

# Nick Murray - Data Product Design at Gro Intelligence

The following screenshots showcase my work at Gro Intelligence from 2021-2022. For any questions or other materials, please don't hesitate to contact me directly:

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(917)-386-3609

<http://nickm.io>

## About Gro Intelligence

Gro Intelligence empowers customers to make data driven decisions around responding to climate change impacts, and raising the efficiency of agricultural supply chains to support the activities of farmers and their customers. Gro's users also include sovereign governments and multinational donors, who employ Gro's analytics to promote and maintain food security among vulnerable populations.

My role has been to lead the design process behind both our paid analytics tools, and our public facing data products, screenshots below. For more details on select work, please refer to the "Case Studies" section of [my portfolio](#).

## Carbon Barometer - Comparing Climate Policy across the Globe

**Purpose:** Many policy mechanisms exist for regulating carbon emissions by effectively "pricing carbon," or incentivising the use of green technology. Experts at Gro Intelligence have recently developed a Carbon Price Index (CPI) that accounts for seven different policy types in its generation of a single, national level carbon price for over 25 countries, adjusted for each country's emission levels.

Our public facing Carbon Barometer (URL pending) highlights the differences in carbon pricing policy across participating countries, providing a launching point for multilateral agencies, fund managers, and NGOs to outline their support for national governments in their strategies for regulating carbon emissions.

**Launching:** October 2022

**Development Partner:** [Kepos Capital](#)

**Public URL:** Pending

# Pricing Carbon Policy Impact - Globally

IN PARTNERSHIP WITH  
 Kepos Capital

The Gro-Kepos Carbon Barometer tracks 7 policies globally for 20+ countries, and normalizes each policy into a standard USD per ton of CO<sub>2</sub> Emissions.

The Carbon Barometer aims to contribute to growing research on carbon prices - by governments, investors, companies, and researchers. Gro's focus is to act as a synthesizer through value-added data ingestion, normalization, and visualization to put this information in the hands of decision makers.

## Global Carbon Prices

## Policy by Country

Select Metric

Carbon Price Index (CPI)

Carbon Policy Spend as % of GDP

The Carbon Barometer price is a country-level price per ton of CO<sub>2</sub> emissions, implied by emissions reduction policies. The price is developed by aggregating together seven different policies. A higher Carbon Barometer price implies that emitters must pay a higher premium, meaning that a country is stricter on its emissions policies. Additional details can be found in our [documentation](#).

### Carbon Price Index (CPI), Participating Countries, 2021

CPI vs. Emissions per Capita, 2021

France  
Belgium  
UK  
Germany  
Italy  
Spain  
Netherlands  
Canada  
Czech Republic  
Poland  
South Korea  
Japan  
Australia  
Turkey  
United States  
India  
South Africa  
Mexico  
China  
Argentina  
Russia  
Indonesia  
Brazil  
Saudi Arabia  
Iran

Carbon Price Index (CPI), \$USD/tCO<sub>2</sub>

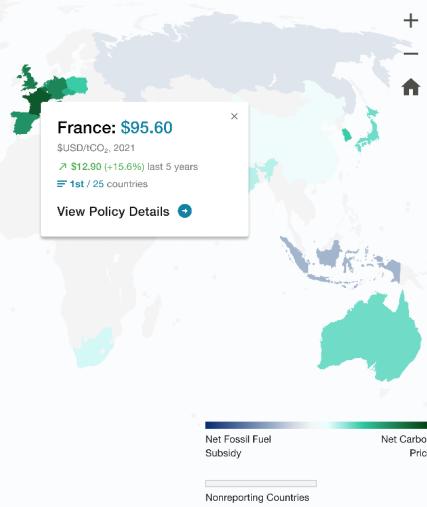
Total Carbon Emissions, MTCO<sub>2</sub>



Global Carbon Price Index (CPI)

\$USD/tCO<sub>2</sub>

**\$15.98**



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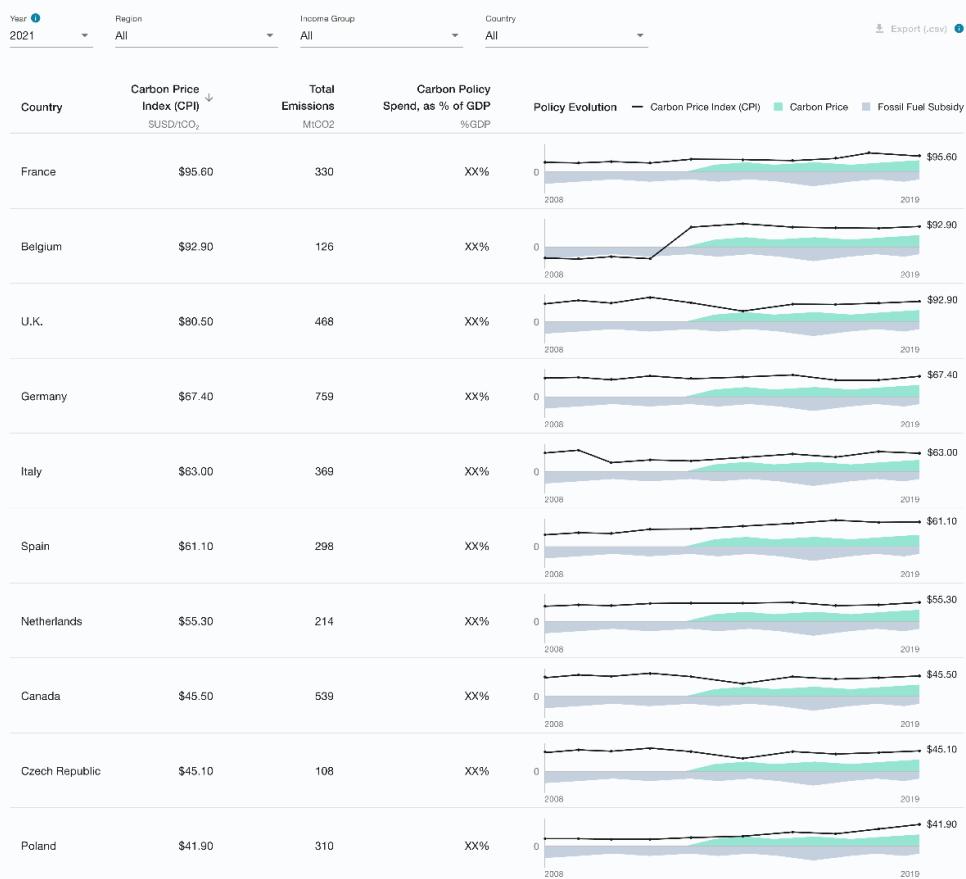
## Global Carbon Prices

