Estimated Processor Value (EPV): Crop Year 2018*

Soybeans are refined by processors into products that are then used as ingredients in the manufacture of feed, food and other products. In each application, a given soybean product is utilized based on its ability to competitively add value to an end-user's product through its compositional characteristics.

In our present commodity-based market, there are three primary products created when a soybean is processed; oil, meal and hulls. Soybean composition dictates both the theoretical amount of each product that can be produced and the respective characteristics of each. Processing parameters, in conjunction with soybean composition determine actual product levels and composition. Thus the total value of a bushel of soybeans ties directly to its compositional characteristics.

In today's commodity market where soybean meal and oil represent the major value products from a bushel of soybeans, soybean protein and oil are of primary interest to processors. As presented within the "Average Protein and Oil at 13 percent Moisture: Crop Year 2018" web page, levels of these two soybean components can vary considerably.

Understanding the economic implications associated with differences in protein and oil is complicated by the nature of the relationship between them and ever-changing markets for each. When trying to better understand complex, multi-faceted situations, the use of mathematical models can be helpful. Models **estimate** outcomes for a given set of assumptions and inputs. As such, results from models represent "snap-shot" estimates relevant only to the set of assumptions employed.

When critically viewed, estimates from models can be used to develop valuable insights that help identify value opportunities that merit further exploration. The models utilized to calculate the estimates presented here are intended to serve that purpose.

Estimated Processor Value (EPV) estimates the combined value of the products (i.e. meal + oil + hulls) produced from a bushel of soybeans based on the soybean's protein and oil levels, a set of assumptions and a given pricing scenario. As such EPV represents a "snapshot" estimate of the soybean's gross commodity product value potential from a processor's perspective. EPV describes the "value-pie" that a processor would have to cover all expenses, including the purchase of soybeans, costs associated with processing and the realization of profit.

Calculating and comparing EPV for soybeans with different protein and oil levels allows for the development of some perspective on how differences in protein

and oil impact the theoretical commodity product value of soybeans for a given pricing scenario and set of assumptions.

The following tables and data maps present EPVs calculated from the protein and oil values obtained from the samples provided by USDA-NASS to USB for further analysis from their Objective Yield survey 2018 sample set. Prices and other assumptions were held constant across all samples and Federal Information Processing Standard (FIPS) districts so that differences in EPV are reflective of observed differences in soybean protein and oil. While the reality is that market prices vary by geographic region and are subject to constant change, the objective here is to gain a better understanding of the economic implications associated with soybean protein and oil variation both across, and within, regions.

While factors in addition to composition contribute to regional pricing differences, a better understanding of the compositional component is critical to evaluating approaches for creating options for farmers to realize further value through their crop production and informed marketing decisions.

Prices and some other assumptions utilized in the following estimates of value are presented immediately below:

Prices used for Estimated Processor Value (EPV) Calculation

	Unit		$/Unit
Soybean Oil	**$/lb**	**$**	**0.29**
Soybean Meal, HiPro	**$/ton**	**$**	**325.00**
Soybean Mill Run (Hulls)	**$/ton**	**$**	**120.00**

- Prices intended to be reflective of mid-June 2019.
- The same set of prices and base assumptions were used in calculating EPV's for all districts.
- For no-hull meal with a theoretical protein level greater than 48%, hulls were included to reduce protein to 48% to the extent that the estimated Crude Fiber level did not exceed 3.5%
- Low Meal Protein (<48.0% CP) Penalty Applied if Applicable

The following table summarizes some outputs from the model. While the tendency is to focus on average values, consistency is also an important consideration. Two descriptors of variation, Standard Deviation (Std. Dev.) and Range (the difference between the highest value and the lowest value in a set of numbers) are provided below and throughout this report.

