

Precision Ag Tools

With a Deep Dive into Irrigation Tech

A Food is Investable Deep Dive

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This report is part of a series that examines the investability of categories across Re:food's four themes, exploring the addressable problem, potential solutions, and investment landscape for venture capital, private equity, and infrastructure investors. Here, we dig into precision agriculture tools with a focus on irrigation technology. To read more about Re:food's views on the Investability of the agrifood sector, download Food is Investable at refood.co/investable.

This report was originally published in March 2025. It has been edited and updated to include information on recent irrigation technology investments and market movements.

The Critical Role of Ag Inputs and Precision Agriculture Tools in Balancing the Productivity and Sustainability Imperatives

Agriculture inputs and precision agriculture tools are essential for achieving high production yields, which drive economic development and contribute to global food security. The actual impact of these technologies on yield is influenced by factors such as soil fertility, climate, and farming practices, but it is undeniable that they have helped the food system fulfill its **Productivity Imperative** of producing enough nutritious food to feed the global population. While chemical inputs have driven the majority of these improvements (synthetic nitrogen fertilizer is estimated to feed 40-50% of the global population), when used together, these inputs create synergistic effects that further enhance yields. These direct productivity benefits can go hand in hand with land-use benefits, as they make existing agricultural land more productive, thereby reducing the amount needed for agriculture and making land available for rewilding or other uses.

On the negative side, however, these agricultural inputs have adverse environmental and socioeconomic consequences that threaten the food system's **Sustainability Imperative**: the food system must limit environmental harm to help us stay within planetary boundaries. These negative impacts include:

- **Greenhouse gas emissions:** Synthetic nitrogen fertilizers are estimated to account for 10.6% of the agrifood sector's total greenhouse gas emissions, which in turn account for about one-third of anthropogenic greenhouse gas emissions. Most of these emissions are caused by energy-intensive production processes, or as nitrous oxide and methane emissions from chemical reactions of fertilizer applied in the soil.
- **Biodiversity loss:** Conventional farming practices currently prioritize chemical fertilizers, pesticides, and intensive soil-management practices such as plowing, harrowing, and tilling. These practices have a profound impact on biodiversity, affecting soil structure and organisms, plant diversity, and insect populations, with downstream impacts on other species that depend on this land for food and habitat. Extensive research underscores agriculture's detrimental effects on biodiversity, which vary with the severity of degradation, ecosystem types, affected species, and restoration efforts. Reports by the World Economic Forum indicate that restoring ecosystems and intricate species interactions will take decades and significant financial effort.
- **Water consumption and pollution:** Water consumption is a key theme in agricultural crop and livestock production, as it accounts for 72% of global freshwater withdrawals today. Agricultural inputs and tools affect water systems in multiple ways. On one hand, modern irrigation systems

efficiently deliver water, reducing wastage and total volume of water required. At the same time, irrigation is a major driver of water scarcity as demand for high-value, water-intensive crops continues to rise. Finally, agricultural inputs such as fertilizers, pesticides, and animal manure pollute waterways through nutrient runoff, pesticide contamination, and sediment from soil erosion, creating significant health risks for humans, particularly infants, and degrading aquatic ecosystems.

- **Human health:** The impact of agricultural inputs on human health is significant and multifaceted. Pesticides and fertilizers play a key role in protecting human health by improving nutrition and making it more accessible, and by suppressing harmful pests and crop diseases. At the same time, though, these toxic chemicals increase the risk of acute poisoning and chronic diseases.

The objective of agricultural intensification, or producing more with fewer inputs, is not new. What has changed is the recognition that the downstream impacts of this intensification must also be considered, and that new tools and technologies must be developed to sustainably produce enough food.

