Gro Intelligence

GRO REPORT

2023 Performance Report on Gro Yield Forecast Models and Acreage Models

JANUARY 2024

Contents

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Executive Summary

Gro Intelligence stands at the forefront of innovation in AI-driven data and analytics across climate, agriculture, and the economy. Gro empowers businesses, financial institutions, and governments to make better decisions on food security and climate risk.

With an extensive repository of 3.5 million unique, proprietary data series, Gro addresses a wide range of questions across crop yield and production, supply and demand, growing conditions, and climate scenarios. Gro's data series are built by our team of domain experts and scaled through artificial intelligence, generating predictive models and real-time applications.

In this report, we focus on the performance of our Global Yield Forecast Models across corn, soy, and wheat, as well as our Acreage Models — including our US Planting Intentions Model and US Prevent Plant Model — for corn, soy, wheat, and cotton.

Our 2023 performance analysis shows that despite an extremely volatile year for climate and weather impacts on growing conditions, Gro's models accurately predicted yields, averaging between 92%-99% of final government reporting up to 10 months in advance.[1]

Gro's Yield and Acreage Models are especially significant because they offer a holistic view of global food supply, a key indicator for prices and global food security. Our suite of **machine learning-based models includes 14 country/crop pairings that cover over 70% of global production for corn and soy, and 50% of the global production of wheat. Gro's models also provide an unprecedented combination of accuracy, global coverage, and granularity down to the district level, with daily in-season updates**. They can be used to forecast supply and assess farmer profitability to make decisions around product pricing, sourcing, trading, or policymaking.

This performance analysis is based on years of actual, live-updating data in addition to back-tested data, a level of proven performance that is unique in the marketplace.

Key takeaways of this 2023 report include:

- Historically, **for the past eight years, Gro's US Corn Yield Forecast Model has been on average within 98% of the USDA final January report by September (i.e., four months in advance). Our US Soybean Yield Forecast Model has been on average within 99% of the USDA's final number by September (i.e., four months in advance) since the model launched six years ago.**

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[1] For this report, in countries where final government reporting has not yet been published, Gro compares our model estimates to the USDA's yield estimates for those countries, current as of January 12, 2024.

2023 US Soybean Yield Forecast
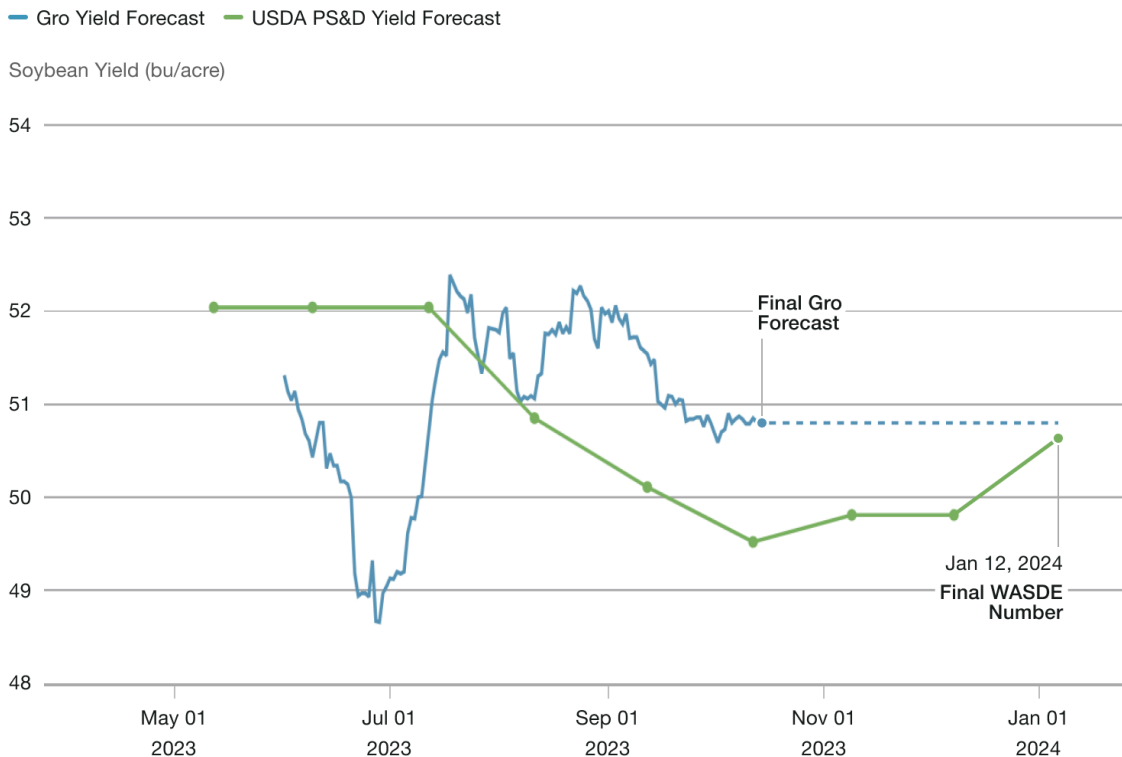
━ Gro Yield Forecast   ━ USDA PS&D Yield Forecast

