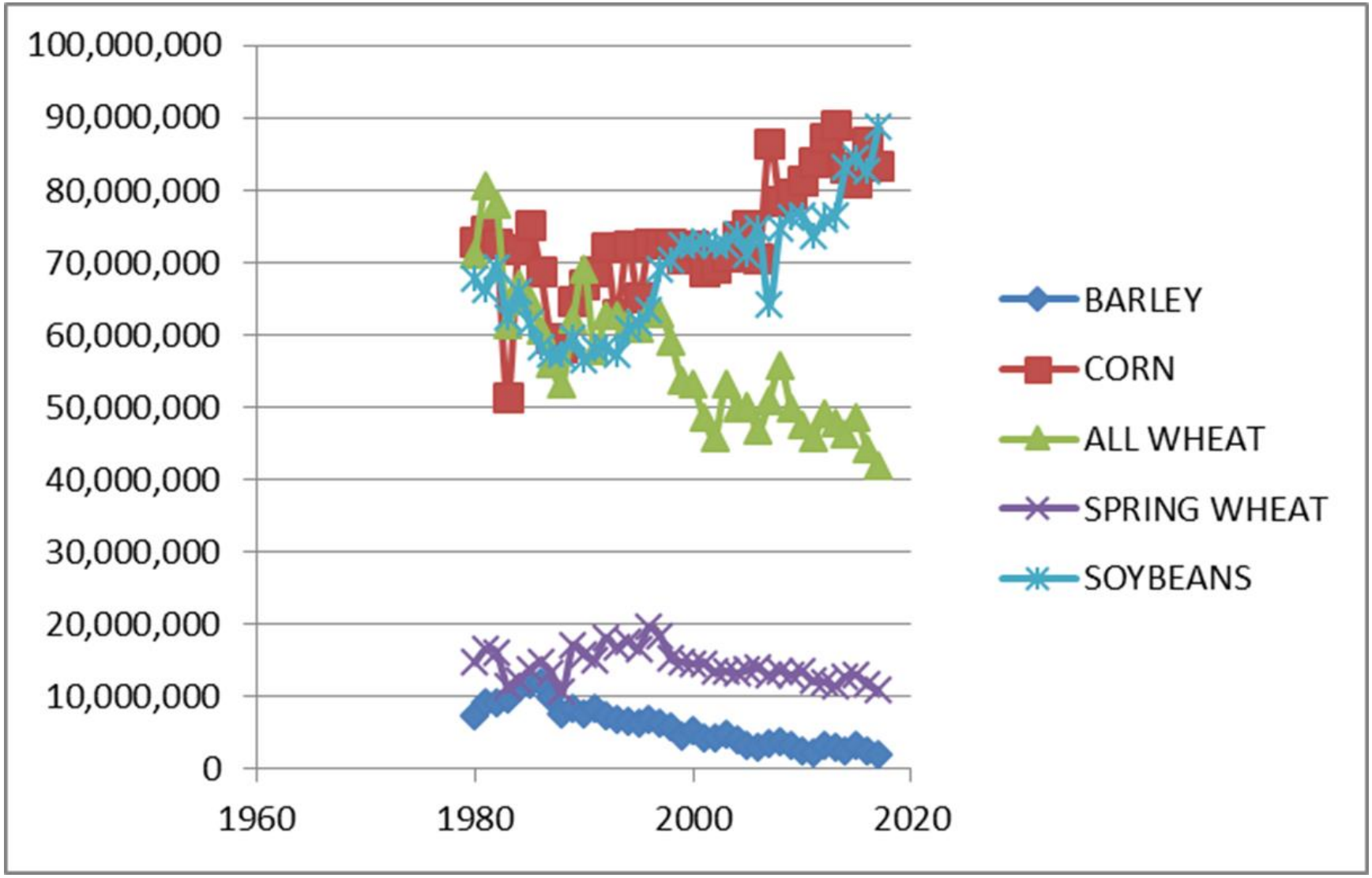
U.S. Department of Agriculture, National Agricultural Statistics Service

Other Spring Wheat 2017
Planted Acres by County
for Selected States

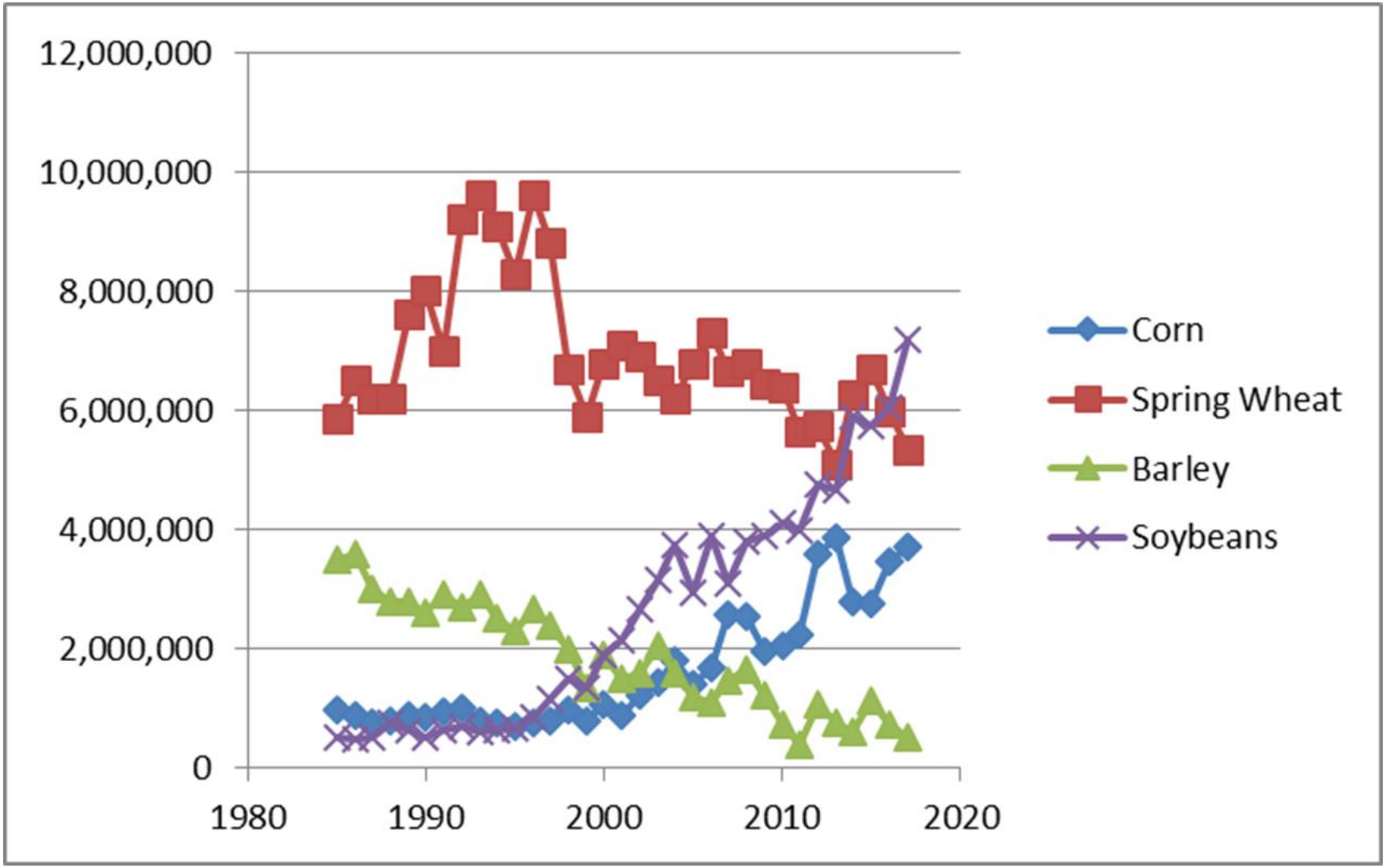


U.S. Department of Agriculture, National Agricultural Statistics Service

Area Harvested (acres) for Selected U. S. Crops (Data Source: USDA-NASS) 1980 – 2017



Area Planted (acres) to Selected Crops in North Dakota
1985 – 2017
Data Source: USDA-NASS