## Policy by Country

Each row shows a single country and the statistics available through the Carbon Barometer. Users can dive into the data and sort based on any metric, and get a quick understanding of how countries compare on carbon prices. Additional details can be found in our [documentation](#).

Data source: [Gro Intelligence](#)  
Last updated: Oct 2, 2022 

[Policy Overview](#) [Policy Breakdown](#)



# Pricing Carbon Policy Impact - Globally

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### Policy Overview

### Policy Breakdown

Year 	Region	Income Group	Country	Export (.csv) 							
2021	All	All	All	Carbon Price Index (CPI) ↓ \$USD/tCO <sub>2</sub>	Fossil Fuel Subsidy \$USD/tCO <sub>2</sub>	Carbon Tax \$USD/tCO <sub>2</sub>	Emissions Trading Scheme \$USD/tCO <sub>2</sub>	Fossil Fuel Tax \$USD/tCO <sub>2</sub>	Feed in Tariff \$USD/tCO <sub>2</sub>	Low Carbon Fuel Std. \$USD/tCO <sub>2</sub>	Renewable Portfolio Std. \$USD/tCO <sub>2</sub>
France	\$95.80	-\$9.00	\$9.00	--	\$29.00	--	--	--	--	--	--
Belgium	\$92.90	-\$3.10	--	\$0.50	\$7.40	--	--	--	--	\$6.80	--
U.K.	\$80.50	-15.10	\$1.10	--	\$37.90	\$1.50	--	--	--	\$5.80	--
Germany	\$67.40	-\$4.70	--	--	\$44.30	\$6.60	--	--	--	--	--
Italy	\$63.00	-\$9.50	--	--	\$29.70	\$0.30	--	--	--	--	--
Spain	\$61.10	-\$2.20	\$0.10	\$1.20	\$16.40	\$1.50	--	--	--	--	--
Netherlands	\$55.30	-\$0.20	--	\$0.80	\$9.20	\$0.80	--	--	--	--	--
Canada	\$45.50	-\$2.21	\$3.50	\$1.30	\$13.80	\$0.40	\$0.10	\$8.40	--	--	--
Czech Republic	\$45.10	-\$0.10	--	\$0.20	\$3.90	\$0.50	--	--	--	--	--
Poland	\$41.90	-\$1.10	--	\$0.50	\$9.10	--	--	--	\$4.30	--	--

## Food Security Tracker - Directing Donor Support for Promoting Food Security

**Purpose:** Supply chain imbalances, and the war in Ukraine have resulted in a spike in global food prices, putting enhanced pressure on food importers in Africa, many of whom were already struggling to maintain food security. Our public facing [Food Security Tracker](#) highlights nations most at risk, and provides the detail necessary for donors to effectively target their support efforts.

**Launched:** April 2022

**Client:** [The Rockefeller Foundation](#)

**Public URL:** <https://community.gro-intelligence.com/food-security-tracker-africa>

# Tracking Food Security Across Africa

SUPPORTED BY  


Environmental, economic, and political shocks are driving rising food prices and limiting access to major crop staples.

Leveraging both the domain expertise of the Gro team and the most comprehensive, up-to-date data on the African continent, this interactive tool provides estimates on supply and demand for four major crops in Africa: wheat, rice, corn, and soybeans. It also shows the relative impact on food security by country.

[Explore 49 African Countries →](#)

## Stocks-To-Use Ratio ⓘ

## Gro Drought Index (GDI) ⓘ

A country's reserves of a specific crop is an indicator of food security. A stocks-to-use ratio shows the relationship between stocks and usage. Lower stocks-to-use ratios indicate higher food insecurity.

Gro's Stocks-to-Use Ratio below shows the stocks-to-use across four major crops for countries in Africa. The darker colors indicate countries that are facing tighter supplies and higher risks of food insecurity. Where applicable, the calculation uses Gro's production forecast in place of the USDA's. Last updated May 3, 2022.

