nuveen
NATURAL CAPITAL

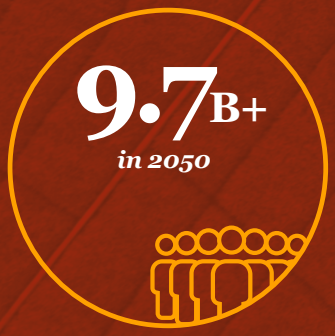
Lozice, Poland

Investing in *farmland*

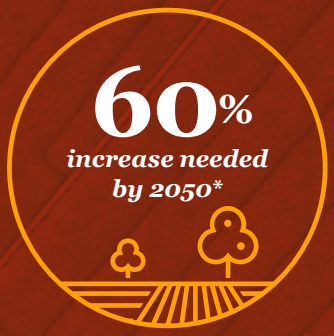
How does direct investment in global farmland provide diversification, inflation protection, and return potential?

By 2050, the world's farmland will likely have to support a population of more than nine billion people—an increase that will require a 60% boost in agricultural productivity.

GLOBAL POPULATION GROWTH



AGRICULTURAL PRODUCTION NEEDED



Sources: World Bank, January 2022 and Food and Agriculture Organization of the United Nations (FAOSTAT).
*Compared to FAO 2005/07 base year measurement

At the same time, the developing world's middle class is likely to continue to upgrade its diet, consuming more protein, and subsequently increasing pressure on global grain supplies. Moreover, industrialization and urban development continue to encroach upon the world's finite farmland resources. As water becomes an increasingly scarce resource, agricultural regions with sustainable water supply will become implied exporters of water by virtue of their crop production.

For these reasons, direct investment into global agricultural land presents an increasingly compelling investment opportunity, as it offers potentially steady returns on investment, low correlation to other assets and a hedge to inflation.

Investing in globally diversified farmland

Supply and demand fundamentals are positive

Investing in agricultural land is a fundamental way to benefit from the growing worldwide demand for food. We believe the case for investing in this asset class is not only strong now, but becoming stronger, due to several positive fundamental factors.

Growing populations will require more food

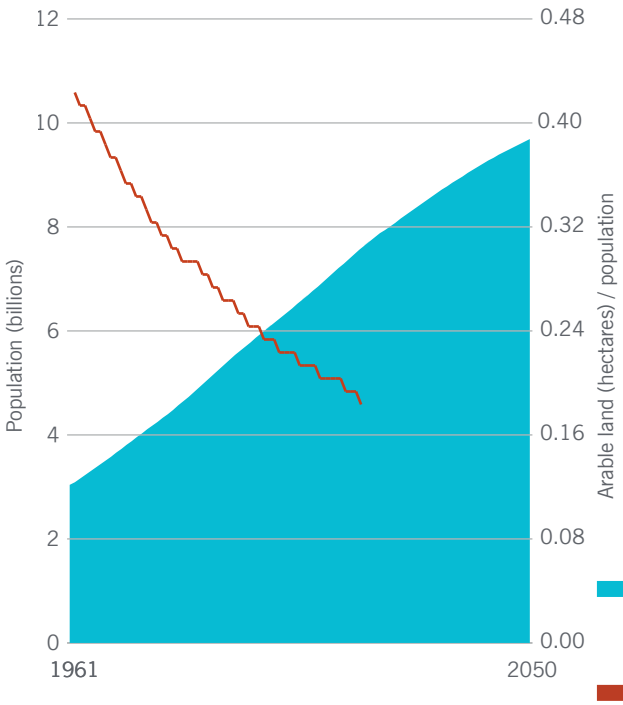
According to the UN, the world's population is currently expanding by over 67 million people per year. By 2050, agricultural producers will have to support a population of more than 9.7 billion people. The Global Harvest Initiative 2023 GAP report estimates that to meet demand by 2050, agricultural producers would have to double their output from 2010 levels. This will require an average annual growth rate of at least 1.91%. This will require an average annual growth rate of at least 1.91% in total factor productivity (TFP)—or the output per unit of total resources employed in production. The USDA's Economic Research Service data that between 2002–2021 global agricultural TFP rose by an average annual rate of 1.50% Although this growth rate does not seem significantly lower than the required 1.91% needed to meet future demand. This potential short-fall is driven primarily by increasing constraints in developing countries such as China and Brazil. However, as developing nations face constraints, including China's limited clean water supply, significant challenges remain in order to sustain the required productivity growth. In the face of continuing population growth and limited land base, farms globally must continue to do more with the same resources. As a result, there is likely to be continued pressure on prices for food-producing land.