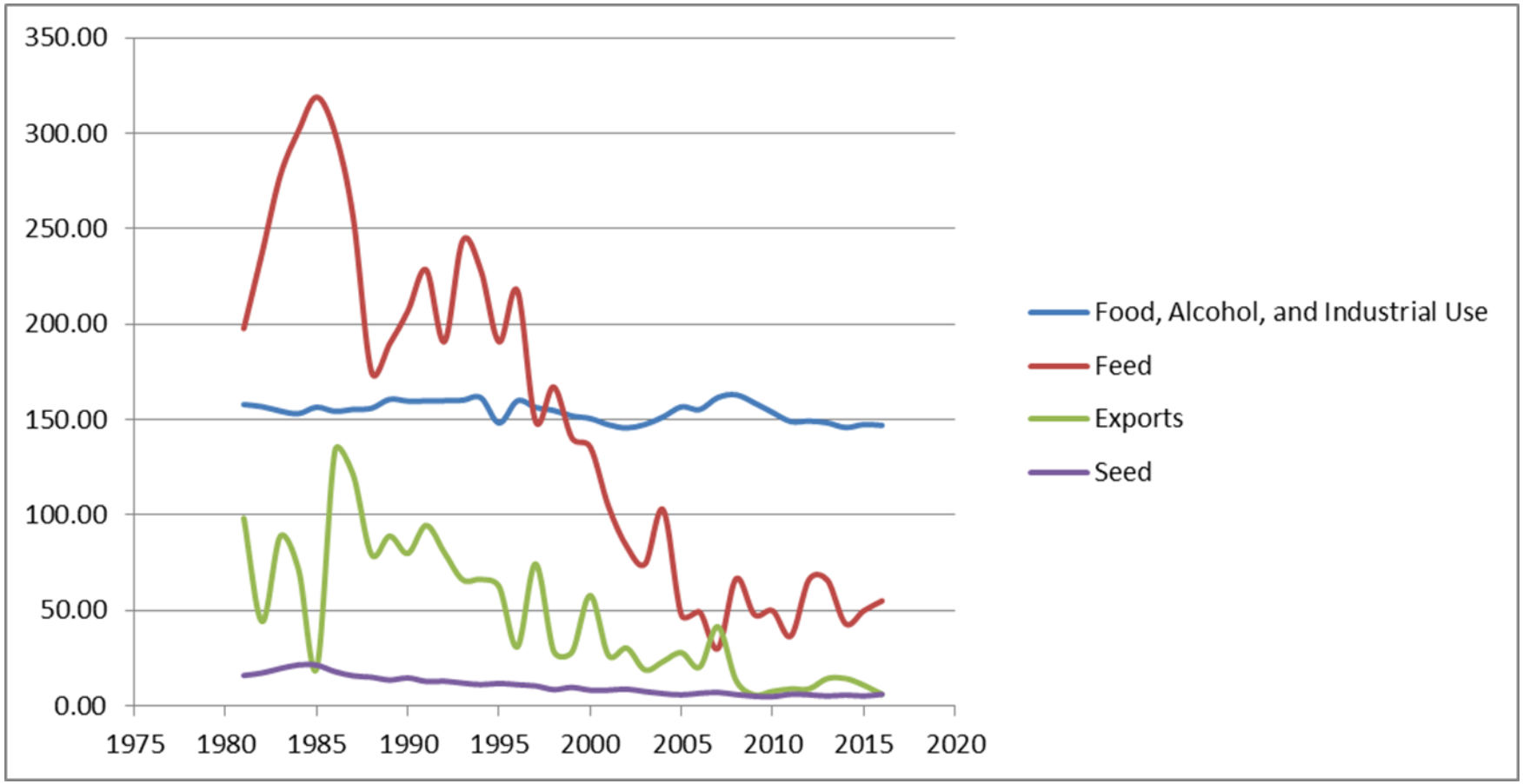
Barley Utilization and Distribution

- Historically, the majority of U. S. barley production was utilized in animal feed.
- As improvements in genetics allowed corn to be produced in new regions, livestock producers shifted from barley to corn as a source of animal feed.
- The decline in barley acreage resulted in less production from which malting companies could select barley for malting and brewing purposes.
- The rapid decline in barley production caused the malting and brewing industry to shift its barley acquisition strategies from open market purchasing to contracting malting barley as a specialty crop.

Understanding the Barley Utilization Shift

- The following chart assists in understanding the shift in barley utilization.
- Barley utilization in livestock feed (the red line) declined from a peak of approximately 310 million bushels in 1981 to approximately 50 million bushels in 2016.
- Barley exports (the green line) were largely for livestock feed. Less barley used in feed in the U. S. translated to less supplies for the export market.
- The blue line is largely production utilized in malting and brewing. Efficiencies in malting and brewing have assisted in generally consistent use of approximately 150 million bushels per year.
- A brief surge in feed barley exports to Japan in 2007 and 2008 largely forced the malting and brewing industry to develop a new procurement strategy for malting barley.

Trends in Barley Utilization and Distribution in the U. S. Million Bushels – USDA-ERS Feed Grains Database 1981 - 2016



How Growers Decide Which Crops to Plant

- Crop production is very similar to other manufacturing processes. There are two key components in any manufacturing business.
  - Turning inventory.
  - Generating cash flow.
- Growers have chosen to produce less malting barley for the following reasons:
  - There are many other choices of crops to plant.
  - The risk of not achieving the malting barley price is too great.
  - Corn and soybeans are easier to store, market, and sell.
  - Corn and soybeans offer less downside risk and greater upside profit potential.
  - Lending institutions consider barley to be too risky.

Selecting a Crop Enterprise

- The North Dakota Barley Council utilized a grower focus group to outline crop selection decision factors.
- Two general categories in crop selection were identified.
  - Crop quality factors.
  - Crop business management factors.
- Growers identified specific factors in each category for malting barley, corn, soybeans, and spring wheat.

Crop Quality Factors

- Corn and soybeans.
  - Test weight (bulk density) and moisture content.
- Malting barley.
  - Bulk density, germination, mycotoxins, plump kernels, protein, heat damage, frost damage, sprout damage, moisture.
  - Malting barley is the only crop that must be delivered in a “living state”.

Crop Business Management Factors

- Profitability.
- Storage. Length of time crop is stored on the farm, requirements for maintaining integrity of the stored crop, and storage costs.
- Price transparency. Malting barley does not have a futures market, thus making price discovery more challenging.
- Availability of crop insurance for risk management.
- Impact on cash flow (e. g. timeliness of sales and payments).
- Banker support. Some bankers consider malting barley to be too risky.
- Crop management intensity. Barley fields must be continuously monitored for weed control, disease control, harvest timing, etc. Stored barley also needs to be monitored.

Scoring the Factors

- Growers scored the factors in each category.
  - Score of “1” (green): easy to achieve.
  - Score of “2” (orange): more difficult and requires more management.
  - Score of “3” (red): very difficult and requires considerable skill and management.
- The result was a “heat map” that provided a color matrix of the grower decision process.

Heat Map – Quality Factors

FACTORS	UNITS	HARD RED SPRING WHEAT	MALTING BARLEY	CORN	SOYBEANS
Crop Quality Factors					
--Falling Numbers	seconds	1	1	1	1
--Test weight (bulk density)	lbs/bu	1	1	1	1
--Protein	%	1	2	1	1
--Moisture	%	1	2	1	1
--Germination	%	1	2	1	1
--Mold in seed crease	visual	1	3	1	1
--Deoxynavalenol (DON)	ppm	2	2	1	1
--Heat damage	%	1	2	1	1
--Frost damage	%	1	2	1	1
--Sprout damage	%	1	2	1	1
--Color	visual	1	2	1	1
--Plump Kernels	%	1	2	1	1
TOTAL SCORE FOR QUALITY:		13	23	12	12

Heat Map: Business Management

Crop Business Management Factors	UNITS	HARD RED SPRING WHEAT	MALTING BARLEY	CORN	SOYBEANS
--Gross margin	$/acre	1	1	1	1
--Storage on farm	NA	1	3	1	1
--Storage payments for on farm	$/bu	1	2	1	1
--Price transparency	NA	1	2	1	1
--Receipt of payment	Days	1	3	1	1
--Banker support	NA	1	3	1	1
--Crop insurance coverage	$/acre	1	3	1	1
--Crop management intensity	NA	1	3	1	1
TOTAL SCORE FOR BUSINESS FACTORS:		8	20	8	8
TOTAL SCORE:		21	43	20	20

Grower Focus Group Results

- Malting barley requires more management time and skill.
- Corn and soybeans are much easier to produce and sell, and are nearly "idiot proof".
- The risk of malting barley production must be quantified to help buyers understand and compare risks between malting barley, corn, soybeans, and wheat.