Investment Hot Spots in the Sustainable Farming Inputs and Precision Agriculture Tools

Awareness of the challenges with agricultural input use has increased over the years. McKinsey's 2023 Farmer Survey, for example, revealed that 90% of surveyed farmers in the United States were aware of alternative sustainable farming practices, but adoption remained low, with operational and financial support as key barriers. These barriers are exacerbated by the current challenging economic environment in agriculture, but farmers continue to adopt technologies that demonstrate clear value and fit into existing workflows (McKinsey 2026 Farmer Survey). We see an interplay of factors that should accelerate adoption going forward:

- **Social awareness:** Growing concerns about the environmental, socioeconomic, and human health impact of certain agricultural inputs, as outlined above. A 2020 survey by the Hartman Group, for example, found that 56% of U.S. consumers are concerned about the environmental impact of food production, including the extensive use of pesticides and fertilizers.
- **Scientific necessity**: pests, weeds, and diseases evolve resistance to pesticides and herbicides, making them less effective over time, while new modes of action are rarely brought to market.
- **Economic motivations:** Rapid increases in the prices of fertilizers due to geopolitical events such as the 2022 Russian invasion of Ukraine and the 2026 Iran Conflict.

While concerns about agricultural inputs are rising, technological innovation and the commercialization of new products are making sustainable alternatives increasingly accessible, including the substitution of chemical crop protection products with biological and mechanical tools. Looking ahead, we expect these trends and changing usage patterns in agricultural inputs and precision agriculture tools to shift value pools across farming input sectors, as illustrated in Chart 1. This includes, for example, a shift in value away from chemical inputs (pesticides, synthetic fertilizers, etc.) and toward biological crop protection, as well as an increasing pool of value for mechanized irrigation equipment.

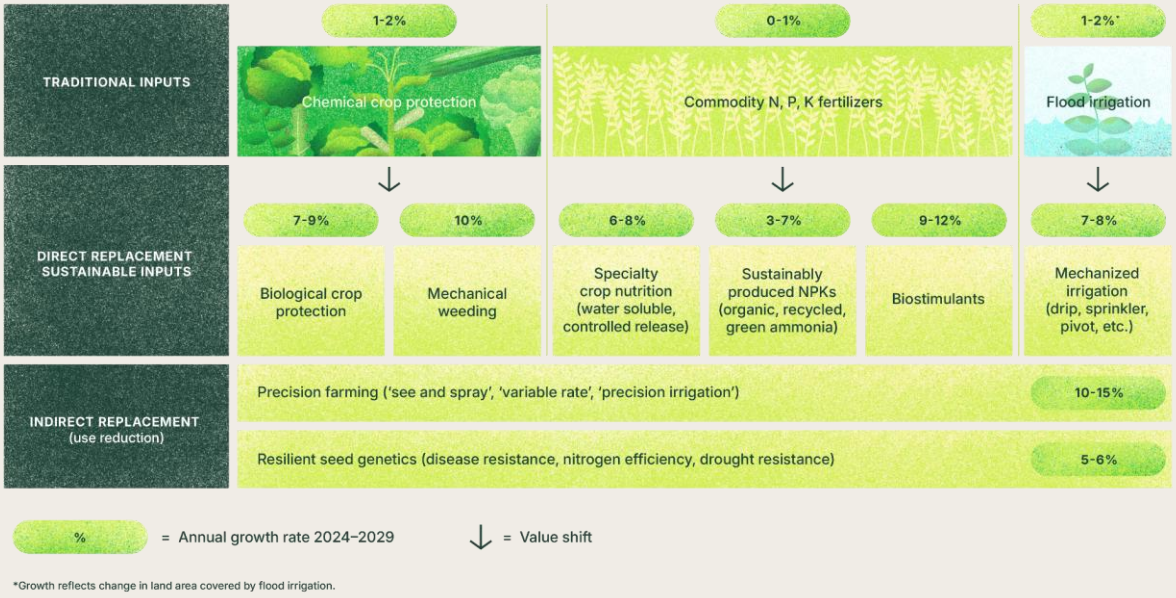


Chart 1: Shifts in value across ag technology segments

These projected shifts in value pools are creating a new category of sustainable agricultural inputs and technologies, presenting attractive investment opportunities that span eight segments:

- **Biological crop protection**: beneficial macro-organisms, microbials, and biochemicals that act alone or in integration with conventional practices to limit pest, weed, and disease pressure.
- **Farm robotics and automation:** technologies that enable precise management, including mechanical weeding, harvesting, and input application.
- **Specialty crop nutrition:** water-soluble, controlled-release, and slow-release fertilizers and micronutrients applied precisely for maximum absorption by the plant.
- **Sustainably produced NPKs:** production methods for fertilizers that focus on organic, recycled, or sustainably produced alternatives to conventional energy-intensive options.
- **Biostimulants**: micro-organisms and biochemicals that enhance or enable natural processes like nutrient uptake, nitrogen fixation, stress tolerance, and crop quality.
- **Mechanized irrigation:** efficient systems that reduce evaporation and waste, such as via drip application, subsurface delivery, or center pivot.
- **Precision agriculture:** management programs that tailor water, fertilizer, and management practices to soil, crop, and weather conditions.
- **Resilient seed genetics**: optimizing plants for disease resistance, nitrogen efficiency, and drought resistance via precision breeding and gene editing.

This diverse array of investment opportunities within this area, and their potential financial and sustainability impacts, positions it as a primary destination for investors in the agrifood space. According to the 2026 AgFunder Global AgriFoodTech Investment Report, these segments collectively

received USD 3.7 billion, or 23% of the sector's total venture capital funding in 2025. Looking ahead, we expect these segments to gain even more traction among investors as they combine real economic value to growers with measurable soil and ecosystem outcomes.

Each of the eight investable segments differs in dynamics such as competitive landscape, economic profile, and exit potential, affecting their relevance for venture investors, growth equity investors, and infrastructure investors. We have selected **mechanized irrigation** as a deep dive in this report due to the urgency around water issues, the theme's relevance across all asset classes, and its strong growth momentum going forward.

Snapshot on Irrigation: Addressing Water Stress

Water scarcity is not a concern confined to a handful of regions; it is already a reality for a meaningful share of global agriculture. An estimated 1.2 billion people, roughly one-sixth of the world's population, live in agricultural areas of severe water constraint, with exposure concentrated in South Asia and East and Southeast Asia, where more than 40% of the rural population farms under significant water stress. Agriculture is both the leading driver of this problem and its unfortunate victim, as it accounts for approximately 72% of global freshwater withdrawals according to FAO's latest Aquastat data. In many regions highly dependent on groundwater, withdrawals are outpacing natural recharge: a 2024 study in Nature found that groundwater level declines have accelerated over the past four decades in nearly a third of the world's regional aquifers, with the steepest losses concentrated in dry regions with extensive cropland, including parts of India, northeastern China, the western United States, Mexico, Iran, and Saudi Arabia.

Looking ahead, agriculture's claim on freshwater will not go uncontested. The rapid buildout of AI infrastructure has put data centers on a steep trajectory for water use. The IEA estimates that data centers today consume more than 560 billion liters of water annually, a figure that could more than double to roughly 1,200 billion liters annually by 2030 as facilities scale up to support more advanced computing. Although agricultural water consumption will still far outpace data centers in much of the world at these elevated run rates, the relevant risk is not aggregate competition for water but local competition. Because water is sourced and managed at the basin or aquifer level rather than globally, a wave of new data center capacity concentrated in already water-stressed regions, such as the western United States, can meaningfully tighten the water available to nearby farmers.

Regardless of water pressure levels, water is a necessity for food production. It supports essential processes such as photosynthesis, nutrient absorption, cell growth, and overall plant health. Conversely, water stress can significantly hinder plant growth and reduce yields by disrupting various physiological functions. Too little water is obviously an issue, but too much water can also pose a threat via soil erosion, nutrient leaching, and crop waterlogging. Managing water efficiency, as the frequency and intensity of extreme wet and dry events are increasing globally, is as important for farmers as the availability of water.