Soybean Yield (bu/acre)

Source: Gro Intelligence

During the 2023 growing season, Gro's US Soybean Yield Forecast Model was predicting lower yields starting in June due to significant drought conditions, providing early insight into lower-than-expected production and potentially lower exports, with the USDA eventually following this downward trend. Heavy rainfall in July, ahead of the critical growing period for soybean production, elevated the forecast until a period of relatively hot and dry conditions in September. Gro's model ended within 0.4% of USDA final January reporting.

- Despite a highly unusual year of extreme weather in 2023, Gro's models provided an earlier view of final numbers, allowing customers to move ahead of the market.

- In critical global regions, where the current marketplace does not have many machine learning-based predictive models, such as Ukraine, Brazil, and China, **Gro's 2023 Global Yield Forecast Models were on average 96% accurate up to 10 months ahead of final government reporting**.

Gro's belief in transparency and access to knowledge are fundamental tenets of our mission to advance the world's food and climate security. **This is the only report currently available in the marketplace that compares model performance against ground truth data in a comprehensive, transparent manner.** Most of Gro's yield and production models have been running for several years and have undergone consistent improvement through the implementation of new data sources and methodologies.

All of Gro's global yield, Planting Intentions and Prevent Plant Models are available through access to our API or through subscriptions to Gro's web-based applications and through Gro's Excel Plug-In.

At the start of 2023, Gro put together a Watchlist with our predictions for seven major themes for agriculture in the year just ended. **Despite experiencing one of the most volatile years in the 20+ years of Gro climate and weather data analysis, 7 out of 7 of our major predictions were proved correct.** For a detailed review of how our Watchlist performed, please read our 2023 prediction recap here.

Yield Forecast Models: Up to 10 Months Ahead of Final Government Reporting[2]

Available Models Include (Year Launched):

- **US:** Corn (2016), Soy (2018), Hard Red Winter Wheat (HRW) (2019)

- **Argentina:** Corn (2020), Soy (2020)

- **Australia:** Wheat (2021)

- **Brazil:** Corn (2020), Soy (2020)

- **Canada:** Spring Wheat (2020)

- **China:** Corn (2019), Wheat (2021)

- **India:** Wheat (2018)

- **Russia:** Winter Wheat (2019)

- **Ukraine:** Wheat (2019)

For Detailed Yield Model
Performance Results
See Pages 8-16

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[2] The USDM, while being a trusted and mature source, is compiled using subjective input from teams on the ground.

Country	Crop	# of Months Gro Accurately Predicts Ahead of Government Estimate[3]	Average Accuracy Since Model Launch[4]
Argentina	Corn	5-6	92%
Argentina	Soybean	5-6	94%
Brazil	Corn	6	99%
Brazil	Soybean	6	98%
Canada	Spring Wheat	1-2	90%
China	Corn	3	96%
China	Winter Wheat	N/A[5]	N/A
India	Wheat	5	93%
Russia	Winter Wheat	8	96%
Ukraine	Wheat	10	95%
US	Corn	4	98%
US	Soybean	4	99%
US	HRW Wheat	6	95%

Key Features and Methodology

Gro's data series are curated and built by our team of domain experts, scaled through artificial intelligence, and commercialized as user-friendly predictive models and real-time applications. Our products provide accurate forecasts and holistic views of the most pressing climate and weather-related impacts across global food supply chains.

Our team of domain experts is available 24/7 to answer any user questions and provide direct access to the knowledge they require. Our customer success team regularly

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[3] The number of months can vary year to year due to irregular reporting dates by a government source. Gro accuracy is 90%-99% on an average absolute basis across models.
[4] This percentage represents the average ratio of Gro's final yield number (released months ahead of the final WASDE report) over the final WASDE number since the model was first released.
[5] The National Bureau of Statistics of China (NBS) has not released winter wheat yield since 2018.

proactively updates our customers when big changes occur with our models due to weather and climate events.