QUANTIFYING CROP ENTERPRISE RISK

- What is the probability of malting barley being competitively profitable with corn, soybeans, and wheat?
- How do we measure "downside risk"?
  - And conversely "upside potential".
- Why should a grower plant malting barley?
  - What is the risk – reward scenario?

What is Downside Risk? Here is an Example

- Malting Barley Yield: 100 bushels per acre.
- Malt Barley Price: $4.00 per bushel
- Feed Barley Price: $2.00 per bushel
- Gross Revenue Comparison
  - 100 bu/ac x $4.00/bu = $400.00 per acre.
  - 100 bu/ac x $2.00/bu = $200.00 per acre.
  - Difference between malt and feed: $200.00 per acre.
  - Downside risk is the probability of not achieving malt and thus selling at a price that cannot provide sufficient profitability (and likely will result in a loss).
  - Can the grower afford to risk $200.00 per acre.
    - On 1000 acres, this is $200,000.00.

Modeling Comparative Risk

- The North Dakota Barley Council funded a project at North Dakota State University (NDSU) to quantify and compare the risk of producing malting barley in comparison with spring wheat, corn, and soybeans.
- The objective was to measure the variability in return to labor and management.
  - (Yield x Price) – Variable Costs = Return to Labor and Management (RLM).
  - Variable costs include seed, fertilizer, weed control, disease control, and machinery costs.
- This level of comparison allows one to move from a static crop budget to a dynamic crop budget.

Risk Measurement Components

- Crop quality factors.
- Yield.
- Price.
- Return to labor and management.
- Crop insurance.
  - This is the first time a project of this level of detail has been developed for malting barley.

Materials and Methods

- The project was conducted in 2013 and utilized crop enterprise budgets developed at NDSU, which focused on two regions in North Dakota.
  - The north central region, where malting barley competes with corn, soybeans, and wheat, but corn is more difficult to produce.
  - The central region, where corn and soybeans have largely displaced malting barley and other crops.

Materials and Methods

- Crop budget data was summarized in an Excel worksheet.
- @Risk (an add-on program that works in Excel) was utilized to calculate all possible combinations of return to labor and management, thus quantifying the entire range of profit and loss potential.

YIELD, PRICE, AND QUALITY COMPONENTS OF COMPARATIVE RISK STUDY

Crop	Yield	Price	Quality	Crop Ins.
Malt Barley	63.5	6.10 c 5.60 m	70% acceptance	75% Revenue Coverage
Spring Wheat	43.5	7.75	Protein Spreads	75% Revenue Coverage
Corn	98.5	5.50	T.W. Drying	75% Revenue Coverage
Soybean	30.5	12.20	None	75% Revenue Coverage
Canola	1580	23.70	None	75% Revenue Coverage

	Malting Barley		Corn Grain	
	Per Acre	Your Figures	Per Acre	Your Figures
Market Yield	66	_____	103	_____
Market Price	4.21*	_____	3.50	_____
MARKET INCOME	277.86	_____	360.50	_____
DIRECT COSTS				
-Seed	13.60	_____	78.30*	_____
-Herbicides	23.70	_____	21.00	_____
-Fungicides	17.00**	_____	0.00	_____
-Insecticides	0.00	_____	0.00	_____
-Fertilizer	52.01	_____	70.77	_____
-Crop Insurance	16.50	_____	16.70	_____
-Fuel & Lubrication	11.28	_____	14.75	_____
-Repairs	19.68	_____	22.81	_____
-Drying	0.00	_____	21.63	_____
-Miscellaneous	1.50	_____	1.50	_____
-Operating Interest	3.30	_____	5.26	_____
SUM OF LISTED DIRECT COSTS	158.58	_____	252.72	_____
INDIRECT (FIXED) COSTS				
-Misc. Overhead	7.86	_____	9.65	_____
-Machinery Depreciation	22.85	_____	32.43	_____
-Machinery Investment	13.36	_____	18.30	_____
-Land Investment	50.00	_____	50.00	_____
SUM OF LISTED INDIRECT COSTS	94.07	_____	110.39	_____
SUM OF ALL LISTED COSTS	252.64	_____	363.11	_____
RETURN TO LABOR & MANAGEMENT	25.22	_____	(2.61)	_____