Summary of Observations Across 73 Individual FIPS* Districts

	Average Soybean Composition at 13% Moisture		Estimated Processor Value (EPV), $/Bu			Estimated Meal % Crude Protein		
	Protein	Oil	Average	Std Dev	Range (High - Low)	Average	Std Dev	Range (High - Low)
Average	34.5	19.6	$ 10.16	$ 0.33	$ 1.00	47.3%	1.7%	5.5%
High	36.8	20.8	$ 10.58	$ 0.82	$ 2.41	50.2%	3.7%	12.6%
Low	32.6	18.3	$ 9.19	$ 0.01	$ 0.02	43.9%	0.8%	1.8%

* F.I.P.S. is an acronym for Federal Information Processing Standard. FIPS Districts are multi-county territories within each state.

Results by FIPS District:

Information is presented by Federal Information Processing Standard (FIPS) Districts. FIPS Districts are multi-county territories within each state. Each district is identified by a numeric code consisting of a combination of the respective state and district codes. For example, district 1730 is District 30 in Illinois, which has a state code of 17.

Downloadable Excel Table:

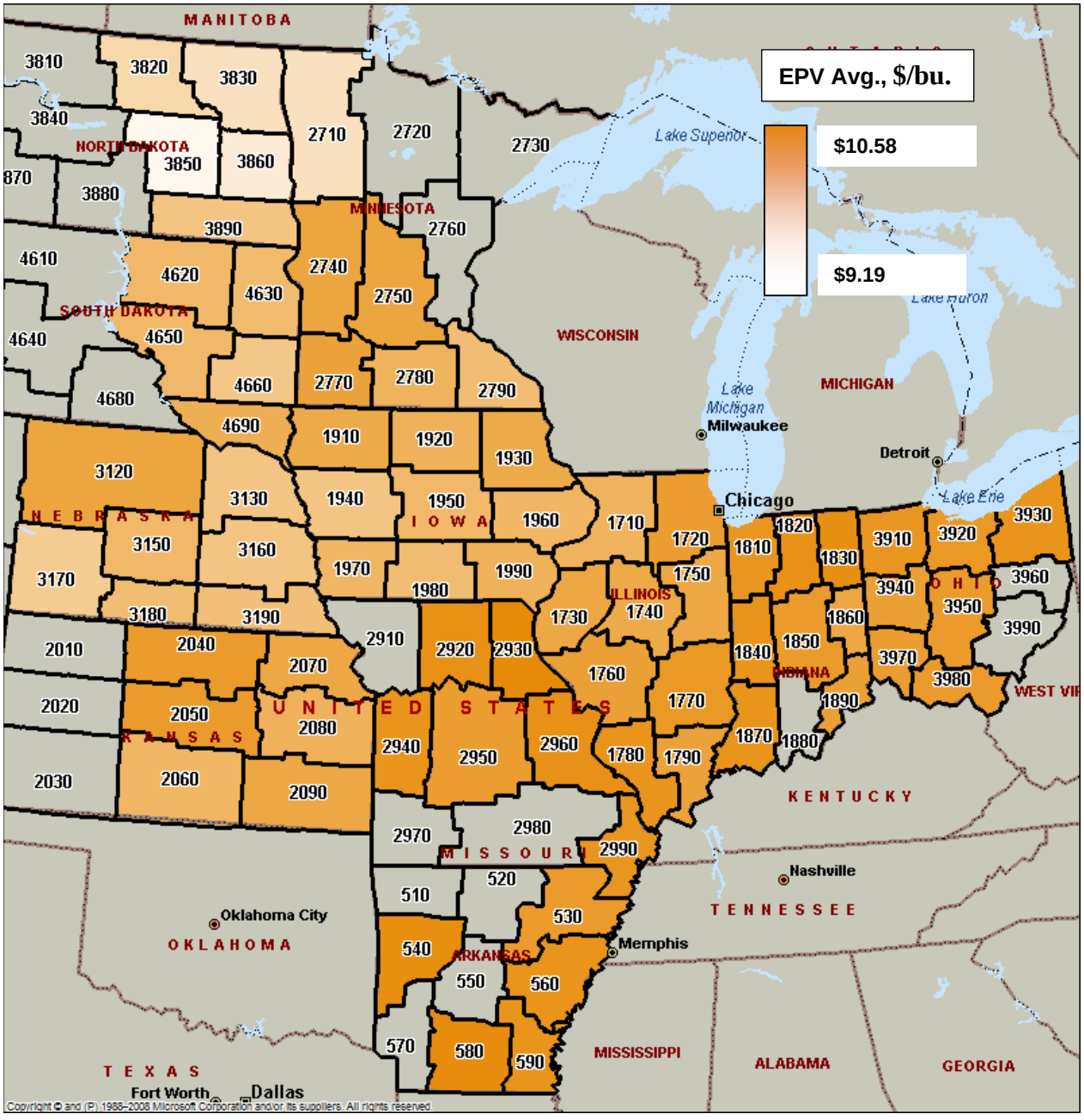
In addition to the tables and data maps presented on this page, data and estimates are available in an Excel file format which can be accessed by "clicking" on the following link: Link to EPV Table.