Developing countries continue to increase protein consumption

The developing world has a growing middle class that will, as it becomes increasingly prosperous, consume greater quantities of protein. The Organization for Economic Co-operation and Development (OECD) estimates that consumption of major meat proteins (beef and veal, pork, poultry and lamb) in developing countries will increase by 12.6% through 2032. Producing a single pound of beef protein requires approximately ten pounds of feed grain, thus a shift toward greater global protein consumption will increase demand for grain dramatically.

In the face of continuing population growth and limited land base, farms globally must continue to do more with the same resources.

Projected population growth and declining arable land per person (1961–2050)



Sources: Food and Agriculture Organization of the United Nations (FAOSTAT)

Regions with secure water resources will become increasingly valuable

As water becomes increasingly scarce, farmland with sustainable water resources, including surface and groundwater, should see enhanced valuations. Given the necessity of water in agricultural production, agricultural exports are a method of transferring water from those countries with abundant water resources to those with lesser water resources.

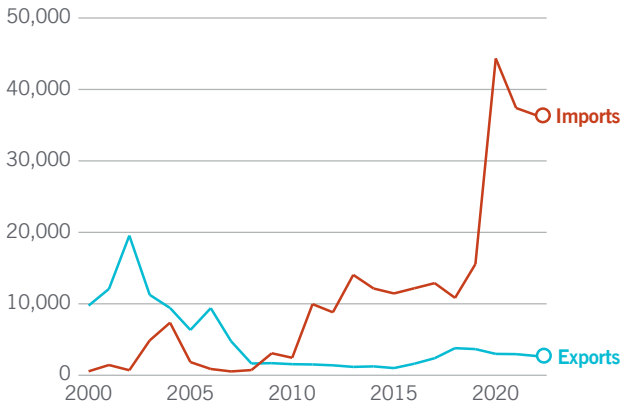
Development and industrialization will continue

Farmland globally continues to disappear under pressure from residential, business and industrial development. We expect this trend to continue and further limit the global supply of agriculturally productive land going forward.

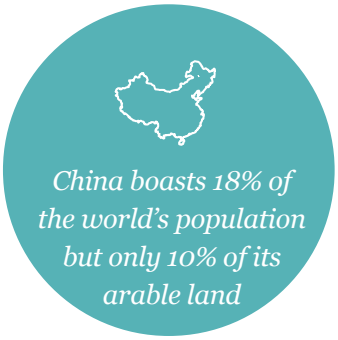
China will provide a strong export destination for producers

China needs to feed 18% of the world's population with approximately 10% of the total arable land—and their supply of arable land is shrinking as urbanization continues. Additionally, the country faces substantial clean water challenges, limiting their ability to bring additional land into production or improve the productivity of the existing land base. As China's population expands, urbanizes, and diets improve, the world's most populous country will become increasingly dependent on agricultural imports. In addition to China's significant presence in the soybean market, in 2011 the country became a net importer of corn, wheat, and rice, significantly increasing its reliance on foreign grains.

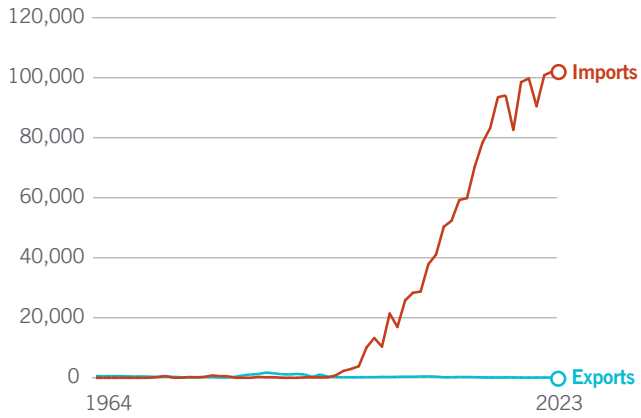
Historical trade of key grains in China
(Combined imports and exports of corn, wheat and rice, measured in 1,000 MT; 2000–2023)



Sources: USDA, Nuveen analysis.