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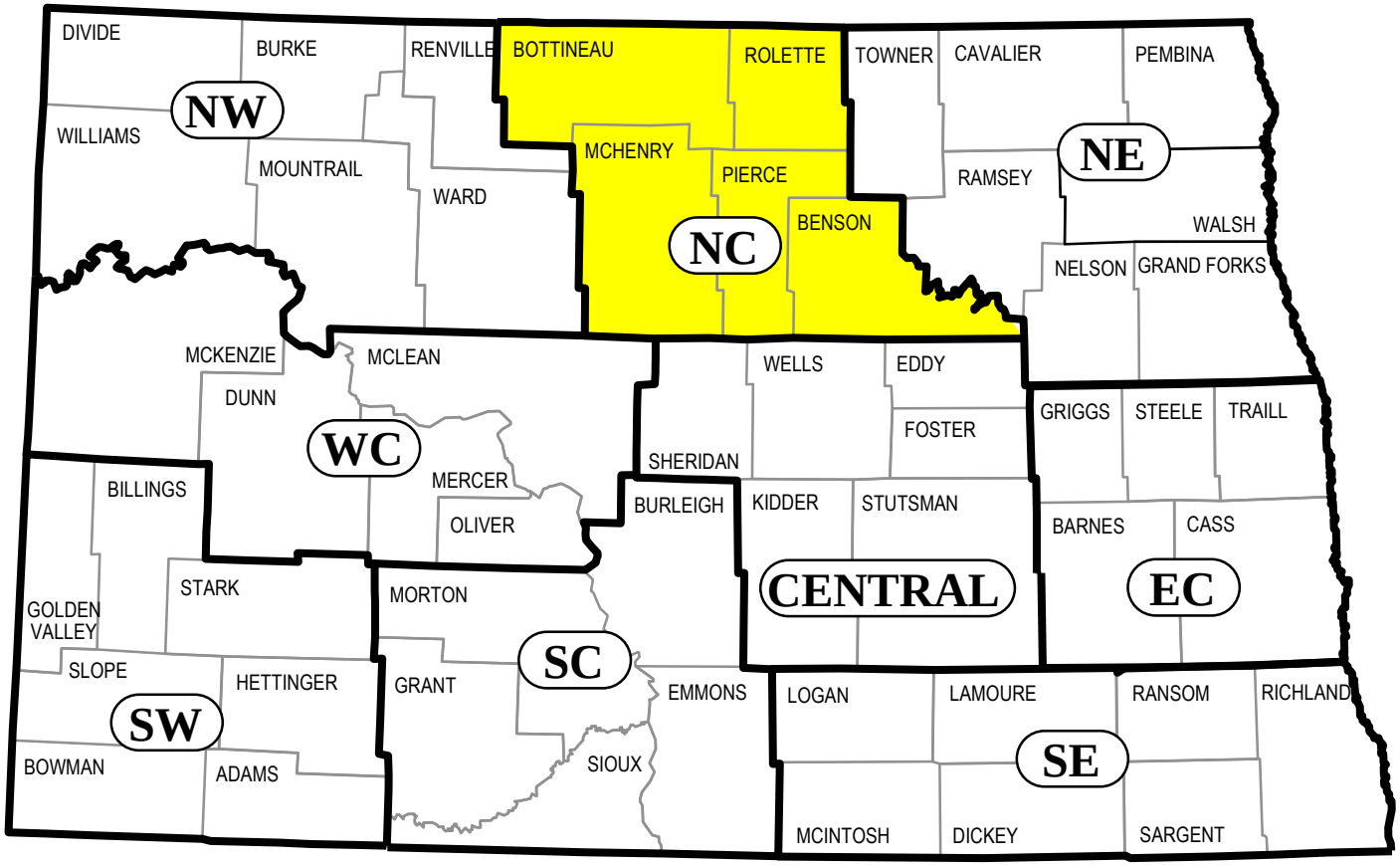
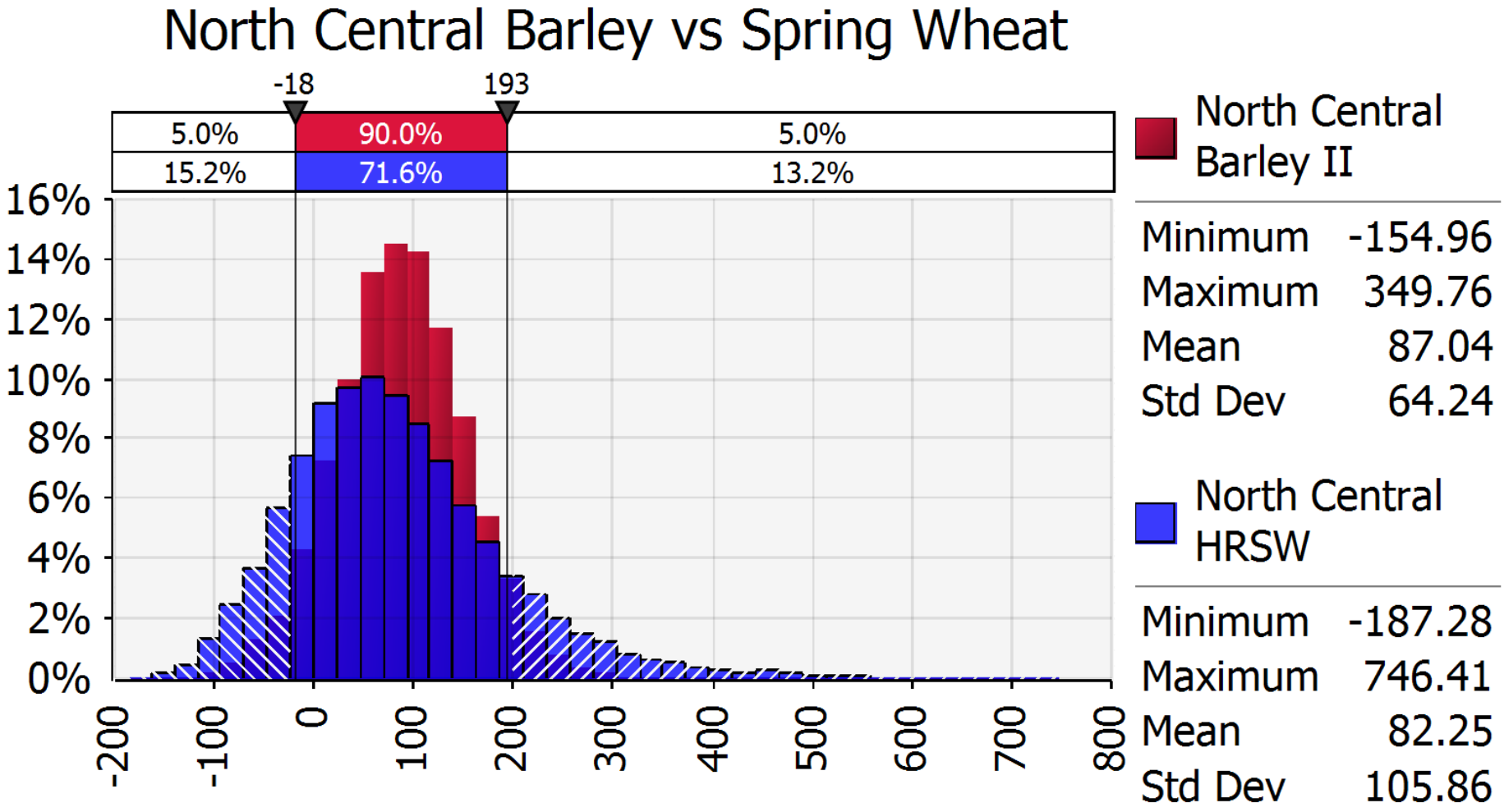
-Land Investment	50.00		50.00	
SUM OF LISTED INDIRECT COSTS	94.07		110.39	
SUM OF ALL LISTED COSTS	252.64		363.11	
RETURN TO LABOR & MANAGEMENT	25.22		(2.61)	
LISTED COSTS PER BUDGET UNIT	(bu)		(bu)	
-Direct Costs	2.40		2.45	
-Indirect Costs	1.43		1.07	
-Total Costs	3.83		3.53	

REGION: NORTH CENTRAL NORTH DAKOTA. MALTING BARLEY AND SPRING WHEAT UNDER PRESSURE FROM SOYBEANS AND CORN

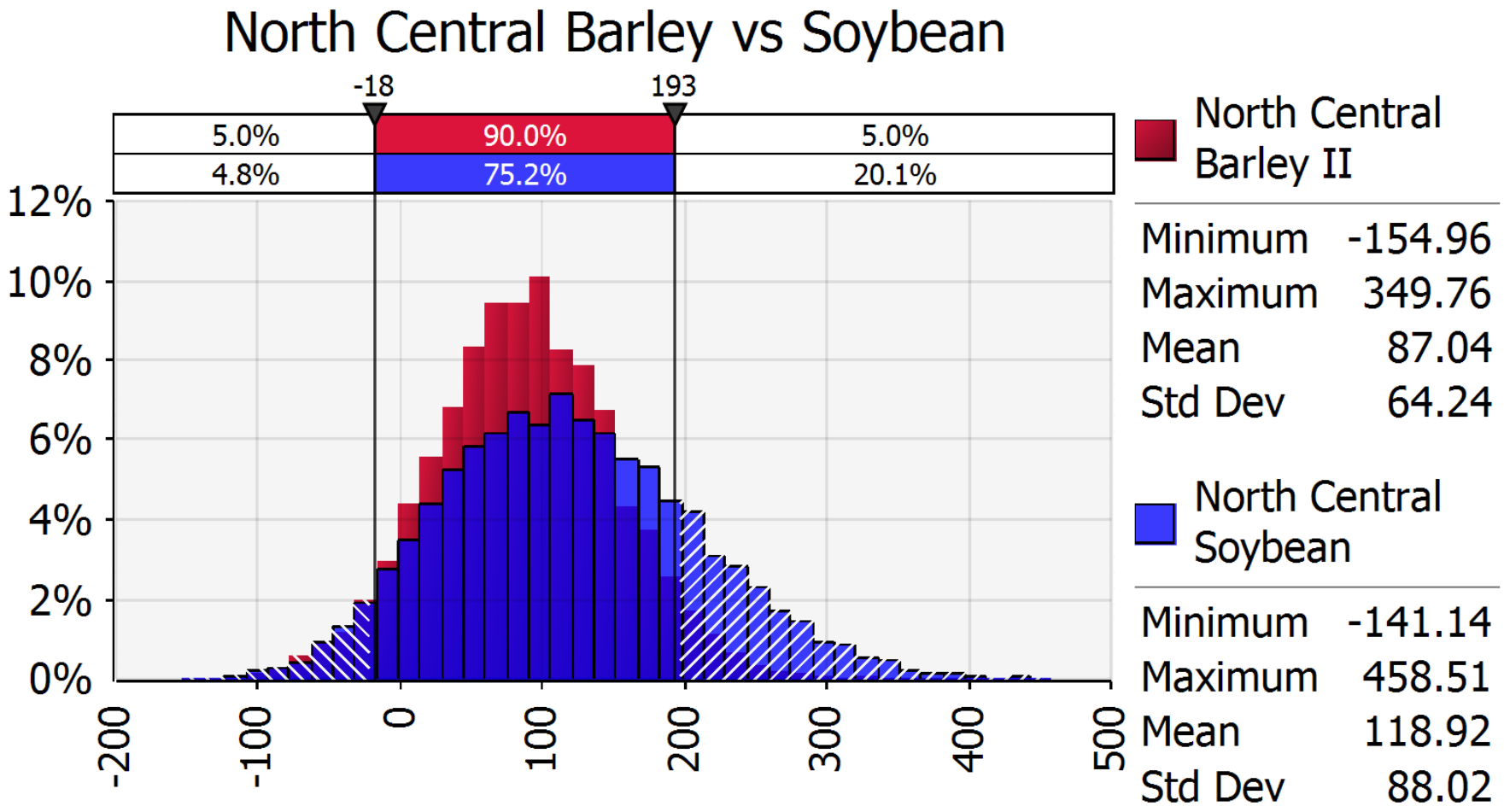
Agricultural Statistics Districts
North Dakota