Gro's Global Yield Forecast Models leverage high-resolution satellite data that captures every field in every district or province, providing for a far more comprehensive and precise data analysis than traditional crop survey methods. Our Yield Forecast and Acreage Models are significantly more accurate and available earlier because of:

- **Human intelligence, scaled by artificial intelligence** - Our team of experienced data scientists and research analysts, who have backgrounds in commodity trading, crop science, climate science, agronomy, and more, have worked together to develop the best possible models which are then scaled and automated by machine-learning algorithms and back-tested on decades of official crop yield and price data.

- **Comprehensive global data sources and variables** - Our forecasts incorporate a combination of Gro's extensive suite of climate, environmental, and crop condition data alongside other variables. Gro has spent the past 10 years building the world's largest platform dedicated to food security, agriculture, and the economy.

- **Historical data** - Our models ingest over 180,000 datasets from hundreds of sources that span decades and, in some cases, even centuries. Our machine learning-based predictive models have trained on this data for eight years, which helps to establish a strong baseline of conditions, plus an accurate accounting for anomalies such as extreme weather occurrences, disruptions to the supply chain, and potential impacts on ground conditions into the future.

- **Daily updates** - One of the most important differentiators of our models is that they update daily, whereas the next most reliable sources in the US are weekly crop conditions reports and monthly yield forecasts provided by the USDA.

  - Each morning, Gro automatically recalculates the model's yield predictions based on the best currently available sets of satellite and ground truth data. If and when any singular source of data is obstructed, delayed or is otherwise offline, Gro's models adapt by reweighting all auxiliary data sources and filling in the gaps in the calculation accordingly.

  - Daily updates not only allow customers to have the most up-to-date information at any given moment, it allows customers to discover multi-day trends in weather conditions that could impact crop health. These discoveries often precede government reporting and the subsequent reactions in the crop futures markets. The *path* of the daily values is therefore particularly useful for agribusinesses, financial traders, insurance

negotiators, procurement officers, and others, to get ahead of forthcoming market-moving news out of the USDA and equivalent institutions globally.

- **Geospatial expertise** - Gro's geospatial team creates proprietary crop covers[6] for each yield model to enhance the explanatory power of climate variables.

- **Regional granularity** - Gro's models operate down to the county or district level, a distinct advantage for agribusinesses, crop insurance companies, and financial traders when compared to the USDA's state-level forecasts. We can also compare conditions between neighboring regions, and detect anomalies in the data values within their 5-year averages.

- **Continuous data evaluation and ingestion of new sources** - Our machine learning-based models constantly improve as additional ground truth data comes in, and our in-house domain experts examine this data to create new predictive features.

Gro-Derived Metrics

One of Gro Intelligence's distinct advantages in predictive modeling is our Gro-derived metrics. Unique to the marketplace, these metrics are built by Gro's team of in-house experts over several years, and are capable of providing daily-updating, highly accurate measurements down to the district level with high correlation to crop health and yield. Two examples of these key Gro-derived Metrics used in our yield models are Land Surface Temperature, and the Gro Drought Index, have been significantly refined in the past year.

- **Land Surface Temperature (LST)** - Gro LST is a generative AI model that incorporates observations from multiple LST and air temperature sources, including NASA MODIS satellites, and shares information across them to deliver a consistent and complete representation of a synthetic LST time-series. This model is designed to withstand outages from any single source. LST is related but not perfectly correlated to air temperature.

- **Gro Drought Index (GDI)** - The GDI is a fully automated, high-resolution index of drought worldwide. It is based on a Gro machine learning-based model that updates daily with a range of inputs from various satellites, including evapotranspiration, soil moisture, precipitation, and land surface temperature. The GDI is processed at the district level and is calibrated to the widely recognized US Drought Monitor (USDM) for the United States, but differs from the USDM in that the GDI is global and fully automated with satellite inputs.[3]

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[6] A crop cover is a crop-specific land cover data layer showing what parts (or %) of a specific area are growing a specific crop.

Accurate Yield Forecasts Months Before Government Reports Are Released

Gro Intelligence's predictive models help inform a customer's view of global grain and oilseed supply, demand, and revenue months ahead of final government reporting. Gro's models incorporate satellite-based data and near-real-time environmental and growing conditions, including vegetative health, soil moisture levels, and GFS 7-day forecasts.