Historical trade of soybeans in China
(Measured in 1,000 MT; 1964–2023)



Sources: USDA, Nuveen analysis.

Together, these factors may drive increased values for agricultural land and create opportunities for early investors in global farmland.

PROJECTED COMPOUND ANNUAL GROWTH RATE (CAGR) (2023–2032)

World population (2020–2030)
0.9%

Wheat *yield gains*
0.3%

Corn *yield gains*
0.6%

Soybean *yield gains*
0.9%

The key features of farmland investments

For the past 29 years, investments in U.S. farmland have achieved attractive total returns relative to asset classes like stocks, bonds and real estate, while also providing strong diversification benefits and a hedge against inflation.

A global portfolio of agricultural assets may provide all these advantages, as well as the additional risk mitigation that comes from diversified exposure to the world's economies. While we anticipate demand to remain relatively inelastic over time, supply shocks in certain regions or countries provide support for investing on a diversified, global basis.

Historically strong return

Agricultural land, as measured by the U.S.-only NCREIF Farmland Index, has outperformed both domestic stocks and bonds on an annualized basis over the last 29 years, providing both consistent income and capital appreciation. Although a global farmland benchmark has not been developed, we believe a global portfolio will deliver higher returns, due to the enhanced diversification, faster growth rates and lower valuations in emerging economies.

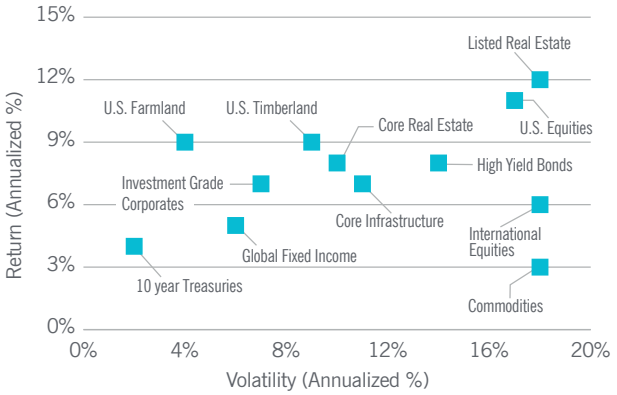
U.S. farmland values
(Average price per acre of Illinois, USA farmland)

$1,469 ↗ **$9,580**

per acre in 1990 *per acre in 2023*

Source: TIAA Center for Farmland Research.

Annual return vs. volatility (1990–2022)



Past performance is no guarantee of future results.

Sources: TIAA-CREF Center for Farmland Research, Standard & Poor's, Federal Reserve, MSCI, Commodity Research Bureau, Consumer Price Index. **U.S. Farmland:** NCREIF Farmland; **Listed Real Estate:** FTSE NAREIT All Equity REITs; **Core Real Estate:** NCREIF NFI-ODCE; **Timberland:** NCREIF Timber; **Investment Grade Corporates:** ICE BofA US Corporate Index (from 1992); **10 Year Treasuries:** ICE BofA U.S. Treasury 7-10 year; **High Yield Bonds:** BAML U.S. Cash Pay High Yield; **U.S. Equities:** SP 500; **International Equities:** EAFE; **Global Fixed Income:** BBG Global Agg; **Commodities:** BBG Commodity (from 1991)

It is not possible to invest in an index. Performance for indices does not reflect investment fees or transactions costs.

Asset return characteristics (1970–2022)

	Annual avg. return	Standard deviation
CPI	3.9%	2.8%
Gold	7.4%	21.7%
10-year treasury	6.8%	9.8%
NSADAQ Composite	9.9%	25.3%
MSCI EAFE	4.7%	20.5%
S&P 500	7.0%	16.7%
U.S. Farmland	10.0%	6.4%

Past performance is no guarantee of future results.

Sources: TIAA Center for Farmland Research, Consumer Price Index, Commodity Research Bureau, Federal Reserve, Standard & Poor's, NASDAQ, MSCI.

