

Accuracy in USDA International Baseline Projections for the U.S. Compared to Other Global Leaders in Corn and Soybeans

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USDA BASELINE PROJECTIONS: IMPORTANCE AND IMPLICATIONS

With the latest “USDA Agricultural Baseline Projections” released on February 16, 2022, discussions about the future agricultural markets, production, and consumption of agricultural commodities, trade, and other agricultural indicators will follow. With optimistic outlook about global trade and local production, the Baseline report projects growth in both corn and soybean yields, production and exports over the next decade. This type of information provided by the USDA International Baseline Projections is important and highly valuable because it helps evaluate local and foreign policy change scenarios for the US and has subsequent implications for US farmers. The USDA baseline projections are used to inform Farm Bill discussions and aid in annual Presidential budgeting. Therefore, accuracy in the projections is essential for impactful domestic agricultural policy.

As the latest report shows confidence about the growth of corn and soybeans in the U.S. over the next decade, it may provide a positive signal for corn and soybean futures and commodity markets. However, stakeholders are cautioned to review the projections carefully and analyze the previous projections and their biases in conjunction with the most recent report before deriving their conclusions. Our report previews the changes in the latest U.S. projections for corn and soybeans, and presents statistics on the historical scale of accuracy in the projections for the same two crops. This is followed by a brief examination of trends that may be increasing or decreasing that accuracy in various variables. We consider major producers and trade partners of the US which are covered in the USDA projection reports and see a tradeoff between (a) the accuracy of projected yields and area harvested and (b) the accuracy of projected exports and ending stocks for the U.S. projections.

ADJUSTMENTS IN U.S. PROJECTIONS IN 2022 REPORT

In each Baseline report, projections are made about various variables for up to 10 years into the future. Figure 1 shows the yield per acre and area harvested projections for U.S. corn and soybeans. The latest baseline report projects the corn yield to increase by 12.7% and the area harvested to decline by 4.0% over the next decade after its sharp increase last year. Despite the optimistic picture, this makes the latest report's 2030 projections for corn yield to be slightly lower than pre-

viously projected and area harvested to be slightly higher than the previous year's projected levels. The upward adjustments in corn production in this year's baseline report is most likely driven by 2020/21's record-setting corn exports of 2753 million bushels. Corn exports are projected to increase further over the next decade by 23% while U.S. continues to be a major global supplier for corn.

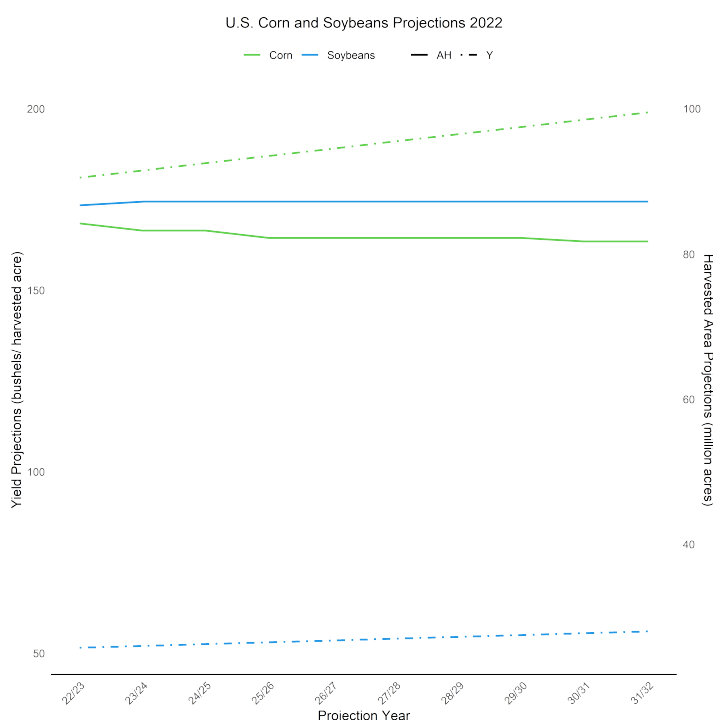


Figure 1: U.S. Projections in the 2022 Baseline Report

Stakeholders can observe a less optimistic and downward adjustment to soybean production in this year's baseline projections. In the latest projections, soybean yield and area harvested are projected to increase by 8.7% and 0.9% over the next decade, signalling an optimistic production growth. However, while this report projects the same yield per harvested acre in 2030/31 as the previous report, soybean area harvested for 2030/31 (and 2031/32) is 2.2% lower than previously projected. This stems from a downward adjustment of 5% to the U.S. soybean exports at the end of the decade in this year's report compared to the last year's projection report. U.S. soybean exports are still projected to grow 8.9% over the next decade, but this is a lower figure than previously projected.