Gro's Yield Forecast Models are accurate – which Gro defines as within 90%-99.9% of final government reporting – 1-10 months in advance, depending on the crop/country pairing. This enables our customers to "see around the corner" and make confident, informed decisions much sooner.

Final government reporting is released at various points during the calendar year, depending on the country and crop (see a chart of release dates in the appendix).

Yield Forecast Model Performance: Final Numbers

Gro's US Yield Forecast Models Are Historically Within 98% of Final Government Reporting

On average, our US Yield Forecast Models for corn and soy are **within 98% of the USDA's final January numbers four months before** those final numbers are released. Final numbers show the official government record for the season's crop yield. Comparing this to Gro's final model number shows how accurate our models are and also indicates which models need to be improved. It also allows us to see how far in advance Gro's model began forecasting the final number.

Historically, for the past eight years, Gro's US Corn Yield Forecast Model has been on average within 98% of the USDA final January report by September (i.e., four months in advance). Our US Soybean Yield Forecast Model has been on average within 99% of the USDA's final number by September (i.e., four months in advance) for the past six years.

In September 2023, we were within 97% and 98% of the agency's final January 2024 numbers for Corn and Soybeans, respectively.

During the 2023 growing season, US corn producing regions experienced highly unusual swings in extreme weather. Gro's US Corn Yield Forecast Model was showing yields consistently below USDA estimates starting in June, providing early insight into lower-than-expected production and potentially lower exports. The model dropped mid-season due to extreme high temperatures and low rainfall, before a rapid upswing thanks to near-record rainfall in July. The forecasts stabilized in September and ended up within 97% of USDA final January reporting.

Globally, our Yield Forecast Models are within 92% of final government reporting

on average, up to 10 months before official figures are released. Final government reporting is released at various points during the calendar year, depending on the country and crop (see a chart of release dates in the appendix).

The following sections compare the performance of Gro's Yield Forecast Models against final government reporting for each respective crop/country combination. We show US 2023 growing season performance, as well as final, end-of-year yield forecasts.

Forecasts at early stages of the growing season are preliminary. As the season progresses, and changes in growing conditions alter crop prospects, Gro's Yield Forecast Models become more accurate. The models update daily.

Gro US Yield Forecast Model Performance, 2023 | US GROWING SEASON

During the US corn and soybean growing season, Gro compares our Yield Forecast Model estimates to the USDA's monthly WASDE report. As the USDA's September WASDE report is the first US government report to incorporate data from the agency's objective yield plots, it is an especially pivotal report.

Gro's machine learning-based yield models use satellite-based data and near-real-time environmental and growing conditions to generate yield forecasts for each county and state, as well as a national yield forecast, each day.

When Gro's forecasts for corn and soybeans stabilized in September, they were already within 97%-99% of the USDA's final January reporting, respectively. In January of 2024, **the USDA increased its estimates for 2023 US corn and soybean production in one of the agency's largest ever end-of-season revisions, bringing the agency's estimates significantly closer to Gro's own final estimates.**

