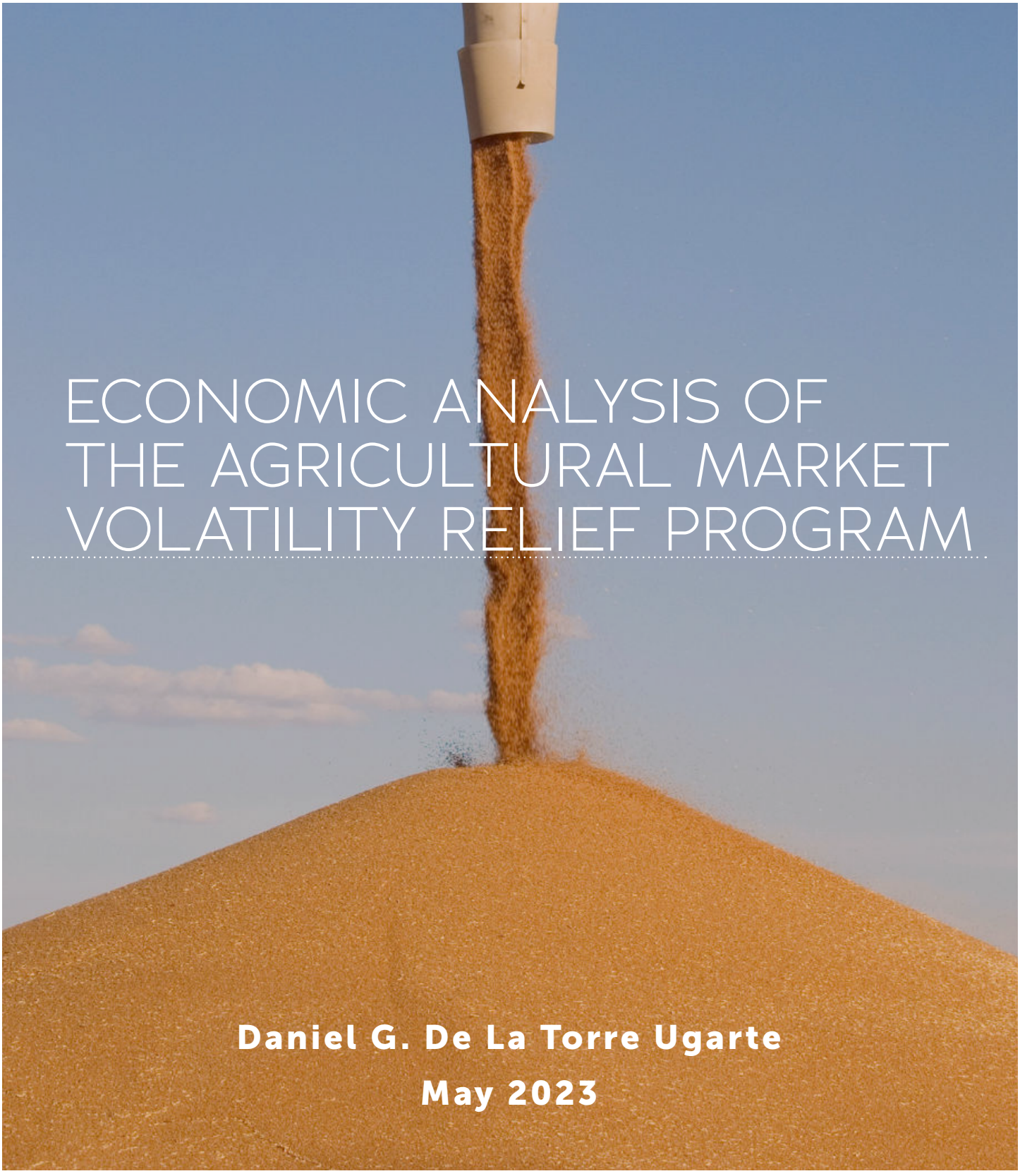

ECONOMIC ANALYSIS OF THE AGRICULTURAL MARKET VOLATILITY RELIEF PROGRAM

Daniel G. De La Torre Ugarte

May 2023

PREPARED FOR

THE CAMPAIGN FOR FAMILY FARMS AND THE ENVIRONMENT

CFFE
Campaign for Family Farms & the Environment

Economic Analysis of the Agricultural Market Volatility Relief Program

Final Report

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The Campaign for Family Farms and the Environment (CFFE) is a coalition of state and national organizations including the Missouri Rural Crisis Center, Iowa Citizens for Community Improvement, Dakota Rural Action, the Land Stewardship Project, Food & Water Watch and the Institute for Agriculture and Trade Policy. CFFE works to support family farms, rural communities and a fair and decentralized food and agriculture system, as well as oppose federal and state policies that prop up corporate factory farms (concentrated animal feeding operations, CAFOs) that drive out independent family farmers, hollow out our rural communities, treat animals inhumanely and pollute our land, water and air.

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ECONOMIC ANALYSIS OF THE AGRICULTURAL MARKET VOLATILITY RELIEF PROGRAM

I. INTRODUCTION

This report analyzes the impact on key farm sector variables from the introduction of policy mechanisms intended to provide a reasonable return to farmers, stable prices and supply for consumers and strengthen domestic and foreign food security.

Market prices are an important variable that influence the economic sustainability of farmers in the United States and abroad. This is linked to U.S. farm programs for crops in which the U.S. is a significant participant in global markets. Overproduction of U.S. corn, wheat and/or soybeans will not only drive domestic prices down but also negatively impact producers of these commodities abroad, and producers of substitute crops as well. On the other hand, shortages in U.S. crop production will result in higher prices domestically and abroad; if the production shortage is too large, price increases could spike and negatively affect the availability and cost of these commodities, negatively impacting consumers. In theory, there is a price band that avoids the worst impacts of overproduction or shortages, benefiting both producers and consumers. The bottom of the price band needs to be high enough to cover farmers costs, and the upper limit of the band needs to be low enough to avoid very high consumer prices.

Currently, because of global market disruptions, commodity prices and costs of production are relatively high. It is possible that the increase in crop prices could be more than compensating for the increases in production costs, including inputs such as fertilizers and energy. However, history shows us that high prices trigger production increases, locally and globally, which in turn outstrip demand and eventually results in low prices for producers. Cycles like this are repeated in the high or low end of prices in response to weather disruptions and global policy events. This volatility can result in short-term gain for producers at the top end of the cycle, but in extremely consolidated markets, commodity buyers and input suppliers often capture much of this extra value. And the resulting increase in production eventually decreases prices for farmers. Over a longer timeframe, high crop prices often trigger a sufficient supply response that farmers do not realize sustained benefits because prices eventually come down.

Volatility can result in short-term gain for producers at the top end of the cycle, but in extremely consolidated markets, commodity buyers and input suppliers often capture much of this extra value.

This report has six sections that describe the objectives of the proposed policy instruments, the methodology used to simulate the performance of the policy instruments, the results and major conclusions and policy recommendations.

II. OBJECTIVES OF THE AGRICULTURAL MARKET VOLATILITY RELIEF PROGRAM

The overall objective of the policy instruments that we analyze in this report is to provide an environment in which family farms can be economically viable, improve the environmental performance of the sector in the face of climate change, and finally to provide consumers with an ample and reliable supply of food at reasonable prices. The instruments addressed in this report are just one important element of an overarching family farm-oriented agricultural policy framework. In addition to the reserve and set aside mechanisms analyzed here, comprehensive reforms would be needed in U.S. Department of Agriculture (USDA) conservation programs, agricultural research and extension programs, regional food processing infrastructure, trade policy and other areas.

The specific objective of this report is to analyze the impacts of the implementation of a combination of policy instruments that seek to:

a. Support farm prices at 100% of the full cost of production.
b. Provide consumers with a stable food supply at reasonable prices.
c. Increase farmers long term income and reduce volatility in commodity markets.

III. POLICY INSTRUMENTS

This report analyzes the effects of two major policy instruments: commodity reserves and production set asides. The reserves have three clear objectives: first, to reduce the variability of crop prices; second, to ensure prices received by farmers cover their cost of production; and third, to provide a safety net for consumers, improving the ability of the markets to respond to crop shortages.

The reserves have two sets of general operating parameters, the price triggers and the reserve capacity. The price triggers include the price level at which products will enter the reserve, and the level at which products will be released from the reserve to respond to market disruptions or shortages. The entry price is directly related to the price floor that the system will provide to farmers, and the release price is related to the price ceiling the system will offer to consumers. In both cases farmers and consumers are benefiting in the face of market volatility. On one hand, a price floor benefits farmers as they avoid low prices, while consumers give up the possibility of purchasing the crops at very low prices. On the other hand, the release or ceiling price means that farmers are giving up the possibility of very high prices, while consumers are protected from the possibility of those same high prices. The establishment of reserves also requires setting the maximum capacity of the reserve to avoid the possibility of an endless growth of the reserve. By the same token, the reserves could have a minimum storage level if the government wants to avoid the possibility of zero reserves. Regardless of who owns the reserves, the government or the farmers, they would have to be stored on farm or in elevators. This storage could include a government payment to cover storage costs.

The role of the set aside program is to keep production at a level that does not depress prices once the reserves have been filled, and to also serve as a short- and medium-term reserve in the form of idle production capacity, which will be called upon when tight supplies demand it. The set asides could be annual, medium-term and long-term. The annual set asides are set to respond to the need to address short-term market disruptions. The midterm set asides (i.e., three-year) try to address more structural disruptions in the market that occur beyond a single year and to allow

farmers to make environmental improvements while keeping the land in agricultural production of crops other than those covered by the reserve program or in grazing. Finally, a long-term set aside, like the Conservation Reserve Program (CRP), has primarily an environmental focus and is based on longer term contracts. It needs to be noted that medium- or longer-term set asides limit the responsiveness of the sector to price levels or government costs; while the exclusive establishment of annual set asides limits the environmental gains that farmers could achieve by making longer term production decisions that prioritize soil health, carbon sequestration, providing wildlife habitat or other conservation goals.

This study analyzes the possible implementation of the policy instruments described above for the three major food/feed crops: wheat, corn and soybeans. These are crops with the largest planted area and the crops in which the U.S. has an important presence in global markets. Consequently, the effects of these policies will be felt by domestic producers and consumers, and by producers and consumers abroad. The expectation is that by intervening in these three crops, the price effects to farmers and consumers will indirectly extend to the other major commodity crops: sorghum, oats, barley, cotton and rice, as well as crops such as oilseeds that interact with soybeans, wheat or corn in other markets.

This study analyzes the effects of the policy instruments based on the following the assumptions:

1. The reserve entry price (and price support price) are set at 100% of the national average cost of production. Table 1 shows the USDA's estimated breakeven prices for all eight major crops over a decade starting in 2021. These are the prices at which producers can cover the full cost of production. In the case of corn, wheat and soybeans, those prices are the entry price to the reserve and the equivalent to a support or floor price for farmers.

2. The reserve release price is set at 120% of the reserve entry price.

3. The maximum level of reserve for each of the three crops is set at: corn (3 billion bushels), wheat (2 billion bushels) and soybeans (1 billion bushels).

4. There is a storage payment of US$0.40 per bushel.

5. The set aside provisions are triggered only when the reserves are filled.

6. Once the set aside is estimated to keep prices for the three crops at 100% of the cost of production, the resulting set aside is distributed between annual and medium term, so as to provide flexibility to the system. Two alternative scenarios are considered, one in which the distribution between annual and medium term set aside is 50%-50% each and the other in which the distribution is 70%-30% respectively.

   Because the reserves benefit all producers, the set aside program should also apply to all producers. Access to crop insurance or disaster payments could be used to induce full participation of farmers. Production of covered crops for on-farm use (such as feeding livestock on that farm) that are not sold, would not be covered.

7. This model does not evaluate long-term set asides, which could provide environmental services such as carbon sequestration and opportunities for longer term shifts in crop mix as part of the transition needed to reply to reduced demand for livestock feed, less export demand or reduced demand for ethanol due to electric vehicles.

If long-term set asides combined with other transition initiatives do change the overall crop mix, that can be factored into calculations of reserve levels and shorter term set aside goals. If agricultural productivity increases beyond expectations, and overproduction becomes the norm, long-term set asides could be implemented. Long-term set aside acreage could be used to plant and market energy dedicated crops (i.e., switchgrass), or farmers could implement environmental practices that could provide ecosystem services to society. Long-term set asides could also be design as a transition mechanism towards the production of managed grazing livestock, perennial grains or pulse crops, among other options.

IV. METHODOLOGY OF ANALYSIS

This study uses the POLYSYS[1] agricultural policy simulation model. POLYSYS is a partial-equilibrium agricultural model that is structured as a system of interdependent modules simulating 1) county-level crop supply for the continental U.S., 2) national crop demands and prices, 3) national livestock supply and demand, and 4) agricultural income. Variables that drive the modules include planted and harvested area, production inputs, yields, exports, costs of production, demand by use, commodity price, government program outlays and net realized income.

POLYSYS was initially calibrated using the USDA Projections to 2031.[2] To consider the most current market conditions, the cost of production was updated using Food and Agriculture Policy Research Institute estimates[3] to reflect the changes in the cost of energy and fertilizers and using the June 2022 World Agricultural Supply and Demand Estimates[4] (WASDE) report to consider the changes in commodity prices induced by the invasion of Ukraine by Russia.

The resulting adjustment constitutes the baseline scenario, which will be used as a benchmark, and over which the policy instruments will be applied. The policy scenario has two variants, one in which the annual and medium-term set asides are evenly distributed, and the other in which 70% of the set aside is annual and 30% is medium term. The direct comparison of these scenarios is considered the deterministic analysis.

It is important to consider that the baseline scenario is the best approximation to what is expected to happen in the next 10 years. However, there are at least two key variables that play a key role in the performance of the agricultural sector. One is yields, highly influenced by local weather conditions, and the other is exports, which are influenced by weather abroad and by political and social events in key producing or consuming countries. Accounting for these structural characteristics of the future behavior of agriculture is particularly important in the context of the food reserves and their impact on the variability of prices and income in agriculture. Consequently, a set of 100 simulations for the baseline and each of the two policy scenarios that consider alternative random yields and exports for all major crops are run to provide some idea of the robustness of the performance of the policy instruments. The discussion of these results of various random scenarios is what is called the stochastic analysis.

1 POLYSYS is an agricultural policy analysis simulation model, initially developed by Daryll E. Ray and extended by Daniel De La Torre Ugarte and Chad Hellwinckel. https://arec.tennessee.edu/wp-content/uploads/sites/17/2021/03/POLYSYS_documentation_1_overview.pdf

2 USDA, USDA Agricultural Projections to 2031. Long-Term Projections Report, OCE-2022-1. February 2022.

3 FAPRI (2022). Costs of Production from April 2022 Baseline Interim Update.

4 USDA, World Agricultural Supply and Demand Estimates, WASDE -625, approved by World Agricultural Outlook Board, June 10, 2022.