It is not possible to invest in an index. Performance for indices does not reflect investment fees or transactions costs.

Attractive risk-return characteristics

When measured on a risk-return basis, farmland compares favorably to other asset classes, demonstrating strong returns per unit of risk. Farmland investments provide resiliency through rising interest rate environments and has exhibited positive performance through every period of increasing interest rates.[1]

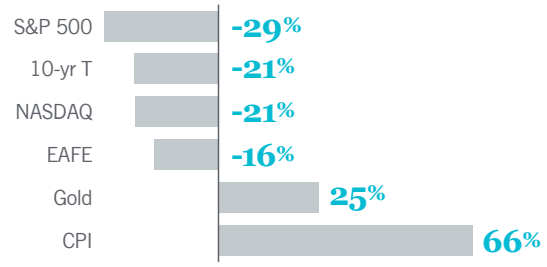
Diversification potential

Over time, agricultural investment performance has moved in different cycles from traditional asset classes such as stocks and bonds; as a result, adding farmland to a portfolio enhances diversification and can result in lower volatility. Over the past 40 plus years, agricultural land has demonstrated a low correlation to both stock and bond indexes.[3] Moreover, a globally diversified portfolio of agricultural investments can further reduce risk, as it spreads its exposure among a variety of crops, government structures and climates. When there is drought in Brazil, for instance, growing conditions in Australia may be very positive. By investing globally, the impact of unexpected events in any single portion of the portfolio can be reduced.

Inflation hedging qualities

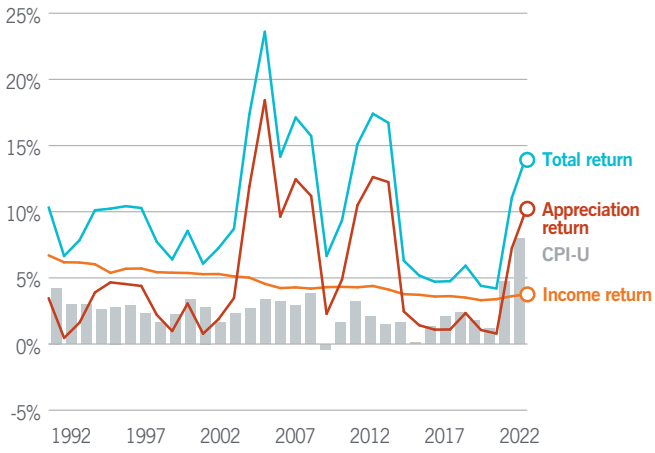
Historical farmland returns have outpaced inflation in a variety of market environments.[2] The NCREIF Farmland Index's Total Return has consistently provided returns more than double the inflation rate since 1991, as the chart below shows.

Correlation of select assets vs. average U.S. farmland (1970–2022)



Source: TIAA Center for Farmland Research, Standard & Poor's, Federal Reserve, MSCI, Commodity Research Bureau, Consumer Price Index.

NCREIF farmland returns vs. inflation (% in 1991–2022)



Past performance is no guarantee of future results.

Sources: NCREIF Farmland Index and the Consumer Price Index – Urban.

The inception date of the NCREIF Farmland Index is 4Q 1990. The CPI-U produces monthly data on changes in the prices paid by urban consumers for a representative basket of goods and services since 1913. NCREIF Farmland Index returns are used for the time frame above to demonstrate income and capital appreciation components, which are not available from the TIAA-CREF Center for Farmland Research database.

How to invest in farmland

With strong fundamentals and historically attractive risk and return characteristics, we believe investments in agricultural land are increasingly compelling for institutional investors.[4] Still, gaining exposure to this relatively nascent asset class requires an understanding of certain basic characteristics and structures. This section discusses some of the most important factors to consider in developing a farmland investment strategy.

Global versus domestic exposure

Institutional farmland investing is more established in the U.S. with a stronger legal and regulatory framework and greater liquidity than other developed and emerging markets. An investment strategy focused solely on the U.S. and other developed countries offers the core attributes of the asset class, including good return potential, low correlation with traditional assets, and inflation hedging. Furthermore, farmland investments in developing countries can offer increased capital return potential due to infrastructure improvements and higher economic growth rates as well as increasing productivity through the modernization of farm management. In addition, a global portfolio provides exposure to a diverse variety of markets, crops, growing seasons, weather, economies, currencies and governments— reducing the impact of changes in any single area.