U.S. VERSUS INTERNATIONAL BASELINE PROJECTIONS

The international baseline projections contain information for over 30 countries and over 10 aggregated global regions in addition to the U.S. which is the only country included in the domestic baseline projection reports. Both types of reports project various variables for all major U.S. crops, livestock, and dairy. In addition to agricultural commodity indicators, the domestic reports also include projections for a set of farm income variables (like cash receipts, government payments, cash expenses, etc.), which the international projection reports do not cover. These extra sets of financial variables provide a picture of the economic wellbeing of the U.S. farm sector and inform personal and policy decisions. Thus, the two sets of reports differ largely in the regions they cover, and slightly in the variables they project. For the purpose of this report, we focus on the international baseline projections.

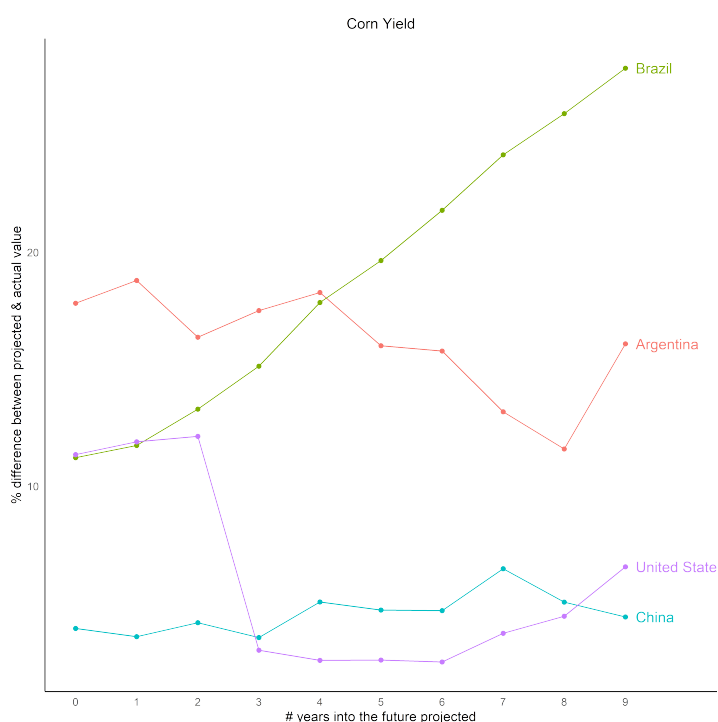


Figure 2: Accuracy of Corn Yield Projections by Projection Horizon

DEFINING PROJECTION ACCURACY

The baseline reports project each variable from one to ten years into the future, enabling researchers to measure the difference between the projections and actual historical values that have been realized. This way, an estimate of accuracy can be formed for different crops, variables, and regions to assess the accuracy and reliability of the volatile baseline projections. To measure accuracy, we calculate the percent difference between the actual historical values and the projections made for each year. Keeping in mind that baseline reports project ten years into the future, "projection horizon" ranges from 0 to 9 and depicts the number of years into the future for which a projection is made. Given that, we calculate the difference between projections and actual values for each projection horizon to evaluate how accurate the baseline projections remain over time.

ACCURACY OF PROJECTIONS

In this report, we only look at the countries that are the top contributors of global production of corn and soybeans. Figures 2, 3, 4, and 5 graph the percent difference between projections and actual values on the vertical axis and the projection horizon on the horizontal axis. These figures display how accurate the USDA International Baseline projections are over time for corn and soybeans yields and areas harvested for each of the top countries.