V. ANALYSIS OF RESULTS

A. DETERMINISTIC ANALYSIS

This section discusses the results of the simulation of the two policy scenarios. We will begin with the discussion of the deterministic analysis, which will help us understand the workings and impacts of the policy instruments on the key variables of the sector. The stochastic analysis follows and addresses variability and the overall performance of the instruments under alternative and extreme conditions of yields and exports.

The first step is to look at behavior of the reserves and the set asides, and then examine their impacts on prices, stock levels, volume of exports and net farm income. We do that with the baseline and two policy scenarios projected to the year 2031. The basic assumption of this analysis is that the baseline is a good representation of the future of the sector. Then the policy changes are introduced, and their performance is compared to the baseline scenario.

The two policy scenarios analyzed were presented in section III. In both scenarios, farm prices are supported at 100% of the national average cost of production, as this is the entry price to fill the reserve, which behaves as a floor price. The reserves' release price is set at 120% of the entry price and behaves as a market ceiling price. The difference between the two scenarios lays in the composition of the set aside. One scenario considers a 50%-50% distribution between annual and medium-term set asides, and the other a distribution of 70%-30% between annual and medium-term.

Table 2 shows the reserve level for the three crops for the two policy scenarios. It can be observed that given the high level of prices for years 2021 and 2022, only in 2021 for wheat were the prices below the full cost of production and a small quantity of reserves were required to support the price. As we move further in the period, the reserves become more active in all three crops, reaching the maximum level for wheat in the years 2027, 2029 and 2031 in the Scenario 50%-50%. For Scenario 70%-30%, the same variable reaches the maximum capacity level in the years 2027, 2029 and 2030.

Following the assumption that set asides are only established once the reserves have reached their maximum capacity level, in Tables 2, 3 and 4 we can observe the set aside acreage necessary to keep the farm price at the support level. Table 2 shows the total level of set aside acreages, for both scenarios. Table 3 shows the distribution between annual and medium-term set asides. Finally, Table 4 shows the set asides by crop.

In the deterministic model results, only wheat required set asides (Table 4), as it is the only crop in which the reserves got to their maximum capacity. A larger proportion of medium-term set asides in Scenario 50%-50% induces a longer effect in the reduction of excess supply. Consequently, the overall level of acres needed to withdraw from production is generally lower than in the Scenario 70%-30%, in which there is a lower proportion of the medium-term set aside. In this scenario, more reliance on annual set asides means less opportunity to invest in environmental improvements in the farm and have a higher degree of price flexibility, as will be shown later. This result is consistent with the results in Table 3, in which the number of acres in medium-term set asides is larger in the Scenario 50%-50%, while annual set asides are larger in Scenario 70%-30%. The risk of having only medium-term set asides is the reduction of flexibility. The set asides could be very effective in the year of their establishment but could easily lead to an overshooting of prices in following years. This will depend on the market conditions of the future years.

After the introduction of two policy instruments is an analysis of their effects with some key variables. We will start with the level of price support, then follow into the overall level of stocks available to ensure reasonable prices, and then we will end with the analysis of the impacts in terms of value of exports, government cost and net farm income.

Let's look at prices. The data in Table 5 are the baseline average market prices from the 2022 USDA baseline and then updated based on the supply and demand estimates provided in the June 2022 WASDE report.[5] These are the reference prices that we will use to compare the results of the two policy scenarios. It is important to mention that the overall level of high prices in years 2021 and 2022 reflect the global disruptions of commodity prices caused by restrictions on the international supply chain resulting from the COVID-19 pandemic and the disruptions caused by the Russian invasion of Ukraine.

We present two different ways to see the performance of the two policy scenarios. First, Table 6 contains the Simulated Average Market Prices by scenario expressed as percentages over the baseline prices. Then in Table 7, we have the average market price as a percentage of the full cost of production. In both tables the prices are presented for all crops. Although the policy interventions are directly related to corn, wheat and soybeans, their impact extends to the other crops as farmers adjust their planting decisions and market demands react to the prices of the three crops subject to the intervention.

Almost all prices for all crops improve over the baseline level over the study period, in both scenarios.

Regarding the simulated average market prices, almost all prices for all crops improve over the baseline level over the study period, in both scenarios. Cotton and rice are the crops that experienced the smallest general improvement, and for which we found that prices are below the baseline in two years.

For corn, barley and soybeans, we found only one year below the baseline price, but overall experienced significant gains, particularly in corn and wheat. Sorghum and oats consistently experienced prices above the baseline. Both policy scenarios experienced very similar price increases, except for the last two years of the period, in which Scenario 70%-30% shows a higher level of annual and overall set aside being necessary to support the price of wheat.

The most important performance measure of the impacts of the two policy scenarios on average market prices is presented in Table 7, which shows the average market price as a percent of the full cost of production. Looking at the baseline numbers, one can confirm that for the years 2021 and 2022, the years of high prices, only the prices of oats and barley were below the full cost of production. However, starting in 2023 the picture starts to change and in most cases the price is below the full cost of production, except for corn and soybeans, which have five years in which prices are above the full cost of production.

For the two policy scenarios, as expected, corn, wheat and soybeans show prices consistently above the full cost of production. The price of rice is also above the full cost of production in several years of the Scenario 50%-50%, while on the Scenario 70%-30%, the price is consistently above the full cost of production. Indirect changes in land use due to farmers making different planting decisions triggered lower plantings of rice. In crops like sorghum, oats, barley and cotton, despite the experienced increase in market prices, these increases were not enough to close the gap with

5 In this report we are using average market price, market price or crop price as synonymous.

respect to the full cost of production. As wheat is the crop that requires higher set aside support, there are some peculiarities in years 2027 and 2031 for Scenario 50%- 50%, which are barely short of full cost of production, while in Scenario 70%-30% this same situation occurs in 2027 and 2029. This indicates that set asides are not foolproof to reduce production because of the slippage that occurs when farmers set aside acres than are less productive than their average land.

The introduction of the policy interventions results in a generalized increase in market prices for all crops evaluated. For corn, wheat and soybeans, the full cost of production becomes in fact a price floor; and for rice this is also true. For rice, it is not a direct intervention, but a consequence of the indirect effects that the policy interventions had on plantings of rice. There are not significant differences in the price impacts of each of the scenarios considered, except for the fact that the price increases are not evenly distributed especially towards the end of the period. Improving the availability of agricultural products to respond to domestic and global shortages is another important objective of introducing these policy instruments. That is precisely what Tables 8, 9 and 10 assess through the impacts of the policy interventions in the level of ending stocks, the changes in the stock to use ratio and the availability of commercial stocks.

As the reserves were introduced for corn, wheat and soybeans, it should not be a surprise that the level of ending stocks increased for these three crops over what the level was in the baseline scenario. For the other five crops (sorghum oats, barley, cotton and rice) the level of stocks decreased. This is an induced effect of directly supporting the prices of corn, wheat and soybeans through the reserves and set asides — as prices for these three crops increase, land shifts towards them, taking land away from the five other crops, consequently reducing acres planted to these crops and at the same time increasing market prices. The differences between the two scenarios are minimal.

Another way to approach this same analysis is to look at the behavior on the stock to use change. These ratios are presented in Table 9 for all crops and the baseline and the two policy scenarios. As expected, the stock to use ratio for corn, wheat and soybeans increased significantly. For corn it increased about 10 percentage points through 2031, wheat more than 100 points through the end of the period and soybeans double in the same time frame. Sorghum, oats and barley are the crops that experienced a more dramatic drop, while cotton and rice were relatively stable. Consequently, increasing the stock-to-use ratio for corn, wheat and soybeans can be interpreted as improving the ability of the system to respond to sudden changes in market conditions or events that disrupt supplies locally or globally. The reduction in the stock use ratio of sorghum, oats and barley helps push their prices upward, and given their non-strategic position, do not undermine food security goals.

One final element to examine when dealing with stocks is the position of commercial stocks, which are the first to respond as price pressure starts to mount in response to changes in market conditions. In Table 10 we can observe that commercial stocks-to-use ratio is very similar for corn in the baseline and the two policy scenarios. That means that the reserves can be considered an additional safety net against market disruption, and not just a replacement of commercial stocks. In the case of wheat, the effect is not the same. The reserve stocks, while improving the overall level of stocks, have also replaced the level of commercial stocks which means that the wheat reserves are likely to be the first to be triggered if markets become tight.

In looking at soybeans, one observes that there is a slight drop in the participation of commercial stocks, however, not as pronounced as in wheat. In the other five crops, if the overall level of stocks are lower, it is also consistent that commercial stocks are lower, as a reflection of the drop in production that those crops experience because of the reduced area planted. Once more in this deterministic analysis we do not see significant differences between the two policy scenarios.

We examine three aggregate indicators to complete the deterministic assessment of the policy instruments in Tables 11 and 12.

In Table 11 we have the absolute levels of three variables: Export Value of all crops, Storage Payments and Realized Net Farm Income. In this Table, we want to focus on the storage payments. It is important to remember that for every bushel in reserves, there is a direct cost of US$0.40 per bushel for storage. Consequently, the storage payments are directly linked to the level of reserves. While we are assuming that farmers receive this payment, the model does not say who owns these inventories. The Table shows that storage costs for storing commodities in the reserve on their farms increases, as the reserves increase for each of the three crop and reaches a maximum of US$1.753 billion and US$1.687 billion for the Scenario 50%-50% and Scenario 70%-30% respectively. The maximum costs in this case occur towards the end of the period, as stocks consistently increased. This is because the deterministic analysis does not allow for random disturbances of the markets that would affect yields or export levels that might have triggered release from the reserves.

The impacts of Export Value and Realized Net Farm Income can be analyzed more easily by looking at the results presented in Table 12, in percentages over baseline levels. The simulation results show that Export Values have maintained almost the same level as the baseline. There is no doubt that the volume of exports has dropped, and can be confirmed by looking at the particular crop tables in the electronic appendix. But at the same time, the price of each unit exported has increased, so the total value contribution of exports has remained almost unchanged in both scenarios with respect to the baseline levels through the period of analysis.

The other key variable is Net Realized Farm Income, which to become Farm Income only needs to incorporate the changes in on farm inventories which POLYSYS does not estimate. As a result of the higher crop prices, and despite the lower production levels when triggering the set aside, we can conclude that the impact on Realized Net Farm Income has been positive in both scenarios and through the duration of the period, reaching a maximum difference over the baseline in 2024 with a 15% higher than the baseline Realized Net Farm Income.

To this point, we have been focused on the deterministic analysis of the policy interventions, assuming that the baseline is the best single predictor of the future 10 years, a very standard economic analysis approach. However, it is evident that a complete assessment of these policy interventions requires a further analysis to make them more robust.

As a result of the higher crop prices, and despite the lower production levels when triggering the set aside, we can conclude that the impact on Realized Net Farm Income has been positive in both scenarios.

B. STOCHASTIC ANALYSIS

The stochastic analysis that follows assumes that crop yields and exports are subject to random shocks, and that the baseline and the simulation of the policy instruments should reflect the impacts of these shocks. Therefore, we developed a set of 100 regional crop yields and crop export levels to represent random shocks.[6] These random shocks could reflect drought, excess moisture or pest pressure in the U.S. and the export demand that the U.S. will face in the presence of political and natural disruptions in the rest of the world.

The stochastic analysis will allow us to focus on the behavior of the reserves and set asides themselves as they respond to the changing market conditions induced by the random events. This will allow us to understand how the average and the level of variability of measures like prices, stocks, exports and realized net farm income are impacted; Tables 13 to 27 below will provide the information for the analysis of the stochastic results.

As we did with the deterministic results, the first result to look at is the level of the reserves. To understand Table 13, we look first at the Scenario 50%-50% and the mean value of reserve level, which is the average value of the 100 iterations. What it shows is that, on average, the reserves for corn start from 0 in 2021, increase to a maximum of 2,020 million bushels in 2030 and drop to 1,988 million bushels in 2031. Consequently, on average, the reserve level is well below the maximum capacity of 3,000 million bushels. There is a 25% probability the reserve will reach its maximum from 2026, a 10% probability that it will reach a maximum in 2023 and just 1% probability that it will be filled in 2022. Therefore, corn reserves will be actively responding to the disruption in market situations.

For the case of wheat, the mean value of the reserve level increases through the period, and it is much closer to the maximum than corn. The probability of the Reserves being filled, at the maximum of 2,000 million bushels is 50% in the year 2028, while for the years 2027 and 2029 the probability is 25%, and 10% in 2030. Only in the year 2030, does the wheat reserve not reach the maximum level in any of the 100 iterations run. Similar to corn, the movement of the different probability of the Reserves levels indicates a dynamic reserve system.

Soybeans' behavior shows an increase in mean or average level of reserves through the year 2027, and steady declines to the end of period of analysis. The years 2026 and 2027 show a 25% probability of filling the reserves, while the other years it shows just a 10% or 1% chance of reaching the maximum capacity. As with corn and wheat, it shows a high movement in the reserves through the years.

The coefficient of variation (CV) indicates degree of variability for the reserves. For the three crops in the first years, it is the highest, as the mean value starts from a very low point in 2022 and then it declines as the mean increases and the Standard Deviation (SD) gets some stability. When compared to the CV of the three crops, we can conclude the more dynamic behavior is shown for corn and soybeans, while for wheat the degree of variability is lower. This means that there is less movement in of the reserves for wheat, which is related to the fact that is the crop that requires a higher effort to support its price, so the reserves are not enough to keep prices above the cost of production. It requires more use of the set aside interventions.

6 Follows the methodology decribed in: Ray, D., Richardson, J., De La Torre Ugarte, D., & Tiller, K. (1998). Estimating Price Variability in Agriculture: Implications for Decision Makers. *Journal of Agricultural and Applied Economics, 30*(1), 21-33. doi:10.1017/S1074070800008014

In Table 14, Scenario 70%-30%, we have similar results as described for the Scenario 50%-50%. We can more directly compare both scenarios by looking directly to the level of the coefficient of variation (CV). The pattern and levels are very similar to the ones described in the previous scenario: corn and soybeans show a more dynamic system, while for wheat the level of variation in the activity of the reserves is much lower. Only in the last three years we can observe that for wheat the Scenario 50%-50% shows a more dynamic behavior, which indicates that the increase in annual set asides compared to Scenario 70%-30% has a stabilization function, reducing the movement from the reserves. It is important to indicate that in a reserve system, a more dynamic behavior helps maintain the quality of the product stored and reduces the cost of storage. But in this case, the higher dynamic behavior of the eserves is also linked to less flexibility in Scenario 50%-50%.

The second policy intervention variable is the acreage set aside. Table 15 shows the distribution of the total set aside acres for the 50%-50% and the 70%-30% Scenarios. Comparing key variables of both scenarios we can conclude that Scenario 50%-50% marginally requires, on average, a larger set aside intervention. This is because the additional flexibility that the annual set aside in the 70%-30% Scenario allows for fine tuning the set side to the requirements of the supply and demand conditions present in every marketing year. The Scenario 70%-30% has a higher CV, which indicates that the additional ability to increase the annual set asides allows a more dynamic change in the annual set aside to reach the support price levels for the three crops involved.