Different types of agricultural assets

Different types of agricultural investments, each with distinctive risk and return characteristics, can further diversify a portfolio.

ROW CROPS

These crops are planted and harvested annually and include **grains and oilseeds such as corn, soybeans and wheat.** Typically, row crop investments produce relatively steady income returns over time since planting decisions can be made annually. A number of row crops, such as corn, soybeans and sugarcane, are also used in the production of alternative fuels. Given their lower risk profile compared to permanent crops, row crops often serve as the core of a diversified portfolio.

PERMANENT CROPS

Permanent crops, such as **wine grapes, tree nuts, citrus, apples and avocados,** have a long lifespan, typically 25 years or more. They mature three to seven years after planting, so there is usually a lag between investment and realization of returns. Roughly 40% to 70% of the value of the investment is above the ground in the form of a tree or vine that makes replanting annually cost-prohibitive. These crops historically have delivered higher average income returns than row crops, but they also have experienced higher volatility on a year-to-year basis.

NATURE-BASED SOLUTIONS

These are investments in **conservation, restoration and improvements in land management that increase ecosystem services, carbon storage or reduce emissions**. In the context of farmland, this is achieved through regenerative land management by decreasing synthetic input use and managing soil health while maintaining crop yield potential. Additionally, protecting and enhancing the biodiversity of natural areas adjacent to cropland offers opportunities for evolving biodiversity and carbon markets. In all, investments in nature-based solutions allow investors to provide food and fiber to a growing population with nature-positive outcomes.

Direct farmland investments vs. commodity futures

Historically, institutional investors have often gained investment exposure to the agricultural asset class via commodity futures markets. Although commodity futures are highly liquid and readily investible, they can also be extremely volatile, with prices driven by short-term market movements and sentiment.

Moreover, by purchasing commodity futures, investors participate only in the appreciation potential of that specific commodity and not in the increase in the value of the land where it was grown, or the added value that can come from investments in agricultural infrastructure. By purchasing farmland, investors gain access to the key factor of production that is most closely tied to the fundamental factors supporting the investment thesis. Direct investments in land are less liquid than commodity investments but offer investors the chance to benefit from long-term appreciation trends in farmland.

As discussed, farmland is a key factor in the production of food. As the demand for food rises and the supply of arable land declines due to increased industrialization and development, owners of high-quality farmland are positioned to benefit for years to come.

Important differences between the two approaches:

	Farmland	Commodities
Liquidity	Often illiquid	Can be traded in real time
Volatility	Low	Very high
Primary drivers of return	Potentially intrinsic value of land; longterm global food supply and demand, capital appreciation	Short-term trading arbitrage[1]
Holding period	Typically multiple years	Unrestricted—from minutes to years
Ability to participate in long-term appreciation of farmland	Yes	No
Ability to improve value of owned assets through infrastructure development	Yes	No
Potentially steady income	Yes	No
Inflation hedge	Yes	Yes

As an asset class, agricultural investments are less developed, more illiquid, and less transparent compared to traditional asset classes. Agricultural investments will be subject to risks generally associated with the ownership of real estate-related assets, including changes in economic conditions, environmental risks, the cost of and ability to obtain insurance, and risks related to leasing of properties.

1 Commodity futures can be used to speculate on longer term trends both on the upside and downside.

Understanding operating strategies

Four primary operating strategies can be utilized for direct farmland investments, each having distinct risk/return implications.

1

CASH LEASE/CASH FLEX

A basic cash lease is structured on a one- to three-year basis at a fixed dollar amount per acre. The tenant pays the lease up front and keeps any profit above the lease amount. In a cash flex structure, the tenant pays lower cash rent, but gives up a portion of the upside of crop production based on commodity pricing during the crop year. In both structures, the tenant is expected to maintain the quality of the property during the lease term.

2

SHARE LEASE

In a share lease, the investor and tenant each provide a share of the inputs to produce the crops. The investor and tenant then share the crops produced or the revenue from the crop production, and the investor typically receives a "preferred return" for providing the land.