2023 US Soybean Yield Forecast
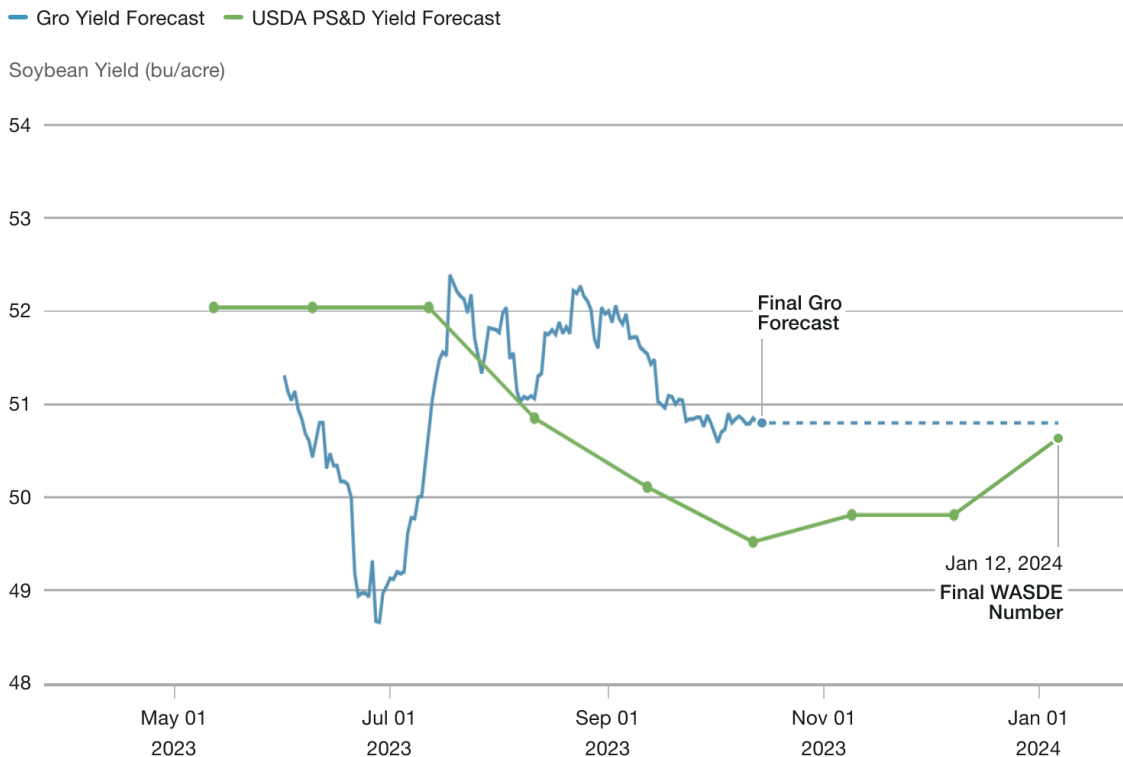
— Gro Yield Forecast   — USDA PS&D Yield Forecast

Soybean Yield (bu/acre)

Source: Gro Intelligence

During the 2023 growing season, Gro's US Soybean Yield Forecast Model was predicting lower yields starting in June due to significant drought conditions, providing early insight into lower-than-expected production and potentially lower exports, with the USDA eventually following this downward trend. Heavy rainfall in July, ahead of the critical growing period for soybean production, elevated the forecast until a period of relatively hot and dry conditions in September. Gro's model ended within 0.4% of USDA final January reporting.

Gro Yield Forecast Performance, 2018-2023 | **US SOYBEAN**

Gro's US Soybean model provides forecasts within 99% of the USDA's final reporting on average.

Country	Crop	Harvest Year	Gro Final (October) Forecast bu/acre	Final (January) Number WASDE
US	Soybean	2018	50.61	50.60
US	Soybean	2019	46.65	47.40
US	Soybean	2020	51.45	51.00
US	Soybean	2021	51.12	51.20
US	Soybean	2022	48.87	49.5
US	**Soybean**	**2023**	**50.8**	**50.6**

Gro Yield Forecast Performance, 2018-2023 | **BRAZIL SOYBEAN**

On average, Gro's Brazil Soybean model provides forecasts within 98% of the Brazilian Institute of Geography and Statistics' (IBGE) final reporting.

Country	Crop	Harvest Year	Gro Final (April) Forecast t/ha	Final (October) Number IBGE
Brazil	Soybean	2020	3.23	3.28
Brazil	Soybean	2021	3.37	3.45
Brazil	Soybean	2022	2.98	2.92
Brazil	**Soybean**	**2023**	**3.37**	**3.43**

Gro Yield Forecast Performance, 2016-2023 | **US CORN**

On average, Gro's model provides forecasts within 98% of the USDA's final reporting.

Country	Crop	Harvest Year	Gro Final (October) Forecast bu/acre	Final (January) Number WASDE
US	Corn	2016	171.02	174.60
US	Corn	2017	176.86	176.60
US	Corn	2018	177.48	176.40
US	Corn	2019	170.02	167.50
US	Corn	2020	180.64	171.40
US	Corn	2021	177.36	177.00
US	Corn	2022	169.83	173.3
US	**Corn**	**2023**	**182.45**	**177.3**

Gro Yield Forecast Performance, 2021-2023 | **BRAZIL CORN**

On average, Gro's model provides forecasts within 99.6% of the IBGE December report's final number.

Country	Crop	Harvest Year	Gro Final (August) Forecast t/ha	Final (December) Number IBGE
Brazil	Corn	2021	5.02	4.65
Brazil	Corn	2022	5.34	5.32[7]
Brazil	**Corn**	**2023**	**5.87**	**5.93**

[7] The IBGE final number has not yet been released. Instead, we compare to the USDA's yield estimates, current as of January 12, 2024.