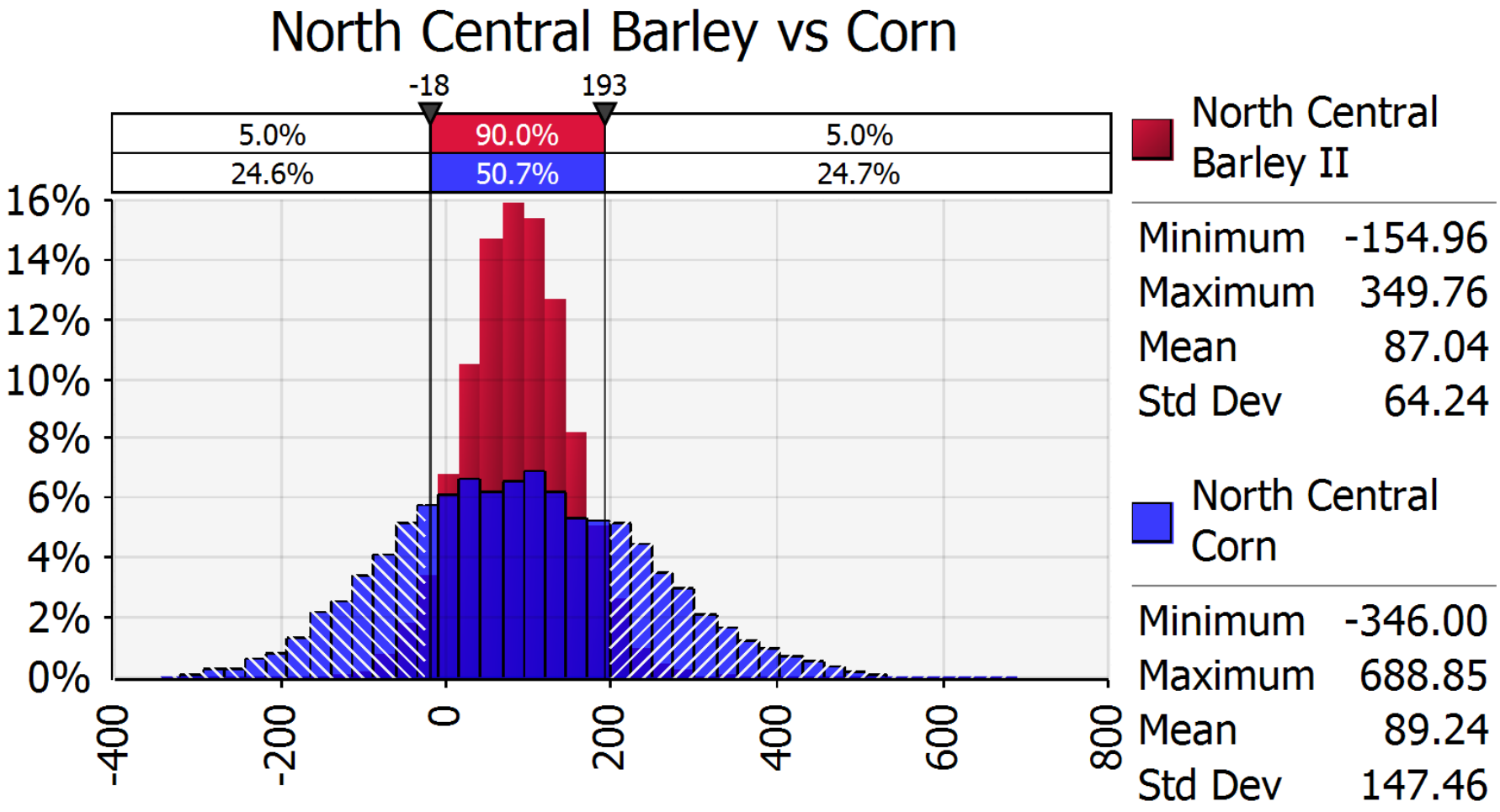
Source: N.D. Agricultural Statistics



Malting barley has a higher mean and a lower standard deviation than spring wheat. However, spring wheat has higher upside profit potential (maximum of $746.41 per acre vs $349.76 per acre for barley).



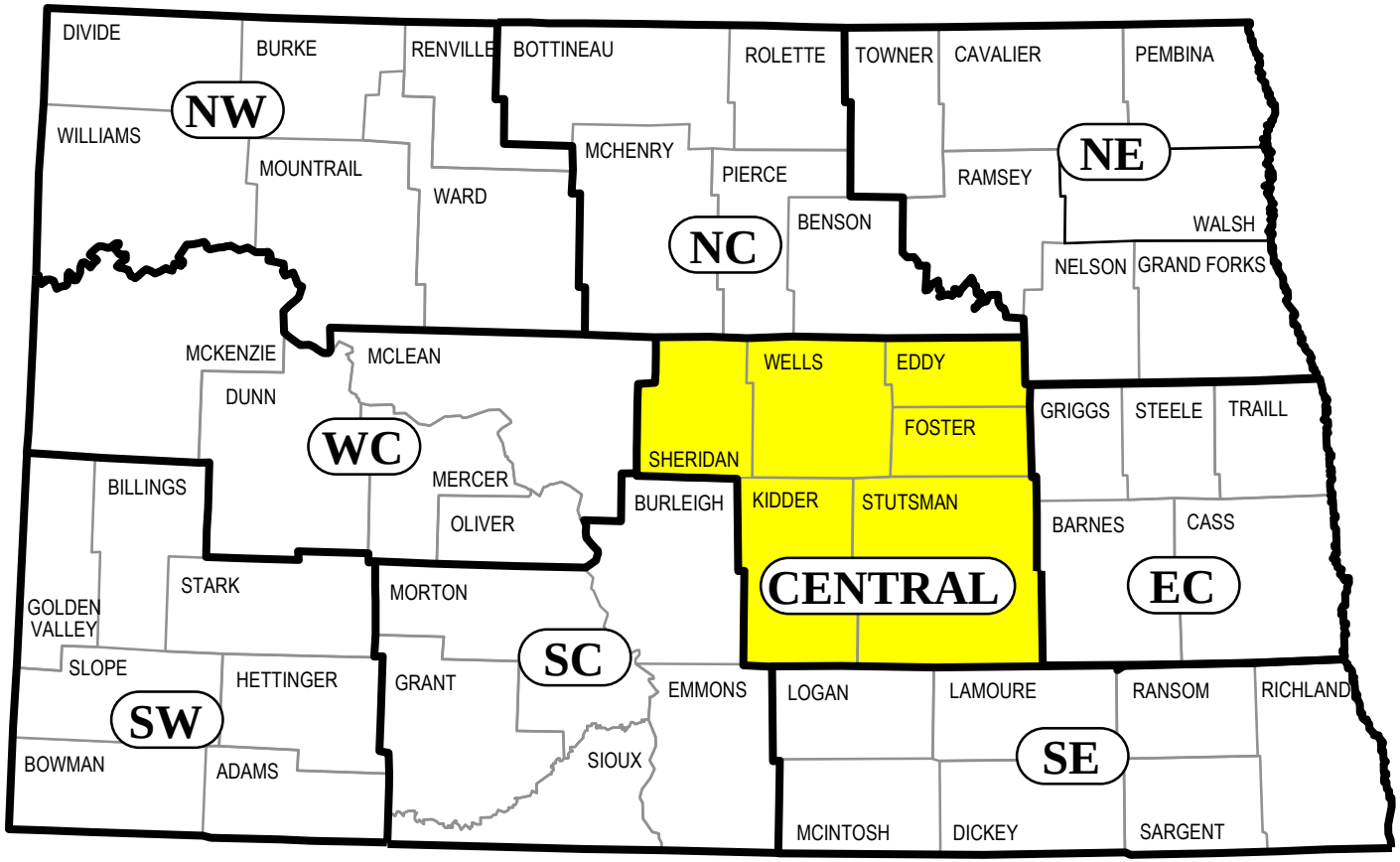
Malting barley has a lower mean than soybeans. Soybeans have a higher maximum profit potential ($458.51 per acre compared with $349.76 per acre for malting barley), and also have lower potential for loss (-$141.14 per acre compared to -$154.96 per acre for malting barley.