District Averages:

The following map illustrates the average of individual sample EPV values for 73 multi-county FIPS districts. The territory code used in the data map corresponds to that used to identify individual districts in the Downloadable Excel file mentioned above.

Each district's average EPV, $/bu., is represented by its background color using the color gradient in the upper right hand corner of the data map.

District Averages for Estimated Processor Value (EPV), $/Bu.



A review of the above data map together with the information in the corresponding downloadable file indicates that a considerable range, $1.39/bu., in average EPV exists across districts for the pricing scenario and set of assumptions that were utilized. This difference in value is large enough to require a market response. The form of this response has significant implications for those with soybeans to sell.

One response the “market” may utilize is differential pricing between regions which requires some level of knowledge about the composition of soybeans from different regions. Another approach is to assume the worst and price all soybeans based on the lowest value.

Variation within FIPS District

There is a general expectation that as we move across geographic regions, differences in environment should be associated with differences in composition. Less anticipated are meaningful differences within a relatively small geographic area. The level of compositional variation and associated economic value within individual districts is therefore another consideration. Compositional variation can be viewed as either a risk or an opportunity, depending upon how it is addressed and managed.

Commodity markets are based on an assumption of product uniformity; that is all product is the same. The extent to which product is not uniform represents a risk since it may result in one party to a trade not obtaining what they expected. If what is delivered is less than the average or standardized value attributed to a product, there is a cost in terms of the purchaser having paid more for what was received than anticipated.