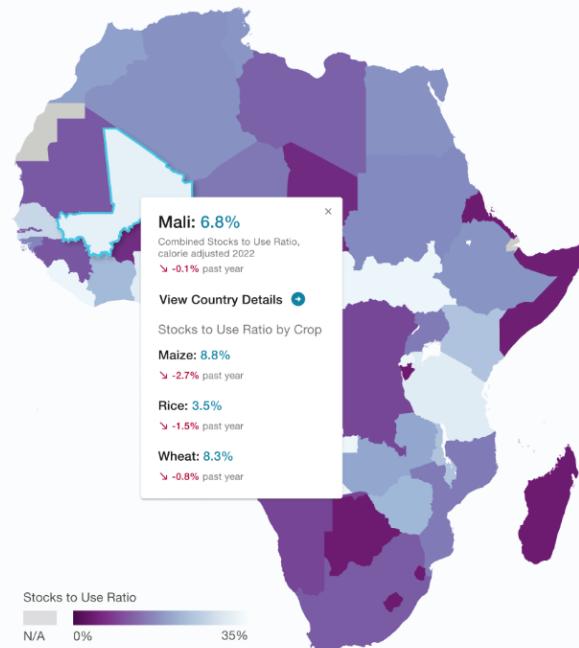
Click any country for details.

COUNTRIES WITH LOWEST STOCKS TO USE RATIO - COMBINED ACROSS CROPS ⓘ

Madagascar  
 Zimbabwe  
 Chad  
 Benin  
 Gambia

COUNTRIES WITH FASTEST FALLING STOCKS TO USE RATIO - COMBINED ACROSS CROPS ⓘ

Zimbabwe  
 Zambia  
 Ghana  
 Angola  
 Gambia



## In the News

### Impact Of Russia-Ukraine Conflict On Global Ag ⓘ

Feb 24, 2022

Given the two countries' importance to export markets, and the relationship between energy and ag prices, the conflict will impact agriculture and food supplies across the globe.

### North Africa Wheat Imports Could Jump As Region Battles Drought ⓘ

Jan 18, 2022

An increased reliance on imports could potentially strain national budgets and further fuel food price inflation.

# Tracking Food Security Across Africa

SUPPORTED BY  
The ROCKEFELLER FOUNDATION

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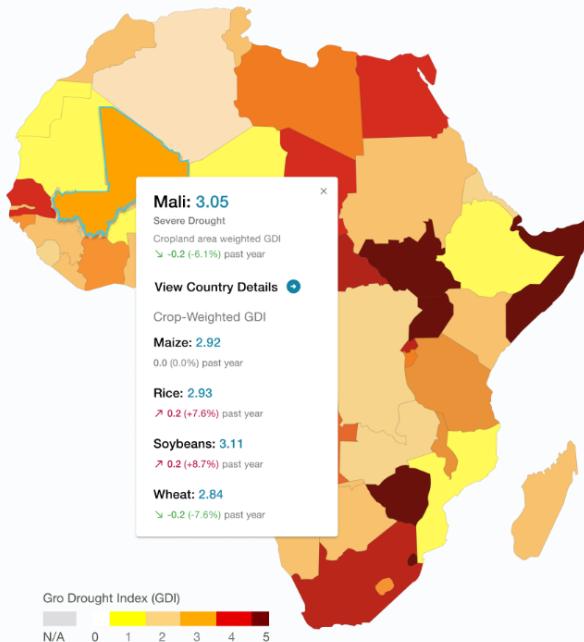
[Explore 49 African Countries →](#)

## Stock-to-Use Ratio ⓘ

## Gro Drought Index (GDI) ⓘ

The Gro Drought Index below shows weekly-updating drought conditions throughout Africa at the country level. Darker colors represent countries facing higher levels of drought, one of the leading indicators of reduced local production and an early warning of food insecurity. The values are weighted by cropland at the district level for each country. [Last updated May 3, 2022](#).

Click any country for details.



### COUNTRIES WITH HIGHEST GRO DROUGHT INDEX ⓘ

Somalia  
Mauritania  
Mali  
Morocco  
Niger

### COUNTRIES WITH FASTEST RISING GRO DROUGHT INDEX ⓘ

Kenya  
Uganda  
Tanzania  
Somalia  
Morocco

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Back

Country / Region

Mali

Commodity

Rice

Data source: Gro Intelligence

Last updated: Apr 26, 2022

## Mali - Rice Supply &amp; Demand Overview

[Download Dataset \(.xlsx\)](#)

## STOCKS TO USE - RICE

**3.47%**

↘ -1.5% past year

## RICE PRICE / TONNE

**347** \$USD/tonne

↘ -64.13 (-15.6%) past year

## GRO PROD. FORECAST, 2022

**2,235** thousand tonnes

↗ +198 (+9.7%) past year

## GRO DROUGHT INDEX

**2.93** (extreme drought)

↗ +0.21 (+7.6%) past year

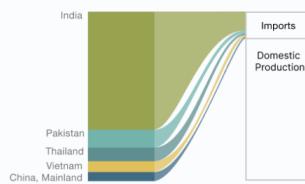
## VEG. HEALTH INDEX (NDVI)

**0.21**

↘ -0.01 (-6.7%) past year

## Import/Export Summary - Rice

## Imports From



Source: Gro Intelligence, Comtrade. Last Updated: Apr 26, 2022

## Balance Sheet - Supply &amp; Demand - Rice

## Elements

10 Year Average

2019/20

2020/21

2021/22

forecast

## Global Fertilizer Impact Monitor - Communicating the Food Security Impact of Fertilizer Shortages

**Purpose:** Exacerbated by the conflict in Ukraine, a global fertilizer shortage has brought a spike in fertilizer prices. This has significant implications for food security, as it affects the volume of staple crops farmers are able to produce, especially in low income countries.