Gro Yield Forecast Performance, 2018-2023 | **ARGENTINA CORN & SOYBEAN**

On average, Gro's Argentina soybean model provides forecasts within 94% of the Ministry of Agriculture's (MAGyP) final number.

Country	Crop	Harvest Year	Gro Final (April) Forecast t/ha	Final (Sep-Dec) Number Ministry of Agriculture
Argentina	Soybean	2018	2.30	2.32
Argentina	Soybean	2019	3.21	3.33
Argentina	Soybean	2020	2.90	2.92
Argentina	Soybean	2021	2.88	2.81
Argentina	Soybean	2022	2.84	2.76
Argentina	**Soybean**	**2023**	**2.16**	**1.74**

On average, Gro's Argentina corn model provides forecasts within 92% of the Ministry of Agriculture's (MAGyP) final number.

Country	Crop	Harvest Year	Gro Final (May) Forecast t/ha	Final (October) Number Ministry of Agriculture
Argentina	Corn	2021	7.02	7.43
Argentina	Corn	2022	6.53	6.73
Argentina	**Corn**	**2023**	**5.89**	**5.11**

Gro Yield Forecast Performance, 2019-2023 | CHINA CORN AND WHEAT

On average, Gro's China corn model provides forecasts within 96% of China's National Bureau of Statistics' (NBS) final number.

Country	Crop	Harvest Year	Gro Final (October) Forecast t/ha	Final December Number China NBS
China	Corn	2019	6.22	6.32
China	Corn	2020	6.29	6.32
China	Corn	2021	6.57	6.29
China	Corn	2022	6.68	6.44
China	**Corn**	**2023**	**6.73**	**6.44**

China NBS has not released final yield numbers for wheat since 2018.

Country	Crop	Harvest Year	Gro Final (June) Forecast t/ha	Final Number China NBS
China	Winter Wheat	2020	5.67	N/A
China	Winter Wheat	2021	5.99	N/A
China	Winter Wheat	2022	6.18	N/A
China	**Winter Wheat**	**2023**	**6.28**	**N/A**

Gro Yield Forecast Performance, 2019-2023 | US HARD RED WINTER WHEAT

On average, Gro's US Hard Red Winter Wheat model provides forecasts within 95% of the USDA's final January Annual Production Report.

	Harvest	Gro Final (June) Forecast	Final (January) Number

Country	Crop	Year	bu/acre	USDA ERS - Wheat Yearbook
US	Hard Red Winter Wheat	2019	44.24	48.18
US	Hard Red Winter Wheat	2020	42.83	42.22
US	Hard Red Winter Wheat	2021	45.02	43.62
US	Hard Red Winter Wheat	2022	38.49	34.82
US	**Hard Red Winter Wheat**	**2023**	**38.19**	**38.61**

Gro Yield Forecast Performance, 2019-2023 | **UKRAINE WHEAT**

On average, Gro's Ukraine Wheat model provides forecasts within 95% of the UkrStat's final number.

Country	Crop	Harvest Year	Gro Final (June) Forecast t/ha	Final (April) Number UkrStat
Ukraine	Wheat	2019	4.34	4.16
Ukraine	Wheat	2020	3.91	3.71
Ukraine	Wheat	2021	4.20	4.46
Ukraine	Wheat	2022	4.04	3.9
Ukraine	**Wheat**	**2023**	**4.31**	**4.63**[8]

Gro Yield Forecast Performance, 2018-2023 | **INDIA WHEAT**

On average, Gro's model provides forecasts within 93% of the USDA Production, Supply, and Distribution's (PS&D) final number.

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[8] The UkrStat final number has not yet been released. Instead, we compare to the USDA's yield estimates, current as of January 12, 2024.

Country	Crop	Harvest Year	Gro Final (April) Forecast t/ha	Final September Number USDA PS&D
India	Wheat	2018	3.10	3.37
India	Wheat	2019	3.22	3.53
India	Wheat	2020	3.23	3.44
India	Wheat	2021	3.57	3.46
India	Wheat	2022	3.61	3.37
India	**Wheat**	**2023**	**3.69**	**3.52**

Gro Yield Forecast Performance, 2019-2023 | RUSSIA WHEAT

On average, Gro's model provides forecasts within 96% of the final number from EMISS (Russian Official Estimates).