The average return per acre for malting barley and corn was very similar ($87.04 vs. $89.24). Corn had higher variability in profit, with a larger maximum profit potential ($688.85 vs. $349.76).

REGION: CENTRAL NORTH DAKOTA. CORN AND SOYBEANS HAVE DISPLACED WHEAT AND BARLEY IN MUCH OF THIS REGION.

Agricultural Statistics Districts
North Dakota



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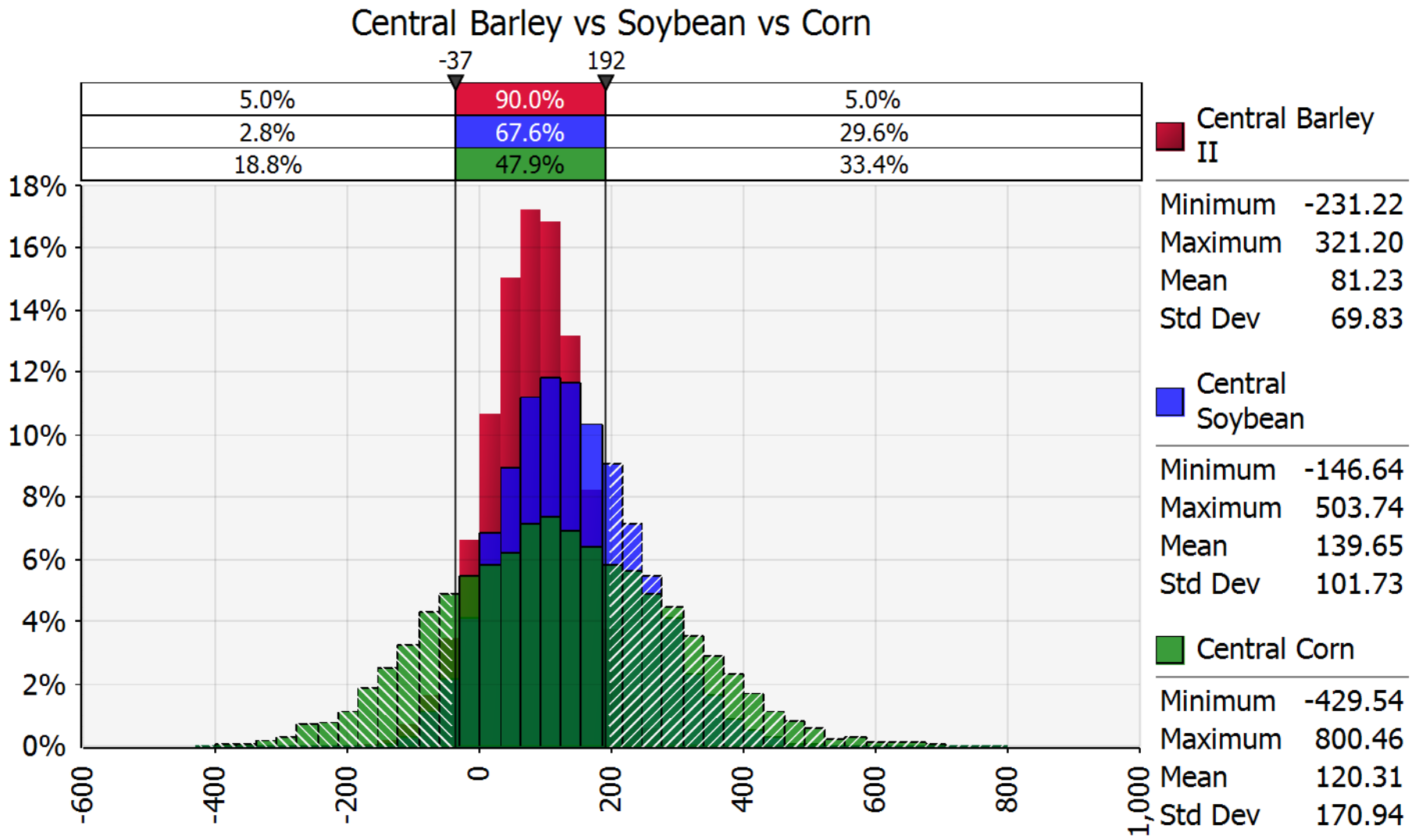

Central Barley vs Soybean vs Corn
-37
192
5.0%
90.0%
5.0%
2.8%
67.6%
29.6%
18.8%
47.9%
33.4%
18%
16%
14%
12%
10%
8%
6%
4%
2%
0%
-600
-400
-200
0
200
400
600
800
1,000
Central Barley II
Minimum -231.22
Maximum 321.20
Mean 81.23
Std Dev 69.83
Central Soybean
Minimum -146.64
Maximum 503.74
Mean 139.65
Std Dev 101.73
Central Corn
Minimum -429.54
Maximum 800.46
Mean 120.31
Std Dev 170.94

Fast Forward to 2016

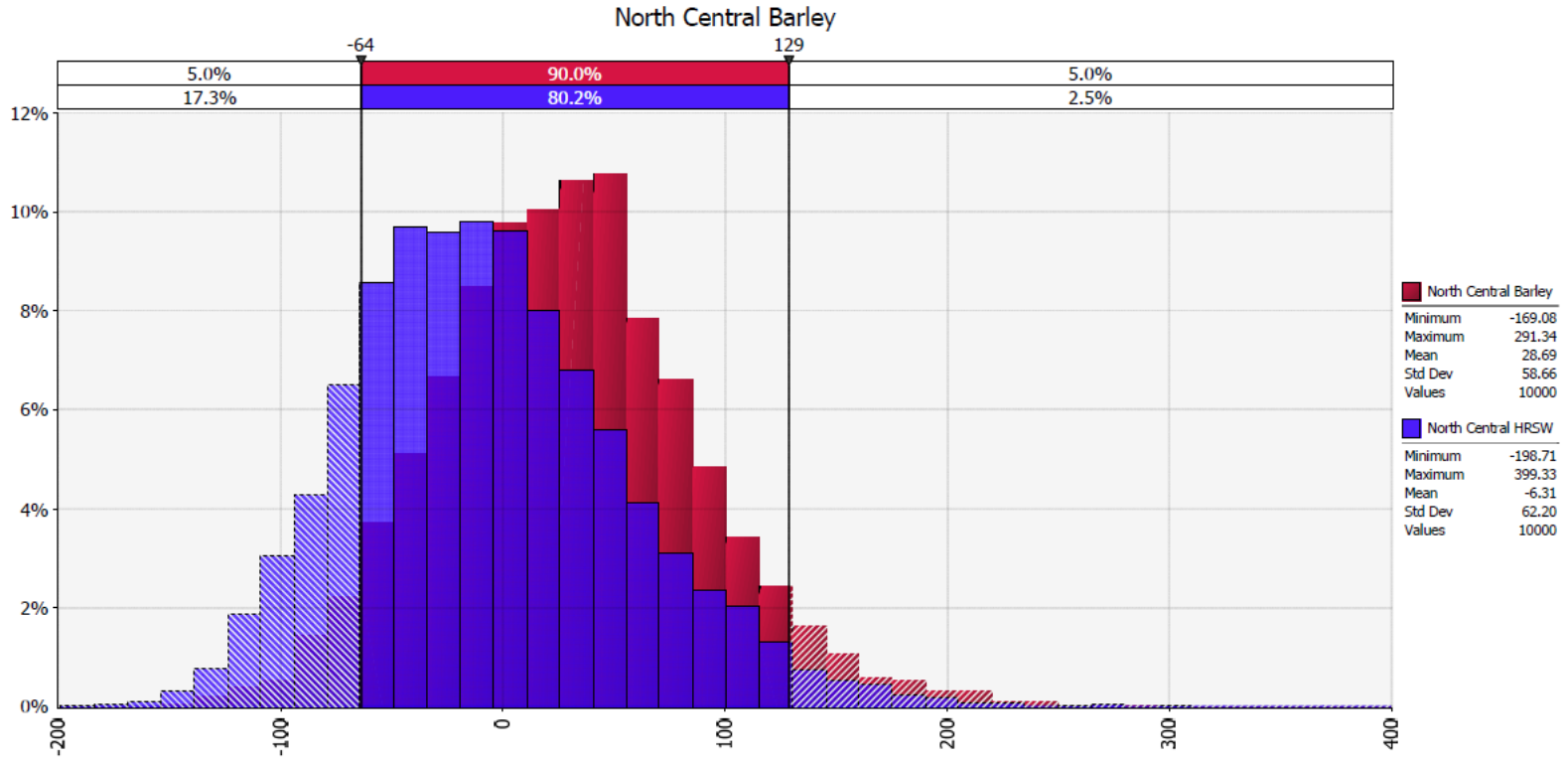
- Using the same procedures, did the overall risk scenario change with new market prices?