The [Global Fertilizer Impact Monitor](#) summarizes this impact in calories, putting a spotlight on how integral fertilizer markets are to food security worldwide. Like the [Food Security Tracker](#), this public-facing website aims to direct the efforts of multinational donors in their approach to combating food insecurity.

**Launched:** June 2022

**Client:** [The Bill & Melinda Gates Foundation](#)

**Public URL:** <https://community.gro-intelligence.com/global-fertilizer-impact-monitor/>

# Tracking the Impact of Fertilizer Shortage on Global Food Security

Unprecedented supply and demand shocks are causing significant fertilizer shortages and soaring prices worldwide. With this scenario explorer tool, see the impact of changing fertilizer availability scenarios on global food production, and the resulting risks to food security.

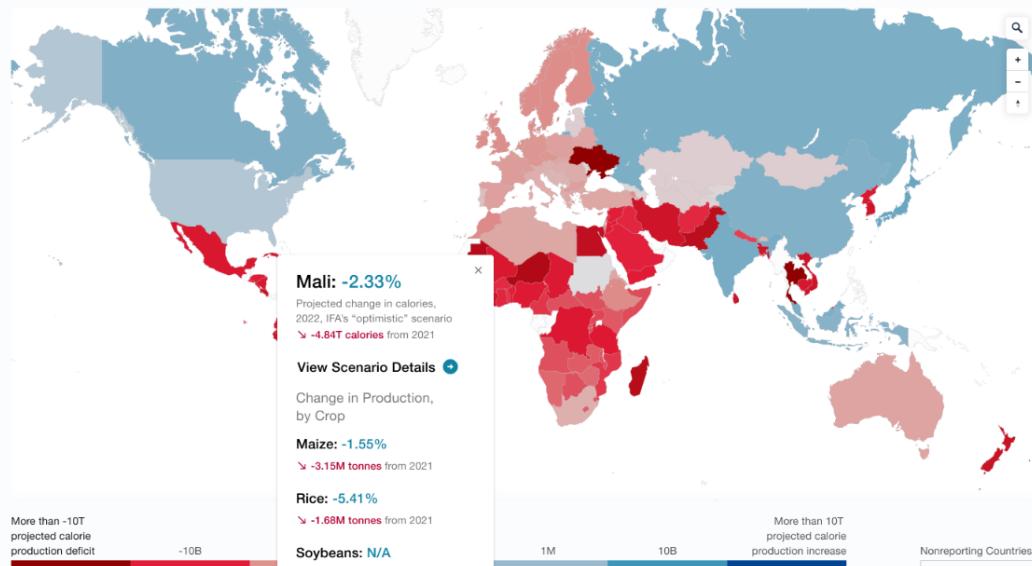
Explore Scenarios for  
Global Population

Select scenario

A change in annual global nitrogen fertilizer application based on **IFAs "optimistic" scenario**

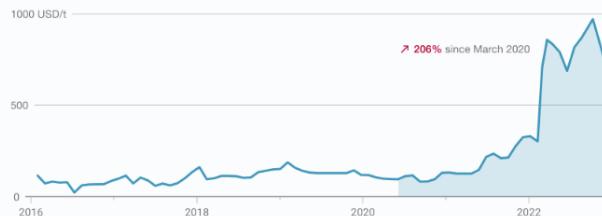
will lead to a production loss of **28 trillion calories.\***

Projected Production Change in Calories, International Fertilizer Association (IFA) "Optimistic" Scenario, 2022



The globe is turning red means a spike in the fertilizer price.  
Because farmers cannot afford the fertilizer they need, food yields suffer.

Global Nitrogen Fertilizer Price: \$707.50 USD/t



\*Read more about our Methodology [here](#)

# Tracking the Impact of Fertilizer Shortage on Global Food Security

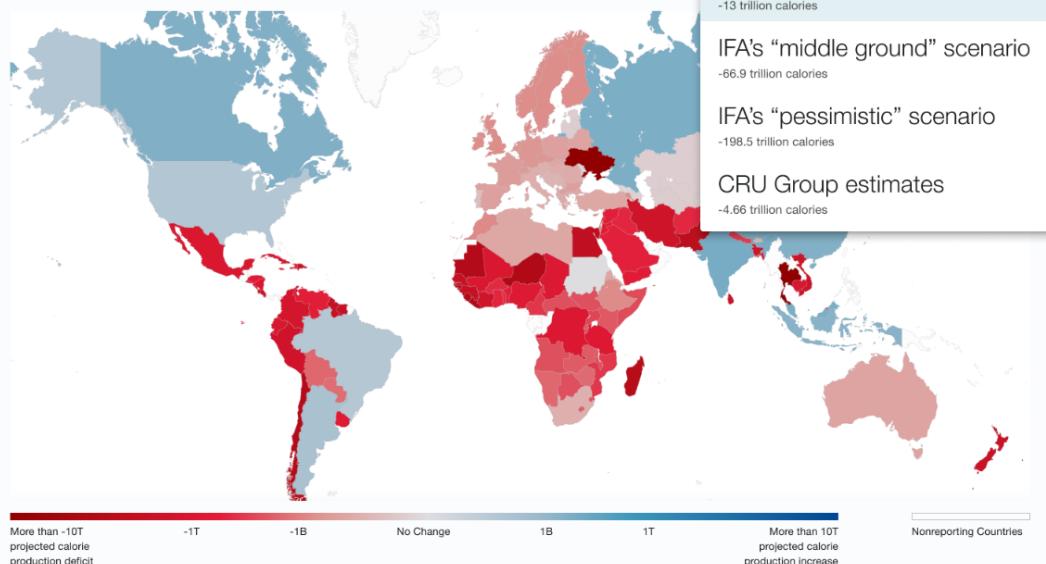
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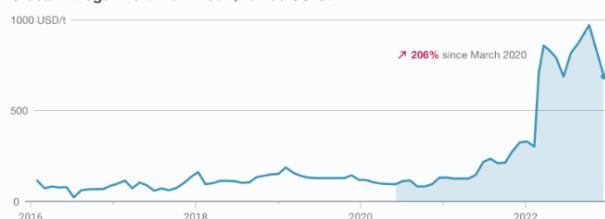
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Projected Production Change in Calories, International Fertilizer Association



