TIAA-CREF Asset Management

Investing in Agriculture
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Direct investment in farmland on a global scale can provide diversification, inflation protection and return potential

By 2030, the world’s farmland will likely have to support a population of more than eight billion people — an increase that will require a 25% boost in agricultural productivity. At the same time, the developing world’s middle class will continue to upgrade its diet, consuming more protein, and subsequently increasing pressure on global grain supplies. Moreover, worldwide usage for alternative fuels is likely to grow, creating additional demands on agricultural land, while continuing industrialization and development will shrink the land available. As water becomes an increasingly scarce resource, those agricultural regions with sustainable water supply will become implied exporters of water by virtue of their crop production.

For all of these reasons, global agricultural land is emerging as an exceptionally compelling investment opportunity, offering potentially stable returns on investment, low correlation to other assets and inflation protection.
Investing in agricultural land is a fundamental way to benefit from the growing worldwide demand for food. The case for investing in this asset class is not only strong now, but becoming stronger, due to several positive fundamental factors that we will discuss here.

Growing populations will require more food

According to the UN, the world’s population is currently expanding by 25 million people per year. By 2030, agricultural producers will have to support a population of more than eight billion. The Global Harvest Initiative 2010 GAP Report estimates that, to meet global demand, by 2050 agricultural producers worldwide will have to double their output. This will require an annual average growth of at least 1.75% in total factor productivity (TFP) — or the output per unit of total resources employed in production. Between 2000 and 2009, the USDA's Economics Research Service estimates that global agricultural TFP roughly kept in line with this pace, driven primarily by productivity gains realized 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, limited land base, and slowing input growth, farms globally must continue to do more with the same resources. As a result, we expect to see continued pressure on prices for food and 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 more and more protein. The Organisation 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 22.3%, or approximately 2.0% per year, through 2022. Producing a single pound of protein requires approximately ten pounds of feed grain, thus a shift toward greater global protein consumption will increase demand for grain dramatically.

Alternative fuel production will increase demand for energy-rich foods

Corn and sugarcane are the primary inputs for ethanol, while soybeans and canola are used to manufacture bio-diesel. A shift to alternative fuels — as when the U.S. government raised the renewable fuel mandate from nine billion gallons per year in 2008 to 36 billion in 2022 — creates additional demand for agricultural products and land. In 2012, the U.S. produced approximately 15.2 billion gallons of renewable fuels, leaving an additional 20.8 billion gallons to be achieved in order to meet the 2022 mandate.

Combined annual consumption of corn, soybeans and wheat

Sources: USDA, FAOSTAT
Regions with secure water will become increasingly valuable producers

As water becomes increasingly scarce, farmland with sustainable water resources, including rainfall and irrigation, should see enhanced valuations over time. Given the importance of water in agricultural production, agricultural exports are a method to transfer water from those countries with abundant resources to those with poor water resources. Furthermore, the value of water assets attached to farmland may overtake the pure, farmland value, depending on the region.

Development and industrialization will continue

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

Some large food producers will become consumers

China feeds 20% of the world’s population with approximately 8% of the total arable land—and the supply of arable land is shrinking as urbanization continues. Additionally, the country faces substantial clean water challenges, limiting the ability to bring any more land into production or improve the productivity of the existing land base. As China’s population becomes larger and more urban and diets improve, we can expect the world’s largest nation to 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, increasing its reliance on foreign grains.

All combined, these factors will drive increased values for agricultural land and create opportunities for early investors in global farmland.

Sources: USDA, FAOSTAT

Historical trade of key grains in China

Combined imports and exports of corn, wheat and rice, measured in 1,000 MT

Sources: Bloomberg, TIAA Analysis.

Historical trade of soybeans in China

Measured in 1,000 MT

Sources: Bloomberg, TIAA analysis.
The key benefits of investing in farmland

For the past 22 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 protection from inflation. A global portfolio of agricultural assets should provide all these advantages, as well as the additional risk protection 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 strong 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 22 years, providing both consistent income and capital appreciation. While a global farmland benchmark has not been developed, we believe a global portfolio can be expected to deliver higher returns, given the enhanced diversification, faster growth rates and lower valuations in emerging economies. Data show that, since 1970, total returns from U.S. farmland have averaged 10.7%, providing further long-term support for the asset class.

U.S. farmland values

Average price per acre of Illinois farmland

Annual return vs. volatility

1970–2012

Asset return characteristics

<table>
<thead>
<tr>
<th>Asset/Index</th>
<th>Annual Average Return</th>
<th>Standard Deviation</th>
<th>Coefficient of Variation</th>
<th>U.S. Avg. (All) Correlation</th>
</tr>
</thead>
<tbody>
<tr>
<td>U.S. Farmland</td>
<td>10.7%</td>
<td>6.5%</td>
<td>0.61</td>
<td>1.00</td>
</tr>
<tr>
<td>PPI</td>
<td>4.0%</td>
<td>4.9%</td>
<td>1.22</td>
<td>0.63</td>
</tr>
<tr>
<td>CPI</td>
<td>4.2%</td>
<td>2.9%</td>
<td>0.68</td>
<td>0.64</td>
</tr>
<tr>
<td>3M T-bill</td>
<td>5.3%</td>
<td>3.1%</td>
<td>0.59</td>
<td>0.23</td>
</tr>
<tr>
<td>S&amp;P 500</td>
<td>6.3%</td>
<td>17.0%</td>
<td>2.68</td>
<td>-0.26</td>
</tr>
<tr>
<td>10-year Treasury</td>
<td>7.0%</td>
<td>2.7%</td>
<td>0.39</td>
<td>0.04</td>
</tr>
<tr>
<td>EAFE</td>
<td>6.5%</td>
<td>21.2%</td>
<td>3.26</td>
<td>0.00</td>
</tr>
</tbody>
</table>

Sources: TIAA-CREF Center for Farmland Research, Standard & Poor’s, Federal Reserve, MSCI, Commodity Research Bureau, Consumer Price Index.
Attractive Risk-Return Characteristics
When measured on a risk-return basis, farmland compares extremely favorably to other asset classes, demonstrating strong returns per unit of risk.