It is important to note that at the maximum extreme of the probability distribution, the levels of set aside acres are the same for both policy scenarios. However, the distribution of the total acres in set asides is slightly larger in Scenario 50%-50%, as it has a higher proportion of set asides than a medium-term intervention.

One key impact is how the interventions and the two policy scenarios impact the variability of market prices. Less variability is highly preferred by farmers as it can allow for better planning decisions. The data from Tables 16 to 23 contains the price distributions for the eight crops for each of the three scenarios (baseline and two policy scenarios). We will focus first on comparing the CVs of each crop by scenario.

For corn, the results indicate that the CV of the two policy scenarios is substantially lower than the baseline. This can also be confirmed for the cases of wheat and soybeans, which are the crops that directly receive the interventions in the model. For these crops, Scenario 50%-50% shows slightly higher level of variability of movement into and out of the reserves than Scenario 70%-30%. This because the Scenario 50%-50%, by definition, has more acreage in medium- term set aside and consequently less flexibility to adjust production, which results in a slightly higher degree of price variability. This indicates that the larger the proportion in medium-term set asides, the larger amount of price variability.

For the other five crops (sorghum, oats, barley cotton and rice) the indirect effect of intervening in corn, wheat and soybeans also results in a significantly lower CV and consequently price variability. This is because the planting decisions in these crops are influenced by more stable prices for the three reserve-eligible crops. In addition, the level of price volatility between scenarios does not show much difference in value and direction than the volatility experienced by the three crops subject to the intervention.

Finally, in all crops, the price distribution indicates that both the lower and higher ends of the price distributions for the policy interventions have been truncated. This means that farmers are trading off the possibility of getting very high prices in exchange for the probability of avoiding very low prices. The expected price is consistently higher and

the price variability is lower, i.e., the price of the income safety net is giving up the possibility of accessing to very high prices that damage food security and consumers.

From this analysis of prices there is an analogous story for consumers. They will be facing higher average or expected prices, with a lower level of price variability. They will be avoiding facing very high prices in exchange for giving up the chance to benefit from very low prices.

Prices are important for consumers, but product availability is also critical, especially globally for critical crops like wheat. Tables 24 through 26 show the results of the total ending stocks by crop for the baseline and the two policy scenarios. The analysis of the contents of these three Tables is very similar to the changes in the probability distribution of market prices. Tables 24, 25 and 26 show a higher level of expected average ending stocks, lower variability, and a truncated probability distribution at both the lower and upper ends. That means that the probability of getting very low-level stocks have been significantly reduced, and the probability of having very large stocks have been also reduced or eliminated. This not only offers consumers a higher probability of an increased level of inventories, but also reduces the pressure from very low prices and the cost to keep very high levels of inventories. The last statement is particularly true in the case of corn and soybeans but less so in the case of wheat, where the upper end of the probability distribution of total ending stocks has not changed much, and even in some years is higher than in the baseline.

Prices are important for consumers, but product availability is also critical, especially globally for critical crops like wheat.

One final indicator to examine is the level and variability of the Realized Net Farm Income. Using the data shown in Table 27, we can observe that the mean level of Realized Net Farm Income is substantially higher in the two policy scenarios than the baseline. A second observation is that the level of variability is much lower in the policy scenarios than it is in the baseline. A third observation is that the minimum Realized Net Farm Income is much lower in the baseline, and the maximum is also much larger in the baseline. In summary, what the policy interventions do with Realized Net Farm Income is offer a higher expected or mean value, by increasing the lower end of the distribution while reducing the higher end of it. Farmers are offered a much higher and stable Realized Net Farm Income while giving up the possibility of very high income that damages consumers.

VI. CONCLUSIONS AND RECOMMENDATIONS

This report presents an analysis of the introduction of two policy mechanisms to influence corn, soybean and wheat production: Crop Reserves and a production Set Aside mechanism. The objectives of the two instruments are to work simultaneously to support prices at 100% of the full cost of production, provide price stability for producers and consumers, and ensure an ample supply through the reserves mechanism. The instruments described were applied to corn, wheat and soybeans, as they are the crops with largest planting areas, and crops in which the U.S. maintains a significant position in global markets.

The main policy instrument is the Crop Reserves, while the role of the set aside instrument is to manage supply to support the prices of the three crops at or above the full cost of production. The set aside has two elements — an annual set aside and a medium term (three-year) set aside. The role of the annual set aside is to correct annual market disturbances, while the three-year set aside addresses more medium-term structural supply and demand

imbalances, and to allow for environmental investments in the land and ensure the sustainability and resilience of the agricultural sector.

The analysis was done using the POLYSYS modeling system to simulate the policy interventions and provide a quantitative analysis of their impacts. The policy interventions were compared against the 2022 USDA baseline updated with supply and demand estimates contained in the June 2022 WASDE report.

The quantitative analysis had two phases, deterministic and stochastic. The deterministic analysis takes the baseline scenario as a full representation of the future 10 years of the agricultural sector and introduces the policy interventions to compare its impacts. The stochastic phase introduces through a random sets of regional crop yields and crop export levels, the major sources of variability in the agricultural sector. These was done by generating 100 random scenarios based on combinations of yield and export market shocks.

The simulation of the two policy instruments resulted in the following findings:

1. The combination of the Reserves and Set Asides are an effective combination to support prices, provide a reliable supply of commodities to consumers, increase realized net farm income, and reduce price and income variability.

2. For the three crops that directly received the interventions, the average market prices were equal or above the full national average full cost of production for the 10-year period modeled.

3. The direct and indirect effects of the implementation of the two policy instruments resulted in substantially higher than baseline average market prices for all commodities and show a lower degree of variability.

4. For corn, wheat and soybeans, the Reserves provided a higher level of expected stocks with a lower degree of stock or price variability. Significant improvement in the level of ending stocks and in the stock-to-use ratios are an indication that there would be an improved level of access for consumers to these commodities in times of market disruptions.

5. For the other major crops (sorghum, oats, barley, cotton and rice) the level of stocks were lower than the baseline, although than contributed to higher prices that close the gap between full cost of production and the market price. Only in the case of rice were the indirect effects large enough to drive the price to the level of the full cost of production.

6. Under the policy interventions, although the volume of exports declined in the face of higher prices and less production, the value of exports for the total eight crops was at around baseline levels.

7. The level of storage payments is capped because the maximum levels of reserves are also capped. The maximum level of storage payments could reach US$2.4 billion per year, compared to an average of US$5 billion per year in direct government payments for all commodity crops for the period of analysis. The proposed price support level would make unnecessary many existing direct government payments for these crops. Other government payments such as CRP and other conservation payments, disaster and crop insurance payments for yield losses would remain in place unless altered.

8. Realized Net Farm Income levels were substantially above baseline levels with a lower degree of variability.

9. The analysis included two different levels of participation of annual and medium-term set asides. The larger the proportion of medium-term set asides, the less flexibility the sector has to adjust to annual disturbances, and the higher prices and income variability becomes.

10. The results of the analysis show that farmers would get higher levels of prices and realized net farm income, overall giving up the probability of obtaining very high prices and income in exchange for a lower probability of facing very low prices and realized net farm income.

11. The results of the analysis show that consumers would face on average higher price levels than the baseline, but in exchange they will avoid very high prices and get access to commodities at reasonable prices in the event of global disruptions.

The two policy instruments analyzed in this report could be the core of building a farm program that will strongly support family farms and the diversification of agriculture as shifts in other industries such as transportation, livestock production and global trade markets change the demand for grains that are currently the major components of U.S. row crop production. These policy interventions would require robust infrastructure at the USDA to implement cost of production calculations that adequately reflected farmers inputs, capital costs, labor, management and good environmental performance. USDA would also need to build infrastructure to manage grain reserves and a set aside program. All of these functions could benefit from the previous iterations of supply management programs run by the department prior to 1996 and also the ongoing sugar program that USDA currently runs. Additionally, a grain reserve and set aside program would have to be accompanied by improvements to conservation programs, research and extension, support for market development and regional processing infrastructure, an overhaul of departmental civil rights enforcement, outreach to historically underserved producers and technical assistance for farmers interested in pursuing new types of production. A grain reserve and set aside program is a critical piece of a bigger transition plan for U.S. agriculture to adapt to be more resilient in the face of future natural and political challenges.

A grain reserve and set aside program is a critical piece of a bigger transition plan for U.S. agriculture to adapt to be more resilient in the face of future natural and political challenges.

TABLES

Table 1. Breakeven Prices: Average crop prices necessary to cover full cost of production ($/bu.)

Year	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031
Corn	**4.04**	**4.67**	**4.58**	**4.30**	**4.08**	**3.98**	**3.94**	**3.92**	**3.92**	**3.91**	**3.91**
Grain Sorghum	4.83	5.56	5.60	5.39	5.25	5.22	5.24	5.28	5.33	5.38	5.43
Oats	6.87	7.01	7.11	6.87	6.69	6.62	6.60	6.61	6.62	6.65	6.68
Barley	7.97	7.01	7.02	6.85	6.63	6.54	6.49	6.49	6.49	6.51	6.53
Wheat	**7.40**	**7.83**	**7.75**	**7.46**	**7.17**	**7.03**	**6.98**	**6.98**	**7.00**	**7.02**	**7.03**
Soybeans	**9.92**	**10.89**	**10.72**	**10.51**	**10.28**	**10.14**	**10.07**	**10.02**	**10.00**	**9.99**	**9.98**
Cotton ($/lb.)	0.84	0.97	0.97	0.94	0.92	0.91	0.91	0.91	0.92	0.92	0.93
Rice ($/cwt)	13.27	14.83	14.97	14.52	14.18	14.04	14.03	14.08	14.17	14.31	14.45

Table 2. Level of Crop Reserves by Scenario in the deterministic analysis (mill bu.)

Year	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031
Scenario 50-50											
Corn	0	0	709	854	998	1166	1336	1454	1575	1683	1820
Wheat	88	0	755	1097	1388	1701	2000	1973	2000	1913	2000
Soybeans	0	0	59	128	200	274	347	402	455	504	562
Scenario 70-30											
Corn	0	0	709	854	998	1166	1336	1454	1587	1704	1781
Wheat	88	0	755	1097	1388	1701	2000	1973	2000	2000	1646
Soybeans	0	0	59	128	200	274	347	402	460	512	546

Table 3. Set Aside by term, annual or medium-term, by Scenario in the deterministic analysis (million acres)

Year	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031
Scenario 50-50											
Total	0	0	0	0	0	0	0	24.1	12.1	26.8	7.4
Annual	0	0	0	0	0	0	0	12.1	0	7.4	0
Medium-term	0	0	0	0	0	0	0	12.1	12.1	19.5	7.4
Scenario 70-30											
Total	0	0	0	0	0	0	0	24.1	7.2	25.1	36.7
Annual	0	0	0	0	0	0	0	16.9	0	12.6	22
Medium-term	0	0	0	0	0	0	0	7.2	7.2	12.6	14.8

Table 4. Set Aside by Crop and Scenario in the deterministic analysis (million acres)

Year	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031
Scenario 50-50											
Corn	0	0	0	0	0	0	0	0	0	0	0
Wheat	0	0	0	0	0	0	0	24.1	12.1	26.8	7.4
Soybeans	0	0	0	0	0	0	0	0	0	0	0
Scenario 70-30											
Corn	0	0	0	0	0	0	0	0	0	0	0
Wheat	0	0	0	0	0	0	0	24.1	7.2	25.1	36.7
Soybeans	0	0	0	0	0	0	0	0	0	0	0

Table 5. USDA Baseline Average Market Prices for the deterministic analysis ($/bu.)

Year	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031
Corn	5.95	6.65	3.64	4.17	4.68	3.82	3.78	4.09	4.08	3.95	4.00
Grain Sorghum	5.95	6.65	3.64	4.06	3.92	3.72	3.72	3.73	3.76	3.78	3.81
Oats	4.55	5.70	3.09	2.84	2.79	2.62	2.58	2.60	2.60	2.58	2.56
Barley	5.31	7.35	5.52	4.75	4.10	3.79	3.89	4.10	4.26	4.36	4.37
Wheat	7.63	10.49	5.45	5.10	5.28	5.42	5.51	5.54	5.32	5.31	5.29
Soybeans	13.35	14.40	11.74	9.75	9.27	10.18	10.36	9.80	9.89	10.22	10.20
Cotton ($/lb.)	0.92	0.97	0.70	0.73	0.74	0.74	0.75	0.75	0.76	0.76	0.77
Rice ($/cwt)	15.80	18.20	17.24	15.28	13.85	13.13	13.18	13.13	13.34	13.48	13.48

Table 6. Simulated Average Market Prices by Scenario (percent change from Baseline) in the deterministic analysis

Year	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031
Scenario 50-50											
Corn	100%	100%	126%	110%	93%	109%	109%	105%	105%	109%	106%
Grain Sorghum	100%	100%	116%	107%	110%	110%	111%	115%	114%	114%	111%
Oats	100%	100%	100%	108%	109%	114%	116%	123%	125%	129%	128%
Barley	100%	100%	97%	106%	119%	124%	122%	128%	129%	134%	132%
Wheat	100%	100%	144%	146%	138%	133%	125%	148%	134%	149%	127%
Soybeans	100%	100%	96%	109%	114%	102%	100%	109%	109%	106%	104%
Cotton ($/lb.)	100%	100%	97%	98%	101%	101%	101%	103%	103%	104%	103%
Rice ($/cwt)	100%	100%	88%	93%	102%	108%	107%	109%	109%	109%	108%
Scenario 70-30											
Corn	100%	100%	126%	110%	93%	109%	109%	105%	104%	108%	112%
Grain Sorghum	100%	100%	116%	107%	110%	110%	111%	115%	113%	113%	118%

Oats	100%	100%	100%	108%	109%	114%	116%	123%	123%	128%	140%
Barley	100%	100%	97%	106%	119%	124%	122%	128%	127%	132%	165%
Wheat	100%	100%	144%	146%	138%	133%	125%	148%	123%	162%	151%
Soybeans	100%	100%	96%	109%	114%	102%	100%	109%	108%	105%	110%
Cotton ($/lb.)	100%	100%	97%	98%	101%	101%	101%	103%	103%	104%	106%
Rice ($/cwt)	100%	100%	88%	93%	102%	108%	107%	109%	109%	108%	109%

Table 7. Average Market Prices as % of Full Cost of Production by Scenario in the deterministic analysis