The global fertilizer shortage means a spike in the fertilizer price.  
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Global Nitrogen Fertilizer Price: \$707.50 USD/t



Source: Gro Intelligence, GEM Commodities. Monthly F.O.B. Price, Middle East - Urea (nominal USD).

Current as of: June 17, 2022.

Current as of: Apr 28, 2022

\*Read more about our Methodology [here](#)

Back

Country  
Mali

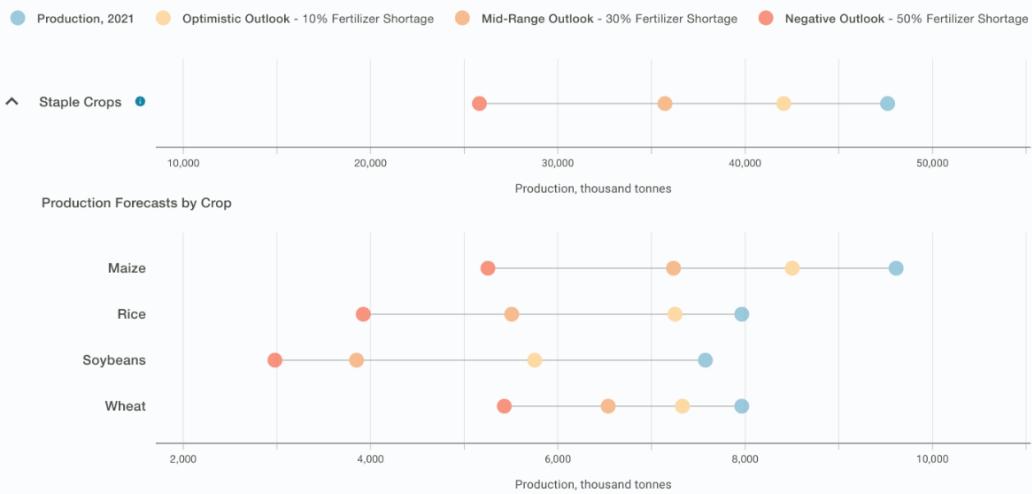
Data source: Gro Intelligence

Current as of: Jun 17, 2022

## Mali - Fertilizer Deficit Impacts

GRO DROUGHT INDEX	GRO FLOOD INDEX	VEGETATION INDEX	FERTILIZER IMPORTS, ANNUAL	FERTILIZER EXPORTS, ANNUAL
<b>2.93</b> (extreme drought)	<b>2.93</b>	<b>0.21</b>	<b>2,235</b> thousand tonnes	<b>2,235</b> thousand tonnes
↗ +0.21 (+7.6%) past year	↗ +0.21 (+7.6%) past year	↘ -0.01 (-6.7%) past year	↗ +198 (+9.7%) past year	↗ +198 (+9.7%) past year

## Food Production Forecasts, 2022

[Export \(.png\)](#)

Data Series	Maize	Rice	Soybeans	Wheat	Total Calories		Total Meals
					Thousands	Millions	Thousands
Staple Crop Production, 2021	4,563	4,563	4,563	2,235		7.65	2,235
Optimistic Outlook 1% Fertilizer Shortage	4,563 (-111.5%)	4,563 (-111.5%)	4,563 (-111.5%)	4,563 (-111.5%)	7.65 (-122.5%)	2,235 (-1.5%)	
Mid-Range Outlook 3% Fertilizer Shortage	4,563 (-111.5%)	4,563 (-111.5%)	4,563 (-111.5%)	4,563 (-111.5%)	7.65 (-1.5%)	2,235 (-1.5%)	
Negative Outlook 5% Fertilizer Shortage	4,563 (-111.5%)	4,563 (-111.5%)	4,563 (-111.5%)	4,563 (-111.5%)	7.65 (-1.5%)	2,235 (-1.5%)	
CRU Group Outlook	4,563 (-111.5%)	4,563 (-111.5%)	4,563 (-111.5%)	4,563 (-111.5%)	7.65 (-1.5%)	2,235 (-1.5%)	

Source: Gro Intelligence, USDA PS&D, CRU Group. Current as of: May 22, 2022. Read more about our Methodology [here](#).