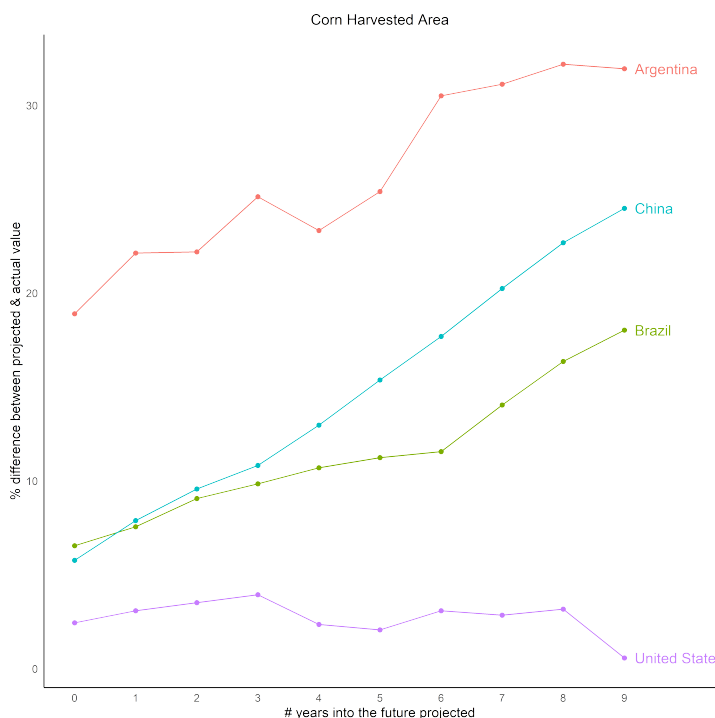


Figure 3: Accuracy of Corn Area Harvested Projections by Projection Horizon

CORN

As shown in figure 2, U.S. and China's projections for corn yields are among the most accurate, with the difference in actual vs. projected values remaining below 5% for most projection horizons. However, there are two sources of inaccuracies depicted in figure 2 which can significantly impact stakeholder returns for future decisions based on the corn yield projections. First, the short-term projections (projecting 1 to 3 years in the future) have about 12% difference from the actual values, which often stems from overpredicting the short-term yield per harvested acre. Second, perhaps to maintain a high accuracy rate for the U.S., the baselines model accommodates a significantly lower accuracy in the projections of other major producers and exporters of corn, i.e. Brazil and Argentina. Figure 3 presents a similar scenario with the difference in actual vs. projected values in corn area harvested for the U.S. being less than 4% while Brazil, China, and Argentina all have projections that decrease significantly in accuracy as the projection horizon increases. That is, the farther in the future, the less reliable the projections are.

Maintaining a high accuracy in the U.S. projections is vital, but it adds more value if it holds across different variables. The higher accuracy in the U.S. corn yield and area harvested projections is matched by up to 30% lower accuracy in projections of other top producers and U.S. trade partners, lead-

ing to inaccurate U.S. exports and global production projections. Since the domestic corn farm price is affected by U.S. trade of corn, a reliable farm price projection necessitates accuracy in production projections of the major trade partners including China, Brazil, and Argentina. Therefore, although it may seem like accurate yield and area harvested projections would allow farmers and other stakeholders to rely on all corn commodity indicators, these statistics suffer from inaccuracy stemming from a different source.