Year	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031
Baseline											
Corn	147%	142%	79%	97%	115%	96%	96%	104%	104%	101%	102%
Grain Sorghum	123%	120%	65%	75%	75%	71%	71%	71%	71%	70%	70%
Oats	66%	81%	43%	41%	42%	40%	39%	39%	39%	39%	38%
Barley	67%	105%	79%	69%	62%	58%	60%	63%	66%	67%	67%
Wheat	103%	134%	70%	68%	74%	77%	79%	79%	76%	76%	75%
Soybeans	135%	132%	110%	93%	90%	100%	103%	98%	99%	102%	102%
Cotton	109%	99%	72%	77%	81%	82%	83%	83%	83%	82%	83%
Rice	119%	123%	115%	105%	98%	94%	94%	93%	94%	94%	93%
Scenario 50-50											
Corn	147%	142%	100%	106%	107%	105%	105%	109%	109%	110%	108%
Grain Sorghum	123%	120%	76%	80%	82%	79%	79%	81%	80%	80%	78%
Oats	66%	81%	44%	45%	45%	45%	45%	48%	49%	50%	49%
Barley	67%	105%	76%	74%	74%	72%	73%	81%	85%	90%	89%
Wheat	103%	134%	101%	100%	102%	103%	99%	118%	102%	113%	96%
Soybeans	135%	132%	106%	101%	103%	102%	103%	107%	108%	109%	107%
Cotton	109%	99%	70%	75%	81%	83%	83%	85%	85%	85%	85%
Rice	119%	123%	101%	98%	100%	101%	101%	102%	103%	102%	100%
Scenario 70-30											
Corn	147%	142%	100%	106%	107%	105%	105%	109%	108%	109%	115%
Grain Sorghum	123%	120%	76%	80%	82%	79%	79%	81%	80%	80%	83%
Oats	66%	81%	44%	45%	45%	45%	45%	48%	48%	50%	54%
Barley	67%	105%	76%	74%	74%	72%	73%	81%	83%	88%	110%
Wheat	103%	134%	101%	100%	102%	103%	99%	118%	93%	123%	114%
Soybeans	135%	132%	106%	101%	103%	102%	103%	107%	107%	108%	112%
Cotton	109%	99%	70%	75%	81%	83%	83%	85%	85%	85%	88%
Rice	119%	123%	101%	98%	100%	101%	101%	102%	102%	102%	102%

Table 8. Ending Stocks as percent change from Baseline by Scenario in the deterministic analysis

Year	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031
Scenario 50-50											
Corn	96%	97%	88%	119%	155%	129%	134%	149%	152%	147%	157%
Grain Sorghum	86%	93%	109%	74%	62%	61%	61%	39%	29%	34%	45%
Oats	92%	93%	98%	78%	76%	65%	61%	52%	49%	39%	43%
Barley	91%	100%	114%	86%	71%	66%	67%	54%	43%	29%	33%
Wheat	115%	114%	132%	172%	223%	281%	328%	305%	331%	295%	322%
Soybeans	78%	79%	188%	94%	85%	198%	251%	177%	201%	254%	284%
Cotton	100%	100%	100%	100%	100%	75%	100%	75%	75%	75%	75%
Rice	98%	92%	155%	127%	93%	78%	73%	74%	75%	74%	77%
Scenario 70-30											
Corn	96%	97%	88%	119%	155%	129%	134%	149%	154%	149%	149%
Grain Sorghum	86%	93%	109%	74%	62%	61%	61%	39%	37%	31%	48%
Oats	92%	93%	98%	78%	76%	65%	61%	52%	53%	43%	36%
Barley	91%	100%	114%	86%	71%	66%	67%	54%	48%	34%	30%
Wheat	115%	114%	132%	172%	223%	281%	328%	305%	339%	312%	250%
Soybeans	78%	79%	188%	94%	85%	198%	251%	177%	208%	263%	250%
Cotton	100%	100%	100%	100%	100%	75%	100%	75%	75%	75%	75%
Rice	98%	92%	155%	127%	93%	78%	73%	74%	75%	77%	75%

Table 9. Total Ending Stock to Use Ratio (%) in the deterministic analysis

Year	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031
Baseline											
Corn	13%	14%	21%	17%	15%	18%	18%	16%	17%	17%	17%
Grain Sorghum	7%	13%	8%	8%	9%	11%	10%	9%	8%	8%	7%
Oats	20%	19%	29%	33%	32%	36%	37%	36%	35%	36%	36%
Barley	20%	28%	31%	46%	56%	59%	57%	53%	48%	46%	46%
Wheat	37%	39%	41%	39%	37%	35%	34%	34%	34%	34%	35%
Soybeans	4%	7%	3%	9%	10%	5%	5%	7%	6%	5%	5%
Cotton	16%	26%	28%	22%	19%	19%	19%	18%	18%	18%	18%
Rice	21%	11%	9%	13%	17%	19%	20%	19%	18%	18%	18%
Scenario 50-50											
Corn	12%	14%	19%	21%	23%	24%	25%	25%	26%	26%	27%
Grain Sorghum	6%	12%	9%	6%	6%	7%	6%	4%	3%	3%	3%
Oats	19%	18%	27%	25%	25%	24%	23%	19%	18%	15%	16%
Barley	18%	28%	34%	40%	41%	40%	39%	30%	22%	14%	16%
Wheat	42%	45%	59%	78%	96%	114%	128%	124%	131%	122%	130%
Soybeans	3%	5%	5%	8%	9%	11%	12%	12%	13%	14%	16%
Cotton	15%	26%	30%	23%	19%	18%	18%	17%	17%	16%	17%
Rice	20%	10%	13%	15%	16%	15%	15%	15%	14%	14%	15%

Scenario 70-30											
Corn	12%	14%	19%	21%	23%	24%	25%	25%	26%	26%	26%
Grain Sorghum	6%	12%	9%	6%	6%	7%	6%	4%	3%	3%	4%
Oats	19%	18%	27%	25%	25%	24%	23%	19%	19%	16%	14%
Barley	18%	28%	34%	40%	41%	40%	39%	30%	24%	16%	15%
Wheat	42%	45%	59%	78%	96%	114%	128%	124%	130%	133%	109%
Soybeans	3%	5%	5%	8%	9%	11%	12%	12%	14%	15%	14%
Cotton	15%	26%	30%	23%	19%	18%	18%	17%	17%	16%	15%
Rice	20%	10%	13%	15%	16%	15%	15%	15%	14%	14%	14%

Table 10. Commercial Ending Stock to Use Ratio (%) in the deterministic analysis

Year	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031
Baseline											
Corn	13%	14%	21%	17%	15%	18%	18%	16%	17%	17%	17%
Grain Sorghum	7%	13%	8%	8%	9%	11%	10%	9%	8%	8%	7%
Oats	20%	19%	29%	33%	32%	36%	37%	36%	35%	36%	36%
Barley	20%	28%	31%	46%	56%	59%	57%	53%	48%	46%	46%
Wheat	37%	39%	41%	39%	37%	35%	34%	34%	34%	34%	35%
Soybeans	4%	7%	3%	9%	10%	5%	5%	7%	6%	5%	5%
Cotton	16%	26%	28%	22%	19%	19%	19%	18%	18%	18%	18%
Rice	21%	11%	9%	13%	17%	19%	20%	19%	18%	18%	18%
Scenario 50-50											
Corn	12%	14%	15%	15%	16%	16%	16%	15%	16%	15%	16%
Grain Sorghum	6%	12%	9%	6%	6%	7%	6%	4%	3%	3%	3%
Oats	19%	18%	27%	25%	25%	24%	23%	19%	18%	15%	16%
Barley	18%	28%	34%	40%	41%	40%	39%	30%	22%	14%	16%
Wheat	37%	45%	19%	18%	21%	21%	21%	12%	20%	11%	20%
Soybeans	3%	5%	4%	5%	5%	5%	5%	4%	4%	3%	4%
Cotton	15%	26%	30%	23%	19%	18%	18%	17%	17%	16%	17%
Rice	20%	10%	13%	15%	16%	15%	15%	15%	14%	14%	15%
Scenario 70-30											
Corn	12%	14%	15%	15%	16%	16%	16%	15%	16%	16%	15%
Grain Sorghum	6%	12%	9%	6%	6%	7%	6%	4%	3%	3%	4%
Oats	19%	18%	27%	25%	25%	24%	23%	19%	19%	16%	14%
Barley	18%	28%	34%	40%	41%	40%	39%	30%	24%	16%	15%
Wheat	37%	45%	19%	18%	21%	21%	21%	12%	22%	14%	12%
Soybeans	3%	5%	4%	5%	5%	5%	5%	4%	4%	4%	3%
Cotton	15%	26%	30%	23%	19%	18%	18%	17%	17%	16%	15%
Rice	20%	10%	13%	15%	16%	15%	15%	15%	14%	14%	14%

Table 11. Aggregate Sectoral Indicators (million US$) in the deterministic analysis

Year	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031
Baseline											
Export Value	58966	63241	45047	45033	46606	46592	46969	47426	47986	48633	49303
Storage Payments	0	0	0	0	0	0	0	0	0	0	0
Realized Net Farm Income	132571	129069	103229	87060	86749	84622	80897	81961	83060	87752	90279
Scenario 50-50											
Export Value	58966	63241	47511	46516	46383	45915	46232	47594	47129	47723	47571
Storage Payments	35	0	609	832	1035	1256	1473	1532	1612	1640	1753
Realized Net Farm Income	133168	128615	112116	100194	94812	92171	88723	91234	91413	97361	98065
Scenario 70-30											
Export Value	58966	63241	47511	46516	46383	45915	46232	47594	46890	47996	48400
Storage Payments	35	0	609	832	1035	1256	1473	1532	1619	1687	1589
Realized Net Farm Income	133168	128615	112116	100194	94812	92171	88723	91234	90120	97968	100842

Table 12. Value of Export and Realized Net Farm Income (% change from Baseline) in the deterministic analysis.

Year	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031
Scenario 50-50											
Value of Exports	100%	100%	105%	103%	100%	99%	98%	100%	98%	98%	96%
Realized Net Farm Income	100%	100%	109%	115%	109%	109%	110%	111%	110%	111%	109%
Scenario 70-30											
Value of Exports	100%	100%	105%	103%	100%	99%	98%	100%	98%	99%	98%
Realized Net Farm Income	100%	100%	109%	115%	109%	109%	110%	111%	108%	112%	112%

Table 13. Food Reserves in Scenario 50-50: Probability Distribution from the stochastic analysis

	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031
CORN											
Mean (Mil Bu.)	0	370	1191	1479	1717	1910	1976	1961	1974	2020	1988
Standard Deviation	0	737	1050	1069	1037	1078	1003	1060	1037	1037	1005
SD as % of Mean (CV)	0	199.2	88.22	72.25	60.38	56.42	50.77	54.07	52.52	51.34	50.55
Minimum	0	24	1	72	63	83	25	92	13	29	64
10% Prob less/Eq to	0	0	0	72	164	171	363	252	298	178	311
25% Prob less/Eq to	0	0	214	422	792	959	1222	949	1144	1231	1179
33% Prob less/Eq to	0	0	348	806	1217	1346	1473	1390	1403	1634	1494
50% Prob less/Eq to	0	0	934	1513	1731	2136	2239	2322	2356	2294	2333
66% Prob less/Eq to	0	98	1561	1889	2429	2789	2713	2888	2745	2902	2741
75% Prob less/Eq to	0	176	1853	2528	2809	3000	3000	3000	2989	3000	3000
90% Prob less/Eq to	0	1455	3000	3000	3000	3000	3000	3000	3000	3000	3000
Maximum	0	3000	3000	3000	3000	3000	3000	3000	3000	3000	3000
WHEAT											
Mean (Mil Bu.)	341	381	635	1038	1368	1657	1838	1872	1774	1693	1698
Standard Deviation	115	128	198	267	318	301	218	184	240	271	269
SD as % of Mean (CV)	33.84	33.63	31.24	25.72	23.24	18.19	11.88	9.83	13.54	15.99	15.86
Minimum	39	92	138	469	616	796	834	1132	1167	885	1008
10% Prob less/Eq to	135	166	386	694	957	1243	1482	1567	1378	1318	1292
25% Prob less/Eq to	304	300	476	847	1127	1403	1740	1787	1569	1504	1491
33% Prob less/Eq to	305	341	531	913	1202	1516	1821	1852	1645	1561	1557
50% Prob less/Eq to	379	402	639	994	1310	1669	1900	2000	1854	1694	1701
66% Prob less/Eq to	397	443	701	1178	1553	1872	2000	2000	2000	1863	1901
75% Prob less/Eq to	409	473	782	1277	1665	1989	2000	2000	2000	1992	2000
90% Prob less/Eq to	479	510	917	1366	1772	2000	2000	2000	2000	2000	2000
Maximum	507	665	1063	1531	1939	2000	2000	2000	2000	2000	2000
SOYBEANS											
Mean (Mil Bu.)	8	255	318	513	645	730	750	734	703	688	684
Standard Deviation	20	218	282	284	300	277	246	249	277	284	268
SD as % of Mean (CV)	244	85.62	88.66	55.44	46.54	37.92	32.86	33.85	39.38	41.34	39.13
Minimum	1	17	30	27	12	42	63	54	112	3	24
10% Prob less/Eq to	0	46	0	125	235	360	420	329	230	271	267
25% Prob less/Eq to	0	69	89	280	401	509	589	574	533	523	482
33% Prob less/Eq to	0	80	128	351	473	571	676	652	646	566	601
50% Prob less/Eq to	0	149	197	505	621	767	780	779	756	722	705
66% Prob less/Eq to	1	364	431	660	892	975	939	865	893	861	828
75% Prob less/Eq to	11	419	490	745	959	1000	1000	964	925	951	937
90% Prob less/Eq to	14	535	751	905	1000	1000	1000	1000	1000	1000	1000
Maximum	90	1000	1000	1000	1000	1000	1000	1000	1000	1000	1000

Table 14. Food Reserves in Scenario 70-30: Probability Distribution from the stochastic analysis

	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031
CORN											
Mean (Mil Bu.)	0	370	1191	1482	1721	1914	1976	1969	1987	2033	1999
Standard Deviation	0	737	1050	1068	1035	1077	1001	1063	1039	1041	1002
SD as % of Mean (CV)	0	199.2	88.22	72.09	60.14	56.27	50.66	53.97	52.3	51.22	50.13
Minimum	0	24	1	72	63	83	25	92	13	29	148
10% Prob less/Eq to	0	0	0	72	164	171	363	278	333	153	368
25% Prob less/Eq to	0	0	214	422	885	994	1222	949	1168	1231	1292
33% Prob less/Eq to	0	0	348	884	1217	1346	1469	1390	1372	1556	1541
50% Prob less/Eq to	0	0	934	1513	1731	2136	2239	2322	2363	2365	2327
66% Prob less/Eq to	0	98	1561	1889	2429	2789	2700	2891	2823	2968	2860
75% Prob less/Eq to	0	176	1853	2528	2809	3000	3000	3000	3000	3000	3000
90% Prob less/Eq to	0	1455	3000	3000	3000	3000	3000	3000	3000	3000	3000
Maximum	0	3000	3000	3000	3000	3000	3000	3000	3000	3000	3000
WHEAT											
Mean (Mil Bu.)	341	381	635	1038	1368	1659	1839	1877	1798	1749	1757
Standard Deviation	115	128	198	267	318	301	218	187	226	217	202
SD as % of Mean (CV)	33.84	33.63	31.24	25.72	23.24	18.17	11.88	9.99	12.59	12.43	11.51
Minimum	39	92	138	469	616	796	834	1132	1253	1258	1334
10% Prob less/Eq to	135	166	386	694	957	1243	1482	1567	1504	1462	1489
25% Prob less/Eq to	304	300	476	847	1127	1403	1761	1787	1594	1579	1596
33% Prob less/Eq to	305	341	531	913	1202	1516	1821	1889	1641	1623	1619
50% Prob less/Eq to	379	402	639	994	1318	1669	1900	2000	1880	1739	1746
66% Prob less/Eq to	397	443	701	1178	1553	1872	2000	2000	2000	1902	1869
75% Prob less/Eq to	409	473	782	1277	1665	1989	2000	2000	2000	2000	2000
90% Prob less/Eq to	479	510	917	1366	1772	2000	2000	2000	2000	2000	2000
Maximum	507	665	1063	1531	1939	2000	2000	2000	2000	2000	2000
SOYBEANS											
Mean (Mil Bu.)	8	255	318	514	649	732	755	744	723	709	704
Standard Deviation	20	218	282	285	300	276	244	246	270	282	267
SD as % of Mean (CV)	244.0	85.62	88.66	55.36	46.29	37.65	32.35	33.1	37.41	39.75	37.94
Minimum	1	17	30	27	12	42	62	54	116	3	45
10% Prob less/Eq to	0	46	0	125	235	360	420	329	248	254	299
25% Prob less/Eq to	0	69	89	280	401	509	613	599	550	557	502
33% Prob less/Eq to	0	80	128	351	473	618	697	690	646	616	618
50% Prob less/Eq to	0	149	197	509	625	767	780	800	786	772	742
66% Prob less/Eq to	1	364	431	660	896	975	949	871	902	905	839
75% Prob less/Eq to	11	419	490	745	960	1000	1000	970	943	961	961
90% Prob less/Eq to	14	535	751	905	1000	1000	1000	1000	1000	1000	1000
Maximum	90	1000	1000	1000	1000	1000	1000	1000	1000	1000	1000

Table 15. Total Set Aside per Scenario: Probability Distribution from the stochastic analysis.