3

CUSTOM FARMING

In this structure, the investor selects an operator who will farm the land and provide the necessary inputs, man-power and machinery. The investor takes all the risk and reward of crop production while making minimal direct capital investments in farmland equipment and personnel.

4

DIRECT FARMING

Here, the investor operates the property directly, providing the machinery, personnel and crop inputs needed. This structure offers the best return potential to the investor, but also the highest degree of risk.

Managing risk in agricultural investment

As an institutional asset class, farmland is less developed, more illiquid and more inefficient compared to traditional asset classes. Many deals take place off-market, making reputation and local market knowledge vitally important in accessing and closing transactions. It is difficult to measure performance since no global benchmark has, as of yet, been established.

For all these reasons, it is critical to manage risk carefully, through diversification by geography, crop type and strategy. In addition, seasoned investors can mitigate risk by developing in-depth knowledge of local conditions and strong relationships with local partners as well as a broad understanding of the global factors that influence agricultural production and marketing. Furthermore, investors need to have robust compliance and oversight capabilities in order to address environmental issues, legal, accounting and control requirements, sustainability and labor practices, among other factors. Management experience and relationships are key differentials in developing, managing and executing a successful farmland investment portfolio.

From a broader portfolio perspective, investors should understand that though agricultural investments on the whole have a low historical performance correlation to traditional asset classes, these correlations might collapse during broad market downturns and significantly limit the diversification benefits of any one asset class, including agricultural investments.

An emerging asset class for institutional investors

Interest among institutional investors in global farmland portfolios is growing, given the asset class's strong fundamentals, risk-adjusted returns, low correlations with traditional investments and inflation protection.

Global farmland investing typically falls within the alternative asset category, but farmland is a unique asset class even within this classification. A global portfolio offers inflation hedging characteristics similar to commodities. However, it also offers the potential for further value creation through active management and infrastructure development that is typical of real estate or private equity. Agricultural land also offers a steady cash income stream. Moreover, since there is a finite supply of global farmland and growing demand for food, these assets seem likely to appreciate even more strongly in the years to come.

Designing and building global farmland portfolios requires significant involvement on the part of the portfolio manager in developing agricultural assets to their full potential. It requires both macro insights into worldwide trends in food supply and demand, as well as an understanding of specific local markets and conditions. Finally, farmland is a long-term investment in which positions often cannot be traded readily and where returns may take several years to materialize. Based on the complexity involved, institutional investors seeking exposure to global farmland should take care in selecting an experienced investment manager with a track record for success investing in agricultural properties.

Nuveen is the global asset management arm of TIAA, managing $1.3 trillion in assets[1] for over 1,300 institutional clients in 32 countries[2] worldwide, across fixed income, equities, alternatives and solutions based strategies.

Nuveen Natural Capital is a land-focused investment manager with $13.1 billion of assets under management. We provide investors access to global farmland, global timberland, and nature-based solutions, with $13.1 billion of assets under management across diverse geographies, crop and tree species, operating strategies and environmental markets such as carbon and mitigation banking.

With over 39 years of investment experience and more than 175 employees globally, the platform offers extensive geographic reach combined with deep sector expertise.[3]

1 As of 31 Mar 2025. Nuveen assets under management (AUM) is inclusive of underlying investment specialists. 2 As of 31 Dec 2023; updated annually. 3 NNC data is as of 31 Dec 2024, AUM reflective of fair market value for farmland and invested capital for timberland. 46 NNC employees sit within the Brazil Radar JV and are not included in these figures.

For more information about investing in farmland, visit us at nuveen.com/naturalcapital.

Endnotes

1 How do rising interest rates affect natural capital investments? Nuveen Research, June 2023.

2 Inflation hedging ability of natural capital investments, Nuveen Research, November, 2022.

3 The power of private real assets. Nuveen Research, January 2022.

4 Building resilient natural capital portfolios through diversification. Nuveen Research, October 2023

Risks and other important considerations

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As an asset class, agricultural investments are less developed, more illiquid, and less transparent compared to traditional asset classes. Agricultural investments will be subject to risks generally associated with the ownership of real estate-related assets, including changes in economic conditions, environmental risks, the cost of and ability to obtain insurance, and risks related to leasing of properties.

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