Yields and Prices for 2016 for North Central Region

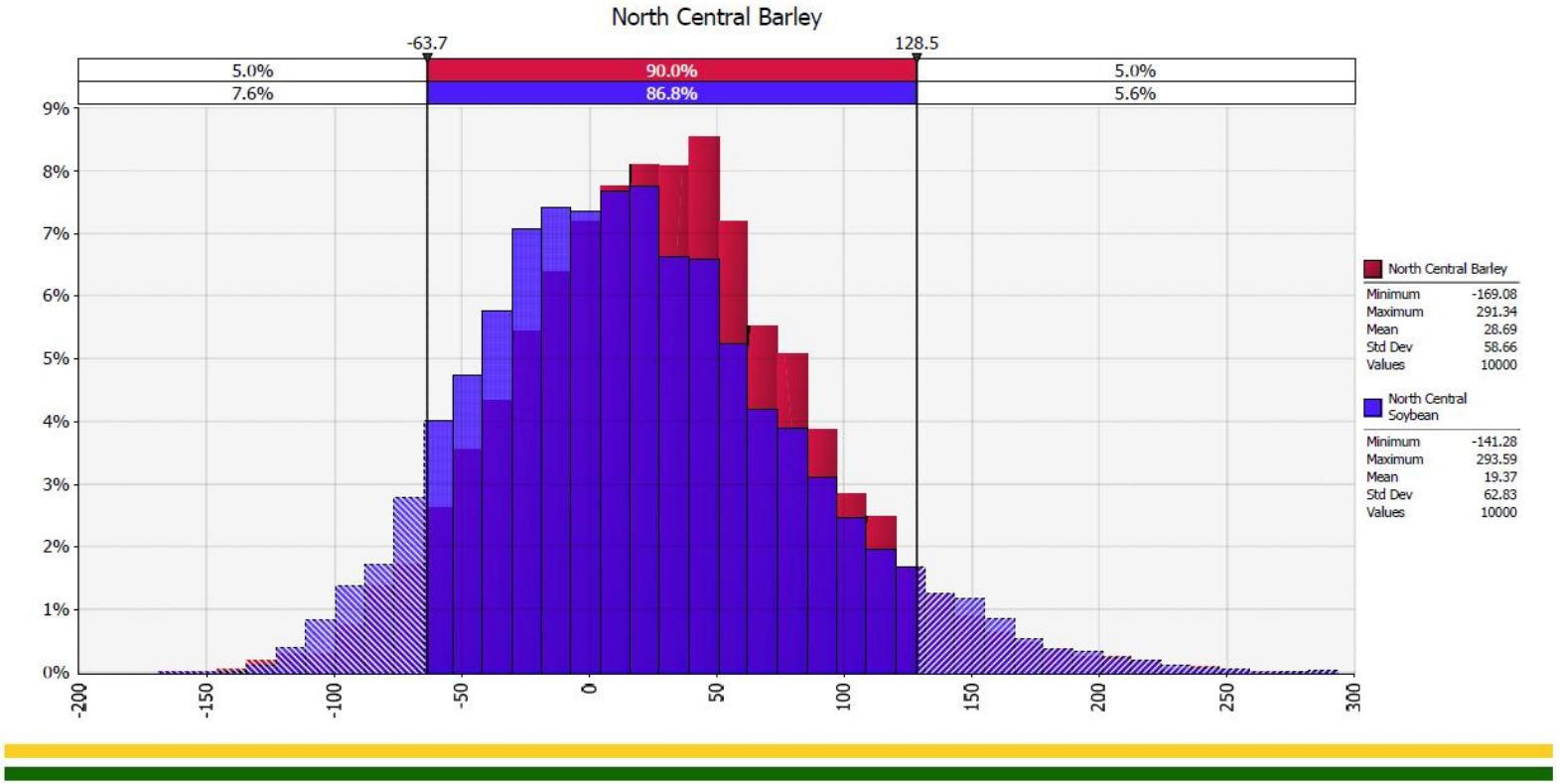
Base Line Assumptions: NC District

Crop	Yield	Price	Quality	Crop Ins.
Malt Barley	67.4	4.40 c 3.20 m	70% acceptance	75% Revenue Coverage
Spring Wheat	44.6	4.10	Protein Spreads	75% Revenue Coverage
Corn	103.9	2.65	T.W. Drying	75% Revenue Coverage
Soybean	32.3	8.70	None	75% Revenue Coverage
Canola	1679	13.70	Green Count	75% Revenue Coverage