Country	Crop	Harvest Year	Gro Final (June) Forecast t/ha	Final March Number EMISS
Russia	Winter Wheat	2019	3.44	3.41
Russia	Winter Wheat	2020	3.76	3.77
Russia	Winter Wheat	2021	3.62	3.43
Russia	Winter Wheat	2022	3.82	4.17[9]
Russia	**Winter Wheat**	**2023**	**4.12**	**4.18**

[9] The EMISS final number has not yet been released. Instead, we compare to the USDA's yield estimates, current as of January 12, 2024.

Gro Yield Forecast Performance, 2020-2023 | **CANADA WHEAT**

On average, Gro's model provides forecasts within 90% of StatCan's final number.

Country	Crop	Harvest Year	Gro Final (September) Forecast t/ha	Final November Number StatCan
Canada	Spring Wheat	2020	3.56	3.60
Canada	Spring Wheat	2021	3.37	2.53
Canada	Spring Wheat	2022	3.71	3.61
Canada	**Spring Wheat**	**2023**	**3.48**	**3.2**

Acreage Models: 2-6 Months Ahead of Final Government Reporting

Gro's US Planting Intentions Model (launched in 2021) and US Prevent Plant Model (launched in 2019) estimate planted area for the upcoming US season with county- or state-level forecasts.

Our US Planting Intentions Models for corn, soybeans, wheat, and cotton project how much land will be devoted to major crops in the coming year based on farm-level economics. To accurately predict farmers' planting intentions ahead of the USDA's official estimates, the models draw on Gro platform datasets that include local new crop cash prices, historical planted area, costs and profitability data, and futures prices.

- **Our US Prevent Plant Model** estimates the number of acres that have been prevented from being planted at the county and national levels well ahead of the USDA's FSA Crop Acreage Data report. These estimates allow our customers to measure the impact of lost acreage on demand for seeds and inputs. The model uses spatially explicit environmental data to predict the amount of acreage the farmers will be unable to plant.

| Acreage Model Performance: Final Numbers

Governments, financial institutions, and companies can leverage these models to predict planted acreage for corn, soybeans, cotton, and wheat, to forecast state and regional seed and crop protection demand and to understand US production of important global crops.

Model	Country	Crop	# of Months Gro Accurately Predicts Ahead of Final January Government Estimate[10]
Prevent Plant	US	Corn	6
Prevent Plant	US	Soybean	6

Model	Country	Crop	# of Months Gro Accurately Predicts Ahead of Final March Government Estimate
Planting Intentions	US	Corn	2
Planting Intentions	US	Soybean	2
Planting Intentions	US	Wheat	2
Planting Intentions	US	Cotton	2

Gro's 2023 US Planting Intentions Model for corn and soybeans was disrupted due to a bug that was introduced between versions of modeling software. The model's performance for these crops suffered as a result and is not considered applicable. Gro notified customers and addressed the issue immediately, and we have updated our QA procedures which will prevent the possibility of a bug in the future.

Gro Planting Intentions Performance, 2021-2023 | US CORN, SOYBEANS, WHEAT, & COTTON

Country	Crop	Harvest Year	Gro Forecast million acres	USDA NASS March Prospective Plantings million acres	Final Acreage January USDA NASS million acres
US	Corn	2021	93.14	91.14	93.30
US	Soybeans	2021	88.56	87.60	87.20

[10] USDA Farm Service Agency (FSA) publishes final reporting in January.

US	Wheat	2021	44.33	46.36	46.74
US	Cotton	2021	15.11	12.04	11.22
US	Corn	2022	94.96[11]	89.49	88.58
US	Soybeans	2022	84.80	90.96	87.45
US	Wheat	2022	48.31	47.35	45.74
US	Cotton	2022	12.45	12.23	13.76
US	**Corn**	**2023**	**99.82***	**91.99**	**94.64**
US	**Soybeans**	**2023**	**81.82***	**87.50**	**83.60**
US	**Wheat**	**2023**	**49.43**	**49.85**	**49.58**
US	**Cotton**	**2023**	**11.58**	**11.26**	**10.23**

Gro Prevent Plant Performance, 2019-2023 | US CORN & SOYBEANS

Country	Crop	Harvest Year	Gro Forecast As of End June million acres	January Final Number USDA FSA million acres
US Corn Belt[12]	Yellow Corn & Common Soybeans, non-irrigated	2019	10.30	11.13
US Corn Belt	Corn & Soybeans	2020	3.34	5.26

[11] Gro's 2022 US Corn & Soybeans planting intentions estimates did not factor in the skyrocketing fertilizer prices seen earlier in that year. The model now incorporates fertilizer prices.