	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031
Scenario 50-50											
Mean ACRES (M AC)	0	0	0	1	1	4	12	20	27	26	22
Standard Deviation	0	0	1	3	3	6	14	17	15	13	14
SD as % of Mean (CV)	0	0	623.7	315.2	250.6	166	117.8	85.27	54.93	49.56	64.44
Minimum	0	0	0	0	0	0	0	0	0	0	0
10% Prob less/Eq to	0	0	0	0	0	0	0	0	0	12	1
25% Prob less/Eq to	0	0	0	0	0	0	0	0	16	15	12
33% Prob less/Eq to	0	0	0	0	0	0	0	7	24	19	13
50% Prob less/Eq to	0	0	0	0	0	0	2	17	25	25	23
66% Prob less/Eq to	0	0	0	0	0	2	15	26	35	35	26
75% Prob less/Eq to	0	0	0	0	0	2	17	38	38	36	29
90% Prob less/Eq to	0	0	0	4	3	15	34	41	49	41	40
Maximum	0	0	13	18	16	17	42	56	54	52	54
Scenario 70-30											
Mean ACRES (M AC)	0	0	0	1	1	3	11	19	25	25	20
Standard Deviation	0	0	1	3	3	6	14	17	15	13	14
SD as % of Mean (CV)	0	0	623.7	323.2	259.2	170.2	119.2	90.33	61.3	52.32	70.94
Minimum	0	0	0	0	0	0	0	0	0	0	0
10% Prob less/Eq to	0	0	0	0	0	0	0	0	0	9	4
25% Prob less/Eq to	0	0	0	0	0	0	0	0	13	13	9
33% Prob less/Eq to	0	0	0	0	0	0	0	4	17	16	12
50% Prob less/Eq to	0	0	0	0	0	0	2	15	24	24	17
66% Prob less/Eq to	0	0	0	0	0	1	15	25	30	29	22
75% Prob less/Eq to	0	0	0	0	0	2	17	38	36	36	26
90% Prob less/Eq to	0	0	0	4	3	15	31	41	47	41	39
Maximum	0	0	13	18	16	17	42	56	54	52	54

Table 16. Corn Season Average Market Price by Scenario: Probability Distribution from the stochastic analysis

	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031
BASELINE											
Mean ($/Bu.)	6.11	6.79	3.67	3.71	4.24	4.3	4.1	3.8	3.66	3.38	3.69
Standard Deviation	0.58	0.54	1.27	1.2	1.43	1.55	1.46	1.31	1.49	1.02	1.38
SD as % of Mean (CV)	9.54	7.89	34.51	32.35	33.64	36.12	35.62	34.41	40.76	30.29	37.53
Minimum	5.95	6.65	1.93	2.11	2.28	2.02	1.98	2.13	1.98	1.57	1.7
10% Prob less/Eq to	5.95	6.65	2.46	2.63	2.71	2.8	2.67	2.57	2.39	2.35	2.31
25% Prob less/Eq to	5.95	6.65	2.78	2.92	3.28	3.19	3.08	3	2.73	2.68	2.82
33% Prob less/Eq to	5.95	6.65	3	3.09	3.41	3.26	3.26	3.1	2.83	2.89	2.99
50% Prob less/Eq to	5.95	6.65	3.45	3.4	3.8	3.68	3.69	3.41	3.12	3.16	3.27
66% Prob less/Eq to	5.95	6.65	3.81	3.61	4.4	4.72	4.13	3.72	3.51	3.5	3.78
75% Prob less/Eq to	5.95	6.65	4.14	3.76	4.69	5.09	4.59	4.11	3.92	3.8	4.03
90% Prob less/Eq to	5.95	6.78	4.98	5.46	6.67	6.78	6.35	5.24	6.15	4.71	5.94
Maximum	8.5	10.49	8.65	7.58	8.11	8.82	9.42	8.23	8.62	7.82	8.39
SCENARIO 50-50											
Mean ($/Bu.)	6.13	6.11	4.95	4.67	4.38	4.19	4.21	4.26	4.31	4.23	4.24
Standard Deviation	0.64	1.12	0.93	0.78	0.59	0.59	0.46	0.58	0.61	0.45	0.39
SD as % of Mean (CV)	10.44	18.38	18.71	16.8	13.55	14.03	10.93	13.69	14.18	10.65	9.23
Minimum	5.95	4.49	3.16	3.57	3.3	3.17	3.24	3.34	3.29	3.34	3.29
10% Prob less/Eq to	5.95	4.68	4.57	4.06	3.86	3.47	3.58	3.6	3.69	3.7	3.67
25% Prob less/Eq to	5.95	5.01	4.6	4.31	4.08	3.97	3.95	3.92	3.93	3.93	3.95
33% Prob less/Eq to	5.95	5.28	4.63	4.32	4.11	3.99	4	3.95	3.98	3.97	4.01
50% Prob less/Eq to	5.95	6.65	4.67	4.4	4.21	4.08	4.14	4.13	4.22	4.17	4.23
66% Prob less/Eq to	5.95	6.65	4.81	4.56	4.36	4.17	4.3	4.36	4.53	4.36	4.35
75% Prob less/Eq to	5.95	6.65	4.93	4.89	4.54	4.28	4.59	4.64	4.63	4.56	4.54
90% Prob less/Eq to	5.95	6.78	6.31	5.2	4.89	4.77	4.71	4.7	4.7	4.69	4.69
Maximum	8.84	10.08	9.02	8.3	7.99	6.81	5.99	7.51	7.47	6.18	5.36
SCENARIO 70-30											
Mean ($/Bu.)	6.13	6.11	4.95	4.66	4.37	4.19	4.21	4.25	4.29	4.2	4.23
Standard Deviation	0.64	1.12	0.93	0.78	0.59	0.59	0.46	0.58	0.62	0.41	0.4
SD as % of Mean (CV)	10.44	18.38	18.71	16.8	13.54	14.07	10.88	13.76	14.41	9.75	9.5
Minimum	5.95	4.49	3.16	3.57	3.3	3.17	3.24	3.35	3.29	3.39	3.27
10% Prob less/Eq to	5.95	4.68	4.57	4.06	3.86	3.47	3.58	3.56	3.61	3.7	3.71
25% Prob less/Eq to	5.95	5.01	4.6	4.31	4.08	3.97	3.95	3.92	3.93	3.92	3.94
33% Prob less/Eq to	5.95	5.28	4.63	4.32	4.11	3.99	3.99	3.96	3.97	3.95	4.02
50% Prob less/Eq to	5.95	6.65	4.67	4.4	4.21	4.08	4.14	4.13	4.15	4.13	4.19
66% Prob less/Eq to	5.95	6.65	4.81	4.56	4.36	4.17	4.3	4.34	4.39	4.36	4.36
75% Prob less/Eq to	5.95	6.65	4.93	4.89	4.54	4.27	4.59	4.63	4.64	4.52	4.56
90% Prob less/Eq to	5.95	6.78	6.31	5.2	4.89	4.77	4.71	4.7	4.7	4.69	4.69
Maximum	8.84	10.08	9.02	8.3	7.99	6.81	5.99	7.51	7.47	5.34	5.52

Table 17. Sorghum Season Average Market Price by Scenario: Probability Distribution from the stochastic analysis

	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031
BASELINE											
Mean ($/Bu.)	6	6.69	3.43	3.45	3.67	3.49	3.4	3.34	3.21	3.1	3.18
Standard Deviation	0.39	0.19	0.86	0.85	0.92	0.85	0.72	0.8	0.9	0.77	0.91
SD as % of Mean (CV)	6.42	2.79	25.18	24.6	25.07	24.25	21.16	23.82	28.21	24.91	28.68
Minimum	5.9	6.6	1.93	2.11	2.28	2.02	1.98	2.08	1.96	1.57	1.58
10% Prob less/Eq to	5.9	6.65	2.46	2.63	2.71	2.73	2.57	2.5	2.32	2.09	2.12
25% Prob less/Eq to	5.9	6.65	2.78	2.92	3.09	3.07	2.97	2.81	2.62	2.56	2.68
33% Prob less/Eq to	5.9	6.65	3	3.05	3.22	3.11	3.03	3	2.73	2.7	2.82
50% Prob less/Eq to	5.95	6.65	3.43	3.34	3.46	3.25	3.29	3.18	3.03	3.09	3.04
66% Prob less/Eq to	5.95	6.65	3.69	3.48	3.75	3.38	3.56	3.47	3.25	3.34	3.27
75% Prob less/Eq to	5.95	6.65	3.85	3.62	3.89	3.68	3.69	3.68	3.53	3.47	3.45
90% Prob less/Eq to	5.95	6.73	4.48	4.36	5.05	4.89	4.18	4.16	4.28	4.09	4.35
Maximum	8.17	8.21	6.74	6.77	6.6	6.83	6.39	6.6	6.78	5.29	6.61
SCENARIO 50-50											
Mean ($/Bu.)	6.01	5.88	4.36	4.16	4.04	3.81	3.95	4.09	4.13	4.12	4.17
Standard Deviation	0.41	1.01	0.77	0.61	0.58	0.49	0.45	0.51	0.51	0.43	0.4
SD as % of Mean (CV)	6.87	17.12	17.69	14.77	14.43	12.75	11.4	12.37	12.24	10.36	9.48
Minimum	5.9	4.08	2.93	3.2	3.27	3.03	3.2	3.3	3.24	3.29	3.29
10% Prob less/Eq to	5.9	4.61	3.48	3.49	3.46	3.31	3.41	3.49	3.53	3.62	3.66
25% Prob less/Eq to	5.9	4.75	3.8	3.74	3.62	3.41	3.58	3.66	3.82	3.83	3.9
33% Prob less/Eq to	5.9	5.03	3.94	3.85	3.71	3.48	3.73	3.82	3.92	3.91	3.96
50% Prob less/Eq to	5.95	6.65	4.27	4.01	3.85	3.7	3.93	3.99	4.08	4.05	4.16
66% Prob less/Eq to	5.95	6.65	4.64	4.29	4.21	3.96	4.07	4.25	4.24	4.23	4.32
75% Prob less/Eq to	5.95	6.65	4.73	4.36	4.35	4.05	4.16	4.4	4.38	4.36	4.5
90% Prob less/Eq to	5.95	6.73	5.19	5.02	4.8	4.68	4.67	4.69	4.66	4.68	4.68
Maximum	8.33	8.33	6.84	6.71	6.35	5.15	5.77	6.05	6.44	5.36	5.36
SCENARIO 70-30											
Mean ($/Bu.)	6.01	5.88	4.36	4.16	4.04	3.81	3.95	4.08	4.11	4.1	4.15
Standard Deviation	0.41	1.01	0.77	0.61	0.58	0.48	0.45	0.5	0.51	0.42	0.42
SD as % of Mean (CV)	6.87	17.12	17.69	14.73	14.38	12.73	11.45	12.34	12.47	10.24	10.18
Minimum	5.9	4.08	2.93	3.2	3.27	3.03	3.2	3.3	3.24	3.29	3.27
10% Prob less/Eq to	5.9	4.61	3.48	3.49	3.46	3.31	3.41	3.48	3.53	3.62	3.62
25% Prob less/Eq to	5.9	4.75	3.8	3.74	3.62	3.4	3.58	3.68	3.77	3.82	3.84
33% Prob less/Eq to	5.9	5.03	3.94	3.85	3.72	3.48	3.7	3.82	3.91	3.87	3.88
50% Prob less/Eq to	5.95	6.65	4.27	4.01	3.85	3.7	3.93	3.98	4.08	4	4.16
66% Prob less/Eq to	5.95	6.65	4.64	4.29	4.21	3.96	4.08	4.19	4.21	4.17	4.32
75% Prob less/Eq to	5.95	6.65	4.73	4.36	4.34	4.05	4.16	4.39	4.37	4.37	4.52
90% Prob less/Eq to	5.95	6.73	5.19	5.02	4.79	4.68	4.67	4.7	4.66	4.68	4.69
Maximum	8.33	8.33	6.84	6.71	6.35	5.15	5.77	6.05	6.44	5.34	5.52

Table 18. Oats Season Average Market Price by Scenario: Probability Distribution from the stochastic analysis