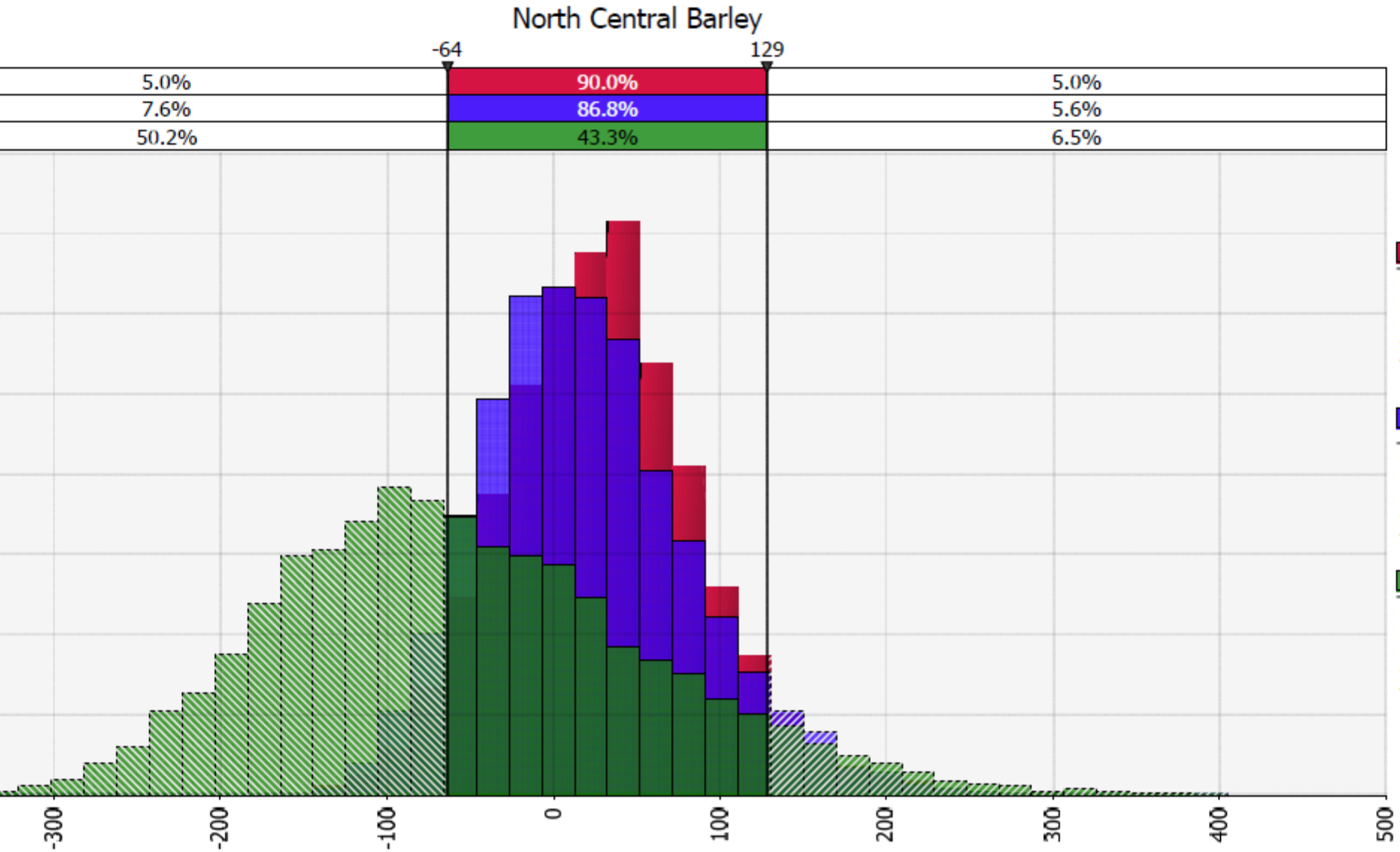
Barley vs. Spring Wheat



Barley vs. Soybean



arley vs. Soybean vs. Corn - 201



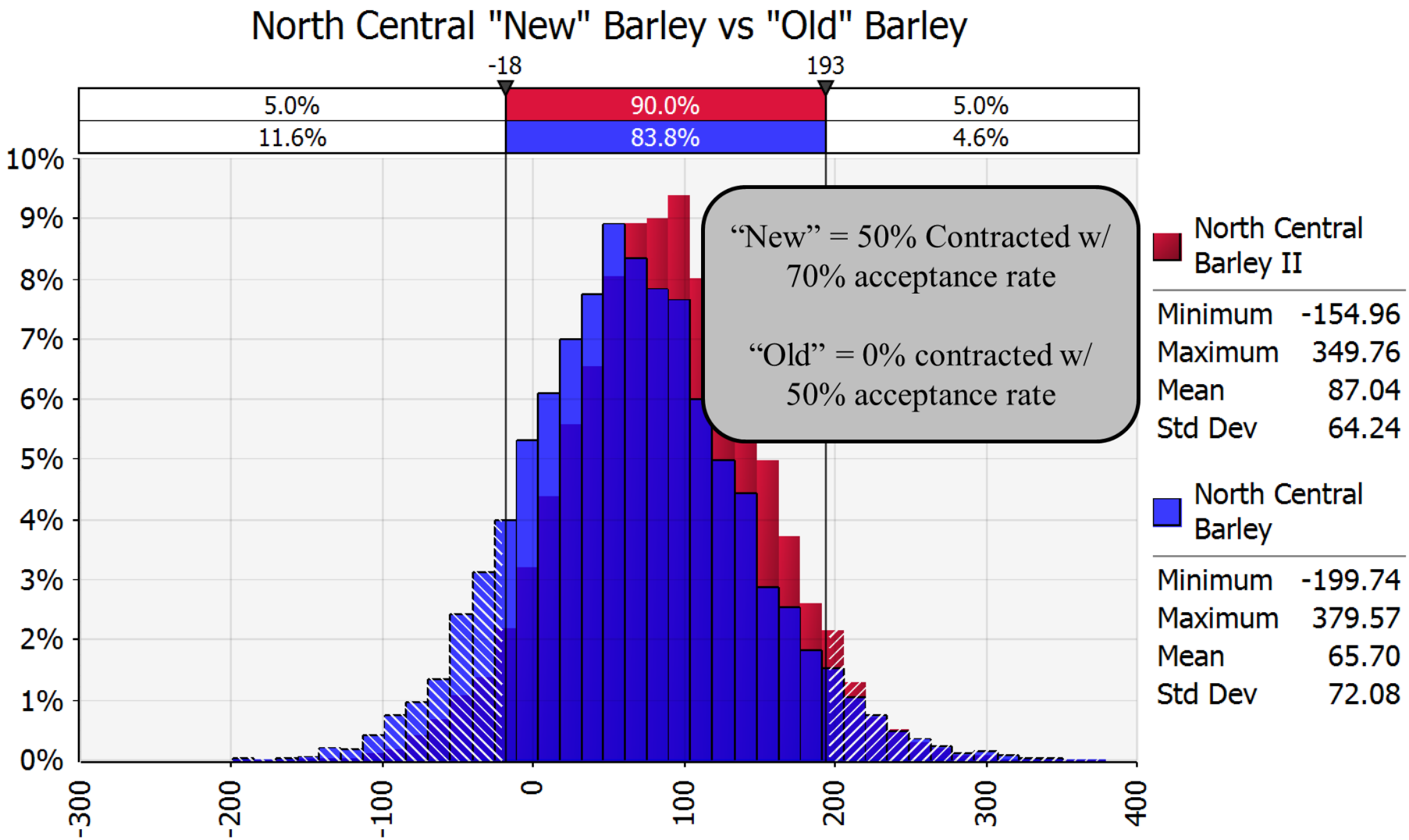
OVERALL PROJECT RESULTS

- The relative risks of producing malting barley, spring wheat, corn, and soybeans, can be quantified and compared.
- Malting barley contracting programs implemented by the industry have helped stabilize production.
- Malt barley must be procured as an ingredient, not traded as a commodity.

PROCUREMENT SHIFT

- Malting barley contracting programs provide benefits to buyers and growers.
  - Secure a base of malting barley production.
  - Minimize volatility in purchasing.
  - Developing long term business relationships with growers.
  - Spread risk.

Have Malt Barley Contracting Programs Improved? Yes!



PROCUREMENT - CONTRACTING

- Malting barley is a “specialty crop” produced under contract and sourced as an ingredient.
- Buyers have implemented contracting procure malting barley from growers. Contract components include but are not limited to:
  - Area produced (acres, hectares).
  - Quantity produced (bushels, tons).
  - Price and terms of payment.
  - Best management practices (planting, fertilizer, etc.).
  - Storage and delivery (when and where).
  - Quality specifications (plump, protein, germination).
  - Act of God (Force Majeure).

The Barley Buyer

- May or may not have a background in production agriculture.
- May not completely understand the number of crop choices available to growers.
- May consider buying barley is similar to purchasing other supplies and ingredients (e. g. packaging).
- How do we educate?

CROP INSURANCE

- A new crop insurance product for malting barley was deployed in 2016.
  - Submitted to USDA Risk Management Agency (RMA) by ND Barley Council and Watts and Associates (a private insurance developer).
  - The insurance product insures malting barley based upon malting industry purchasing practices.
  - Cooperative effort between growers, industry, and crop insurance.
  - Data for rating was provided by the malting industry.
- Crop insurance is vital for risk management and securing production.

Summary and Outlook

- Growers will raise malting barley under the following criteria.
  - It must be profitable in comparison to corn, soybeans, wheat, and other crops.
  - It must have crop insurance.
  - It must provide an acceptable risk/reward scenario.
- U. S. buyers need to support growers with stable contract and delivery programs to maintain a consistent supply of malting barley.


NO BARLEY
NO BEER

THANK YOU

Follow-Up Education

- The North Dakota Barley Council can provide follow-up education on malting barley.
  - Crop enterprise analysis (production costs & returns).
  - Contracting production with growers.
  - Crop insurance.
  - Comparative risk evaluation with other crops.
- For further information

Steven Edwardson, M. Sc.
Executive Administrator
North Dakota Barley Council
1002 West Main Avenue #2
West Fargo, ND 58078
Tel: 701-239-7200
Email: steven.edwardson@ndbarley.net
Internet: www.ndbarley.net

The North Dakota Barley Grower

- Area planted in ND: 520,000 Acres in 2017 (source: USDA-NASS)
- Number of growers: approximately 3,400 (source: USDA-FSA).
- Average acres per grower is approximately 155.
- Range: 80 acres to 3,000 acres.
- Other crops: corn, soybeans, wheat, canola, flax, lentils, sunflowers, etc.

Barley Basics

- Test weight (bulk density)
  - 48 lbs/bu.
  - 60 kg/hl.
- Average yield in North Dakota
  - 57 bushels per acre (USDA NASS 15 year average).
- Average production per grower
  - 150 acres x 57 bu/ac = 8,835 bushels (Approximately 9 semi-truck loads)