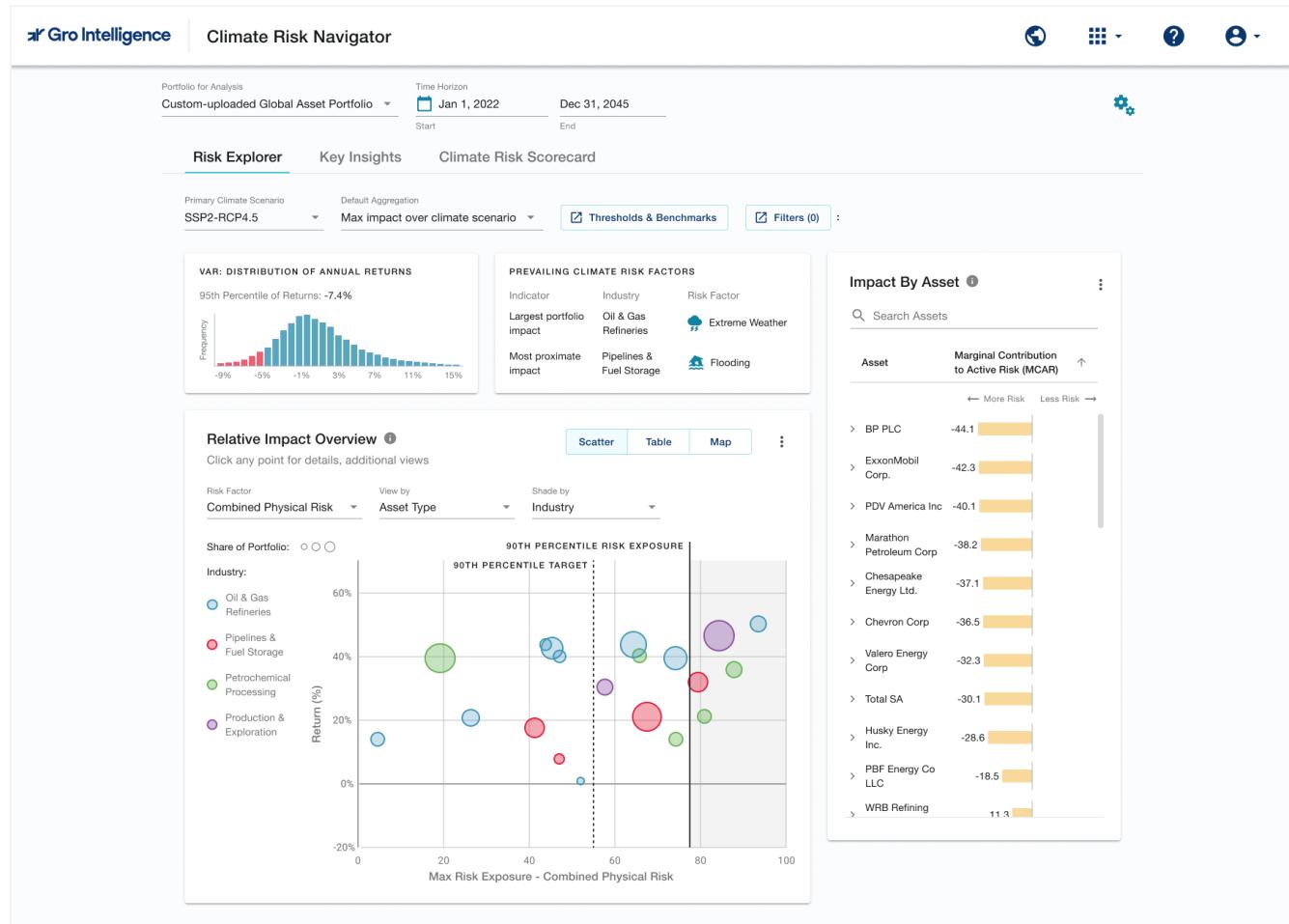
# Climate Risk Navigator - Enabling Data-Driven Strategies for Responding to Climate Risk

**Purpose:** Both industry and government have grown incredibly advanced in their ability to model and respond to various risk factors, informing their strategies for allocating resources, and managing portfolios of financial and physical assets. To date, climate risk factors do not commonly feature in these models. The Climate Risk Navigator enables Gro's industry and government partners to incorporate climate factors into their risk analysis strategies, enabling a proactive response to the inevitable impacts of climate change.

*For more detail on the design process behind this particular application, please refer to the Case Studies section of my portfolio: <http://nickm.io>*

**Launched:** TBD

**Client:** Multiple (Financial Services, Government Agencies)



Portfolio for Analysis

Custom-uploaded Global Asset Portfolio

Time Horizon

Jan 1, 2022

Dec 31, 2045

Start

End



Risk Explorer

Key Insights

Climate Risk Scorecard

Scatter Table Map

## Relative Impact Overview ⓘ

Click any point for details, additional views

Risk Factor

Combined Physical Risk

View by

Asset Type

Shade by

Industry

Share of Portfolio:

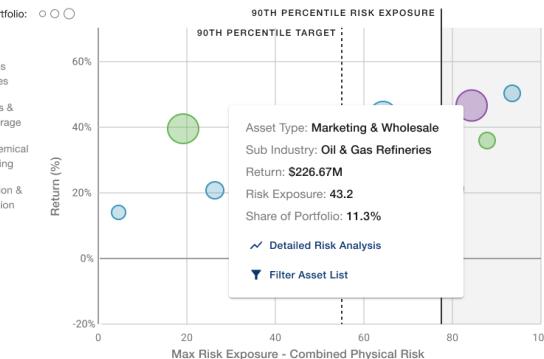
Oil &amp; Gas Refineries

Pipelines &amp; Fuel Storage

Petrochemical Processing

Production &amp; Exploration

Industry:



## Impact By Asset ⓘ

Search Assets

Asset

Marginal Contribution to Active Risk (MCAR)

	Marginal Contribution to Active Risk (MCAR)	More Risk	Less Risk
> BP PLC	-44.1		
> ExxonMobil Corp.	-42.3		
> PDV America Inc	-40.1		
> Marathon Petroleum Corp	-38.2		
> Chesapeake Energy Ltd.	-37.1		
> Chevron Corp	-36.5		
> Valero Energy Corp	-32.3		
> Total SA	-30.1		
> Husky Energy Inc.	-28.6		
> PBF Energy Co LLC	-18.5		
> WRB Refining	11.3		

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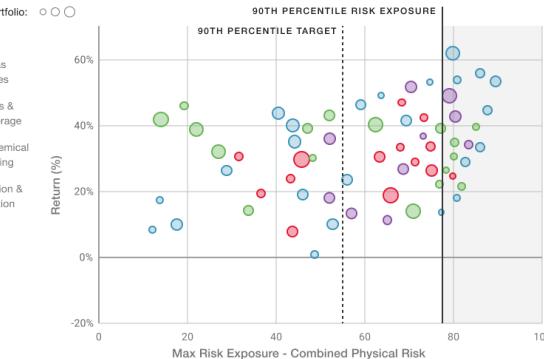
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**Gro Intelligence | 'Climate Risk Navigator'**

Portfolio for Analysis: Custom-uploaded Global Asset Portfolio | Time Horizon: Jan 1, 2022 Start to Dec 31, 2045 End

Risk Explorer Key Insights Climate Risk Scorecard

### Relative Impact Overview

Click any point for details, additional views

Risk Factor: Combined Physical Risk

View all Climate Scenarios

Year	HISTORIC	PROJECTED
1990	~15	~15
2000	~18	~20
2010	~20	~22
2020	~22	~25
2030	~28	~32
2040	~35	~40
2045	~42	~45

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## US Farmer Profitability & Crop Budgets - Assessing Demand for Agricultural Inputs

**Purpose:** Agricultural suppliers are constantly updating their sales and marketing strategy based on short and long term indicators such as yield forecasts, crop prices, and estimates of how farmer balance sheets are changing across regions and crop combinations. This application delivers timely signals on significant indicator movements, along with the deeper context suppliers need to move quickly, and in the right direction.

**Launched:** July 2022

**Client:** Multiple (Industry, Agricultural Suppliers)

[Overview](#)[Crop Budgets](#)[US Insights](#)[Global Yields](#)**Yield Forecast Models**

Estimates in-season yields at the district, province, and national levels on a daily basis

[explore the data](#) →**Planting Intentions**

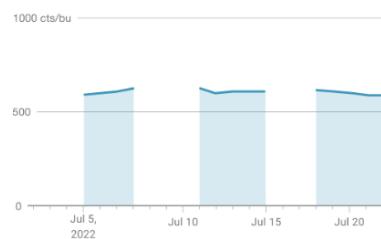
Gro's early projections of final planted area reported at the county level.

[explore the data](#) →**Climate and Weather**

Up-to-date overview of current conditions and long-term projections

[explore the data](#) →

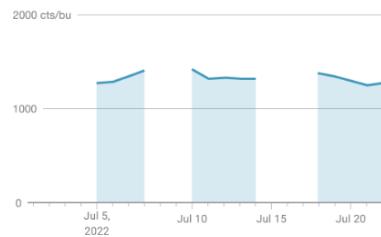
Crop Preview Current as of: July 22, 2022

Time Period of Percent Change: [1 Day](#) [7 Day](#) [30 Day](#) [1 Year](#)**Corn**[See Detailed Analysis](#)US Price: \$564.25 cts/bu ▼ -1.6% past day**Yield Projections**

State	Gro Projected Yield (bu/acre)	1 Day Change (%)
United States →	164.4	▼ -2.1%
Illinois →	189.6	▼ -0.9%
Indiana →	163.8	▼ -1.9%
Iowa →	164.4	▼ -2.1%
Kansas →	116.3	▼ -3.8%
Minnesota →	171.2	▼ -1.7%

1-7 of 18 &lt; &gt;

Source: Gro Intelligence. Current as of: July 22, 2022.

**Soy**[See Detailed Analysis](#)US Price: \$1315.75 cts/bu ▲ +1.1% past day**Yield Projections**

State	Gro Projected Yield (bu/acre)	1 Day Change (%)
United States →	50.6	▼ -0.1%
Arkansas →	50.6	▼ -0.1%
Illinois →	60.7	▲ +0.1%
Indiana →	54.3	▼ -0.4%
Iowa →	50.6	▼ -0.1%
Kansas →	41.0	▼ -0.5%

1-7 of 11 &lt; &gt;

Source: Gro Intelligence. Current as of: July 22, 2022.