	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031
BASELINE											
Mean ($/Bu.)	4.57	5.71	3.13	2.73	2.54	2.42	2.31	2.13	2.00	1.85	1.79
Standard Deviation	0.16	0.06	0.47	0.43	0.43	0.51	0.55	0.59	0.72	0.62	0.64
SD as % of Mean (CV)	3.41	1.07	15.13	15.75	17.07	20.93	23.77	27.67	35.85	33.66	35.55
Minimum	4.55	5.70	2.63	2.02	1.53	1.13	0.81	0.26	0.27	0.24	0.36
10% Prob less/Eq to	4.55	5.70	2.79	2.27	1.99	1.81	1.72	1.36	1.11	1.04	0.95
25% Prob less/Eq to	4.55	5.70	2.91	2.49	2.24	2.10	2.04	1.82	1.59	1.38	1.29
33% Prob less/Eq to	4.55	5.70	2.93	2.58	2.33	2.20	2.19	1.97	1.71	1.57	1.54
50% Prob less/Eq to	4.55	5.70	3.04	2.68	2.53	2.41	2.30	2.15	1.99	1.82	1.77
66% Prob less/Eq to	4.55	5.70	3.11	2.82	2.71	2.59	2.45	2.38	2.22	2.06	2.02
75% Prob less/Eq to	4.55	5.70	3.16	2.89	2.81	2.67	2.60	2.52	2.34	2.24	2.21
90% Prob less/Eq to	4.55	5.70	3.45	3.16	2.98	2.99	2.88	2.84	2.79	2.73	2.64
Maximum	5.66	6.29	6.20	5.16	4.30	4.31	4.59	3.49	4.27	3.45	3.21
SCENARIO 50-50											
Mean ($/Bu.)	4.58	4.57	3.26	3.18	3.08	3.00	3.04	3.15	3.27	3.29	3.30
Standard Deviation	0.20	1.17	0.44	0.39	0.34	0.30	0.21	0.33	0.40	0.28	0.25
SD as % of Mean (CV)	4.47	25.54	13.46	12.39	10.94	9.87	6.91	10.43	12.10	8.55	7.43
Minimum	4.55	3.20	2.65	2.61	2.45	2.41	2.40	2.71	2.76	2.88	2.80
10% Prob less/Eq to	4.55	3.27	2.93	2.88	2.82	2.70	2.80	2.89	2.96	3.00	3.01
25% Prob less/Eq to	4.55	3.32	3.06	2.98	2.94	2.84	2.89	2.98	3.03	3.09	3.14
33% Prob less/Eq to	4.55	3.41	3.11	3.03	2.99	2.89	2.96	3.01	3.09	3.17	3.17
50% Prob less/Eq to	4.55	4.55	3.19	3.11	3.05	2.95	3.02	3.06	3.20	3.25	3.26
66% Prob less/Eq to	4.55	5.70	3.26	3.18	3.10	3.03	3.06	3.19	3.27	3.33	3.39
75% Prob less/Eq to	4.55	5.70	3.32	3.22	3.14	3.06	3.16	3.26	3.32	3.38	3.44
90% Prob less/Eq to	4.55	5.70	3.49	3.41	3.30	3.27	3.29	3.38	3.54	3.61	3.69
Maximum	6.00	6.42	5.91	5.11	4.92	4.59	3.79	4.95	5.74	5.03	3.94
SCENARIO 70-30											
Mean ($/Bu.)	4.58	4.57	3.26	3.18	3.08	2.99	3.03	3.14	3.24	3.25	3.29
Standard Deviation	0.20	1.17	0.44	0.39	0.34	0.30	0.21	0.32	0.39	0.22	0.26
SD as % of Mean (CV)	4.47	25.54	13.46	12.38	10.92	9.86	6.87	10.33	12.07	6.88	7.98
Minimum	4.55	3.20	2.65	2.61	2.45	2.41	2.40	2.71	2.76	2.86	2.87
10% Prob less/Eq to	4.55	3.27	2.93	2.88	2.82	2.70	2.80	2.88	2.96	3.00	3.00
25% Prob less/Eq to	4.55	3.32	3.06	2.98	2.94	2.84	2.89	2.97	3.02	3.10	3.12
33% Prob less/Eq to	4.55	3.41	3.11	3.03	2.99	2.89	2.96	3.00	3.06	3.17	3.15
50% Prob less/Eq to	4.55	4.55	3.19	3.11	3.05	2.95	3.02	3.06	3.16	3.23	3.22
66% Prob less/Eq to	4.55	5.70	3.26	3.18	3.10	3.02	3.06	3.17	3.25	3.29	3.32
75% Prob less/Eq to	4.55	5.70	3.32	3.22	3.14	3.06	3.16	3.24	3.30	3.33	3.45
90% Prob less/Eq to	4.55	5.70	3.49	3.41	3.30	3.27	3.29	3.34	3.54	3.47	3.69
Maximum	6.00	6.42	5.91	5.11	4.92	4.59	3.79	4.95	5.74	4.52	4.08

Table 19. Barley Season Average Market Price by Scenario: Probability Distribution from the stochastic analysis

	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031
BASELINE											
Mean ($/Bu.)	5.33	7.43	5.51	4.54	3.85	3.55	3.44	3.36	3.40	3.29	3.26
Standard Deviation	0.04	0.79	1.23	1.05	0.73	0.69	0.66	0.77	0.92	0.78	0.80
SD as % of Mean (CV)	0.73	10.69	22.38	23.14	19.09	19.39	19.19	23.05	27.15	23.81	24.51
Minimum	5.31	7.35	3.67	2.00	1.72	1.52	1.63	1.04	1.35	1.28	1.27
10% Prob less/Eq to	5.31	7.35	4.72	3.83	3.06	2.75	2.52	2.37	2.29	2.21	2.30
25% Prob less/Eq to	5.31	7.35	4.99	4.06	3.34	3.04	3.01	2.84	2.83	2.78	2.78
33% Prob less/Eq to	5.31	7.35	5.10	4.22	3.47	3.17	3.20	3.07	3.07	2.99	2.91
50% Prob less/Eq to	5.31	7.35	5.40	4.44	3.86	3.57	3.45	3.41	3.34	3.26	3.17
66% Prob less/Eq to	5.31	7.35	5.65	4.66	4.05	3.85	3.71	3.60	3.69	3.55	3.53
75% Prob less/Eq to	5.31	7.35	5.72	4.73	4.24	4.01	3.84	3.71	3.83	3.71	3.79
90% Prob less/Eq to	5.42	7.35	5.94	5.16	4.72	4.35	4.13	4.37	4.39	4.24	4.17
Maximum	5.42	15.30	14.79	13.30	6.02	5.21	5.51	5.22	8.36	5.46	5.68
SCENARIO 50-50											
Mean ($/Bu.)	5.35	6.47	5.23	4.96	4.82	4.71	4.82	5.09	5.51	5.77	5.65
Standard Deviation	0.12	1.31	0.94	0.66	0.51	0.54	0.37	0.53	0.89	1.03	0.64
SD as % of Mean (CV)	2.17	20.27	17.94	13.24	10.56	11.52	7.72	10.33	16.13	17.78	11.38
Minimum	5.31	4.63	4.06	3.43	3.77	3.97	4.07	4.23	4.29	4.41	4.54
10% Prob less/Eq to	5.31	5.14	4.44	4.37	4.26	4.27	4.35	4.50	4.78	4.96	4.99
25% Prob less/Eq to	5.31	5.49	4.83	4.60	4.49	4.41	4.58	4.72	5.07	5.27	5.25
33% Prob less/Eq to	5.31	5.63	4.97	4.70	4.59	4.47	4.66	4.79	5.15	5.44	5.30
50% Prob less/Eq to	5.31	6.18	5.20	4.90	4.78	4.59	4.77	5.02	5.37	5.55	5.57
66% Prob less/Eq to	5.31	7.35	5.35	5.12	4.96	4.77	4.96	5.25	5.49	5.73	5.74
75% Prob less/Eq to	5.31	7.35	5.44	5.23	5.08	4.87	5.02	5.36	5.68	5.77	5.80
90% Prob less/Eq to	5.42	7.35	5.74	5.48	5.36	5.24	5.33	5.68	6.17	6.83	6.38
Maximum	6.10	15.30	12.70	9.66	7.36	8.58	5.77	7.28	9.84	12.53	8.42
SCENARIO 70-30											
Mean ($/Bu.)	5.35	6.47	5.23	4.96	4.82	4.71	4.82	5.06	5.45	5.65	5.62
Standard Deviation	0.12	1.31	0.94	0.66	0.51	0.54	0.37	0.48	0.83	0.90	0.64
SD as % of Mean (CV)	2.17	20.27	17.94	13.23	10.56	11.52	7.72	9.45	15.19	15.89	11.46
Minimum	5.31	4.63	4.06	3.43	3.77	3.97	4.07	4.21	4.29	4.41	4.54
10% Prob less/Eq to	5.31	5.14	4.44	4.37	4.26	4.27	4.35	4.50	4.78	5.01	4.98
25% Prob less/Eq to	5.31	5.49	4.83	4.60	4.48	4.41	4.58	4.71	5.03	5.31	5.26
33% Prob less/Eq to	5.31	5.63	4.97	4.70	4.59	4.47	4.66	4.79	5.12	5.41	5.35
50% Prob less/Eq to	5.31	6.18	5.20	4.90	4.78	4.59	4.77	5.02	5.35	5.52	5.56
66% Prob less/Eq to	5.31	7.35	5.35	5.12	4.96	4.77	4.96	5.19	5.47	5.68	5.71
75% Prob less/Eq to	5.31	7.35	5.44	5.23	5.07	4.87	4.99	5.33	5.59	5.74	5.75
90% Prob less/Eq to	5.42	7.35	5.74	5.48	5.34	5.24	5.33	5.59	6.11	6.13	6.18
Maximum	6.10	15.30	12.70	9.66	7.36	8.58	5.77	7.13	9.64	12.13	8.85

Table 20. Wheat Season Average Market Price by Scenario: Probability Distribution from the stochastic analysis

	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031
BASELINE											
Mean ($/Bu.)	7.63	10.49	5.61	5.16	4.88	4.57	4.45	4.23	4.10	4.01	4.17
Standard Deviation	0.00	0.00	1.04	1.28	1.33	1.30	1.55	1.50	1.86	1.51	2.33
SD as % of Mean (CV)	0.00	0.00	18.61	24.79	27.31	28.40	34.72	35.52	45.37	37.57	55.85
Minimum	7.63	10.49	3.56	2.73	2.06	1.83	1.19	1.06	0.58	0.98	0.45
10% Prob less/Eq to	7.63	10.49	4.40	3.78	3.43	3.00	2.70	2.26	2.18	2.02	1.87
25% Prob less/Eq to	7.63	10.49	4.79	4.35	4.11	3.57	3.34	3.10	2.96	2.80	2.83
33% Prob less/Eq to	7.63	10.49	5.05	4.60	4.32	3.94	3.71	3.50	3.36	3.26	3.20
50% Prob less/Eq to	7.63	10.49	5.59	4.87	4.75	4.39	4.23	4.09	4.05	3.84	3.92
66% Prob less/Eq to	7.63	10.49	5.92	5.38	5.14	5.10	4.93	4.75	4.56	4.62	4.46
75% Prob less/Eq to	7.63	10.49	6.22	5.64	5.26	5.53	5.30	5.30	4.96	5.21	5.03
90% Prob less/Eq to	7.63	10.49	6.70	6.54	6.24	6.27	6.17	6.18	5.77	5.86	6.11
Maximum	7.63	10.49	9.45	11.54	10.59	7.32	10.95	8.95	13.25	8.16	18.12
SCENARIO 50-50											
Mean ($/Bu.)	7.53	8.25	7.87	7.71	7.31	7.08	7.24	7.50	7.54	7.62	7.48
Standard Deviation	0.07	0.32	0.21	0.38	0.07	0.39	0.87	0.91	0.77	0.78	0.75
SD as % of Mean (CV)	0.91	3.86	2.71	4.95	0.98	5.50	11.99	12.11	10.28	10.27	10.05
Minimum	7.40	7.88	7.74	7.45	7.19	5.79	5.66	5.61	5.31	5.43	5.13
10% Prob less/Eq to	7.44	7.97	7.74	7.45	7.24	6.38	6.17	6.19	6.10	6.64	6.53
25% Prob less/Eq to	7.47	8.05	7.75	7.46	7.26	7.18	6.83	6.87	7.11	7.11	7.09
33% Prob less/Eq to	7.48	8.07	7.76	7.47	7.27	7.22	6.97	7.24	7.36	7.28	7.15
50% Prob less/Eq to	7.52	8.12	7.79	7.49	7.30	7.23	6.99	7.42	7.85	7.87	7.42
66% Prob less/Eq to	7.56	8.21	7.86	7.55	7.33	7.25	7.27	8.14	7.90	7.92	7.98
75% Prob less/Eq to	7.59	8.34	7.90	7.61	7.34	7.27	7.38	8.21	7.94	7.94	8.00
90% Prob less/Eq to	7.62	8.82	7.99	8.38	7.36	7.31	8.24	8.48	8.26	8.36	8.21
Maximum	7.63	9.02	8.95	8.46	7.65	7.71	9.94	9.89	9.61	9.61	9.60
SCENARIO 70-30											
Mean ($/Bu.)	7.53	8.25	7.87	7.70	7.31	7.08	7.23	7.46	7.38	7.57	7.31
Standard Deviation	0.07	0.32	0.21	0.38	0.07	0.39	0.85	0.91	0.76	0.62	0.72
SD as % of Mean (CV)	0.91	3.86	2.71	4.95	0.99	5.51	11.76	12.24	10.26	8.20	9.86
Minimum	7.40	7.88	7.74	7.45	7.19	5.79	5.66	5.61	5.41	5.48	5.65
10% Prob less/Eq to	7.44	7.97	7.74	7.45	7.24	6.38	6.17	6.18	6.09	7.02	6.20
25% Prob less/Eq to	7.47	8.05	7.75	7.46	7.25	7.18	6.83	6.84	7.03	7.16	7.05
33% Prob less/Eq to	7.48	8.07	7.76	7.47	7.27	7.22	6.97	6.98	7.13	7.25	7.08
50% Prob less/Eq to	7.52	8.12	7.79	7.49	7.29	7.23	6.99	7.39	7.66	7.50	7.16
66% Prob less/Eq to	7.56	8.21	7.86	7.55	7.33	7.25	7.28	8.00	7.86	7.88	7.78
75% Prob less/Eq to	7.59	8.34	7.90	7.60	7.34	7.27	7.40	8.20	7.89	7.91	7.96
90% Prob less/Eq to	7.62	8.82	7.99	8.38	7.36	7.32	8.24	8.47	8.09	8.26	8.03
Maximum	7.63	9.02	8.95	8.46	7.65	7.71	9.94	9.98	8.53	9.52	9.67

Table 21. Soybeans Season Average Market Price by Scenario: Probability Distribution from the stochastic analysis