Diversification potential
Over time, agricultural investment performance has moved in very different cycles from traditional asset classes like stocks and bonds; as a result, adding farmland to an investor’s portfolio enhances diversification and can result in lower volatility. Over the past 40 years, agricultural land has demonstrated a low performance correlation to both stock and bond indexes, meaning that land prices have generally risen as stocks have fallen and vice versa. 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 Russia, 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.

Protection against inflation
Returns on farmland investments have historically outpaced inflation in a variety of market environments. The NCREIF Farmland Index’s Total Return has consistently provided returns more than double the inflation rate since 1991, as the chart below right shows.

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 agriculture

With strong fundamentals and historically attractive risk and return characteristics, agricultural investments have become increasingly compelling for institutional investors. Still, developing an exposure to this relatively new institutional asset class requires an understanding of certain basic characteristics and structures. In the sections below, we’ll discuss some of the most important factors to consider in developing an agricultural investment strategy.

Global versus domestic exposure

Institutional farmland investing is more well-established in the U.S. with a stronger legal and regulatory framework and greater market liquidity than other developed and emerging markets. An investment strategy focused solely on the U.S. and other developed countries offers many benefits of the asset class, including good return potential, low correlations and inflation protection. However, agricultural investments in developing countries can offer increased capital return potential because of higher economic growth and the ability for investors to improve farm productivity by upgrading infrastructure and modernizing 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

A portfolio can be further diversified among different types of agricultural investments, each with distinctive risk and return characteristics. These include:

- **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 more stable 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, nuts, citrus, apples, and cranberries, 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 70% to 80% 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.
Value-added investments: These are not agricultural investments per se, but instead are investments in related companies and technologies that aid in the production and distribution of food. They might include alternative fuel producers and distributors, grain storage facilities, water treatment companies, and other allied businesses. Given that many of these investments are private or exclusive in nature, access to these transactions is often based on a manager’s relationships and breadth in the sector. Generally, only portfolio managers with sufficient scale and strong relationships within the sector consider these types of transactions, which allows them to participate in opportunities that are related to agriculture, but further up the value chain.

Direct investments versus 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. Commodity futures are also expensive to hold due to high transaction costs, and have relatively high carrying costs as well.

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. In addition, 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 we have discussed, farmland is the 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. Here are some important differences between the two approaches:

<table>
<thead>
<tr>
<th></th>
<th>Direct Investment</th>
<th>Commodities</th>
</tr>
</thead>
<tbody>
<tr>
<td>Liquidity</td>
<td>Often illiquid</td>
<td>Can be traded in real time</td>
</tr>
<tr>
<td>Volatility</td>
<td>Low</td>
<td>Very high</td>
</tr>
<tr>
<td>Carry costs</td>
<td>Low</td>
<td>High</td>
</tr>
<tr>
<td>Primary drivers of return</td>
<td>Intrinsic value of land; long-term global food supply and demand</td>
<td>Short-term trading arbitrage</td>
</tr>
<tr>
<td>Holding period</td>
<td>Typically multiple years</td>
<td>Unrestricted—from minutes to years</td>
</tr>
<tr>
<td>Ability to participate in long-term appreciation of farmland</td>
<td>Yes</td>
<td>No</td>
</tr>
<tr>
<td>Ability to improve value of owned assets through infrastructure development</td>
<td>Yes</td>
<td>No</td>
</tr>
<tr>
<td>Stable income</td>
<td>Yes</td>
<td>No</td>
</tr>
<tr>
<td>Inflation protection</td>
<td>Yes</td>
<td>Yes</td>
</tr>
</tbody>
</table>
Understanding operating structures

Direct investors in agriculture use four primary structures for managing their properties, each with its own characteristics and benefits. These include:

- **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.

- **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.

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

- **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’ strong fundamentals, historic high returns, low correlations to traditional investments and protection from inflation. 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-protection 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.
TIAA-CREF Global agricultural investments

TIAA-CREF has been managing institutional assets for more than 95 years. We provide institutional investors and intermediaries with disciplined investment strategies across all asset classes and investment styles, emphasizing pure asset class exposure and rigorous risk management. Our Global Agriculture Investments program was established in 2007. We currently oversee an approximately $5 billion portfolio of high-quality farmland diversified across the United States, Australia, Brazil, and Eastern Europe.

In September 2010, TIAA expanded its platform by acquiring a controlling ownership interest in the Westchester Group, Inc., one of the U.S.’s premier independent agricultural asset managers, with nearly 25 years of investment experience. TIAA’s Global Agriculture Investments platform is further supported by our majority-owned joint venture, Radar Propriedades Agrícolas SA. In partnership with Cosan SA, a leading global agribusiness company with a more than 80-year history, TIAA has developed Radar into a highly efficient and successful company dedicated to sourcing, acquiring and managing farmland assets in Brazil. With approximately 50 people across numerous locations around the world, TIAA and its affiliates offer potential investors access to an extensive network of experienced professionals with significant operating scale.

Find out more about investing in agriculture

To learn more about agriculture and TIAA-CREF’s investment approach, please contact us.

www.tiaa-cref.org/assetmanagement

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