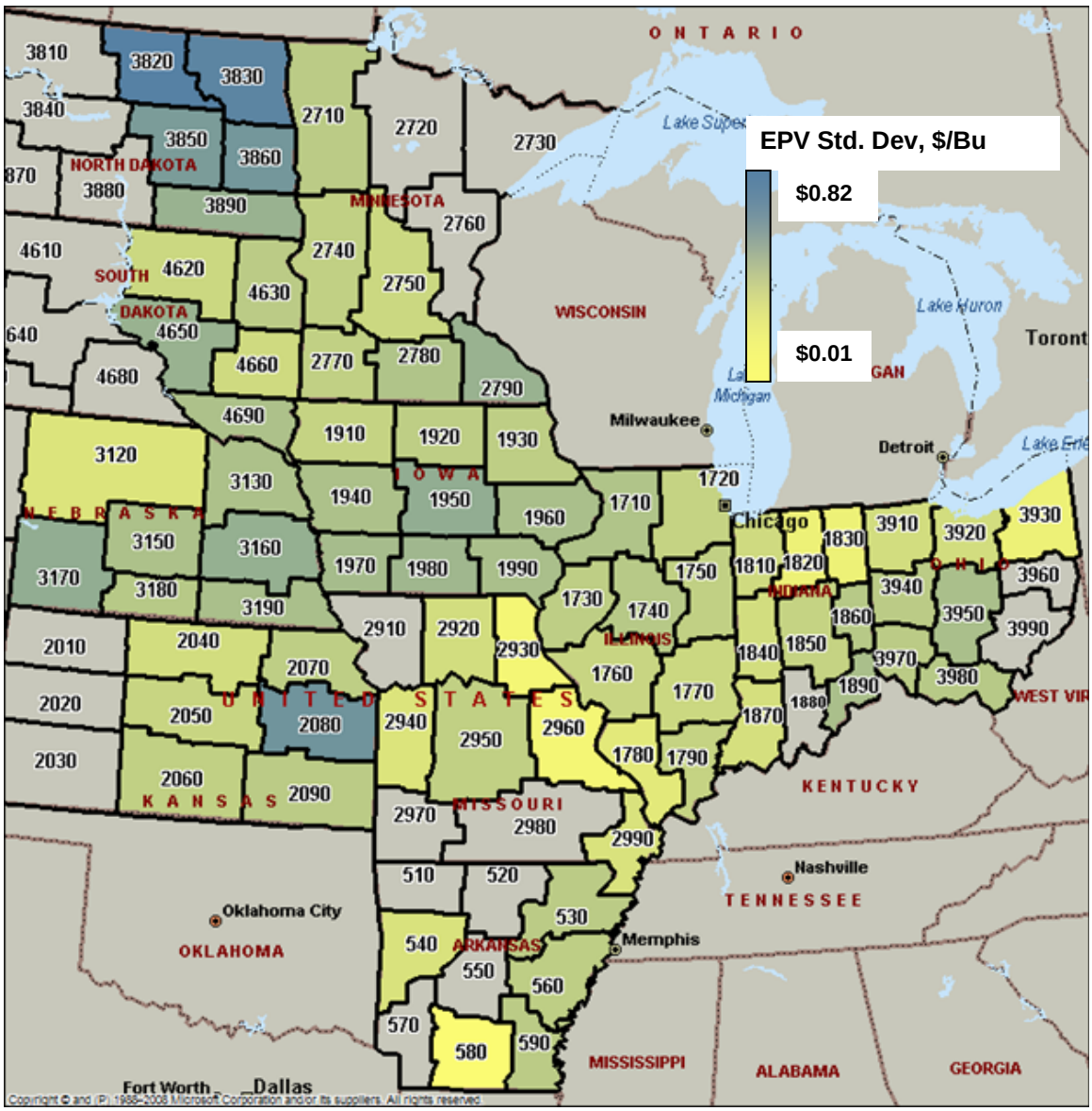
If what is delivered is greater than the target value, it can represent an opportunity if the purchaser is able to capture this greater value. If not captured, this additional value is often “lost”. Such a loss represents an inefficiency that ultimately becomes a cost to the overall system.

The extent to which variation exists around a targeted value describes the extent to which better management of variation may represent an opportunity. One descriptor of variation is the Range, which is the difference between the highest and lowest value. Another statistical measure of variation is the Standard Deviation The greater the Standard Deviation, the greater the level of variation.