	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031
BASELINE											
Mean ($/Bu.)	13.69	14.48	11.68	9.15	8.03	7.38	7.91	8.18	8.49	8.57	8.35
Standard Deviation	0.80	0.15	3.74	2.72	3.14	3.02	3.47	3.17	3.12	3.27	3.25
SD as % of Mean (CV)	5.81	1.02	31.98	29.73	39.03	40.91	43.94	38.76	36.79	38.16	38.98
Minimum	13.35	14.40	4.60	4.50	2.06	0.57	1.20	1.62	2.00	1.99	2.00
10% Prob less/Eq to	13.35	14.40	7.68	6.37	4.63	3.69	3.63	4.25	5.21	5.40	4.61
25% Prob less/Eq to	13.35	14.40	8.89	7.35	6.07	5.39	5.70	6.16	6.41	6.20	5.99
33% Prob less/Eq to	13.35	14.40	9.32	7.77	6.83	6.24	6.62	6.96	7.11	6.86	7.27
50% Prob less/Eq to	13.35	14.40	10.50	8.56	7.69	7.37	7.58	7.97	8.05	7.87	8.08
66% Prob less/Eq to	13.62	14.40	13.10	9.24	8.33	8.20	8.65	8.79	9.00	8.91	8.81
75% Prob less/Eq to	13.62	14.40	14.11	10.05	8.86	8.71	9.02	9.70	9.26	10.15	9.49
90% Prob less/Eq to	15.03	14.69	16.80	13.22	12.36	10.94	12.64	13.17	12.89	12.45	13.35
Maximum	17.62	15.28	22.13	18.98	20.12	15.39	21.08	16.13	21.13	18.68	18.12
SCENARIO 50-50											
Mean ($/Bu.)	12.82	11.43	11.88	11.04	10.88	10.69	10.97	11.10	11.11	11.07	11.03
Standard Deviation	1.50	0.62	1.15	0.74	0.82	0.89	0.81	0.87	0.91	1.09	0.82
SD as % of Mean (CV)	11.72	5.43	9.71	6.68	7.51	8.32	7.39	7.83	8.17	9.88	7.41
Minimum	10.86	10.89	10.63	10.01	9.16	8.30	9.04	9.11	8.52	8.51	9.38
10% Prob less/Eq to	11.67	10.93	10.75	10.52	10.10	9.63	10.08	10.03	10.04	10.01	9.99
25% Prob less/Eq to	11.73	11.01	10.96	10.56	10.32	10.17	10.28	10.17	10.30	10.12	10.18
33% Prob less/Eq to	11.80	11.11	11.09	10.60	10.36	10.23	10.49	10.48	10.55	10.30	10.47
50% Prob less/Eq to	12.19	11.23	11.43	10.77	10.63	10.57	10.90	11.17	11.24	11.08	11.05
66% Prob less/Eq to	13.21	11.39	12.07	11.02	10.98	10.98	11.18	11.90	11.95	11.59	11.40
75% Prob less/Eq to	13.32	11.47	12.66	11.32	11.40	11.21	11.57	12.01	11.98	11.96	11.93
90% Prob less/Eq to	15.32	12.23	13.18	11.90	12.22	12.00	12.05	12.03	12.00	11.98	11.97
Maximum	17.95	14.83	16.18	14.46	12.78	12.47	12.52	12.48	12.44	17.41	12.44
SCENARIO 70-30											
Mean ($/Bu.)	12.82	11.43	11.88	11.04	10.87	10.67	10.95	11.04	11.04	11.02	10.97
Standard Deviation	1.50	0.62	1.15	0.74	0.81	0.91	0.80	0.89	0.89	1.01	0.80
SD as % of Mean (CV)	11.72	5.43	9.71	6.69	7.48	8.50	7.30	8.03	8.07	9.21	7.34
Minimum	10.86	10.89	10.63	10.01	9.16	8.25	9.04	9.11	8.65	8.78	9.63
10% Prob less/Eq to	11.67	10.93	10.75	10.52	10.10	9.52	10.08	10.01	10.04	9.99	9.99
25% Prob less/Eq to	11.73	11.01	10.96	10.56	10.32	10.17	10.28	10.15	10.20	10.12	10.15
33% Prob less/Eq to	11.80	11.11	11.09	10.60	10.36	10.23	10.53	10.35	10.49	10.28	10.46
50% Prob less/Eq to	12.19	11.23	11.43	10.77	10.63	10.55	10.85	11.02	10.98	11.02	10.82
66% Prob less/Eq to	13.21	11.39	12.07	11.02	10.98	10.98	11.18	11.87	11.87	11.57	11.41
75% Prob less/Eq to	13.32	11.47	12.66	11.32	11.40	11.21	11.49	12.00	11.98	11.96	11.93
90% Prob less/Eq to	15.32	12.23	13.18	11.90	12.22	12.00	12.05	12.03	12.00	11.98	11.97
Maximum	17.95	14.83	16.18	14.46	12.78	12.47	12.52	12.48	12.49	16.04	12.45

Table 22. Cotton Season Average Market Price by Scenario: Probability Distribution from the stochastic analysis

	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031
BASELINE											
Mean ($/lb.)	0.94	0.97	0.77	0.65	0.61	0.62	0.64	0.64	0.67	0.65	0.68
Standard Deviation	0.04	0.00	0.19	0.21	0.20	0.19	0.20	0.21	0.22	0.21	0.24
SD as % of Mean (CV)	3.73	0.00	24.44	32.00	32.16	30.57	30.87	32.43	32.27	32.79	34.56
Minimum	0.92	0.95	0.24	0.19	0.04	0.19	0.19	0.13	0.04	0.09	0.17
10% Prob less/Eq to	0.92	0.95	0.50	0.37	0.39	0.40	0.40	0.39	0.43	0.37	0.40
25% Prob less/Eq to	0.92	0.95	0.65	0.53	0.48	0.50	0.53	0.53	0.54	0.51	0.52
33% Prob less/Eq to	0.92	0.95	0.68	0.58	0.51	0.54	0.55	0.56	0.60	0.54	0.58
50% Prob less/Eq to	0.92	0.97	0.80	0.64	0.59	0.60	0.63	0.64	0.66	0.64	0.67
66% Prob less/Eq to	0.94	0.97	0.86	0.70	0.65	0.65	0.68	0.69	0.71	0.73	0.71
75% Prob less/Eq to	0.94	0.97	0.91	0.74	0.74	0.69	0.71	0.72	0.79	0.78	0.79
90% Prob less/Eq to	0.96	1.01	1.01	0.92	0.85	0.84	0.90	0.95	1.00	0.95	1.03
Maximum	1.06	1.07	1.16	1.20	1.16	1.31	1.26	1.24	1.20	1.29	1.35
SCENARIO 50-50											
Mean ($/lb.)	0.92	0.90	0.72	0.73	0.75	0.75	0.77	0.78	0.80	0.78	0.80
Standard Deviation	0.06	0.06	0.04	0.04	0.04	0.04	0.04	0.04	0.05	0.05	0.05
SD as % of Mean (CV)	6.61	7.24	5.49	5.35	5.55	5.78	5.39	5.78	6.06	6.65	6.81
Minimum	0.84	0.77	0.63	0.66	0.68	0.68	0.68	0.68	0.68	0.69	0.71
10% Prob less/Eq to	0.85	0.82	0.67	0.68	0.70	0.69	0.71	0.72	0.73	0.73	0.74
25% Prob less/Eq to	0.87	0.84	0.69	0.70	0.72	0.72	0.74	0.74	0.76	0.75	0.76
33% Prob less/Eq to	0.90	0.85	0.70	0.71	0.73	0.72	0.75	0.76	0.77	0.75	0.77
50% Prob less/Eq to	0.91	0.88	0.72	0.72	0.74	0.74	0.76	0.77	0.80	0.78	0.80
66% Prob less/Eq to	0.93	0.92	0.73	0.74	0.76	0.78	0.77	0.78	0.82	0.79	0.82
75% Prob less/Eq to	0.97	0.94	0.74	0.75	0.78	0.79	0.79	0.80	0.83	0.82	0.84
90% Prob less/Eq to	1.02	0.99	0.78	0.79	0.81	0.81	0.82	0.83	0.85	0.87	0.89
Maximum	1.09	1.06	0.81	0.82	0.86	0.86	0.89	0.90	0.91	0.91	0.94
SCENARIO 70-30											
Mean ($/lb.)	0.92	0.90	0.72	0.73	0.75	0.75	0.77	0.77	0.80	0.78	0.80
Standard Deviation	0.06	0.06	0.04	0.04	0.04	0.04	0.04	0.04	0.05	0.05	0.05
SD as % of Mean (CV)	6.61	7.24	5.49	5.35	5.54	5.78	5.39	5.76	6.20	6.63	6.80
Minimum	0.84	0.77	0.63	0.66	0.68	0.68	0.68	0.68	0.68	0.69	0.72
10% Prob less/Eq to	0.85	0.82	0.67	0.68	0.70	0.69	0.71	0.72	0.73	0.73	0.73
25% Prob less/Eq to	0.87	0.84	0.69	0.70	0.72	0.72	0.74	0.74	0.75	0.74	0.76
33% Prob less/Eq to	0.90	0.85	0.70	0.71	0.73	0.72	0.75	0.75	0.76	0.75	0.77
50% Prob less/Eq to	0.91	0.88	0.72	0.72	0.74	0.74	0.76	0.77	0.79	0.77	0.80
66% Prob less/Eq to	0.93	0.92	0.73	0.74	0.76	0.78	0.77	0.78	0.82	0.79	0.82
75% Prob less/Eq to	0.97	0.94	0.74	0.75	0.78	0.79	0.79	0.80	0.83	0.81	0.84
90% Prob less/Eq to	1.02	0.99	0.78	0.79	0.81	0.81	0.82	0.83	0.87	0.87	0.86
Maximum	1.09	1.06	0.81	0.82	0.86	0.86	0.89	0.90	0.91	0.91	0.94

Table 23. Rice Season Average Market Price by Scenario: Probability Distribution from the stochastic analysis

	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031
BASELINE											
Mean ($/cwt)	15.80	18.28	19.35	14.08	11.95	11.41	11.63	12.26	12.36	12.27	12.12
Standard Deviation	0.00	0.16	2.16	3.08	1.68	1.20	1.45	1.62	1.55	1.47	1.40
SD as % of Mean (CV)	0.00	0.88	11.14	21.84	14.09	10.48	12.46	13.23	12.57	11.97	11.56
Minimum	15.80	18.20	14.77	9.60	9.04	8.31	8.21	8.87	7.89	7.83	8.00
10% Prob less/Eq to	15.80	18.20	16.67	10.56	9.64	9.88	9.98	10.45	10.48	10.40	10.43
25% Prob less/Eq to	15.80	18.20	17.47	11.79	10.76	10.53	10.56	11.37	11.53	11.34	11.28
33% Prob less/Eq to	15.80	18.20	17.91	12.16	11.19	11.01	11.00	11.68	11.89	11.91	11.54
50% Prob less/Eq to	15.80	18.20	19.11	13.39	11.86	11.35	11.50	12.20	12.42	12.50	12.44
66% Prob less/Eq to	15.80	18.20	20.76	14.95	12.46	12.03	12.39	12.84	12.83	12.86	12.90
75% Prob less/Eq to	15.80	18.20	20.96	15.75	12.80	12.24	12.56	13.11	13.09	13.12	13.04
90% Prob less/Eq to	15.80	18.56	22.05	18.71	13.98	12.80	13.24	13.67	13.60	13.73	13.61
Maximum	15.80	18.94	24.31	23.40	17.52	15.38	15.40	20.90	20.56	16.40	15.24
SCENARIO 50-50											
Mean ($/Bu.)	14.76	17.61	14.47	14.11	14.14	14.21	14.27	14.49	14.61	14.60	14.59
Standard Deviation	0.40	0.43	0.56	0.48	0.44	0.45	0.43	0.48	0.51	0.50	0.47
SD as % of Mean (CV)	2.70	2.42	3.89	3.39	3.09	3.16	3.02	3.31	3.52	3.39	3.20
Minimum	14.12	16.83	13.26	13.24	13.39	13.32	13.32	13.53	13.60	13.68	13.66
10% Prob less/Eq to	14.25	17.01	13.91	13.51	13.68	13.64	13.71	13.87	13.94	14.02	13.98
25% Prob less/Eq to	14.50	17.26	14.06	13.78	13.75	13.88	13.90	14.15	14.16	14.17	14.21
33% Prob less/Eq to	14.50	17.41	14.09	13.84	13.82	13.93	14.01	14.20	14.32	14.25	14.35
50% Prob less/Eq to	14.68	17.58	14.31	14.02	14.05	14.09	14.24	14.53	14.56	14.55	14.58
66% Prob less/Eq to	14.89	17.72	14.64	14.23	14.24	14.36	14.46	14.69	14.77	14.78	14.84
75% Prob less/Eq to	15.01	17.93	14.79	14.49	14.39	14.59	14.62	14.81	14.99	14.96	14.92
90% Prob less/Eq to	15.39	18.18	15.28	14.71	14.72	14.90	14.79	15.16	15.29	15.28	15.22
Maximum	15.67	18.71	16.24	15.44	15.31	15.13	15.31	15.61	15.78	15.79	15.63
SCENARIO 70-30											
Mean ($/Bu.)	14.76	17.61	14.47	14.11	14.14	14.20	14.27	14.47	14.59	14.57	14.57
Standard Deviation	0.40	0.43	0.56	0.48	0.44	0.45	0.43	0.48	0.51	0.49	0.46
SD as % of Mean (CV)	2.70	2.42	3.89	3.38	3.09	3.16	3.01	3.33	3.49	3.37	3.15
Minimum	14.12	16.83	13.26	13.24	13.39	13.32	13.32	13.53	13.60	13.67	13.63
10% Prob less/Eq to	14.25	17.01	13.91	13.51	13.68	13.64	13.71	13.83	13.95	13.97	13.98
25% Prob less/Eq to	14.50	17.26	14.06	13.78	13.75	13.88	13.90	14.14	14.15	14.16	14.20
33% Prob less/Eq to	14.50	17.41	14.09	13.84	13.82	13.93	14.01	14.18	14.30	14.25	14.36
50% Prob less/Eq to	14.68	17.58	14.31	14.02	14.05	14.09	14.21	14.50	14.54	14.53	14.57
66% Prob less/Eq to	14.89	17.72	14.64	14.22	14.24	14.36	14.46	14.69	14.76	14.73	14.78
75% Prob less/Eq to	15.01	17.93	14.79	14.49	14.39	14.59	14.62	14.81	14.97	14.91	14.92
90% Prob less/Eq to	15.39	18.18	15.28	14.71	14.72	14.90	14.79	15.15	15.29	15.25	15.19
Maximum	15.67	18.71	16.24	15.44	15.31	15.12	15.30	15.61	15.78	15.74	15.69

Table 24. Corn Total Ending Stocks by Scenario: Probability Distribution from the stochastic analysis