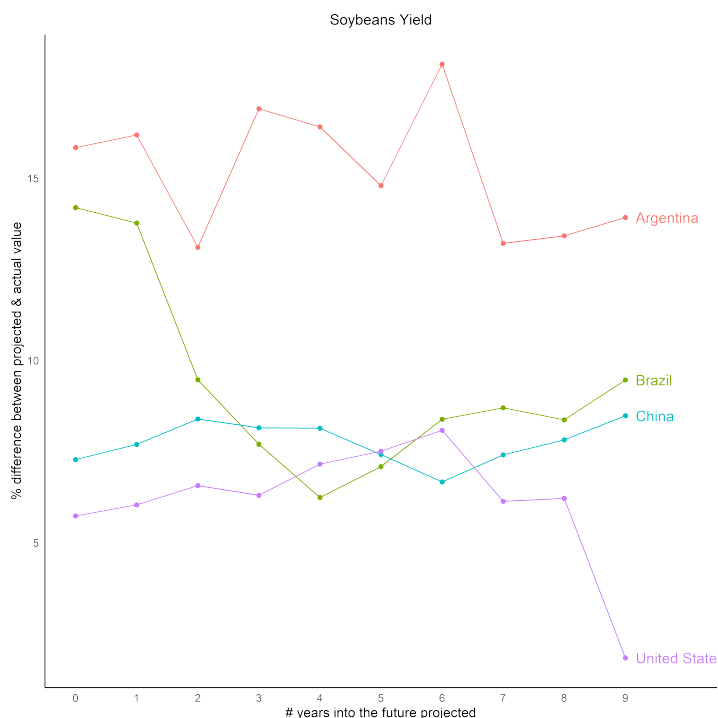


Figure 4: Accuracy of Soybeans Yield Projections by Projection Horizon

SOYBEANS

Figures 4 and 5 show that the difference between actual vs. projected values for U.S. soybean yields as well as area harvested is consistently below 10%. On the other hand, while the difference in yields for China and Brazil is also mostly below 10%, the actual vs. projections difference in area harvested for these nations is approximately 10% and 50% in the last projection horizon. Similarly, Argentina, another major soybean producers and trader, has roughly 15% inaccurate projections for soybean yield but 25% inaccuracy for soybean area harvested.

HOW DOES ACCURACY VARY BY PROJECTION HORIZON?

The inaccuracy trends for corn and soybean yields are relatively flatter on average for most countries, implying that the accuracy of projections remains similar for predictions close by as well as farther into the future. Projections about yield per harvested acre are mostly flatter in their trends as well as actual values, making the accuracy of yield projections over time more consistent and one of the best out of all variables. The accuracy of soybeans area harvested has flatter trends in U.S. and Brazil, while the accuracy for China and Argentina falls much more sharply as we try to project farther into the

future. Therefore, this compromises the reliability of other agricultural indicators for the U.S. (like ending stocks, exports, and total supply) in later projection horizons as they are closely related to the area harvested. The inaccuracy in projections for other major producers increases the margin of error in global trade projections, and hence also impacts the accuracy of projections about domestic prices and other commodity indicators.

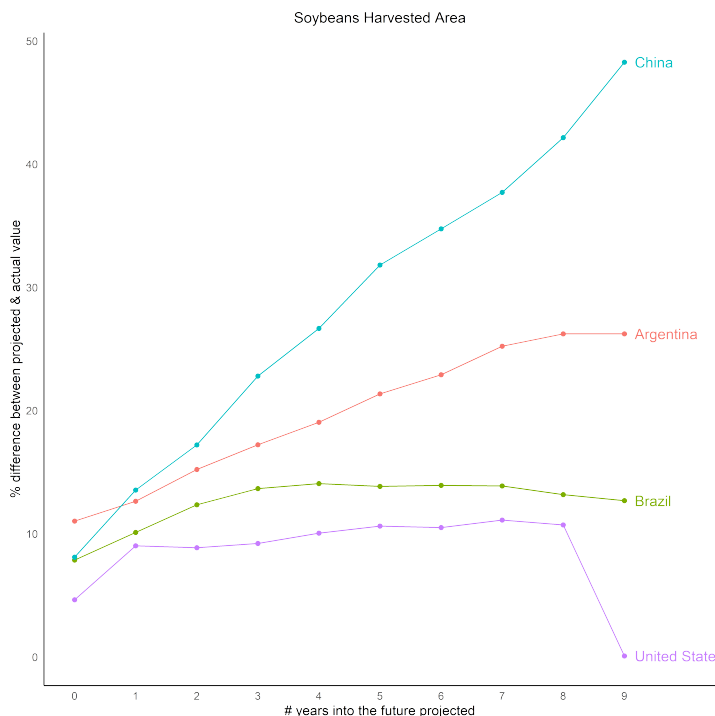


Figure 5: Accuracy of Soybeans Area Harvested Projections by Projection Horizon

CONCLUDING REMARKS

Persistently higher error in the other countries' projections for major U.S. crop indicators eventually introduces error in the domestic projections as well. While the projection models have maintained a lower error that is below 10% in corn yield and area harvested for the U.S., the error in its ending stocks ranges from 25-45%, and the error in exports ranges from 13-62%. Following the same pattern, the error in U.S. soybean yield and area harvested (error below 10%) are drastically lower than for other major producers (error up to 50%). Consequently, the projections for U.S. soybean ending stocks and exports have much higher errors within the ranges 45-80% and 12-20%, respectively.

Therefore, stakeholders are advised to exercise prudence when making inference based on the USDA Baseline Projections.

REFERENCES



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