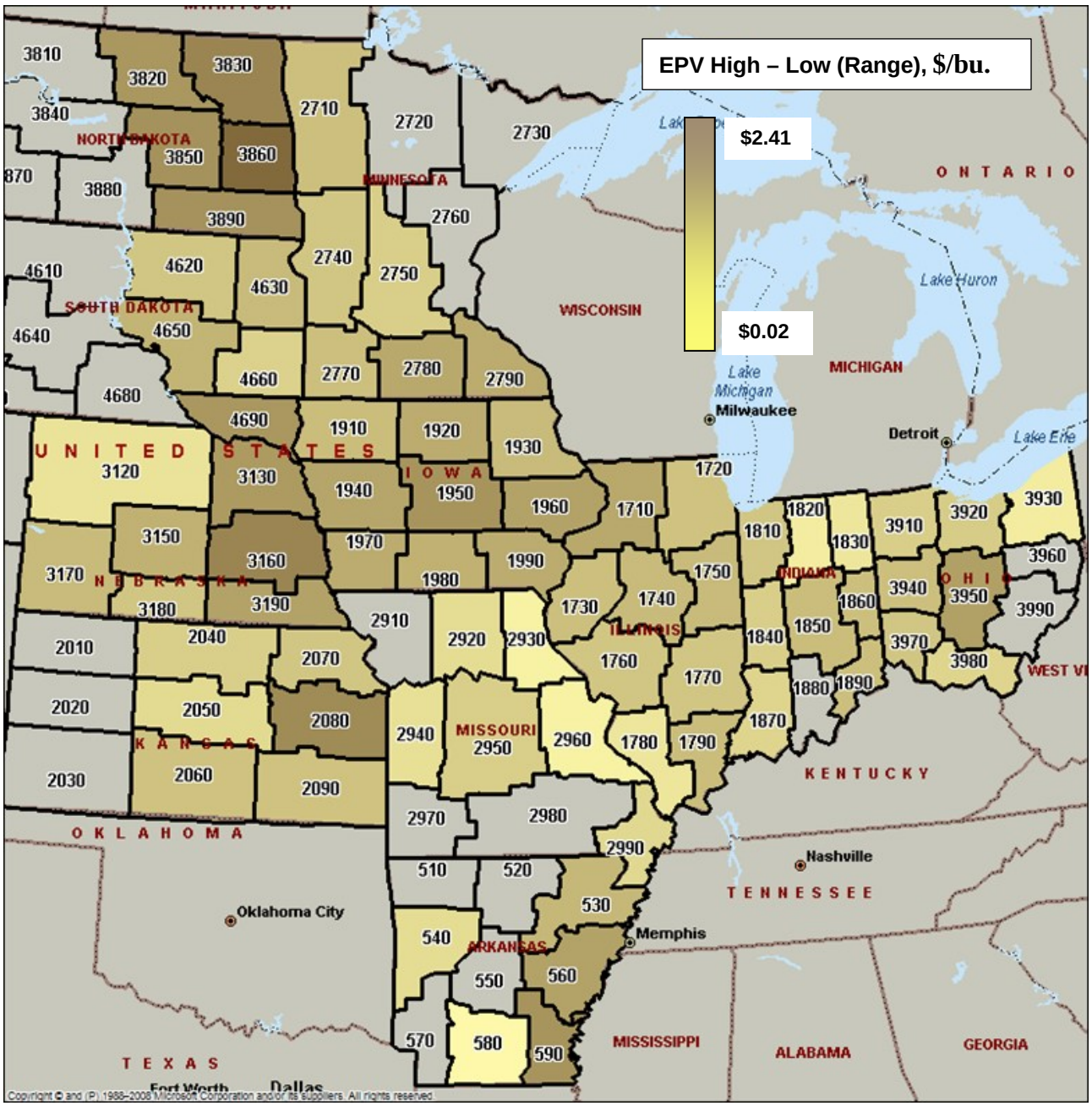
The greater the extent to which variation exists, the greater the opportunity represented by its better management. Options for better management include soybean variety selection and/or measurement and segregation at harvest.

Presented below are two data maps. Both present a descriptor of variation within the FIPS districts for which values are reported. In the first case, the descriptor is Standard Deviation. In the second, the range is reported. Numeric values for the districts presented can also be obtained from the “Click Here” table presented above.

EPV Standard Deviation for Reported Districts, $/Bu.



Within District Ranges: Difference between Highest EPV and Lowest Values, $/Bu.



A comparison of within District Variation with the Range of District Average values presented above indicates that at least as much variation can be found within many FIPS districts as exists between districts. This difference in value is large enough to require a market response.

The fact that differences exist represents the potential for improvement if properly managed. Unmanaged, differences represent risk, the cost of which must ultimately be factored into what buyers are willing to pay sellers.

The next page further explores the management of compositional diversity and the associated risks/rewards depending upon how it is managed.