[12] US Corn Belt includes IA, IL, IN, OH, KS, NE, MO, MN, SD, ND, and WI

*These figures are the result of a bug that was introduced between versions of modeling software and therefore are not considered applicable. The results of the corrected model showed 95.1 and 86.6 million acres for US Corn and Soybeans, respectively.

US Corn Belt	Corn & Soybeans	2021	0.54	0.38
US Corn Belt	Corn & Soybeans	2022	3.18	3.22
US Corn Belt	**Corn & Soybeans**	**2023**	**0.35**	**1.20**

Conclusion

Our 2023 performance analysis shows that Gro's models accurately predicted global yields, averaging within 92% of final government reporting up to 10 months in advance.

Key takeaways of this report covering 2023 include:

- Historically, **for the past eight years, Gro's US Corn Yield Forecast Model has been on average within 98% of the USDA final January report by September (i.e., four months in advance). Our US Soybean Yield Forecast Model has been on average within 99% of the USDA's final number by September (i.e., four months in advance) for the last six years.**

- This remained true during the 2023 US growing season. **By September, Gro's forecasts for corn and soy were already within 97% and 99%, respectively, of the USDA's final January reporting.** Gro's models thus provided an earlier view of final numbers, allowing customers to move ahead of the market.

- In critical global regions, where the current marketplace does not have many machine learning-based predictive models, such as Ukraine, Brazil, and China, **Gro's 2023 Global Yield Forecast Models were on average 96% accurate up to 10 months ahead of final government reporting**.

Gro has spent the past 10 years building the world's largest platform dedicated to food security, agriculture, and the economy. Gro's predictive models provide unparalleled forecasting accuracy because they leverage unique skill sets across domain expertise, machine-learning capabilities, and data science. Our forecasts incorporate a combination of Gro's extensive suite of climate, environmental, and crop conditions data alongside other variables.

About Gro

Gro Intelligence illuminates the interrelationships between the Earth's ecology and human economy. Our system is curated by human intelligence and scaled through artificial

intelligence, enabling companies and countries to both see the big picture and act on the small details.

Gro's globally comprehensive data and forecast models cover a variety of subjects, geographies, and environmental conditions. By examining and translating the intersectional effects of supply, demand, price, climate, pests, and disease, the Gro platform provides meaningful, actionable insights. Our mission is to help customers make decisions with confidence.

Schedule a demonstration to learn more about our models.

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Appendix

When Do Government Agencies Typically Release Their Final Yield Estimates?

Country	Crop	Source	Month the government issues its final yield estimates
Argentina	Corn	The Ministry of Agriculture, Forestry, and Fisheries (MAGyP)	September-October
Argentina	Soybean	The Ministry of Agriculture, Forestry, and Fisheries (MAGyP)	September-October
Brazil	Corn	Instituto Brasileiro de Geografia e Estatística (IBGE)	October-December
Brazil	Soybean	Instituto Brasileiro de Geografia e Estatística (IBGE)	October-December
Canada	Spring Wheat	Statistics Canada's (StatCan)	November
China	Corn	The National Bureau of Statistics of China (NBS)	December
China	Winter Wheat	The National Bureau of Statistics of China (NBS)	N/A[13]
India	Wheat	The Department of Agriculture and Farmers Welfare	August
Russia	Winter Wheat	Russia United Interdepartmental Information and Statistical System (EMISS)	March
Ukraine	Wheat	State Statistics Service of Ukraine (Ukrstat)	April
US	Corn	USDA Annual Crop Production Summary	January
US	Soybean	USDA Annual Crop Production Summary	January

[13]The National Bureau of Statistics of China (NBS) has not released winter wheat yield since 2018.

| US | HRW Wheat | USDA Annual Crop Production Summary | January |

When Does The USDA Issue Its Final Planted Acreage Estimates?

Model	Country	Crop	Month the USDA releases initial prevent plant estimates	Month the USDA releases final prevent plant estimates
Prevent Plant	US	Corn	August	January
Prevent Plant	US	Soybean	August	January

Model	Country	Crop	Date the USDA releases planting intentions estimates
Planting Intentions	US	Corn	March 31
Planting Intentions	US	Soybean	March 31
Planting Intentions	US	Wheat	March 31
Planting Intentions	US	Cotton	March 31

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