**Gro Intelligence**[Gro Portal](#)[Gro Applications](#)[Support & Feedback](#)[Contact Us](#)

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Overview

Crop Budgets

US Insights

Global Yields

Crop  
CornState  
All Corn States (35)

Area

Crop Prices

Fertilizer Prices

Yields

Climate &amp; Weather

Supply &amp; Demand

Trade

Growing Conditions

CORN, CURRENT SEASON, USA

Gro Drought Index (GDI)

GRO YIELD MODEL (FORECAST)

48.62 bu/acre

↘ -6.90% since last year

HARVESTED AREA

87.2M acres

↗ +1.04% since last year

FUTURES PRICE, RFM

13.70 \$USD/bu

↘ -4.00% since last year

ANNUAL PRODUCTION

4.53B bu

↗ +7.11% since last year

STOCKS TO USE RATIO

5.41 %

↗ +0.39 since last year

Vegetative Health Index (NDVI)

Daily Land Surface Temperature

Gro Soil Moisture

NASS Soil Moisture

Observed Flood

Daily Weather

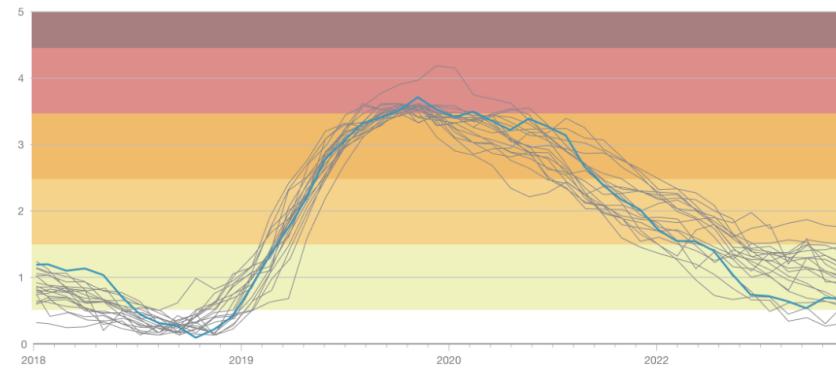
GFS Temperature Forecast

GFS Precipitation Forecast

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## Gro Drought Index (GDI), Corn - United States

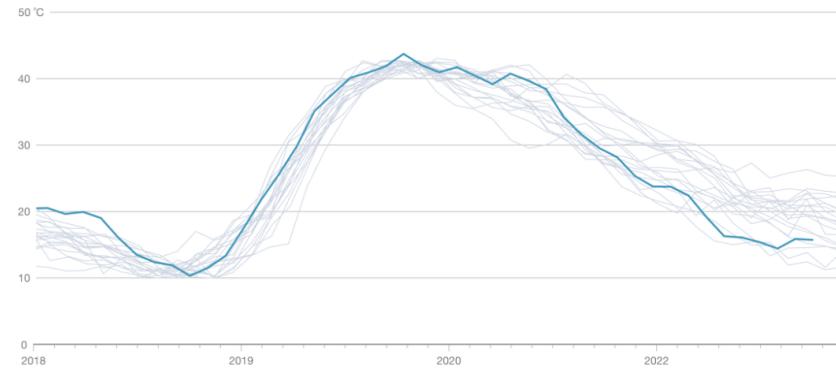
— 2022 — Past Years



Source: Gro Intelligence. Current as of: Jul 22, 2022.

## Vegetative Health Index (NDVI), Corn - United States

— 2022 — Past Years



Source: Gro Intelligence. Current as of: Jul 22, 2022.

## Daily Land Surface Temperature, Corn - United States

— 2022 — Past Years



Overview

Crop Budgets

US Insights

Global Yields

Crop  
CornRegion  
United States

## Crop Budget For Corn In United States



Source: University of Illinois

Crop Budget

Corn, following soybeans

Productivity Scenario

High Productivity

NET PROFIT

721 \$USD/acre

+421 since last year

GROSS REVENUE

1,505 \$USD/acre

+71.02% since last year

TOTAL COST

784 \$USD/acre

+35.17% since last year

GRO YIELD FORECAST

225.45 bu/acre

+3.60% since last year

CASH PRICE

7.0 \$USD/bu

+65.17% since last year

Revenue

2018

2019

2020

2021

2022

User Defined (2022)

YoY chg. (%)

Yield  
bu/acre

208

188

218

220

228

225.45

3.6%

Latest Gro Yield Forecast: 225.45 ± 5.3\*

Price  
\$/bu

3.6

4.5

3.3

4.0

6.6

7.0

65%

Latest DTN Price: 7.0\*

Crop Production Revenue  
\$/bu

749

846

719

880

1,505

1,505

71%

Government & Insurance Payments  
\$/acre  
[View all costs](#)

0

57

30

0

0

0

0%

Gross Revenue  
\$/acre

749

846

719

880

1,505

1,505

71%

## Fixed and Variable Expenses

Total Operating costs  
\$/acre  
[View all costs](#)

467

518

496

504

705

705

39.8%

Total Allocated Overhead  
\$/acre  
[View all costs](#)

67

74

75

76

79

79

3.9%

Total Costs  
\$/acre

534

592

571

580

784

784

35.2%

## Net Income

Operating Profit  
\$/acre

282

328

223

376

800

800

112.8%

Net Profit  
\$/acre

215

254

148

300

721

721

140.3%

Learn more about [metrics used in Crop Budgets](#).

\* Yield data is provided by Gro Yield Forecast that updates daily in-season. Price data is provided by DTN and updates daily.

Source: University of Illinois. Last released April 2022. Updates yearly.