	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031
BASELINE											
Mean ($/Bu.)	2106	2354	3858	3798	3106	2947	3196	3591	4000	4222	3970
Standard Deviation	1098	1547	1666	1410	1417	1434	1485	1529	1777	1711	1839
SD as % of Mean (CV)	52.15	65.7	43.18	37.12	45.64	48.68	46.47	42.58	44.43	40.54	46.34
Minimum	106	102	309	867	528	253	109	300	102	556	234
10% Prob less/Eq to	358	151	1889	1674	1273	1098	1333	1422	1509	2162	1490
25% Prob less/Eq to	1386	1132	2583	3017	2168	1776	2154	2372	2731	2859	2729
33% Prob less/Eq to	1653	1405	2854	3323	2325	2055	2468	2727	3262	3253	2963
50% Prob less/Eq to	1989	2086	3611	3767	2946	2958	2991	3497	4086	3942	3880
66% Prob less/Eq to	2531	2950	4606	4410	3577	3666	3772	4289	4920	4708	4612
75% Prob less/Eq to	3181	3420	5013	4801	4146	3866	4146	4504	5170	5288	5022
90% Prob less/Eq to	3512	4612	6060	5492	5162	4654	5067	5542	6149	6285	6574
Maximum	4204	5824	7990	6815	7251	6899	7944	7505	8118	9286	9003
SCENARIO 50-50											
Mean ($/Bu.)	2035	2247	3238	3778	4191	4447	4503	4481	4491	4590	4572
Standard Deviation	1085	1446	1408	1368	1312	1424	1241	1343	1342	1266	1242
SD as % of Mean (CV)	53.31	64.35	43.47	36.2	31.3	32.02	27.56	29.98	29.89	27.59	27.16
Minimum	129	112	130	504	594	1083	1377	708	756	1496	1656
10% Prob less/Eq to	288	373	1402	1986	2413	2415	2694	2677	2604	2775	2572
25% Prob less/Eq to	1320	1259	2332	2738	3100	3280	3543	3507	3500	3603	3782
33% Prob less/Eq to	1585	1523	2472	3129	3620	3838	4016	3971	4025	3991	4193
50% Prob less/Eq to	1916	1868	3070	3817	4229	4663	4651	4681	4745	4764	4671
66% Prob less/Eq to	2449	2689	3765	4346	4876	5362	5027	5178	5245	5321	5166
75% Prob less/Eq to	3099	3180	4015	4642	5314	5539	5356	5454	5457	5652	5570
90% Prob less/Eq to	3429	4492	5165	5573	5754	6304	6156	6105	6008	6049	6117
Maximum	4121	5865	6873	6436	6743	6788	6738	6633	6760	6705	6815
SCENARIO 70-30											
Mean ($/Bu.)	2035	2247	3238	3780	4196	4453	4506	4498	4528	4626	4595
Standard Deviation	1085	1446	1408	1367	1310	1425	1239	1351	1358	1255	1249
SD as % of Mean (CV)	53.31	64.35	43.47	36.16	31.22	32.01	27.49	30.03	29.99	27.12	27.17
Minimum	129	112	130	504	594	1083	1377	708	756	1649	1522
10% Prob less/Eq to	288	373	1402	1986	2413	2415	2694	2611	2684	2841	2714
25% Prob less/Eq to	1320	1259	2332	2753	3100	3368	3543	3507	3522	3671	3816
33% Prob less/Eq to	1585	1523	2472	3129	3620	3838	4010	3971	3971	4014	4206
50% Prob less/Eq to	1916	1868	3070	3817	4280	4663	4651	4681	4745	4911	4618
66% Prob less/Eq to	2449	2689	3765	4346	4876	5362	5047	5252	5290	5308	5265
75% Prob less/Eq to	3099	3180	4015	4642	5327	5570	5356	5398	5515	5652	5570
90% Prob less/Eq to	3429	4492	5165	5573	5754	6304	6156	6107	6078	6052	6083
Maximum	4121	5865	6873	6436	6743	6788	6738	6615	6751	6626	6843

Table 24. Wheat Total Ending Stocks by Scenario: Probability Distribution from the stochastic analysis

	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031
BASELINE											
Mean ($/Bu.)	725	759	821	862	962	1036	1097	1152	1177	1177	1211
Standard Deviation	161	230	251	287	325	382	414	445	489	482	507
SD as % of Mean (CV)	22.17	30.37	30.57	33.29	33.81	36.84	37.77	38.65	41.53	40.91	41.87
Minimum	217	236	238	272	225	371	192	235	165	300	182
10% Prob less/Eq to	503	396	502	456	484	510	496	537	526	542	531
25% Prob less/Eq to	641	639	624	648	786	699	785	789	825	732	825
33% Prob less/Eq to	660	660	694	722	830	833	878	951	950	909	985
50% Prob less/Eq to	731	783	786	899	946	1064	1130	1174	1121	1198	1189
66% Prob less/Eq to	785	850	927	989	1087	1211	1263	1358	1356	1394	1425
75% Prob less/Eq to	814	891	1032	1050	1165	1322	1421	1461	1503	1554	1553
90% Prob less/Eq to	916	1041	1148	1250	1348	1519	1620	1765	1760	1816	1848
Maximum	1148	1260	1392	1582	1825	1897	2111	2151	2634	2733	2704
SCENARIO 50-50											
Mean ($/Bu.)	764	738	996	1356	1747	2062	2221	2221	2068	1982	2010
Standard Deviation	109	149	205	262	318	331	258	262	324	341	338
SD as % of Mean (CV)	14.24	20.15	20.6	19.31	18.21	16.03	11.61	11.78	15.69	17.21	16.81
Minimum	476	329	454	787	968	1162	1184	1519	1365	1094	1282
10% Prob less/Eq to	578	544	732	1025	1329	1620	1850	1781	1612	1519	1585
25% Prob less/Eq to	733	643	835	1179	1517	1786	2046	2085	1769	1717	1745
33% Prob less/Eq to	737	683	904	1227	1582	1911	2101	2141	1861	1818	1802
50% Prob less/Eq to	784	749	1003	1326	1700	2058	2248	2276	2086	1924	1979
66% Prob less/Eq to	808	814	1076	1490	1932	2252	2331	2315	2269	2177	2197
75% Prob less/Eq to	841	840	1141	1598	2045	2366	2406	2392	2307	2285	2272
90% Prob less/Eq to	883	903	1269	1689	2149	2480	2502	2531	2480	2374	2427
Maximum	923	1055	1406	1829	2308	2636	2682	2694	2715	2678	2790
SCENARIO 70-30											
Mean ($/Bu.)	764	738	996	1356	1747	2063	2222	2232	2109	2042	2087
Standard Deviation	109	149	205	262	318	331	258	265	306	253	276
SD as % of Mean (CV)	14.24	20.15	20.6	19.31	18.21	16.02	11.62	11.86	14.51	12.4	13.2
Minimum	476	329	454	787	968	1162	1184	1519	1486	1505	1591
10% Prob less/Eq to	578	544	732	1025	1334	1620	1850	1764	1717	1689	1727
25% Prob less/Eq to	733	643	835	1179	1517	1786	2025	2115	1830	1839	1822
33% Prob less/Eq to	737	683	904	1227	1582	1911	2101	2191	1917	1889	1894
50% Prob less/Eq to	784	749	1003	1326	1706	2058	2241	2285	2177	2049	2078
66% Prob less/Eq to	808	814	1076	1490	1932	2252	2340	2346	2289	2178	2204
75% Prob less/Eq to	841	840	1141	1598	2045	2366	2406	2398	2339	2265	2314
90% Prob less/Eq to	883	903	1269	1689	2149	2480	2504	2536	2493	2355	2473
Maximum	923	1055	1406	1829	2308	2636	2682	2694	2686	2663	2625

Table 25. Soybeans Total Ending Stocks by Scenario: Probability Distribution from the stochastic analysis

	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031
BASELINE											
Mean ($/Bu.)	417	698	650	843	1116	1220	1172	1074	989	1027	1074
Standard Deviation	289	373	369	442	595	725	728	721	633	626	728
SD as % of Mean (CV)	69.27	53.42	56.76	52.42	53.31	59.41	62.16	67.16	64.05	60.97	67.81
Minimum	53	78	75	50	88	130	55	58	65	51	81
10% Prob less/Eq to	66	241	246	287	384	392	381	263	193	269	257
25% Prob less/Eq to	174	437	364	500	632	633	585	543	504	560	532
33% Prob less/Eq to	230	516	454	583	820	776	711	680	559	638	634
50% Prob less/Eq to	365	671	598	814	999	1051	1037	868	850	969	914
66% Prob less/Eq to	530	793	747	1019	1271	1440	1339	1243	1199	1279	1130
75% Prob less/Eq to	664	943	858	1152	1498	1666	1634	1445	1430	1504	1582
90% Prob less/Eq to	851	1138	1087	1455	1967	2193	2175	2108	1808	1762	2031
Maximum	1173	2058	1991	2020	2764	3234	3560	3563	3550	2888	3773
SCENARIO 50-50											
Mean ($/Bu.)	306	433	463	709	848	928	910	886	861	857	849
Standard Deviation	153	253	324	312	368	348	265	297	333	338	319
SD as % of Mean (CV)	49.94	58.45	69.94	43.99	43.38	37.54	29.14	33.56	38.66	39.44	37.58
Minimum	56	72	54	57	57	59	189	110	52	50	110
10% Prob less/Eq to	70	149	80	297	319	462	548	399	344	386	405
25% Prob less/Eq to	202	224	160	488	569	670	748	708	613	632	628
33% Prob less/Eq to	216	281	244	565	623	751	822	775	724	730	719
50% Prob less/Eq to	341	339	406	714	841	962	926	921	943	863	855
66% Prob less/Eq to	386	560	584	854	1085	1118	1064	1040	1053	1053	1018
75% Prob less/Eq to	416	622	651	956	1165	1165	1094	1076	1094	1102	1072
90% Prob less/Eq to	429	730	938	1127	1298	1342	1213	1238	1214	1262	1273
Maximum	674	1220	1262	1342	1521	1678	1510	1456	1647	1658	1420
SCENARIO 70-30											
Mean ($/Bu.)	306	433	463	710	852	934	918	904	887	881	876
Standard Deviation	153	253	324	312	367	351	263	298	327	335	319
SD as % of Mean (CV)	49.94	58.45	69.94	43.9	43.03	37.61	28.7	32.96	36.79	38.04	36.39
Minimum	56	72	54	57	57	59	189	110	52	61	127
10% Prob less/Eq to	70	149	80	297	319	462	548	399	377	361	397
25% Prob less/Eq to	202	224	160	488	575	689	772	723	649	681	669
33% Prob less/Eq to	216	281	244	568	655	761	845	805	753	754	721
50% Prob less/Eq to	341	339	406	714	841	962	937	928	948	882	923
66% Prob less/Eq to	386	560	584	854	1085	1118	1064	1071	1072	1059	1056
75% Prob less/Eq to	416	622	651	956	1166	1165	1101	1101	1130	1126	1087
90% Prob less/Eq to	429	730	938	1127	1298	1348	1213	1263	1223	1275	1282
Maximum	674	1220	1262	1342	1521	1690	1510	1456	1615	1591	1371

Table 26. Realized Net Farm Income by Scenario: Probability Distribution from the stochastic analysis

	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031
BASELINE											
Mean (Bill $)	134.1	130.2	102.5	81.8	77.6	75.3	73.5	72.5	71.8	75.4	77.7
Standard Deviation	2.8	4.6	9.2	12.6	11.3	12.2	13.7	14.2	15.9	14.5	14.4
SD as % of Mean (CV)	2.05	3.5	8.99	15.42	14.56	16.17	18.63	19.59	22.08	19.18	18.6
Minimum	127.4	120.9	84.6	49.0	47.2	48.1	43.3	38.8	37.6	42.7	42.1
10% Prob less/Eq to	130.4	124.2	92.9	67.8	63.4	59.6	55.9	55.5	53.2	58.2	59.2
25% Prob less/Eq to	132.7	126.3	95.6	72.9	69.5	67.7	64.8	62.6	59.9	65.3	67.6
33% Prob less/Eq to	132.9	127.6	97.9	75.7	71.2	69.9	66.3	65.5	62.7	68.6	69.6
50% Prob less/Eq to	133.4	129.9	100.6	79.8	77.0	74.8	72.0	72.5	70.1	74.5	76.2
66% Prob less/Eq to	136.3	132.4	104.2	86.0	81.3	80.5	77.2	78.7	78.7	78.8	83.7
75% Prob less/Eq to	136.5	133.5	107.6	89.1	85.7	84.2	82.3	81.0	80.3	82.5	86.4
90% Prob less/Eq to	137.5	136.6	114.5	95.8	92.7	92.5	92.2	88.5	93.1	93.9	97.6
Maximum	138.4	139.3	131.9	115.7	105.7	101.8	110.1	106.8	119.9	111.8	109.7
SCENARIO 50-50											
Mean (Bill $)	133.3	117.1	107.4	103.3	98.0	93.3	91.1	91.1	92.5	97.5	99.6
Standard Deviation	2.2	3.8	5.3	5.5	4.1	3.3	3.6	3.1	3.7	3.1	2.9
SD as % of Mean (CV)	1.67	3.28	4.89	5.32	4.2	3.54	3.95	3.45	4.04	3.14	2.9
Minimum	128.1	109.5	97.7	94.2	90.5	87.4	82.7	83.0	80.8	90.7	94.1
10% Prob less/Eq to	130.4	112.9	100.4	97.4	93.8	90.2	87.7	87.7	88.8	93.7	95.9
25% Prob less/Eq to	131.7	114.3	103.9	99.8	95.7	91.1	89.2	89.2	90.5	95.8	97.5
33% Prob less/Eq to	132.7	114.9	105.4	100.9	96.5	91.2	89.9	90.0	91.0	96.2	98.1
50% Prob less/Eq to	133.6	116.4	106.6	103.2	97.5	92.6	90.9	90.8	92.2	97.3	99.9
66% Prob less/Eq to	134.4	118.5	109.0	104.1	98.5	94.3	91.9	91.8	93.8	98.3	100.6
75% Prob less/Eq to	134.6	119.1	110.2	104.6	99.0	95.2	92.7	92.7	94.1	99.2	101.2
90% Prob less/Eq to	135.3	122.4	113.8	109.0	102.0	96.4	94.0	93.9	96.5	100.5	102.2
Maximum	138.5	127.5	122.3	128.0	115.8	108.8	109.6	111.1	112.3	112.0	112.4
SCENARIO 70-30											
Mean (Bill $)	133.3	117.1	107.4	103.3	98.0	93.3	91.1	90.9	92.1	97.2	99.2
Standard Deviation	2.2	3.8	5.3	5.5	4.1	3.3	3.6	3.2	3.7	3.2	2.8
SD as % of Mean (CV)	1.67	3.28	4.89	5.32	4.2	3.52	3.92	3.48	3.96	3.26	2.81
Minimum	128.1	109.5	97.7	94.2	90.5	87.4	82.7	83.0	80.8	90.6	94.0
10% Prob less/Eq to	130.4	112.9	100.4	97.4	93.8	90.2	87.7	87.7	88.1	93.7	95.9
25% Prob less/Eq to	131.7	114.3	103.9	99.8	95.7	91.1	89.2	89.1	90.1	95.3	97.2
33% Prob less/Eq to	132.7	114.9	105.4	100.9	96.5	91.2	89.9	89.6	90.8	95.8	97.6
50% Prob less/Eq to	133.6	116.4	106.6	103.2	97.5	92.6	90.8	90.8	92.0	97.1	99.1
66% Prob less/Eq to	134.4	118.5	109.0	104.1	98.5	94.3	91.7	91.3	93.3	97.9	100.3
75% Prob less/Eq to	134.6	119.1	110.2	104.6	99.0	95.1	92.4	92.3	94.0	98.6	100.7
90% Prob less/Eq to	135.3	122.4	113.8	109.0	102.0	96.4	94.0	93.9	95.8	100.5	101.8
Maximum	138.5	127.5	122.3	128.0	115.8	108.8	109.6	111.1	112.3	111.5	*109.9*