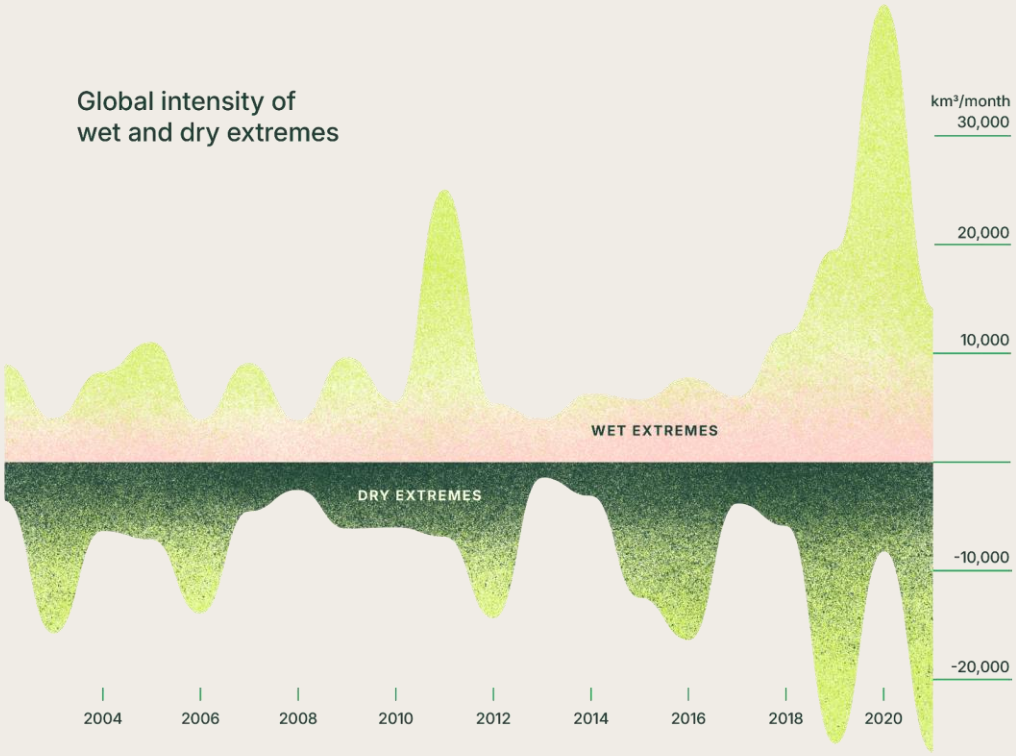


Chart 2: Global intensity of wet and dry extremes. Note: Multiyear events are assigned to the year with peak intensity. Source: Rodell and Li, Nature Water (2023), based on an analysis of NASA Grace and Grace-FO data

Water Technology Solutions

Approaches to addressing water challenges are broadly grouped into two categories. The first focuses on enhancing plants' own water efficiency and drought resistance through drought-tolerant genetics, biostimulants (like microbials and seaweed) that improve soil health and enhance plant stress responses, and soil conditioners (such as biochar) that improve water retention. The second category focuses on improving water availability and uptake efficiency, using technologies such as modern microirrigation systems and digital irrigation monitoring and control applications. As with all agricultural technologies, factors such as crop type, environmental and soil conditions, and farm capabilities and resources affect which strategy is most effective, and growers will likely see the greatest benefit from a combination of approaches rather than a silver-bullet solution. Here, we focus on the second category of irrigation technologies.

Not all irrigation is equally efficient. FAO's indicative field-application efficiencies are 60% for flood and furrow irrigation, 75% for sprinklers such as center pivots, and 90% for drip. At the global level, replacing surface systems with sprinklers or drip could cut non-beneficial water use by 54% and 76%, respectively, without lowering yields. Even so, drip adoption remains low and uneven. It covers under 11% in the United States and about 8% of net sown area in India, even after a decade of national

subsidies. Water stress alone does not explain where farmers adopt drip. Other key factors include whether water is priced, capped, or mandated, as in California under SGMA and Australia's Murray–Darling Basin, where water prices rose 89–159% in major zones in 2025. Generous subsidies matter too, in markets such as Morocco, Chile, and India. Drip also pays off when it can deliver fertilizer and save labor on high-value orchards, vineyards, and vegetables. On lower-value row crops, the economics are harder: in the U.S. Great Plains, subsurface drip costs $1,200–1,400 per acre against $800–1,000 for a center pivot and must last at least 11 years to break even. As a result, it covers less than 1% of Kansas's irrigated land. We expect drip to stay a niche technology in broad-acre crops for the foreseeable future, with most new growth coming from high-value crops in water-constrained emerging markets.

The technology landscape is anchored by incumbents with established distribution networks and brand recognition, ranging from diversified equipment and software providers that serve irrigation, such as John Deere and AGCO, to irrigation specialists like The Toro Company, Lindsay Corporation, Rivulis, and Jain Irrigation Systems. Despite incumbents' presence, innovative startups have a role to play in addressing some of the challenges of precision irrigation, such as digital solutions that drive irrigation efficiency, remote or automated application, and drip irrigation hardware that lowers pumping costs and addresses clogging issues (source: Pitchbook Irrigation Tech Innovation Spotlight, Q1 2025).

At the more hardware-heavy end of the segment, private equity's engagement with mechanized irrigation has moved from initial entry to active consolidation, but deals remain limited. Netafim, a manufacturer of drip- and micro-irrigation systems, was acquired by Orbia (then Mexichem) in 2018. Recently, Orbia has been engaged in a prolonged sale process for the business; an initial Chinese buyer group's bid reportedly ran into regulatory friction, and a Spanish bidder has since emerged, all around a valuation of roughly $1.4 billion, which is a discount to the $1.8 billion price that Orbia paid. Rivulis, also a manufacturer of drip- and micro-irrigation systems, was acquired by Temasek in 2020 from existing investors Paine Schwartz Partners and FIMI Opportunity Funds. Three years later, Temasek backed Rivulis' acquisition of the international irrigation business of Jain Irrigation, creating what the parties describe as a global irrigation and climate leader. It remains to be seen whether these transactions mark the start of a broader trend of PE engagement in the space.

Infrastructure-related activity in agricultural irrigation is beginning to take a more defined shape, at least in the United States, although private infrastructure investment capital has yet to meaningfully enter the space. Bluefield Research now forecasts $84 billion in cumulative U.S. irrigation spending between 2026 and 2031, split between on-farm systems and off-farm delivery infrastructure such as canals, districts, and federal water projects, which draw a disproportionate share of investment in water-scarce Western states. Public capital has done much of the early work here. The Bipartisan Infrastructure Law directed $8.3 billion over five years to the Bureau of Reclamation for water storage, conveyance, and desalination projects, including dedicated funding for on-farm water conservation partnerships with irrigation districts.

Venture capital dollars continue to flow into the space, with a focus on capital-light sensors and software-enabled solutions that improve the efficiency of existing systems. Irrigreen, for example, raised a $19 million Series A in April 2025 for its robotic, digitally mapped sprinkler platform, while Verdi Expeditions closed a $6.5 million seed round in May 2025 for retrofittable, AI-driven irrigation controls that the company says can cut water use by up to 70%. Although still a small segment compared to the wider agtech landscape (PitchBook recorded just 3 deals and $271 million in total

capital raised in 2026), trends indicate that companies in the space are maturing. Deal count has declined over the last few years, even as total capital raised has increased, mirroring a trend in the wider AgTech landscape: capital flowing to fewer, better companies that are seeing real market traction. Acquisition activity by incumbents remains limited, with just two transactions since 2020: Valmont Industries acquired Prospera in May 2021 for a reported $300 million, and Lindsay Corporation acquired FieldWise in July 2023. The largest source of exits in the space has been CropX, which has acquired three irrigation-related technologies since 2020 (Regen, Tule, and Green Brain). Macro trends support the importance of this sector going forward, but venture investors should view this space as nascent and be prepared for long hold periods.

Takeaways for Investors

Taken together, we continue to consider mechanized irrigation a highly relevant investment destination, though the opportunity is currently constrained by incumbent strength and a challenging ag economy that limits growers' ability to invest in expensive irrigation systems. **Venture capital** continues to flow into the software and sensing layers that improve existing hardware rather than replace it. A wave of **private equity** consolidation has brought together a maturing set of platforms at prices that are being tested in real time, with the outcome of Netafim's sale likely to serve as the next read on where those valuations settle. **Infrastructure capital**, still the least developed of the three, may finally be pulled off the sidelines, though it will likely remain concentrated in a handful of water-stressed geographies rather than a broad-based opportunity. Still, the incentive for growers to adopt more efficient and sustainable irrigation technologies will only grow as climate change and competition from data centers continue to impact global water availability, providing a meaningful and inescapable tailwind for the sector.

The analysis and conclusions expressed here are the work of Re:food Invest.
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